Land economic inventory of the state of Wisconsin. [1934/]

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1 Land economic inventory of the State of Wisconsin, Juneau County

2 Land economic inventory of the State of Wisconsin, Rusk County

3 Wisconsin land inventory [forests]

4 Land economic inventory of the State of Wisconsin, Waukesha, Racine and Kenosha Counties

5 Inventory of northern Wisconsin lakes

STATE OF WISCONSIN
EXECUTIVE COUNCIL

No. 1

Madison, Wisconsin

June, 1934

(3)

Land Economic Inventory

of

The State of Wisconsin

JUNEAU COUNTY

By

JOHN S. BORDNER, *in charge*

H. R. ALDRICH, *geologist*

WILLIAM W. MORRIS, *forester*

JOHN H. STEENIS, *associate*

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LEO T. CROWLEY, *Chairman*
Executive Council

January 28, 1915, at the po
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Division of Land Economic Inventory

Cooperating Agencies

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E. F. Bean, State Geologist
Walter F. Choinski, Cartographer, Conservation Department
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The Wisconsin Historical Library
The Wisconsin National Guard
The Wisconsin Department of Public Instruction

For Cover and Land use Township Plats : Write Land Economic Inventory of Executive Council, Room 411 W., Capitol, Madison, Wisconsin.

Table of Contents

LAND ECONOMIC INVENTORY OF THE STATE OF WISCONSIN

JUNEAU COUNTY

INTRODUCTION

A social economy that offers the greatest economic security to the population of any geographic region can only be attained by a careful analysis of its potential possibilities for honest effort and an adequate return to maintain family and community life and governmental functions. A well planned land use policy based upon scientific findings is therefore basic to such an economy. A planless policy results in hardship and frequently a decadent social order, where that which is good becomes perverted into evil. True con-

PLATE I

servation, therefore, begins with the conservation of human life, and is reflected in the preservation of environmental resources.

Nature has been kind to the people of Juneau county in that it has furnished them a land base adapted to varied uses, reaching from that of intensive land culture by the cranberry grower, and the splendid general and dairy farm practices, to the uses for forest and wild life. Developing this diversified adaptation of its land requires patience and vision on the part of the people of the county and should be based on a careful study of the land inventory report. It is hoped that schools and community clubs will use the report freely in arriving at a better understanding of the county's potential possibilities.

JUNEAU COUNTY

Location

Juneau county is located in south central Wisconsin, about 50 miles due south of the geographic center of the state. It lies in two of the major physiographic provinces of the State, the Central Sand Plain and the Western Upland. (See Plate I, page 5.)

Transportation

Rail and motor transport connect Juneau county with such primary markets as the twin cities to the northwest, the industrial cities on the Lake Michigan waterfront to the east and south, and the less remote cities and towns with extensive wood-working industries on the Wisconsin and Fox Rivers.

Elevations

The highest and lowest elevations are about 1350 and 850 feet indicating a maximum relief of about 500 feet. The higher elevations are concentrated in the southwest, the north and east having an average elevation of slightly above 900 feet. Details of physiography are discussed in the following paragraphs.

PRIMARY LAND DIVISIONS

Juneau county is divided into three major land divisions or provinces determined by its geological past. These are (1) the Northern or Sand Plain Province, (2) the Intermediate Province and (3) the Southern or Upland Province.

The Northern or Sand Plain Province

Fully 60% of the county lies in this low-lying plain sloping southward at the rate of about 4 feet to the mile. Locally the underlying sandstone rises gradually above the plain in low mounds, frequently to become exposed on their summits, or it juts abruptly above the plain in isolated crags. With the exception of the southern part, this province is monotonous and depressing.

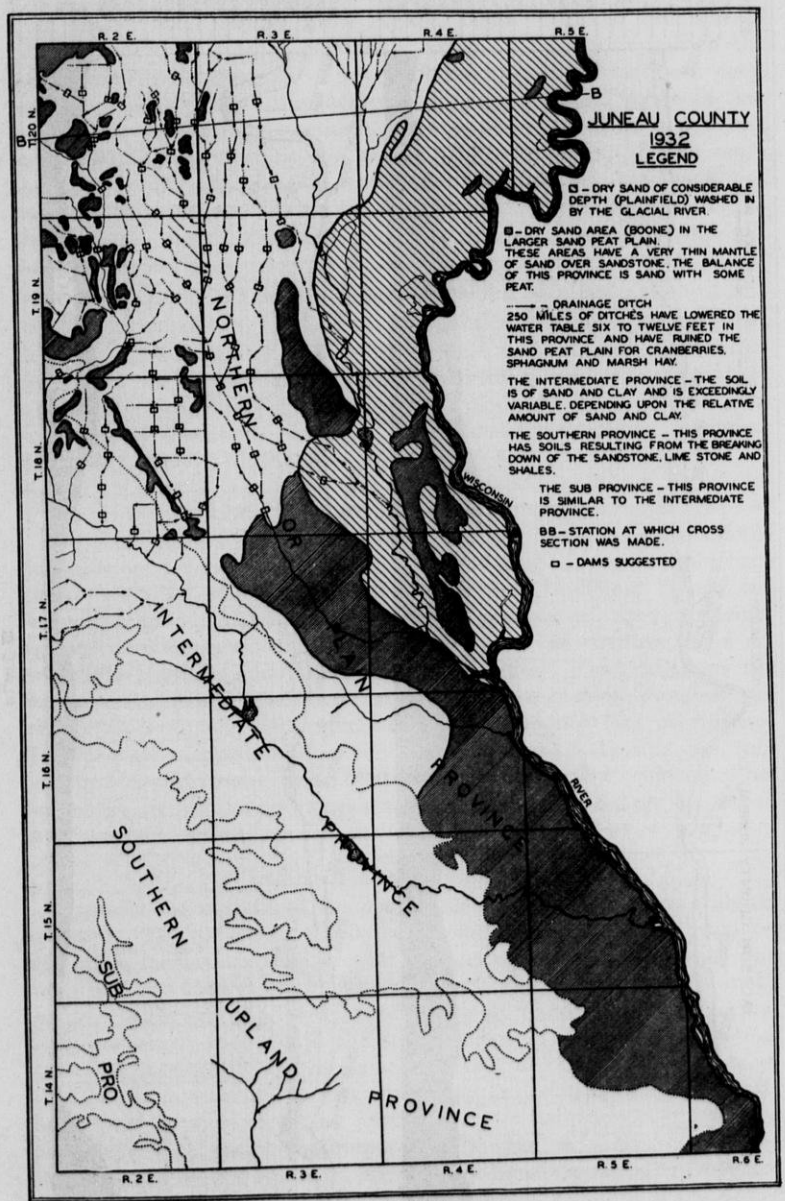

R.2 E.
R.3 E.
R.4 E.
R.5 E.
R.6 E.
T.20 N.
T.19 N.
T.18 N.
T.17 N.
T.16 N.
T.15 N.
T.14 N.
B
B
JUNEAU COUNTY
1932
LEGEND
- DRY SAND OF CONSIDERABLE DEPTH (PLAINFIELD) WASHED IN BY THE GLACIAL RIVER.
- DRY SAND AREA (BOONE) IN THE LARGER SAND PEAT PLAIN. THESE AREAS HAVE A VERY THIN MANTLE OF SAND OVER SANDSTONE. THE BALANCE OF THIS PROVINCE IS SAND WITH SOME PEAT.
- DRAINAGE DITCH
250 MILES OF DITCHES HAVE LOWERED THE WATER TABLE SIX TO TWELVE FEET IN THIS PROVINCE AND HAVE RUINED THE SAND PEAT PLAIN FOR CRANBERRIES, SPHAGNUM AND MARSH HAY.
THE INTERMEDIATE PROVINCE - THE SOIL IS OF SAND AND CLAY AND IS EXCEEDINGLY VARIABLE, DEPENDING UPON THE RELATIVE AMOUNT OF SAND AND CLAY.
THE SOUTHERN PROVINCE - THIS PROVINCE HAS SOILS RESULTING FROM THE BREAKING DOWN OF THE SANDSTONE, LIME STONE AND SHALES.
THE SUB PROVINCE - THIS PROVINCE IS SIMILAR TO THE INTERMEDIATE PROVINCE.
BB - STATION AT WHICH CROSS SECTION WAS MADE.
- DAMS SUGGESTED
NORTHERN
WISCONSIN
RIVER
INTERMEDIATE
PROVINCE
SOUTHERN
SUB
PROVINCE
UPLAND
PROVINCE

PLATE II

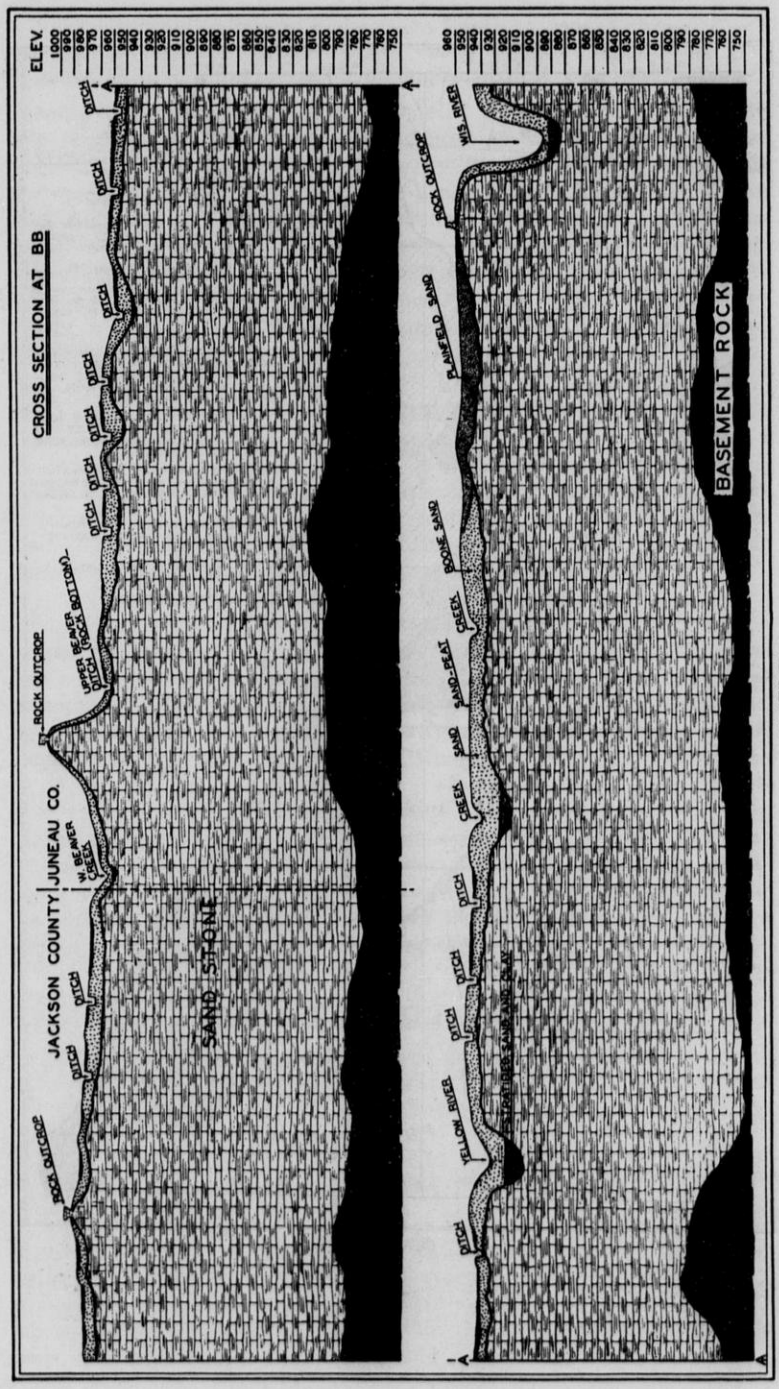

CROSS SECTION AT BB
ELEV.
JACKSON COUNTY
JUNEAU CO.
W. BEAVER CREEK
ROCK OUTCROP
UPPER BEAVER DITCH (ROCK BOTTOM)
DITCH
SAND STONE
YELLOW RIVER
CREEK
SAND
SAND-PEAT
BOOSE SAND
PLAINFIELD SAND
WIS. RIVER
BASEMENT ROCK

PLATE III

The Present Aspect of the Landscape in this Province

In shallow sags sedges grow rankly, small shrunken fire scarred remnants of their former domains. Aspen saplings shimmer in the sun around their margins. Jack pine and scraggy dwarf oak compete for sustenance on the low swells. Harsh ground cover is thin and varies in details detectable only by trained botanists. Loose, ashen-gray sands shift in the wind. Across country, stretch more than 250 miles of straight white ribs of sand on the banks of partially dry ditches. With blind perfection, the sole resource of the region — water — has been drained. (See Plates II and III, pages 7 and 8.)

The Intermediate Province

The intermediate province to the south, although partly plain, presents a far different aspect. Its northern boundaries are sharply marked by an abrupt change from very poor to superior vegetation, which reflects a clay soil, or a mixture of clay with sand and generally more abundant moisture. The Lemonweir River meanders sluggishly through this area.

The Southern Upland Province

The southern province is a rough, intricately and deeply dissected limestone and sandstone upland about 300 feet above the northern plain. Here on ridges and spurs are fine soils, splendid farms, and remnant stands of hardwoods. The steep, rock-walled narrow ravines are cool and damp and are grown to mixtures of hardwood and occasionally hemlock simulating northern forests. The Valley of the Baraboo River and the lower reaches of its major branches are wider, flat-bottomed, and their walls are commonly less precipitous. Here too are extensive tilled lands and pastures. This is the subprovince of the map. (See Plate II, page 7.) The contrasts between the two major provinces are many and are deeply rooted in their natural history.

Origin of the Physiography

Formerly the surface of the county had lain at a uniformly higher elevation. The sandstones and limestones of the southern province, and other formations now present only in counties to the south and west, had extended to the north far beyond the boundaries of Juneau county. Although commonly referred to as flat-lying, these formations are gently inclined to the south and west, and stream erosion, operating incessantly in the same direction through vast periods of time, has been wearing them away. They are still retreating in this direction. To the north, in northeastern Wood county, they have long since been entirely eliminated. Between that region and the north margin of the southern province of Juneau county, the general slope is relatively smooth and only sandstones remain on the series of alternating limestones, shales, and sandstones, hundreds of feet thick. The abrupt change of conditions at the north margin of the southern province of Juneau county is due to the presence there of a much more resistant formation at about a 1060 foot elevation.

This formation has temporarily protected the weaker sandstone below and has slowed up the process of destruction. Erosion working at the foot of the cliffs undermines them, propagating the cliff conditions and causing the resistant over-hanging beds to fall. The many bluffs, crags, and rocks scattered over the plain, but most numerous toward the south, are like the stragglers of a routed army. They have been cut off and surrounded, and all stages of their inevitable extermination may be seen. These general physiographic conditions have existed for geological periods. The most recent event in the history of the region is the glacial episode.

The Glacial Episode and Glacial Lake Wisconsin

The entire county escaped glaciation although ice fields overrode the greater part of the state. They failed by miles to invade Juneau county, halting some 10 miles to the north, 12 to 20 miles to the east, and about 4 miles to the southeast. Accordingly, there can be no morainic deposits in the county. However, melt waters from these ice fronts flowed into the county and produced certain effects. Moreover, the eastern ice-front joined the Baraboo Range not far to the southeast, forming a dam across the natural drainage way and impounding waters which rose to an elevation of about 980 feet and flooded fully 75% of the county. All the northern and intermediate provinces were flooded excepting the higher of the small scattered uplands and isolated crags, which existed as islands. This vast body of water is known as Glacial Lake Wisconsin. The southern province, with elevations rising to above 1300 feet, presented an irregular shore line with bold headlands and island fringes alternating with narrow embayments of the lake. The Baraboo Valley and its major branches thus inundated constitutes a small distinct subprovince, in the southwestern part of the county. (See Plate IV, page 11.)

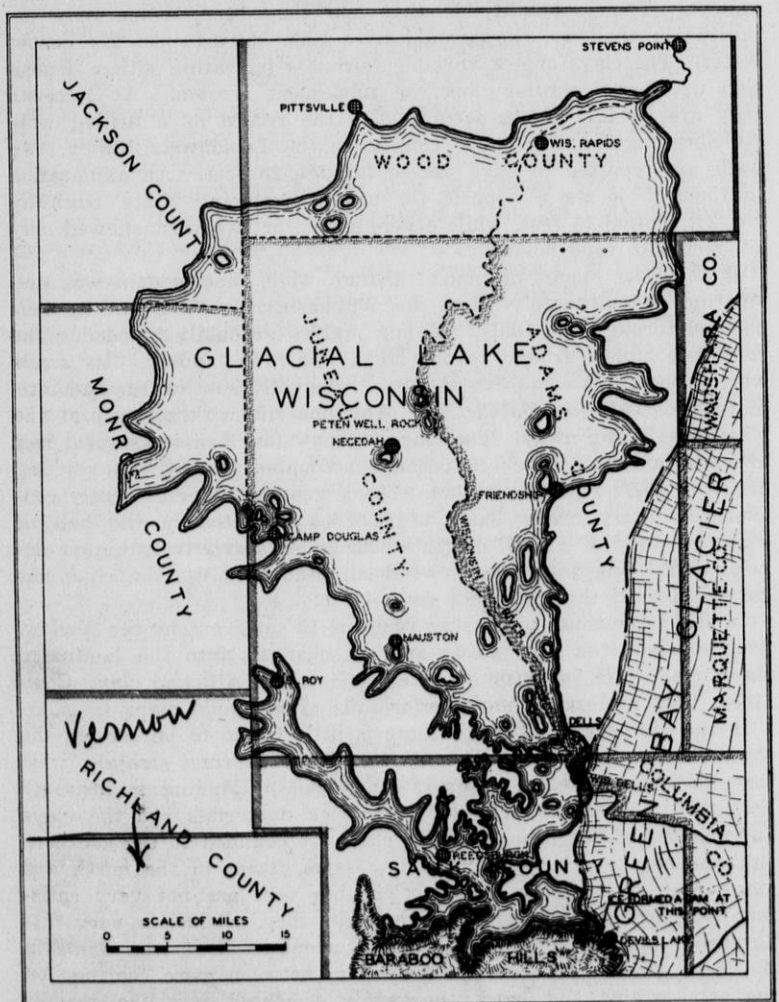
The surface of the northern province before flooding was evidently not greatly different from conditions existing today. The topography was mild with possibly a greater number of prominent islands. One distinct difference was the presence of deeper valleys along the present Lemonweir and Yellow rivers. Deposits of clay here are indications of deeper water in the glacial lake and drilled wells show loose filling to considerable depths. A well at Necedah shows a depth of 198 feet including 70 feet of clay. Others at Mauston show 30 to 100 feet of fill, chiefly sand. At Shennington, just over the line in Monroe county, two wells are reported to have passed through 26 feet of the laminated clay.

The surface materials of this northern province are mainly sands with minor amounts of chert. The latter represents the persistent, insoluble residue from the limestone that once covered this region. The sand is mainly residual from sandstone like that now seen in Cranberry and Petenwell rocks, the Hog Island Bluff, and the hills northeast of Mather. These residual materials are the Boone sands of the soils map. The areas of undifferentiated soils are essentially the same though they may have been shifted by the wind action and

mixed with organic matter in the lower marshy tracts. At the present time much of the organic matter has been destroyed by fire. The Plainfield sands in the east represent the same with an admixture of igneous sands washed in by the Wisconsin River in late glacial time.

The glacial lake caused two main effects. Its waves probably under-cut the base of the higher mounds causing rock fall and a steepening of the cliffs. Lower mounds entirely submerged were probably smoothed by currents and waves which shifted the sands.

MAP OF GLACIAL LAKE WISCONSIN



NOTE: DATA USED IN MAKING THIS MAP WAS TAKEN FROM BULLETINS XVI AND XXXVI BY WIS. GEOLOGICAL AND NATURAL HISTORY SURVEY.

PLATE IV

The general surface was more or less billowy with dunes of all sizes, and these were smoothed over by the lake. The second effect was the deposition of fine rock flour and clay material contributed by melt waters flowing into the lake from the ice fields. These ice fields had traversed the eastern counties that contain limestone of which they had accumulated considerable loads. Since the ice front lay some distance away, only the finer materials were carried into Juneau county. The only trace of these is found along the Lemonweir and Yellow rivers. Reference has been made to the probable presence of deeper valleys along the pre-glacial courses of these streams. The clays have not been found anywhere outside these valleys. The probability is that had they been temporarily deposited in shallows, they would have been shifted into the deeper water. The clays are of variable thickness indicating either deposition upon an irregular floor, or subsequent erosion. At Necedah they are 70 feet thick, according to the record of a drilled well. At Shennington, in Monroe county, in the Lemonweir Valley, two wells are reported to have passed through 28 feet. An exploration in them to locate a deposit for use in surfacing State Highway No. 21, showed 13 feet, while others a mile or two west showed only six feet with sand below.

In the later stages of glacial history, while the ice dam was dissipating and ultimately when the Wisconsin River had cut its new channel through the Dells, the lake waters gradually receded. The relatively higher ground to the north was first exposed. Its sands were probably to some extent moved gradually southward, and ultimately exposed to wind action. Any fine silt within reach of the winds was blown away. The clays are now found under several feet of sand, and this cover is perhaps accounted for by the shifting action of these receding waters. The Wisconsin River evidently continued to carry heavy loads of sand as indicated in the belt of Plainfield sand of glacial origin which forms a relatively higher deposit correlating with periods of flood. Subsequently, the river has cut its channel through these deposits.

In still later time, the Lemonweir and to some extent the Yellow, have removed the sand cover and cut channels into the laminated clays. There are various mixtures of fine sand, silt, and clay. Combined, they represent the Superior soils of the soils map.

In the sand plain, although there is little traffic to be served, the town roads, and State Highway No. 21, which runs straight west through Necedah, have required some kind of binding material to hold the loose sands. The only two local materials are the clays and deposits of bog iron ore. The clays are confined to the southern belt and bog ores have been used to some extent in the north and along part of Highway No. 21. The bog ores are not very satisfactory, particularly in dry weather, for they produce a very disagreeable dust. They are essentially cementations of iron oxide in the loose sand. There are all gradations between mere coatings on the sand grains and hard, thoroughly cemented rock-like masses comparable to the sandstones of the higher areas.

The origin of the ores is simple. A ground water carries ferrous iron in solution probably as the bicarbonate. At the water-table atmospheric oxygen comes in contact, oxidizes the iron and causes precipitation of hydrated iron oxide. Interesting observations were made in the Valley of the Yellow River, on the north line of Section 11, T. 19, R. 3 E. A hole was dug through a hard rock-like deposit just below the surface. Below this were loose sands extending down to the water-table. At the latter horizon the sands were mixed with slimy deposits of yellow limonite. The purpose of the work was to examine the relative acidity conditions through the soil profile. The yellow deposit was strongly acid. The sands both above and below the water-table were neutral or slightly alkaline. Similar results had been obtained elsewhere and the explanation seems to be that the carbonic acid set free by the oxidation of the ferrous carbonate, although a weak acid, gives the observed acid reaction.

The ultimate of the iron in the ground water is not so clear. The sands certainly contain too little iron to account for deposits. They are nearly pure silica. The cements of the sandstones of the region are reported to contain iron carbonate, however, and the leeching of this by the solutions produced by the decaying peat in the marshy tracts, is a possible source of iron.

It is interesting to note that the yellow deposit just described on Yellow River lies two or three feet below the upper crust. This region has been rather thoroughly drained by ditches which dropped the ground-water level rather suddenly. The two deposits of bog ore are separated by about four feet of loose sands.

It is of further interest to note that the deposits farthest northeast, therefore on higher ground, are most commonly the deep red variety and fairly loose. The present ground water-table is 6 to 12 feet below the surface, suggesting that these bog ores were deposited very soon after the withdrawal of the lake. Since that time the deposit of hydrous limonite has become dehydrated, and the volume shrinkage has reduced the mass to the granular state.

Cementation by iron oxide is observable to some extent throughout the plain province. Many holes were dug throughout the province, however, and the deposits rich enough to be called bog ores seem to be more abundant between the Yellow and Wisconsin rivers. None of any note were found very far west of the Yellow.

GEOLOGICAL ORIGIN

The Southern or Upland Province

The dissected upland province was probably very much like its present condition in glacial times. It, of course, stood above the level of Glacial Lake Wisconsin. Its surface materials also are mainly of residual origin. The rock formations, as indicated in discussing the origin of the provinces, are flat-lying sandstones, shales and limestone. The highest elevations are slightly above 1300 feet. At this elevation and down to about 1275 feet occurs Lower Magnesian limestone. Its areas are small. The surface material here

is a tough, heavy clay with blocks and fragments of chert. These represent the insolubles from which the lime and magnesia have been leeched. The limestone had once extended completely across the county but has been reduced by erosion to these small, irregularly shaped areas. On nearby lower ground are scattered blocks of chert. The chert pebbles found commonly on the plain to the north are of this origin.

On lower ground, down to between 1000 and 1050 feet, depending on location, the higher formations are sandstones, more or less shaly and at the top slightly dolomitic; and below them are thin-bedded shaly sandstones also containing some lime and dolomite. On the higher ground in this interval the surface material is mainly sand, Boone of the soils map, and originating, of course, in the break-up of the higher sandstones. Conical rock hills are not uncommon. In the lower range, surface materials are silt, and fine sandy silt mixtures. These are Knox loams of the soils map. They occur over the greater area of the high ground in this province, and are the primary agricultural soils. Rock exposures show thin-bedded sandstone and yellowish shales with a sprinkling throughout of dark green sand. Some thin beds are almost pure concentrates of the green sand. In many of the rock exposures, pits have been dug by the highway engineers to get material for surfacing the roads. The sides of these pits show a gradation upwards from rock to fine textured loams containing fragments of thin-bedded sandstone. To some extent, therefore, these surface materials are of residual origin. There has been no removal of residual material by the glacial method and the fine texture of the soil correlates well with the fine sands and shale matter in the formations of the interval. They are coextensive with the spurs and ridges just above the cliffs of sandstones. However, the fact that wind blown material, loess, is abundant farther west on these uplands, indicates that some of the finer constituents of these soils were of loessial origin.

At the edge of the upland spurs and ridges, occurring at about the 1060 foot elevation along the north side, but at a lower elevation to the southwest, there occurs a change in the rock. The green sand disappears and the shales have disappeared. A hard brownish red sandstone and a red shale occur at this position sloping precipitously over yellowish sandstone cliffs. The ravines are commonly V shaped in their upper ends and the loose material is generally sand. In the lower reaches the bottoms widen out and are flat with stratified silty and fine sandy soils. These lower reaches were covered by the glacial lake. Their stratified silts and clays are analgous to those along the Lemonweir. At Wonewoc they are 54 feet deep.

The sandstones that form the walls of the ravines extend down to considerable depth, and of course are continuous under the northern province. The various crags and mounds such as Mile Bluff, Sheep Pasture Bluff, Petenwell, and Cranberry rocks and the many low sandstone exposures are residuals of these formations. The greatest depth to which they are known to extend is to the 463 foot eleva-

tion in a well near Wisconsin Dells. With the highest point some 1275 feet, the maximum thickness of sandstone was about 812 feet. The base of the sandstones was an irregular surface so that at the few points where it has been located there is a considerable variation in elevation. Thus at Necedah it lies at 620 feet, at Wonewoc it is about 480 feet, and in sections 13 and 14 of T. 18 N., R. 3 E., in the vicinity of Necedah Mound, it lies at about 720 feet. The sandstone formerly covered Necedah Mound, and at that point it was about 190 feet thick.

Intermediate Province

The contact between the two major provinces is not sharp. Instead, there is a zone of variable width which is outlined on the map as an intermediate province. It is low and plain-like, particularly along its north side, although along the south there are low sandstone areas of greater relief resembling the southern province. It was covered by the glacial lake. Its surface materials are generally finer textured than those dominating the plain, and they are therefore transported materials. Where frost action has not been extreme, they show stratification indicating deposition in the glacial lake. They include the laminated clays along the Lemonweir and various mixtures of clay, fine sand, and silts. Three agencies have to be considered when accounting for their origin, washing from the fine sand and silt areas on the upland, wave and current action bringing fine suspensions from the ice front to the east, and the wind. The clays are reported to contain a considerable amount of lime carbonate which would strongly suggest derivation of that fraction from the east. The silts of the upland, in part possibly wind blown, are the most immediate sources and the direct contribution of wind blown material from farther west is also a possibility.

Basement Rock

The basement rock of the entire county, i. e. the rock below the sandstones is but slightly known, but has been struck in drilled wells as indicated in other connections. It is exposed only in Necedah Mound which is quartzite. A similar rock was struck at Wonewoc. Four diamond drill holes put down many years ago in the vicinity of Necedah Mound to test the possibility that there might be iron formation, struck quartzite, diorite, and granite. These few points indicate that the basement rock is mainly igneous with some areas of quartzite and lies at considerable depth below the sand rock still remaining.

LAND ADAPTATION

The adaptation of Juneau county land depends upon markets, climate and soil.

Markets

The market for such primary products as were produced by the northern province in its natural condition, viz., cranberries, blue berries, sphagnum moss, and forest products has continued rela-

tively good. In fact the berry and sphagnum moss market has never been over stocked and the nearby paper mills and wood-working industries are cognizant to the fact that back yard forests save the enormous expense of transporting pulp and lumber from Canada and the Pacific Coast. Standard agricultural production in the southern part of the county is also assured of a market comparable to that of any agricultural county of Wisconsin. (See Plate I for distances to Principal Markets, page 5.)

Climate

Since water is all important in using the northern plain for the production of natural products as well as some agricultural produce, precipitation records have been checked for this region. These records also apply in a more general manner to the remainder of the county.

The records show the average rainfall for Mather for the past 28 years is 32.10 inches. Going backward from 1933 the annual rainfall was 23.78 inches, 1932 — 27.88, 1931 — 27 inches, 1930 — 26.40 inches, 1929 — 32.10 inches, 1928 — 34.10 inches, 1927 — 30.60 inches, 1926 — 34.40 inches, 1925 — 35.14 inches, 1924 — 34.30 inches, 1923 — 23.30 inches, 1922 — 30.40 inches, and 1921 — 21.20 inches. The average precipitation at Meadow Valley for the last forty years was 29.42 inches, with an approximate variation from year to year the same as at Mather. Meadow Valley records 27.57 inches for 1932 and 23.78 for 1933.

Excessive Evaporation and Excessive Drainage. Drying Winds.

Drying winds dissipate moisture very rapidly over the northern plain. This condition is intensified by increasing dryness due to heat radiation.

Drying winds are associated directly with the entire number of clear days. The figures selected for comparison for this region are the clear and cloudy days of June, July, August and September. A comparison of the years 1926-1932 inclusive follow:

Table I

	32		31		30		29		28		27		26	
	Clear	Cloudy	Clear	Cloudy	Clear	Cloudy	Clear	Cloudy	Clear	Cloudy	Clear	Cloudy	Clear	Cloudy
June	14	4	13	7	13	8	14	7	9	12	15	6	13	8
July	18	4	19	3	19	4	18	4	15	7	14	7	14	8
August	14	6	14	8	18	4	16	6	16	7	17	5	13	10
September	20	4	15	8	17	6	13	9	14	8	10	13	7	16
	66	18	61	26	67	22	61	26	54	34	56	29	47	42

These figures show that the percentage of clear days per year for these months for the years 1929-32 inclusive, much higher than for the years 1926-1928 inclusive, and the percentage of cloudy days much lower. With few exceptions the prevailing winds were westerly, sometimes northwest but generally southwest winds. These figures indicate greater evaporation for the years 1929-1932 inclusive. All

the factors contributory to increasing dryness, resulted in making the 1930 peat and forest fire in this region difficult to check. The long continued burning of peat beds added to the loss of additional ground water, and reduced the sponge of peat and especially the sphagnum peat. This sponge as it exists now is relatively small as compared with the conditions prior to the fire. This fire also destroyed much and in some cases all of the forest cover of the sand islands.

Drainage Ditches

The drainage ditches of the plains region exceed a combined total of more than 250 miles. (See Plate II, page 7.)

The rapid run-off of the precipitation has been probably the largest contributing factor to the present low level of the ground water table particularly in the region of the cranberry marshes in Jackson and Juneau counties, and generally for the entire plain. In other words from the standpoint of drainage engineering the ditches are very efficient. From the standpoint of water conservation for those engaged in the growing of cranberries and sphagnum moss, the ditches are ruinous. The implication of the old adage "you can not eat your cake and have it too" applies here, for water which escapes either into the atmosphere or through the ditches, does not remain in the ground to replenish the water in the cranberry reservoirs and sphagnum marshes.

These factors contributing to the general dryness of the area, i. e. causing excessive evaporation and excessive drainage, have lowered the ground water table of the plain on an average of 8 to 12 feet. The climatic change is reflected in the change of ground cover for everywhere prairie flora is taking the place of the native marsh and forest land cover, though the average total precipitation and frost free period has remained relatively the same.

The southern highland province has a longer frost free season due to its higher elevation.

The nature of the soil, under-lying rock and lack of artificial drainage all help in conserving moisture in this province.

Soils

The physiographic provinces bound the soil types in a general manner, — sand and some peat in the northern, sand and clay in the intermediate and loams in the southern highlands. (See Plate II, page 7.) There are two types of sandy soils in the northern province — one of the Boone series, resulting largely from the breaking down of local sandstone, and the other the Plainfield series, somewhat coarser in texture and of greater depth, deposited by the glacial river which poured in this area from the glacier to the east and north. The Plainfield series are drier, i. e. the ground water table has always, in recent time, been at a considerable depth below the surface. The Boone sands are much more shallow and prior to the construction of the drainage ditches were always more or less

water-logged except in the southeastern part of the northern plain. The ground water table in the extensive flat areas was near the surface which resulted in the production of some almost pure peat soils.

Artificial drainage has reduced these Boone sands and sand peat mixtures, to a dryness comparable to the Plainfield sands and their fertility is lower than that of Plainfield sands. A strip of land bordering the Wisconsin and Yellow Rivers contains more alluvial material of finer texture and agriculture on this land has lasted longer than on the balance of the province. Practically all the abandoned farm land of the county is in this northern province which is a very decisive index that this province is non-agricultural.

The Intermediate Province contains a great deal of alluvial material as well as lake clays. These water transported ingredients of the soils in this province are mixed in varying degrees with the materials derived from the local rock, largely sandstone. The soil series of this province are known as the Superior series, due to their similarity to the soils along Lake Superior. These soils are fairly well adapted to farm use, though the poorer phases are very similar and scarcely more productive than the sand and peat soils of the northern province.

The soils of the Southern Highland Province are primarily of the Knox series. All are well drained and relatively fertile and all but the steep phases are adapted for farm use. The steep phases should be kept under forest cover and where barren reforested.

A detailed report on the soils of Juneau county is found in Wisconsin Geological and Natural History Survey Bulletin — "Soil Survey of Juneau County." A report of the forest possibilities of the sandy and poorly drained soils of central Wisconsin by Dr. Sergius A. Wilde may be found in a similar bulletin "Soil Survey of Monroe County."

A more efficient utilization of land can only obtain if its adaptation, based upon the markets, climate and soil is duly heeded. For example, an effort to develop the northern plain for general agricultural use would not have been successful even if markets for farm produce had continued relatively good because the soil and climate are wholly unsuited to such a use. The vast drainage projects were therefore ill advised because they not only failed to accomplish their intended purpose but ruined the land for cranberries, sphagnum moss, marsh hay and forests.

SOCIAL AND ECONOMIC TRENDS IN LAND USE

The social and economic trends within the major physiographic provinces of Juneau county are shown very clearly by the following:

(a) The present status of land cover.

(b) The present ownership of the land.

The complete analysis of the land cover is tabulated in Table II, between pages 18 and 19.

TABLE II. JUNEAU COUNTY COVER CLASSIFICATION IN ACRES – BY TOWNSHIPS AND BY TYPES.

DESC.						SWAMP FOREST LAND																								PINE FOREST L											
						SPRUCE			LARCH						CEDAR			STREAM BOTTOM										JACK PINE									NORWAY PIN					
						0-3		3-6	0-3			3-6			0-6		6-9	0-6			6-9			9-12			12-18	0-3			3-6			6-9			0-3			3-6		
TOWNSHIP	RANGE	WATER	LEATHER LEAF	MARSH	TAG ALDER	M	M	P	G	M	P	G	M	P	M	P	P	G	M	P	G	M	P	G	M	P	P	G	M	P	G	M	P	G	M	P	M	P	G	M	P	G
14 N	2 E			130	221														15	420																					
14 N	3 E																		120			55																		30		
14 N	4 E		20	381	223					45				35									165																12		
14 N	5 E	115		455	138					7										75									308	10	35	208				113					
14 N	6 E			175	62																	10										65	302						30		
15 N	2 E				123																										27						5		50	144	
15 N	3 E	250		185	277				8			5	7					15	25			10									97	28		7			78		155		66
15 N	4 E			221	521					3			5						112			13	25		310	465			7			327	212		20	3					
15 N	5 E			645	70					60	5		113	40						228		1,180	27		150				143	570	155	476	175		170	698			198	53	30
16 N	2 E			129	355																						56			95	150							143	95	50
16 N	3 E			905	840							68	83				20	277		107		195	353					142	786	25	127	233	43		100					252	
16 N	4 E			1,417	292						57							70			178							135	1,065	506	38	1,684	641		39	90					
16 N	5 E			25														153	25		128									45	3	498	77								
17 N	2 E	142		607	2,140				7			5									50	963		13	15			92	305	85	197	678	324	3	36	122	5		35		17	
17 N	3 E			1,078	330	25							40					68		8						586		343	1,172	494	977	1,578	391	45	78	343					
17 N	4 E	34		99	166											40			738	40	55	1,053			250	126		255	1,670	687	217	2,654	936		70	285					
18 N	2 E		50	2,659	2,002					3					305		105	25	264	20	70	20		75					370	677		677	421		55					204	
18 N	3 E		33	712	929													93	23		50	12				90		235	1,749	857	462	1,540	1,134		70					10	
18 N	4 E	25		8	15													78	30			547	47		348	70	85	413	1,831	115	429	1,728	361			100					
19 N	2 E	13	11	751	1,458																							219	1,819	1,571		2,170	1,914		125	105					
19 N	3 E			1,299	533								13									517			1604			210	1,565	1,643	743	1,834	1,139								
19 N	4 E	34		39	99													58		56	135	255	102					256	203	596	639	1,267	770								
20 N	2 E			2,415	2,459		138																						361	627		525	701			10	30			35	
20 N	3 E		7	2,118	1,582			13											89		265	742	3		32			34	595	563		2,029	1,314					700		117	32	
20 N	4 E				65																							747	425	2,267	493	2,433	3,319		275	40					
20 N	5 E	5		10	122																								128			572	265		75	67					
TOT. BY DENSITY						25	138	13	15	118	62	78	261	75	305	40	125	837	1,441	954	931	5,572	722	88	2,709	1,337	85	3,137	14,502	11,338	4,734	23,354	14,439	55	1,113	1,976	113	705	35	735	842	14
TOT. BY TYPES		618	121	16,463	15,022	176			609						470			14,676										74,648								5,794					
% BY TYPES		0.1	0.0	3.2	3.0	0.0			0.1						0.1			2.9										14.7								1.1					

AND BY TYPES.

ABBREVIATIONS : G – GOOD M – MEDIUM P – POOR.

PINE FOREST LAND

JACK PINE

3–6			6–9		
G	M	P	G	M	P
0	35	208			113
		65	302		
	27				
	97	28		7	
		327	212		20	3
0	155	476	175		170	698
	95	150				
5	127	233	43		100	
6	38	1,684	641		39	90
5	3	498	77			
5	197	678	324	3	36	122
4	977	1,578	391	45	78	343
7	217	2,654	936		70	285
7		677	421		55	
7	462	1,540	1,134		70	
5	429	1,728	361			100
1		2,170	1,914		125	105
3	743	1,834	1,139			
3	639	1,267	770			
7		525	701			10
9		2,029	1,314			
7	493	2,433	3,319		275	40
		572	265		75	67
3	4,734	23,354	14,439	55	1,113	1,976
	74,648					
	14.7					

NORWAY PINE

0–3			3–6			6–9			9–12	
M	P	G	M	P	G	M	P	P		
			30							
			12			13	51			
	5		50	144		233	42			
78			155		66	70	858	45		
						15				
			198	53	30					
			143	95	50	739	388			
				252		8				
		35		17			80			
						45				
				204			47			
				10						
	700		117	32						
30				35		14	570			
113	705	35	735	842	146	1,137	2,036	45		
	5,794									
	1.1									

WHITE PINE

0–3			3–6			6–9			9–12		12–18
G	M	P	G	M	P	G	M	P	P	M	M
				25		35	233		5		
			55	392							
	25						35				
			145	238		35					
			30			20		75	50		
			118			45	204				
	30	80	123	20							
						130					
							20				
	13							5			
30	60	67			15		50	57		38	38
			15				55		65		
					2						
258							25				
								75			
			58	115							
75		10		265			97				
			30	4							
363	128	157	30	544	1,074	2	340	776	80	158	38
	3,690										
	0.7										

SUITABLE FOR PINE AND SPRUCE

OAK

0–3			3–6			6–9			9–12			12–18		
G	M	P	G	M	P	G	M	P	G	M	P	G	M	P
87	134	265	259	1,404	240	278	1,590	233		113	237		15	25
95	723	13	649	2,415	363	330	2,718	805		203	420			110
50	668	103	212	1,192	416	1,570	2,214	1,077	314	839	374		212	8
583	539	468	840	2,080	410	596	1,929	326		160	50			
	198	25		380	30		125							
133	302	369	419	1,307	303	1,507	2,653	424	25	270	70	17		
91	227	30	32	647		576	1,149	135	5	335	95		5	
169	866	128	110	1,329	217	134	596	358	63	404	53		35	25
270	554	273	439	1,230	60	30	466			35				
95	494	60	242	1,488	83	452	688	817	68	91				
269	490	81	568	771	88	152	583	145	20	30	68			
132	766	160	130	387	203		45	158		5				
	77		3	130										
82	463	116	491	605	439	87	66	71		3	25			
727	3,646	620	240	293	273	75	210	279		57	96			
117	241	947	70	779	87	90	348	352			90			
	332	75	62	893	845	32	513	524						
288	978	594		171	854		318	130						
512	856	32	135	138	10					35				
	761	155		784	699		145	264						
	460	282		547	1,025		105	303						
537	1,017	2,202	31	507	19									
	470	626		431	952		299	1,240		110	35			
	288	313		444	787		222	14						
865	1,835	1,084	139	2,259	257		189	7		7				
5	414	195		449	16		64	148		494		194	76	
5,107	17,799	9,216	5,071	23,060	8,676	5,909	17,233	7,810	495	3,191	1,613	211	343	168
				105,902										
				20.8										

DIUM P – POOR. TOTAL AREA OF JUNEAU COUNTY 508.505 ACRES

SUITABLE FOR PINE AND SPRUCE																				WOOD LOTS							OPEN	RECENT BURN	AGR.		ABANDONED	URBAN	TOTAL
OAK											ASPEN									MIXED HWDS.										CLEARED	PASTURE			
	6–9			9–12			12–18				0–3			3–6			6–9			0–6			6–9			9–12							
	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	M	P	G	M	P	G	M	P	P							
4	240	278	1,590	233		113	237		15	25				3	50				82	15	117		293	40		587		12,734	3,640		435	23,960
5	363	330	2,718	805		203	420			110		35					70		93	45		133	283	453		393		10,863	1,904	8		23,776
2	416	1,570	2,214	1,077	314	839	374		212	8		79		108							14	16	3	5		416		9,690	2,852	83		23,460
0	410	596	1,929	326		160	50				13	483			153	65										245		10,253	1,156	1,309	92	23,274
0	30		125										45													72		1,768	187	10		3,902
7	303	1,507	2,653	424	25	270	70	17				5	13	8	118	22										317	45	10,447	2,746	18	703	23,040
7		576	1,149	135	5	335	95		5		56	135		48	120											132		14,039	1,729	93	808	23,040
9	217	134	596	358	63	404	53		35	25	55	120	29													406		13,568	1,022	366	248	22,560
0	60	30	466			35									112											343	12	5,203	731	1,501		16,698
8	83	452	686	817	68	91					55	46	25		10											142		11,387	1,414	55		20,040
1	88	152	583	145	20	30	68				43	484	174	40	213	126			10							231		8,537	1,111	610	612	20,040
7	203		45	158		5					816	1,456	702	64	130	13							30		30	596	223	5,287	402	834		18,799
0																												975	152	93		2,384
5	439	87	66	71		3	25				127	854	400	57	177	47										1,167		8,175	1,312	253	1,747	23,040
3	273	75	210	279		57	96				40	539	242	207	143	38										936		4,386	285	1,780		22,848
9	87	90	348	352			90					50	40			22										459	902	3,153	165	2,976		20,263
3	845	32	513	524							429	2,694	2,293	22	692	371	30						30			1,487		2,869	628	168		23,040
1	854		318	130							332	1,006	437	5	147	35		143								1,705		3,800	948	2,167	440	22,780
8	10					35						43	20			58				8		3				182		2,321	194	1,491		12,343
4	699		145	264							300	2,229	2,125		362	778										2,675		579	100	675	80	23,040
7	1,025		105	303							425	882	222		348	100										3,342	68	2,413	420	786	20	22,848
7	19											99	118	16	47											218		818	175	2,332		12,645
1	952		299	1,240		110	35				611	2,645	4,167		20	105										4,204	118	194	144	249		24,952
4	787		222	14							264	3,308	1,702		75						19					5,016	112	1,483	141	230		24,687
9	257		189	7		7					133	193	218		3											1,758		2,312	120	2,227	3	23,673
9	16		64	148		494		194	76			21														780		2,692	163	415	3	7,373
0	8,676	5,909	17,233	7,810	495	3,191	1,613	211	343	168	3,699	17,406	12,972	578	2,920	1,780	100	143	185	68	150	152	639	498	30							
105,902											39,598								1,673							27,809	1,480	149,946	23,841	20,729	5,191	508,505
20.8											7.8								0.3							5.5	0.3	29.5	4.7	4.1	1.0	100

This shows the following general classification:

Table III

	Acres	Total acres	Total percentage
Forest Land			
Total Forest cover	247,285		
Total open burned or cleared and abandoned	50,018	297,303	58.5
Farm Land			
Cleared Farm Land	149,946		
Pasture	23,841	173,787	34.2
Waste, Marsh and Water			
Total water	618		
Total marsh including cranberry marshes and untimbered swamp	31,606	32,224	6.3
Urban Land			
Townsites	5,191	5,191	1.0
TOTAL	508,505	508,505	100.0

Plate V shows the trend in agriculture by civil towns. This portrays more clearly the exact locations of the more desirable farming areas, as reflected by the percentage of abandonment with relation to the land cleared. It shows clearly the varied conditions for each governmental unit some of which might be advantageously consolidated.

A further grouping of the cleared farm land and farm land cleared and later abandoned follows by provinces. For this classification the northern province shows 40,935 acres of cleared land and 4,964 acres of pasture still in farm use, and 19,005 acres of cleared land no longer in use. The province south of the northern plain shows 109,011 acres of cleared land and 18,877 acres of pasture in farm use, and less than 1724 acres of land cleared but no longer used for farm production. This shows that the northern province which covers approximately two-thirds of the county, has less than 20% in farm use, while the southern provinces which cover approximately one-third of the county have more than 66% in farm use. It is obvious, therefore, that the southern provinces are relatively well occupied for farm use while more than 80% of the northern plains are in other uses or idle. An analysis of 80% of the northern province and approximately 33% of the southern provinces follows:

PRESENT STATUS OF LAND COVER ON LAND NOT USED FOR AGRICULTURE

The total amount of land now growing some type of forest cover in Juneau county is 247,285 acres or 48.6 per cent of the total area. (See Table II, between pages 18 and 19.) Of this 105,902 acres are oak. The forest cover is practically all small, as 189,279 acres are in the 0-6 inch diameter class, 57,161 acres are in the 6-12 inch diameter class, and 845 are in the 12-18 inch diameter class.

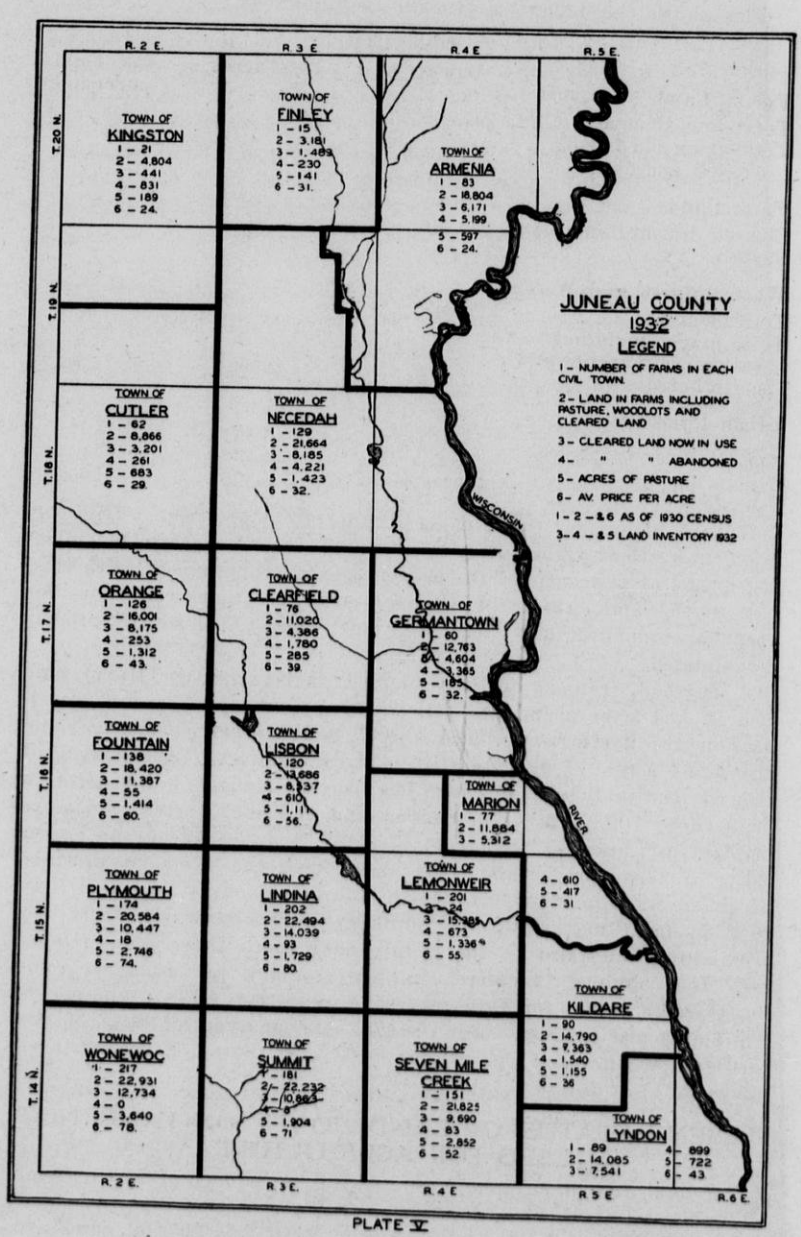

R. 2 E.
R. 3 E.
R. 4 E.
R. 5 E.
R. 6 E.
T. 20 N.
T. 19 N.
T. 18 N.
T. 17 N.
T. 16 N.
T. 15 N.
T. 14 N.
TOWN OF KINGSTON
1 - 21
2 - 4,804
3 - 441
4 - 831
5 - 189
6 - 24.
TOWN OF FINLEY
1 - 15
2 - 3,181
3 - 1,483
4 - 230
5 - 141
6 - 31.
TOWN OF ARMENIA
1 - 83
2 - 18,804
3 - 6,171
4 - 5,199
5 - 597
6 - 24.
TOWN OF CUTLER
1 - 62
2 - 8,866
3 - 3,201
4 - 261
5 - 683
6 - 29.
TOWN OF NECEDAH
1 - 129
2 - 21,664
3 - 8,185
4 - 4,221
5 - 1,423
6 - 32.
WISCONSIN
TOWN OF ORANGE
1 - 126
2 - 16,001
3 - 8,175
4 - 253
5 - 1,312
6 - 43.
TOWN OF CLEARFIELD
1 - 76
2 - 11,020
3 - 4,386
4 - 1,780
5 - 285
6 - 39.
TOWN OF GERMANTOWN
1 - 60
2 - 12,763
3 - 4,604
4 - 3,365
5 - 195
6 - 32.
TOWN OF FOUNTAIN
1 - 138
2 - 18,420
3 - 11,387
4 - 55
5 - 1,414
6 - 60.
TOWN OF LISBON
1 - 120
2 - 13,686
3 - 8,337
4 - 610
5 - 1,111
6 - 56.
TOWN OF MARION
1 - 77
2 - 11,884
3 - 5,312
RIVER
TOWN OF PLYMOUTH
1 - 174
2 - 20,584
3 - 10,447
4 - 18
5 - 2,746
6 - 74.
TOWN OF LINDINA
1 - 202
2 - 22,494
3 - 14,039
4 - 93
5 - 1,729
6 - 80.
TOWN OF LEMONWEIR
1 - 201
2 - 24
3 - 15,385
4 - 673
5 - 1,336
6 - 55.
4 - 610
5 - 417
6 - 31
TOWN OF KILDARE
1 - 90
2 - 14,790
3 - 9,383
4 - 1,540
5 - 1,155
6 - 36
TOWN OF WONEWOC
1 - 217
2 - 22,931
3 - 12,734
4 - 0
5 - 3,640
6 - 78.
TOWN OF SUMMIT
1 - 181
2 - 22,232
3 - 10,883
4 - 8
5 - 1,904
6 - 71
TOWN OF SEVEN MILE CREEK
1 - 151
2 - 21,825
3 - 9,890
4 - 83
5 - 2,852
6 - 52
TOWN OF LYNDON
1 - 89
2 - 14,085
3 - 7,541
4 - 899
5 - 722
6 - 43
JUNEAU COUNTY
1932
LEGEND
1 - NUMBER OF FARMS IN EACH CIVIL TOWN.
2 - LAND IN FARMS INCLUDING PASTURE, WOODLOTS AND CLEARED LAND
3 - CLEARED LAND NOW IN USE
4 - " " ABANDONED
5 - ACRES OF PASTURE
6 - AV. PRICE PER ACRE
1 - 2 - & 6 AS OF 1930 CENSUS
3 - 4 - & 5 LAND INVENTORY 1932

PLATE V

The total area of the forest cover that is well stocked with some type of tree growth is 31,855 acres, or about 12.9 per cent. The total amount with the medium stocking consists of 135,412 acres, or 54.8 per cent, and 80,015 acres or 32.3 per cent are poorly stocked.

Of the 0-6 inch diameter class of forest growth, 33,869 acres are well stocked, 102,917 acres are medium stocked, and 62,495 acres are poorly stocked. In the 6-12 inch diameter class 7,778 acres are well stocked, 32,144 acres are medium stocked, and 17,269 acres are poorly stocked.

In the 12-18 inch diameter class, 211 acres are well stocked, 381 acres are medium stocked, and 253 acres are poorly stocked.

The Oak Woodlands

The oak of Juneau county consists of 68,929 acres in the 0-6 inch diameter class, 36,251 acres in the 6-12 inch diameter class, and 722 acres in the 12-18 inch diameter class. In the small diameter class, 10,188 acres of this oak are well stocked, 40,849 are medium stocked, and 17,892 acres are poorly stocked. In the 12-18 inch class, 211 acres are well stocked, 343 acres are medium stocked, and 168 acres are poorly stocked.

Forty-seven per cent, or 49,510 acres, is scrub oak growing on inferior soil, 32 per cent, or 33,935 acres consists of a medium grade of oak, and 21 per cent, or 22,457 is a fairly good grade of oak growing on the better soils.

A rough estimate would indicate that there are more than 500,000 cords of oak left in the county divided as follows: 57,600 cords of scrub oak in the northern plain section, 200,000 cords of good quality oak on the better soils, and 250,000 cords of medium grade oak on the intermediate soils.

Graphic Representation of Land Cover

Four graphs have been prepared showing diagrammatically, first, all the land cover types, second, a classification of the forest cover types by species, third, a classification of the forest cover according to sizes, and fourth, the open and poorly stocked areas recommended for forest planting.

Plate VI, page 22 (Classification of total area), shows the county divided into four major groups, two of which, the forest land and the cleared farm land constitute about ninety-three per cent of the county. About seven per cent of the county is open swamp and urban land. This graph also shows the relative area occupied by each type of forest cover but not in all cases by individual species of trees. The amount of crop land and open pasture is also shown.

Plate VII, page 23 (Classification of Forest Cover), shows the area occupied by oak, pine, aspen, ash, elm and mixed hardwoods, cedar, tamarack and spruce. It also shows the relative area oc-

cupied by individual tree species, except for the oak which is divided into grades according to soil. It shows that white and Norway pine occupy at present only 3.8 per cent of the total forested area. This type, together with spruce should eventually replace the aspen type, as well as a large per cent of the poorly stocked oak type, especially the scrub oak.

Plate VIII, page 24 (Classification of Forest Cover according to size), shows that there is practically no large timber left in Juneau county. Of the small growth under six inches in diameter which occupies 76 per cent of the forest cover, more than fifty per cent

CLASSIFICATION OF TOTAL AREA

JUNEAU COUNTY

1932

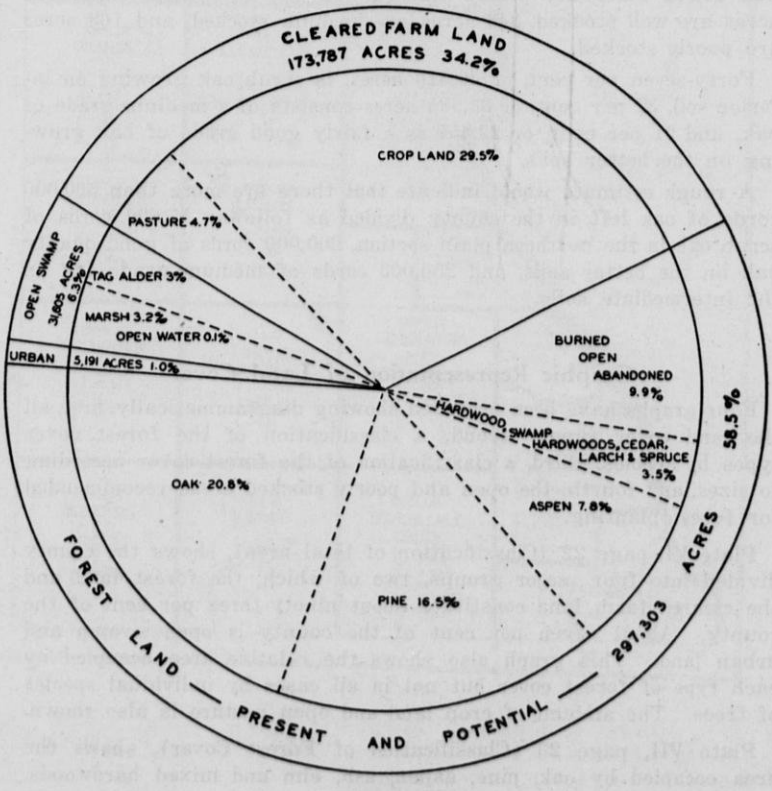


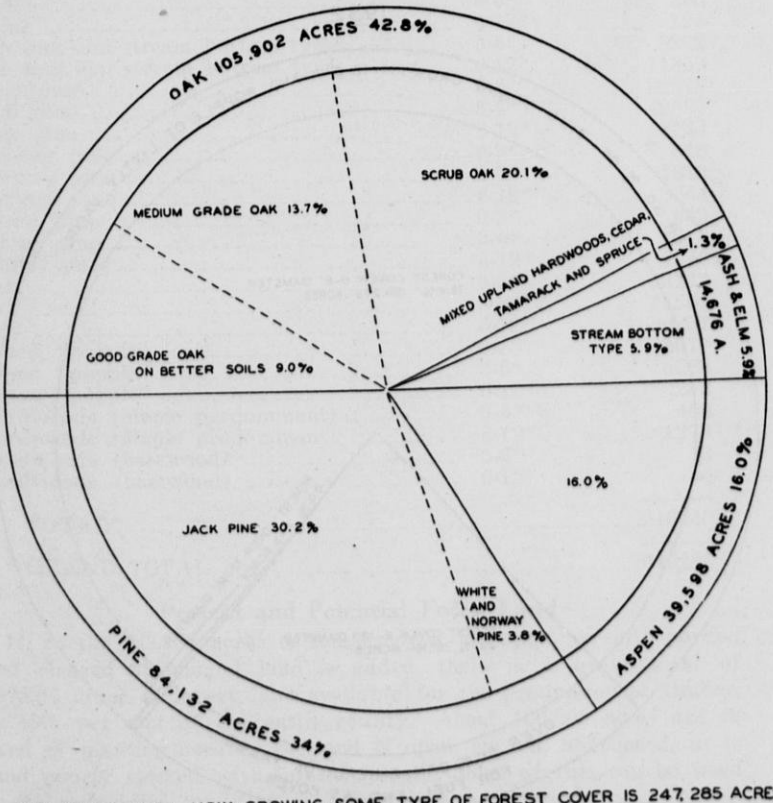
PLATE VI

is young oak and popple that will never grow into any great value. If this land could be converted into stands of pine and spruce, its value would be much greater. Most of the balance of this young growth is jack pine, which grows into a fairly valuable commercial stand in a comparatively short time. The forest cover averaging 6-12 inches in diameter occupies less than a quarter of the entire forested area and the area covered with 12-18 inch trees occupies only a little over a section of land altogether. (See Table II, between pages 18 and 19.)

CLASSIFICATION OF FOREST COVER

JUNEAU COUNTY

1932



THE TOTAL AREA NOW GROWING SOME TYPE OF FOREST COVER IS 247,285 ACRES. 76% OF THIS IS UNDER 6" IN DIAMETER. ONLY 13% IS WELL STOCKED.

PLATE VII

Plate IX, page 26 (Total Wild Land showing possible Forest Planting Areas), gives the relative acreage of the land in immediate need of better forest cover, the land with some cover not in immediate need of planting, and the marsh land. Spruce and pine are recommended for planting the 130,000 acres shown as open, burned, abandoned or poorly stocked. It is interesting to note that less than 10 per cent of the total wild land is well stocked with trees, being practically the same acreage as the untimbered and unproductive marsh land.

CLASSIFICATION OF FOREST COVER ACCORDING TO SIZE.

JUNEAU COUNTY

1932

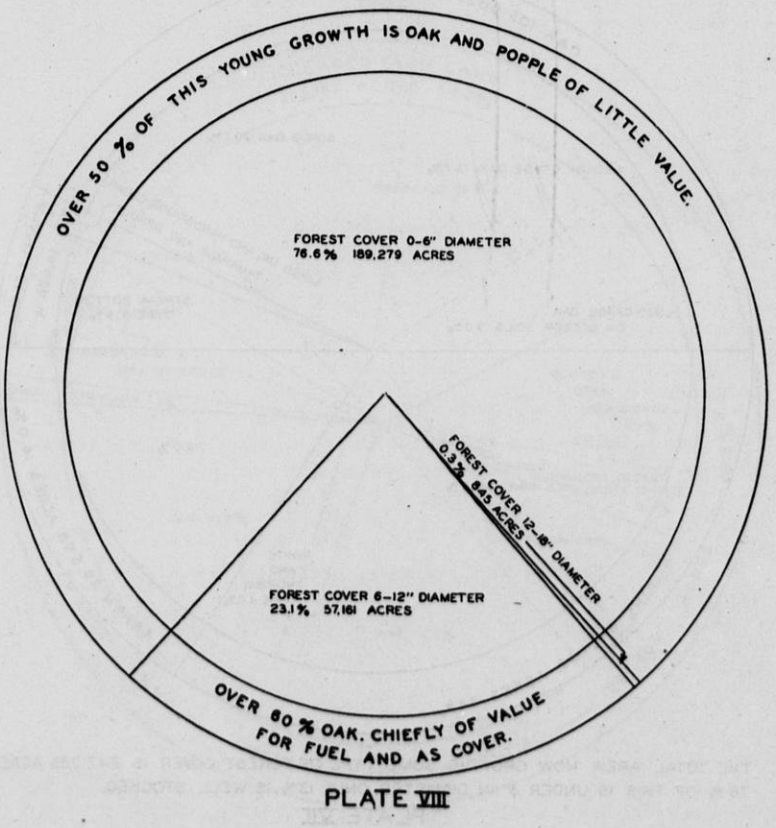


PLATE VIII

Table IV

CLASSIFICATION OF FOREST COVER BY SIZE

(See Plate VIII, page 24)

Forest Cover Types Averaging Over 12 Inches in Diameter:

	Diameter Class	*Acreage*
Ash and elm predominant stream bottom type	12-18″	85
White pine	12-18″	38
Oak	12-18″	722
Total forest types above	12″	845

Forest Cover Types Averaging Under 12 Inches in Diameter:

	Diameter Class	*Acreage*
Spruce	0-3″	25
Spruce	3-6″	151
Larch	0-3″	195
Larch	3-6″	414
Cedar	0-6″	345
Cedar	6-12″	125
Ash and elm stream bottom type	0-6″	3232
Ash and elm stream bottom type	6-12″	11359
Jack pine	0-3″	28977
Jack pine	3-6″	42527
Jack pine	6-12″	3144
Norway pine	0-3″	818
Norway pine	3-6″	1612
Norway pine	6-12″	3364
White pine	0-3″	648
White pine	3-6″	1648
White pine	6-12″	1356
Oak	0-3″	32122
Oak	3-6″	36807
Oak	6-12″	36251
Aspen "popple"	0-3″	34077
Aspen "popple"	3-6″	5278
Aspen "popple"	6-12″	243
Hardwoods (Maple predominant)	0-6″	400
Hardwoods (Maple predominant)	6-12″	1273
Hardwoods (basswood)	0-6″	3
Hardwoods (basswood)	6-12″	46
TOTAL		246440
GRAND TOTAL		247285

Present and Potential Forest Land

If, to the 247,285 acres of forest cover, the open, recently burned and cleared abandoned land is added, there is a grand total of 297,303 acres of forest land available for the production of timber, or 58.5 per cent of the entire county. About 130,000 acres are in need of planting because the land is open, burned, abandoned, or is land poorly stocked with inferior trees. Some of this can be used in its unforested condition for game refuge purposes.

The forest land includes all farm wood lots as well as all timbered areas, and all land with potential possibilities for timber. (See Plate VIII, page 24.) It does not include the wild swamp land of

31,606 acres. According to the present trend in agriculture it is likely that the acreage devoted to farming will continue to decline in the northern plain and that even more land than this will be devoted to forests and game refuges and to the production of cranberries and sphagnum moss.

The whole northern part of the county designated as the northern plain (see Plate II, page 7), should be primarily a forest and game refuge rather than an agricultural area.

White Pine the Important Forest Tree:

White pine has been an important timber tree in Juneau county in the past. The few scattered white pine now found growing in

TOTAL WILD LAND SHOWING POSSIBLE FOREST PLANTING AREA.

JUNEAU COUNTY

1932

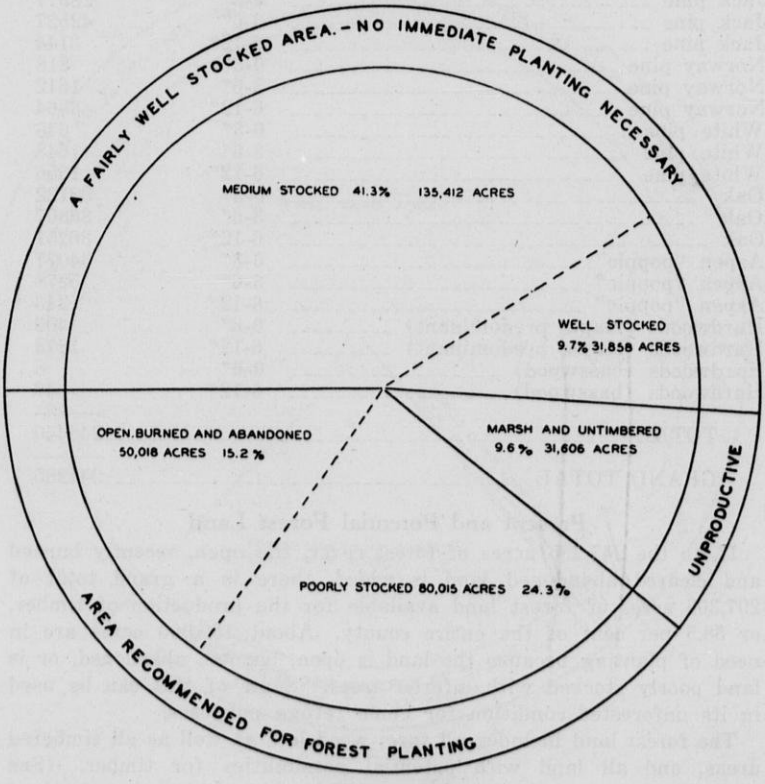


PLATE IX

the northern part of the county have an especially deep green color and indicate a thrifty condition. White and Norway pine, jack pine and Norway spruce would grow well in this region.

Cranberry Culture and Land Use

Wild cranberries and sphagnum moss grew over extensive areas of the northern sand-peat plain prior to drainage. Now the total acreage which can be successfully supplied with an adequate amount of water is limited, because of the general lowering of the water table throughout the entire region. A careful study made in 1932 of the geology of the northern plain and conditions following the construction of the extensive drainage projects disclosed the following:

(a) That sand stone comes relatively close to the surface over most of the area and to the surface in all the major sand islands. (Slight elevations.)

(b) That the ground water table is at present near the bottom and in many cases far below the bottom of the ditches, where before drainage it was near the surface.

(c) That vertical drainage from a practical point of view is limited to the shallow sand and sand peat bed over the sand stone.

(d) That there is nearly twice as much sandy land as shown by the early soil survey because so much of the loose peat has either burned or been carried away by the wind.

(e) That the total evaporation is now much greater than before drainage.

(f) That restoration of the area to a condition comparable to its former status, i. e., its condition before drainage, will require construction of numerous inexpensive regulatory dams with which to again raise the water table to near the surface.

(g) That such a process will reduce rapid drainage and in time create a proper soil condition for the growing of cranberries, sphagnum moss, marsh hay and forest cover, reduce excessive evaporation, and improve an extensive region for waterfowl and upland game birds, furbearing animals and deer.

A structure section of the northern plain running from the Wisconsin River across the towns of Armenia, Finley, Kingston and into the town of Bear Bluff, Jackson County, is shown on Plate III, page 8. This is in part diagrammatic because little is known of the relative depths of sand stone or of the alluvial material in the stream bottoms. It shows very clearly, however, that the general water course within this plain must follow the numerous rock cored sand islands and ridges which all bear slightly east and south. The shallowness of the sand peat plain also shows that water may again be impounded in this plain if rapid run-off is stopped by regulatory dams. The porosity of this sand mass will take care of at least 25% of its volume in water.

The southeasterly flow of water in the earth is slow but sufficiently constant to always keep the water behind the dams relatively fresh.

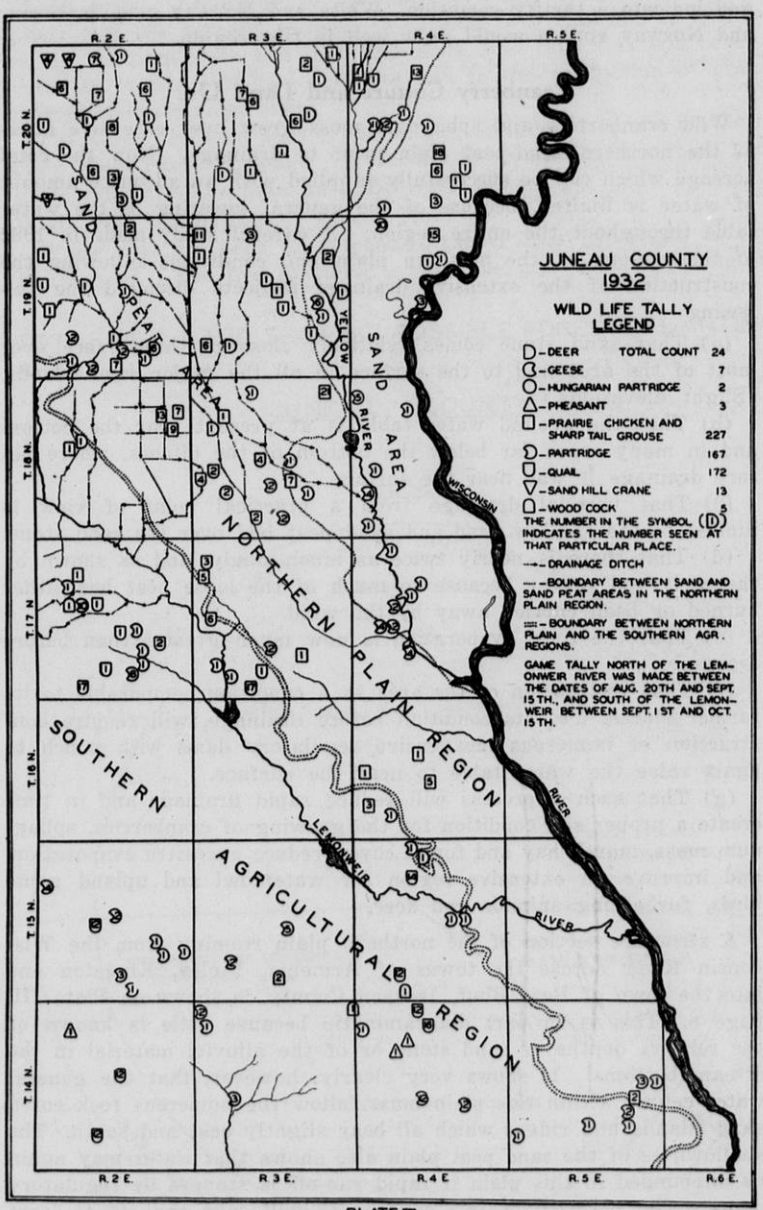

JUNEAU COUNTY
1932
WILD LIFE TALLY
LEGEND
D - DEER TOTAL COUNT 24
G - GEESE 7
O - HUNGARIAN PARTRIDGE 2
△ - PHEASANT 3
□ - PRAIRIE CHICKEN AND SHARP TAIL GROUSE 227
D - PARTRIDGE 167
U - QUAIL 172
▽ - SAND HILL CRANE 13
Ω - WOOD COCK 5
THE NUMBER IN THE SYMBOL (D) INDICATES THE NUMBER SEEN AT THAT PARTICULAR PLACE.
→ - DRAINAGE DITCH
---- - BOUNDARY BETWEEN SAND AND SAND PEAT AREAS IN THE NORTHERN PLAIN REGION.
:::: - BOUNDARY BETWEEN NORTHERN PLAIN AND THE SOUTHERN AGR. REGIONS.
GAME TALLY NORTH OF THE LEMONWEIR RIVER WAS MADE BETWEEN THE DATES OF AUG. 20TH AND SEPT. 15TH., AND SOUTH OF THE LEMONWEIR BETWEEN SEPT. 1ST AND OCT. 15TH.
R.2 E.
R.3 E.
R.4 E.
R.5 E.
R.6 E.
T.20 N.
T.19 N.
T.18 N.
T.17 N.
T.16 N.
T.15 N.
T.14 N.
SAND PEAT AREA
YELLOW RIVER
SAND AREA
WISCONSIN RIVER
NORTHERN PLAIN REGION
SOUTHERN AGRICULTURAL REGION
LEMONWEIR RIVER

PLATE X

Relative Rapidity of Drainage

Water movement through the sand rock, sand peat earth and the open ditches is comparable to water passing through sieves with different sized meshes. The sand stone sieve would have very minute meshes and water passage would be very slow. The sand peat sieve would have somewhat larger meshes and passage would be considerably faster, and the open ditch sieve would have very large meshes which would offer little resistance to the water in its course to lower levels. Blocking the coarse sieve would tend to hold the water within the soil to a higher ground water level, i. e., a level comparable to pre-drainage conditions and vegetation of that period would again come back. Sphagnum moss on the water saturated earth would soon begin to furnish insulation against heat penetration as would forest mulch on the higher sand islands and excessive evaporation would be reduced. It is obvious from the findings of this investigation that this method of water conservation will bring back to this region increasing potential possibilities for the production of cranberries and sphagnum moss on the lower elevations and forest products on the higher land.

GAME AND LAND USE

One of the attractive features of Wisconsin is its wild life. This is an important fact to consider from an economic as well as from an esthetic viewpoint. The interest in wild life by the hunter and the lover of nature is one of the main factors of the recreational industry. Conservation groups have noted with distress the fact that the hunters are increasing while the hunted are decreasing. It is imperative, therefore, that something should be done to conserve this valuable form of recreation.

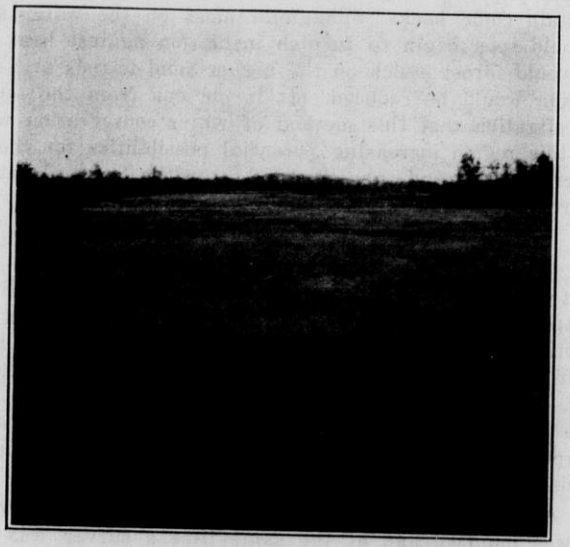
From August 20 to October 15, 1932, the land cover of Juneau county was mapped, and at the same time a survey was made of game and its environment. This was done to serve as a foundation upon which a more effective system of game management could be conducted. As mappers ran their lines at half mile intervals for this survey, they tallied 227 prairie chicken and sharp-tail grouse, 167 partridge, 172 quail, 7 geese, 13 sandhill crane, 5 woodcocks, 2 Hungarian partridge, and 3 pheasants. (See Plate X, page 28.) Rabbits and squirrels were not tallied. No ducks were tallied because mapping in those areas suited for ducks was done before waterfowl migration took place.

The environmental conditions for wild life in Juneau county can be divided into two kinds: the northern plain region which is mostly north of the Lemonweir River and along the Wisconsin River, and the agricultural region mostly south of the Lemonweir River.

The Northern Plain Region

In the past the northern plain region of Juneau county was well populated with game. The drainage of these marsh lands and the unsuccessful attempt to utilize these lands for agriculture have

tended to destroy the natural aptitude this region possessed for game. The repeated burning over of this region has destroyed game birds, nests, food, and cover, as well as mammals, such as deer and fur bearers. In many places the peat has been burned off, leaving pure sand on which a sparse cover of prairie and weed species of plants grow, instead of the more luxurious marsh type of flora. This change of conditions has had a disastrous effect on game. Only remnants of the water-fowl population are left. The upland game birds were more successful in adapting themselves to these changing conditions.



Sandy Peat Plain Northwest of Necedah.

In the northern plain region the game tally was conducted from August 20 to September 16. The plant cover can be classified into types according to adaptability to game. The plant cover types for the northern plain region are discussed in the following paragraphs:

The Grass, Willow, and Popple Seedling Type, covers an area of approximately 42,500 acres. The growth of popple seedlings results from burning over of the peat area. The willow and grass (blue joint grass *Calamagrostis canadensis*) are natural cover. This plant association furnishes excellent cover and desirable food during the spring, summer, and fall period of the year. Based upon the identification of crop contents of the game birds killed in this region, the bird foods are found to be as follows:

Table V

UPLAND GAME BIRD FOODS OF THE GRASS, WILLOW, AND POPPLE SEEDLING TYPE

Common Name	Scientific Name
Bog birch (Leaves, buds)	*Betula pumila* var. *glandulifera*
Wild strawberry (Leaves, fruits)	*Fragaria* spp.
Popple (Leaves, buds, catkins)	*Populus tremuloides*
Dew berry (Leaves, berries)	*Rubus* spp.
Field or sheep sorrel (Leaves)	*Rumex acetosella*
Burdock (Leaves, seeds)	R. spp.
Meadow sweet (Leaves)	*Spirea salicifolia*
Barrens white violet (Leaves)	*Viola lanceolata*
Short horned grasshoppers	*Acridiidae*
Crickets	*Gryllidae*
Other insects	*Insecta*

The Open Type covers an area of approximately 67,000 acres. It includes those regions where there are scattered clumps of brush, trees, and sparse vegetative cover that have little to offer as food and shelter. In these areas are some abandoned farm lands which possess desirable weeds for game birds. Game was usually scarce in these regions.

The Weed Type of cover is scattered through the grass, willow, popple seedling, and open cover as classified by the mappers. Most of these plants are common to the prairies and have migrated into this region since its drainage. Others are of European origin. These plants adapt themselves well to the burned over areas and to abandoned farms. Such plants deserve special consideration because of their year round food value for birds. Though the game tally tended to indicate that these weed patches were not so desirable for prairie game birds as the willow grass type of vegetation, they are, however, of basic importance because many of these plants bear seeds and fruits eaten by game birds during the winter months. Even during times of heavy snows such plants as smart-weed, wild buckwheat, and ragweed bear seeds above the snow. Smart-weed and wild buckwheat, which often predominate the weed patches of the sand peat region, are closely related to the cultivated buckwheat and consequently are a very nutritious bird food. Ragweed is another very important food for prairie game birds in winter. The presence of these species of plants are undoubtedly of particular significance to the prairie chicken. Based on previous reports and from the identification of crop and gizzard contents of prairie game birds the following are the important bird foods found in these weed areas.

Table VI

UPLAND GAME BIRD FOODS OF THE WEED TYPE

Common Name	Scientific Name
Common ragweed (Seeds)	*Ambrosia artemisiifolia*
Stick tight (Seeds)	*Bidens* spp.
Lambs quarters	*Chenopodium album*
Barnyard grass, wild millet (Seeds)	*Echinocholoa crusgalli*
Cultivated buckwheat (Seeds)	*Fagopyrum esculentum*
Wild sunflower (Seeds)	*Heleanthus* spp.
Smart weed (Seeds)	*Polygonum* spp. particularly: *P. Careyi* *P. lapathyfolium* *P. pennsylvanicum*
Arrow-leaved tear-thumb	*P. sagittatum*
False climbing buckwheat (Seeds)	*P. scandens*
Black bind weed (Seeds)	*P. Convolvulus*
Cinquefoil (Leaves)	*Potentilla norvica* var. *hirsuta*
Burdock (Leaves and seeds)	*Rumex* spp.
Field or sheep sorrel (Leaves)	*R. acetosella*
Foxtail (Seeds)	*Seterica glauca*
Night shade (Fruits)	*Solanum nigrum*
Shorthorned grasshoppers	*Acridiidae*
Other insects	*Gryllidae*

The Stream Bottom Type covers an area of approximately 14,000 acres in the county. This type consists of woodland, brush, marsh, and aquatic plant life. This association of types is well adapted to mixed game.

The stream bottom woodland and brush furnish a much desired cover for partridge. The outskirts of these stream regions that adjoin the prairie game bird country also furnish cover and food for prairie birds. Desirable foods of these bottom lands for game birds are listed in the following table:

Table VII

PLANT FOODS FOR UPLAND GAME BIRDS OF THE RIVER BOTTOM TYPE

Common Name	Scientific Name
Sedge (Seeds)	*Carex lupulina*
Sedge (Seeds)	*C. Tuckermani*

Common Name	Scientific Name
Silky dogwood, Kinnikinnik	*Cornus Amomum*
Dogwood	*C. paniculata*
Red-osier dogwood	*C. stolonifera*
Hazelnut (Catkins)	*Corylus americana*
Wild strawberry (Leaves, fruits)	*Fragaria* spp.
Aromatic wintergreen (Berries)	*Gaultheria procumbens*
Michigan holly, black alder (Fruits)	*Ilex verticillata*
Mountain holly (Fruits)	*Nemopanthus mucronata*
Small true Soloman's seal (Fruits)	*Polygonatum biflorum*
Great Soloman's seal (Fruits)	*P. Commutatum*
Smart weed (Seeds)	*Polygonum lapathifolium*
Arrow-leaved tear-thumb (Seeds)	*P. sagittatum*
Poplar, cottonwood, popple (Leaves, buds, catkins)	*Populus deltoides*
Large-tooth aspen, popple (Leaves, buds, catkins)	*P. grandidentata*
Pin cherry (Fruits)	*Prunis pennsylvanica*
Woodbine (Fruits)	*Psedera vitacea*
Choke berry (Berries)	*Pyrus arbutifolia*
Choke berry (Berries)	*P. melanocarpa*
Smooth stem sumac (Seeds)	*Rhus glabra*
Poison ivy, poison oak (Seeds)	*R. toxicodendron*
Burdock (Seeds, leaves)	*Rumex* spp.
Willows (Leaves)	*Salix* spp.
Common elder (Berries)	*Sambucus canadensis*
Red-berried elder (Berries)	*S. pubens*
False spiknard (Fruits)	*Smilacina racemosa*
False Soloman's seal (Fruits)	*S. stellata*
Green brier (Fruits)	*Smilax hispida*
Bitter sweet (Fruits)	*Solanum dulcamara*
Meadow sweet (Leaves)	*Spiraea salicifolia*
Wild raisin (Fruits)	*Viburnum cassinoides*
High-bush cranberry (Fruits)	*V. opulus* var. *americanum*

The river bottoms of meandering streams, particularly the bottoms of the Yellow and Lemonweir rivers with their flowages, sloughs, and oxbows have brush, marsh, and aquatic vegetation that furnish desirable environment for water fowl. Wild rice and coontail in particular are common and are excellent duck foods. Many of the plant foods listed for upland game birds are also valuable for water fowl. The aquatic duck foods are listed in the following table:

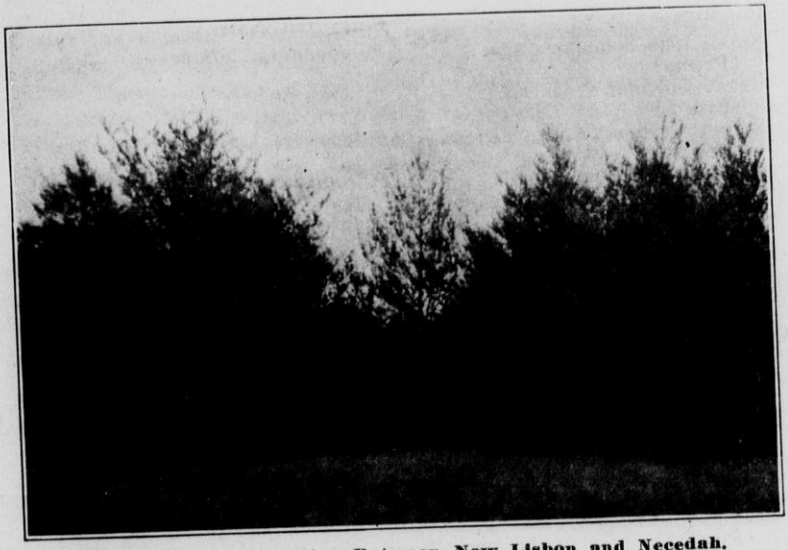
Table VIII

AQUATIC PLANT FOODS FOR DUCKS OF THE RIVER BOTTOMS

Common Name	Scientific Name
Water marigold	*Bidens Beckii*
White water lily	*Castalia tuberosa*
Coontail, hornwort	*Ceratophyllum demersum*
Water-weed, Elodea	*Elodea canadensis*
Duck-weed, duck's meat	*Lemna perpusilla*
Water milfoil	*Myriophyllum spicatum*
Bushy pondweed	*Najas flexilis*
Yellow water lily, cow lily, spatter dock	*Nymphozanthus variegatus*
Water smartweed	*Polygonum natans*
Pondweed, bass weed	*Potamogeton americanus*
	P. amplifolius
Leafy pondweed	*P. epihydrus*
Pondweed, floating brown leaf	*P. natans*
Sago pondweed	*P. pectinatus*
Pondweed	*P. Robbinsii*
	P. zozteriformis
	P. spp.
Water crowfoot	*Ranunculus longirostris*
Wapato, duck potato	*Sagittaria latifolia*
Bur-reed	*Sparganium chlorocarpum*
Duck-weed, duck's meat	*Spirodela polyrhyza*
Wild celery	*Vallisnera americana*
Wild rice, Indian rice, duck oats	*Zizania aquatica* var. *interior*

Other wild game such as rabbits, squirrels, and in the more isolated regions, deer, find the environment of the stream bottoms a good cover. The beaver, mink, and otter are rare even though most of the stream bottom land is well adapted for them. Muskrats are fairly abundant. They are particularly fond of the flowage regions where the dense cover of sedges, wild rice, bulrushes, and cat-tail of the water margins are to their liking. The pad vegetation, such as the yellow and the white water lilies, are their favorite food. They use also the lax flexious pondweeds, coontail and water weed.

The Mixed Brush and Forest Type covers approximately 90,000 acres. The drier sandy regions, particularly along the Wisconsin River, are in part covered by brush and trees of the scrub oak, jack pine type. This type of cover is not so well adapted for game as the more varied and dense brush and tree cover of the sand peat region, where such brush as choke berry, choke cherry, alder, dogwood, bog birch, willow, Michigan holly, and hazelnut are common. The for-



School Forest Plantation Between New Lisbon and Necedah.

ested areas which consist of the different oaks, jack pine, white pine, popple and birch are better adapted for partridge. The correlation of the game tally with cover indicates that the mixed brush and forest area cover of the sand peat soils are also desirable for deer. The upland game bird foods found in this mixed cover type are in many cases those found in the grass and willow type of cover plus the plant foods listed in the following table:

Table IX

UPLAND GAME BIRD FOODS OF MIXED BRUSH AND FOREST TYPE

Common Name	Scientific Name
Juneberry (Fruits)	*Amelanchier* spp.
White birch (Buds)	*Betula papyrifera*
Creeping snow berry (Berries, leaves)	*Chiogenes hispidula*
Red-osier dogwood (Fruits)	*Cornus stolonifera*
Hazelnut (Catkins)	*Corylus americana*
Aromatic wintergreen (Berries)	*Gaultheria procumbens*
Huckleberry (Leaves, berries)	*Gaylussacia braccata*
Michigan holly, black alder (Fruits)	*Ilex verticillata*
Sweet Gale (Buds)	*Myrica Gale*
Mountain holly (Fruits)	*Nemopanthus mucronata*

Common Name	Scientific Name
Small true Soloman's seal (Fruits)	*Polygonatum biflorum*
Great Soloman's seal (Fruits)	*P. sagittatum*
Smart weed (Seeds)	*Polygonum lapathifolium*
Arrow-leaved tear-thumb (Seeds)	*P. sagittatum*
Pin cherry (Fruits)	*Prunis pennsylvanica*
Choke cherry (Fruits)	*P. virginiana*
Choke berry (Fruits)	*Pyrus arbutifolius* *P. melanocarpus*
Oaks (Acorns)	*Quercus* spp.
Dwarfed sumac (Fruits)	*Rhus copallina*
Smooth stem sumac (Friuts)	*R. glabra*
Poison ivy (Fruits)	*R. toxicodendron*
Staghorn sumac (Fruits)	*R. typhina*
Rose (Rose hips)	*Rose* spp.
Elderberry (Fruits)	*Sambucus canadensis*
False spiknard (Berries)	*Smilacina racemosa*
False Soloman's seal (Berries)	*S. stellata*
Velvet-leaved blueberry (Fruits, leaves)	*Vaccinium canadensis*
Early blueberry (Fruits, leaves)	*V. pennsylvanicum*

Game Management

The most efficient utilization of the northern plain region for game implies management. In the peat sand areas where the land is well suited for mixed game, Nature has begun this wild life project by spreading the weed flora. The seeds and fruits of these plants are important foods for the prairie chicken during the winter months. Game management in this region would augment further adaptation of this land for wild life. However, such a project should be a guided one in order to be of mutual advantage for game and for cranberry farming, a highly specialized form of agriculture for which certain parts of this area are well adapted.

Cooperation between game management and cranberry farming should result in mutual benefit to both projects. In this connection there are two fundamental factors to consider:

1. The propagation of wild game should be a guided one in order that it will not produce harmful effect on the cranberry farming. This would result if too many muskrats were allowed to propagate. Since the burrowing activities of this animal destroy the effectiveness of the dikes bordering cranberry marshes, it is imperative therefore,

that the muskrat should not be protected but eradicated from the vicinity of cranberry farms.

2. The impounding of the water by dams, earth plugs, and dikes is important to the cranberry growers so that water will be stored for flooding the cranberry marshes. Such flooded areas will furnish suitable environment for water fowl.

The Improvement of the Environment for Water Fowl

The natural marsh conditions with its scattered ponds, and sloughs which existed before drainage ditches were dug was a very desirable breeding ground for water fowl. The proposed damming and plugging of the drainage ditches would tend to restore this former environment. This fact is well illustrated in those areas where water has been impounded for cranberry farming. Several varieties of ducks have nested in this region. Seven geese were seen early in August 1932 west of Meadow Valley. Five of these were reported to be young birds which had been hatched there that season. Other rare birds such as the sandhill crane were found in these marshy regions.

A dense growth of marsh vegetation would result were the water retained by dams. However, aquatic vegetation would be very slow in coming back. It would be necessary to plant a few essential aquatic duck foods to make this area a better place for water fowl. Before carrying out such a project it is necessary to know whether a suitable environment exists for these plants. The analysis of the water of the streams and ditches for hardness (alkalinity) or softness (acidity) was based on the parts per million of bound carbon dioxide which is the relative amount of carbonates, or lime, in the water.[1] These tests showed that the parts per million of bound carbon dioxide were between 20 and 29. This indicates a medium hard water. Medium hard waters have been observed to be associated with a balance of mineral nutrients which is necessary for an abundant and varied vegetation including most of the aquatic duck foods. Some desirable plants for ducks are:

Table X

Common Name	Scientific Name
Bushy pond weed or water naiad	*Najas flexilis*
Coontail or hornwort	*Ceratophyllum demersum*
Sago pond weed	*Potamogeton pectinatus*
Pondweeds	*P. angustifolius*
	P. amplifolius
	P. natans
	P. spp.
Wild celery	*Valisneria americana*
Wild rice	*Zizania aquatica*

[1]Seyler, C. A.
1894, Chemical News, Volume 70.

Birge, E. A. and Juday, C.
1911, Inland Lakes of Wisconsin, Wisconsin Geological and Natural History Survey Bulletin 22.

Sixth Edition
1925, Standard methods of Water Analysis, American Public Health Association, 370 Seventh Avenue, New York, N. Y.

Wild rice is an excellent food for ducks. Observations also tend to indicate that one of the attractive features of wild rice for ducks is the desirable shelter and cover afforded. In the open water margins bordering wild rice beds other essential duck foods of the submerged long flexious type (coontail) are invariably found.

Wild rice requires an alkaline condition, an exchange of water due to drainage, and fairly constant water level during its growing season. If the water level fluctuates as much as twelve inches, the wild rice will die. Ripe grains of wild rice that have not been roasted can be successfully planted in the autumn. If wild rice is planted in the spring, seed should be obtained from a reliable aquatic nursery because of the difficulty involved in preserving its vitality.

Coon Tail.

Coontail is a very desirable duck food. Young shoots growing from the old stem of this plant are among the first aquatic plant foods to be eaten by ducks, and in the fall when most of the aquatic vegetation has disappeared, this semi-bristled leaved plant is still available. Since this plant does not have roots, though it is often anchored, it can easily be transplanted. Coontail can be found and

gathered in the sloughs and flowages of the river bottoms where it is already quite abundant.

The Improvement of the Environment of the Upland Game Birds

The partridge, which is found in the forested areas is a very hardy bird that lives on a variety of foods. In winter, it eats buds of popple, birch, and of other trees and shrubs.

The sharp-tail grouse and particularly the prairie chicken subsist largely on seeds in winter. Planting of patches of food bearing plants such as buckwheat, wild millet, and corn would, therefore, be of aid to these birds. Though these prairie birds are not so dependent on buds as the partridge, Mr. F. Schmidt has observed that they do eat the buds of white birch and bog birch during the winter months.[2]

Bog birch is already quite common in the willow and mixed brush areas. The introduction of more white birch would also improve prairie game birds conditions.

The mild winters and light snow fall have made it possible for quail to become quite common in the northern part of Juneau county. If such birds are to exist permanently in these parts, sheltered feeding stations should be established. These stations will also be of benefit to the other upland game birds.

The Improvement of the Other Game Conditions

Other game includes deer, rabbits, squirrels, and the fur bearing animals. The number of deer in this region has decreased due to insufficient protection. The rabbits are plentiful. Squirrels are also fairly common in the wooded areas.

Of the fur bearing animals beaver, mink, and otter are rare. Muskrats are quite plentiful in certain regions. The proposed damming back of the water in the drainage ditches would furnish much additional desirable environment for muskrats. However, it is advisable to reinforce earth plugs with iron piling or wire mesh because of the burrowing habits of these animals.

Game Refuge[3]

A refuge for wild life is an essential factor of a game management program because it serves as a suitable place for game propagation, shelter, and as a resting ground. A large game refuge in the northwestern part of Juneau county would be beneficial because it possesses a variety of environmental conditions essential for mixed game. Such a game refuge would be centralized in a populated mixed game country.

The Southern Agricultural Region

The agricultural region with its crop land, pastures, and rugged wood land possesses excellent possibilities for the cooperation of

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[2]Mr. F. Schmidt, formerly associated with the State Conservation Commission, unpublished data.

[3]Leopold, A.
1933, Game Management, Chapter VIII Game Refuges, Page 195, Published by Charles Scribner's Sons, New York, N. Y.

Agricultural Region of Southern Juneau County.

game management with farming. The utilization of wild life as an added agricultural revenue in Wisconsin has been given impetus by the passage of the "Wisconsin Licensed Shooting Preserve Law."[4]

Game birds of this region are mainly partridge and quail. Partridge are fairly common in the wooded areas, while quail find the margin of the woods, the thicket fence lines, and the fields suitable.

The quail deserves special consideration since it is one of the most desirable game birds and because of its economic importance. During spring, summer, and fall it feeds on weed seeds and insects, many of which are very destructive. "One farmer estimates that each Bob-white in his fields is worth at least five dollars a year because of the good it does in destroying insects."[5] Mild winters and light snow fall has made it possible for this bird to become more abundant. The construction of winter feeding stations is necessary if the present number of these birds is to be maintained and increased should more severe weather occur in the future.

THE TREND IN LAND OWNERSHIP AND POPULATION

When land ceases to find a buyer who is willing to pay taxes, it reverts through tax delinquency to public ownership. Two factors are contributory viz., (a) excessive taxes — in this case for drainage and in some instances for schools (b) low productivity. Plate XI, page 41, shows the trend to public ownership in the northern plains province. It also shows the county forest area which has been definitely set off to again revert to wild cover.

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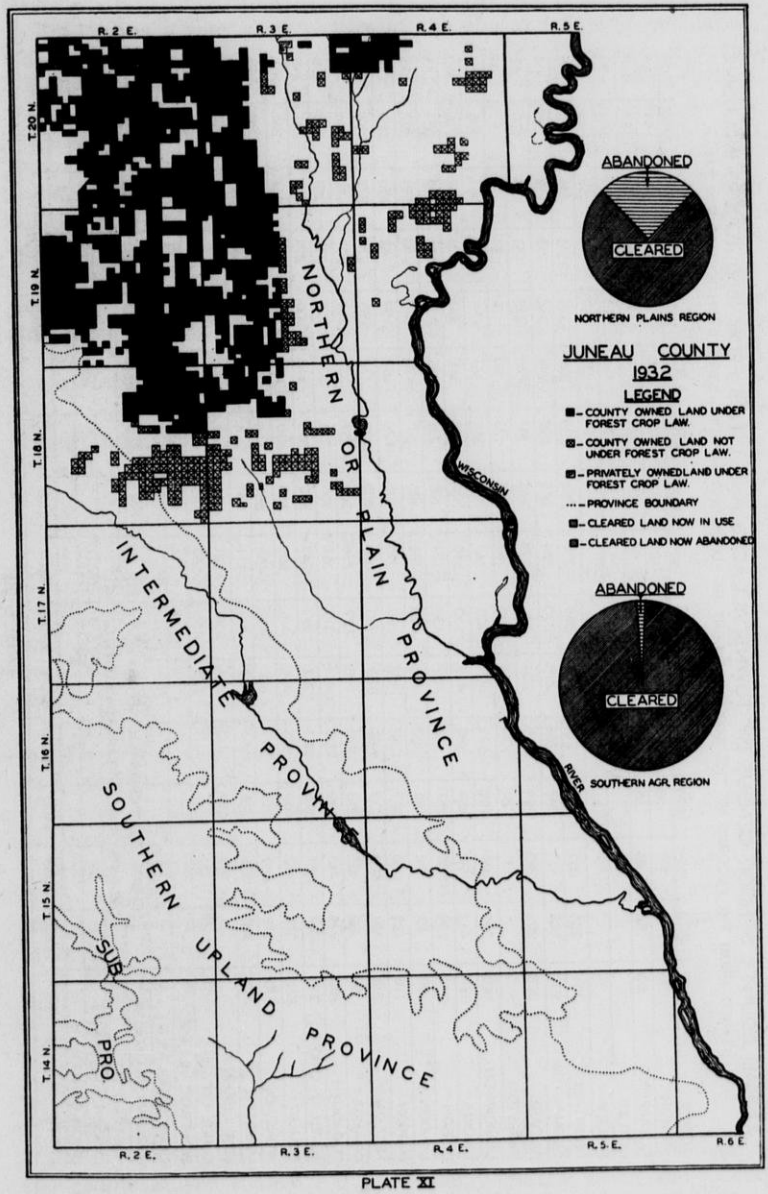
[4]1932, Wisconsin Licensed Shooting Preserve Law, State of Wisconsin Conservation Department, Madison, Wisconsin. Copies of this law with explanation will be mailed upon request from the Conservation Department.

[5]Forbush, E. H.
1927, Birds of Massachusetts and other New England States Part II, Page 11, Massachusetts Department of Agriculture.


R. 2 E.
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NORTHERN DRIFT PLAIN PROVINCE
INTERMEDIATE PROVINCE
SOUTHERN URLAND PROVINCE
SUB PRO
WISCONSIN RIVER
ABANDONED
CLEARED
NORTHERN PLAINS REGION
JUNEAU COUNTY
1932
LEGEND
- COUNTY OWNED LAND UNDER FOREST CROP LAW.
- COUNTY OWNED LAND NOT UNDER FOREST CROP LAW.
- PRIVATELY OWNED LAND UNDER FOREST CROP LAW.
- PROVINCE BOUNDARY
- CLEARED LAND NOW IN USE
- CLEARED LAND NOW ABANDONED
ABANDONED
CLEARED
SOUTHERN AGR. REGION

PLATE XI

JUNEAU COUNTY SCHOOL CENSUS BY TOWNS, VILLAGES AND CITIES FROM 1866 TO 1933 INCLUSIVE.

TAKEN FROM THE RECORDS OF THE SUPERINTENDENT OF PUBLIC INSTRUCTION – STATE CAPITOL. MADISON. WIS.

TOWNS	1866	1870	1874	1878	1882	1886	1890	1894	1898	1902	1906	1910	1916	1924	1932	1933
ARMENIA	76	70	97	95	92	61	107	105	342	372	328	279	300	246	157	168
CLEARFIELD	53	54	85	96	107	98	99	91	185	207	213	175	184	189	157	158
CUTLER										154	153	125	123	157	103	94
FINLEY										81	73	49	46	55	23	30
FOUNTAIN	181	255	255	258	276	265	266	276	263	324	325	321	(1)245	225	215	207
GERMANTOWN	239	202	153	247	269	210	200	204	240	238	242	242	218	119	93	104
KILDARE	303	299	290	264	235	204	240	278	295	347	(2)223	215	182	134	136	162
KINGSTON				27	34	51	55	67	126	125	90	76	84	70	57	67
LEMONWEIR	348	399	414	468	399	407	403	361	337	357	361	426	377	291	289	304
LINDINA	393	411	492	384	380	413	350	340	339	323	326	332	376	343	274	260
LISBON	547	629	(3)155	157	133	167	134	161	198	231	226	207	174	179	201	185
LYNDON	196	195	142	186	190	191	202	186	195	171	178	166	161	191	167	165
MARION	116	128	120	147	152	163	199	175	196	124	184	169	142	156	129	132
NECEDAH	218	401	508	517	660	823	710	883	805	(3)225	172	205	237	273	233	217
ORANGE	57	82	167	213	210	270	227	268	305	(4)217	238	211	197	172	154	143
PLYMOUTH	260	274	415	489	608	(6)411	316	359	306	315	309	307	272	271	278	258
SEVEN MI. CREEK	275	429	387	395	303	247	210	247	322	358	340	309	297	253	233	241
SUMMIT	222	313	342	409	373	414	416	386	388	410	384	381	360	361	314	282
WONEWOC	278	372	469	213	611	691	433	468	557	528	502	449	(7)421	342	296	348
MAUSTON	295	368	366	378	364	343	419	411	467	544	546	515	448	540	527	474
NEW LISBON (5)			493	430	410	554	295	381	404	347	364	366	381	308	317	318
ELROY CITY (6)						438	455	589	563	543	559	496	442	439	423	390
WONEWOC VILLAGE							170	371	118	314	185	176	211	189	188	195
CAMP DOUGLAS (4)										134	139	121	123	127	113	109
NECEDAH VILLAGE (3)			SCHOOL CENSUS TAKEN SEPARATELY FOR							449	450	497	407	250	221	226
HUSTLER (1)			THE FIRST TIME IN YEARS MARKED (1) (2) ETC.										46	51	36	32
LYNDON STATION (2)											108	112	101	54	97	98
UNION CENTER (7)													59	54	48	46
TOTAL	4,057	4,481	5,350	5,400	5,806	6,204	5,906	6,607	6,951	7,438	7,218	6,927	6,656	6,039	5,360	5,414

TABLE XI

The occupation of the land of Juneau county by the white man came early in the history of the state. A school census dating back to 1866 gives a very clear picture of the ebb and flow of population. The northern plains province shows a very marked decrease in school population since the turn of the century while south of this province, where the land is largely agricultural the school population has remained about the same. The annual cost per pupil is also much lower. (See Table XI, page 42.)

Economic duress has caused numerous schools to close, which usually leads to the consolidation of districts and results in greater efficiency and a lower cost per pupil.

The school map shows several proposed consolidations as suggested by school officials. One includes the four districts in the town of Kingston. Necedah district No. 6 would be annexed to Joint District No. 10; Armenia No. 6 would be annexed to Armenia Joint No. 5; Finley No. 2 would be annexed to Finley No. 1. Other possible changes may be suggested following a careful study of the school map with its enrollment and cost data. (See Plate XII, page 44.)

Conclusions

A land inventory does not infer recommendations other than those implied in the inventory analysis. Summarily these are:

A. Restoration of a higher water table in the northern plains by the construction of regulatory dams in the 250 miles of drainage ditches.

B. The reversion of this region to its natural native cover of forest and marsh vegetation, with limited areas reserved for agriculture and cranberry culture.

C. The establishment of a game refuge primarily for migratory and nesting birds.

D. The utilization of the vast system of dammed drainage ditches for propagation of fish and in some cases for fur bearing animals. Muskrats, however, must be kept away from regulatory dams and cranberry levees.

E. The increase of the natural forest cover on the rough land of the southern provinces.

F. The increase through consolidation of areas of governmental units as town and school districts where it is found that greater governmental efficiency at lower costs may be attained (see Plate XII, page 44).

The inventory data should suggest numerous other changes to the people of the county and particularly to the Town and County Boards because of the fact that ordinances regulating land use are now possible under the laws of Wisconsin, and many counties are availing themselves of the opportunity of zoning their lands for their best uses.

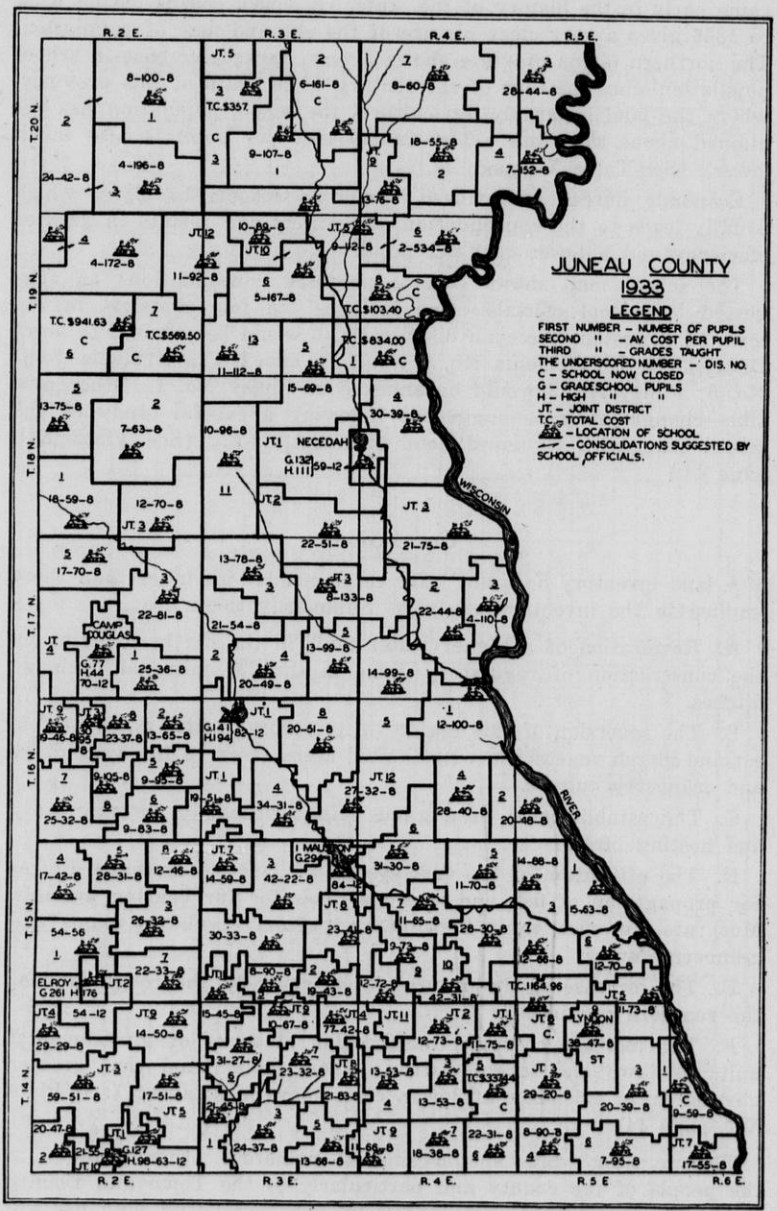
JUNEAU COUNTY
1933
LEGEND
FIRST NUMBER – NUMBER OF PUPILS
SECOND " – AV. COST PER PUPIL
THIRD " – GRADES TAUGHT
THE UNDERSCORED NUMBER – DIS. NO.
C – SCHOOL NOW CLOSED
G – GRADE SCHOOL PUPILS
H – HIGH " "
JT. – JOINT DISTRICT
T.C. – TOTAL COST
– LOCATION OF SCHOOL
– CONSOLIDATIONS SUGGESTED BY SCHOOL OFFICIALS.
WISCONSIN RIVER
NECEDAH
CAMP DOUGLAS
ELROY
LYNDON ST
R. 2 E.
R. 3 E.
R. 4 E.
R. 5 E.
R. 6 E.
T. 20 N.
T. 19 N.
T. 18 N.
T. 17 N.
T. 16 N.
T. 15 N.
T. 14 N.

PLATE XII

FLORA OF JUNEAU COUNTY

The character of the timbered areas of the county is described elsewhere in this bulletin so this discussion is limited to a consideration of the vegetation of the broad expanses of prairie and peat soils and the ground cover of the wooded land. The chief element of this flora consists of grasses, some of which are general in their distribution throughout the county, but most of which show preferences as to soil types. The northern and eastern portion of the county is divided roughly into two soil types — sand plain and peat soils. The peat soil varies in the relative proportions of sand and peat and is further classified by the soils expert upon this basis. These peat lands almost wholly occupy the northwest quarter of the county. The sand plains include those soil types designated as Plainfield sand, Boone sand, Superior sand and Dunning sand and occupy a broad strip adjacent to the Wisconsin River with an extension of the Superior sand across the central part of the county to the west county line.

The most conspicuous feature of the sand plain flora is the presence of the prairie triple-awned grass occurring over broad expanses of cleared land in almost pure stands. Two species of the grass were noted, *Aristida basiramea*,[1] dominant in Plainfield sand, and *A. intermedia* which was more plentiful than the first in the Boone sand areas but reached its maximum in Superior sand and sand peat. The upland prairie bluestem,[2] *Andropogon scoparius* var. *frequens*, which occurs throughout the county becomes plentiful in Plainfield sand while its lowland sister species *A. furcatus*, which reaches its maximum in the peat soils, is plentiful in Dunning sand and occurs less frequently on Boone and Plainfield sands. The early flowering Kentucky blue grass, *Poa pratensis*, which is the dominant roadside and pasture grass in the loam soils of the southwestern portion of the county is also a common element of the Plainfield sand flora in spare stands but occurs more sparingly in the Boone sand areas than elsewhere in the county. The Canada blue grass, *Poa compressa* occurs occasionally in Plainfield sand. Timothy is rare in the Plainfield and Boone sand areas but becomes plentiful in Superior sand. Both of these species reach their maximum frequencies in the southwestern part of the county. The fox-tail grass, *Setaria lutescens*, which is plentiful in cultivated soils throughout the county becomes a common weed in the Plainfield and Superior sands. *S. viridis* occurs in similar situations throughout the rest of the county but was not collected in Plainfield sand. Sandbur is plentiful throughout in cultivated soil but most common on Boone sand. The prairie species *Bouteloua hirsuta* was observed only once and that was on Boone sand.

Associated with the above named grasses in the sand plain areas are a number of typical prairie species such as *Aster sericeus;* the

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Note 1. For the sake of accuracy, where there is no common name for the species the scientific name is used.

Note 2. Weaver, J. E., Who's Who Among the Prairie Grasses. Ecology, 1931.

tickseed, *Coreopsis palmata;* the blazing star, *Liatris pycnostachya;* lead plant and the false indigo, *Baptisia bracteata.* The rush, *Juncus interior,* is a common element of the flora, and the ragweed, *Ambrosia psilostachya,* especially noxious because of its long deeply buried runners, is well established in cultivated soil. Plants occurring in similar situations but of general distribution in the North Central states are represented by *Polygonella articulata;* the golden rod, *Solidago rigida;* hazelnut; the blazing star, *Liatris scariosa;* the horse mint, *Monarda punctata* and dewberry, the last being common in Dunning sand. A typically eastern species occurring in the area is the flax, *Linum medium,* while *Amaranthus blitoides* and white sage are representatives of a more westerly flora.

Attention was especially paid to the ground cover of the jack pine and scrub oak areas in an effort to discover significant differences which might be useful indicators as to the most economical utilization of the soil. In a jack pine stand the ground cover was found to consist largely of bearberry; two species of blueberry; the red root, *Ceanothus ovatus;* hazelnut and sedges. Flowering spurge and *Coreopsis palmata* were also present. All of these species with the exception of Bearberry occurred sparingly and fruited poorly or not at all. In a recently burned jack pine area the above species were all present with the additional prairie bluestems, indian grass, pinweeds and frostweeds, all fruiting freely beneath the open tree growth which consisted of oak sprouts. A scrub oak stand showed a similar ground cover with a stronger development of the prairie flora, the prairie June grass, *Koeleria cristata* becoming dominant. Jack pine seedlings were plentiful in the scrub oak cover. It seems evident that jack pine originally grew on the scrub oak areas but the oak has arisen due to burning, and, serving as cover to the jack pine seedlings the area will eventually return to jack pine unless further interrupted by fire. In the absence of scrub oak cover, seedlings of jack pine occur sparingly in Plainfield sand but are found in much heavier stands in the moister Boone and Dunning sands.

The moister peat soils of the northwestern part of the county are characterized by broad meadows of the blue joint, *Calamagrostis canadensis* var. *typica,* which in the sand plain areas occurred only in ditches and sparingly on shaded soil. In wetter conditions it gives way to sedge (*Carex* spp.) with wool grass, and where deep burning has exposed the underlying sand it is replaced by heavy stands of hair grass, *Agrostis hyemalis.* In Kingston where a severe burn occurred in 1930 it is not uncommon to see the blue joint and hair grass together, the latter occurring on the bare sand between the hummocks of peat which are covered with the former. The barnyard grass, *Echinochloa muricata,* has also become well established in this region as have tickseed sunflower and several species of knotweeds, *Polygonum pennsylvanicum, P. lapathifolium, P. Careyi, P. Hydropiper, P. Convolvulus* and *P. scandens,* all valuable sources of food for game birds. Also occurring plentifully in the area are beard grass and Indian grass. Slough grass is plentiful in low lying

places and especially so along drainage and roadside ditches, while wild oat grass which occurs in spare stands along wood edges and fence rows throughout becomes plentiful in sand peat in the northern part of the county. The dropseed, *Muhlenbergia uniflora*, occurs occasionally in moist sands and becomes plentiful as a weed in the commercial cranberry marshes.

Spiraea salicifolia and the pink flowered *Spiraea tomentosa* are common on the peat soils while the collections of the prairie gentian, *Gentiana puberula*, and the northern species, *Gentiana linearis* var. *latifolia* are notable because of their rarity in the region. *Gerardia tenuifolia* is plentiful along the roadsides and bristly sarsaparilla occurs occasionally although it is more common in rocky situations as on the buttes along the Wisconsin River. Fireweed, *Epilobium angustifolium*, is plentiful over the burned area and E. coloratum, willow herb, is common in moist situations. Relics of a time when these peat lands were forested are found in the species *Clintonia borealis*, bunchberry, twisted stalk, Canada mayflower, star flower, red raspberry, the spinulose shield fern, cinnamon fern and royal fern.

The bottomlands of the rivers and streams crossing the county offer a wide variety in their flora. Here are found the brome grasses, *Bromus ciliatus*, *B. Kalmii* and *B. purgans*. Rattlesnake grass, *Glyceria canadensis*, and its more rare sister species *G. grandis* are found not only in the creek bottoms but also along ditches throughout. *Muhlenbergia foliosa* was observed only in wooded river bottoms while *M. racemosa* is plentiful in spare stands on moist soils throughout. The bent grass, *Agrostis perennans*, commonly seen in moist soil was only occasionally seen in Boone sand areas but was common in moist soil elsewhere. The last two species were not observed in the Plainfield sand area. More rarely occurring species confined to the river bottoms are rice cut grass, white grass, dropseed *(Sporobolus heterolepis)*, wood reed grass and *Brachyelytrum erectum*. Two species of wild rice are plentiful in heavy stands in the Lemonweir River and similar situations, the broader leaved species, *Zizania aquatica*, being more common than the narrower leaved var. *angustifolia*.

Characteristic also of the bottomlands are mild water pepper; lance-leaved lousewort; the loosestrifes, *Lysimachia terrestris* and *L. quadrifolia;* the false loosestrife, *Ludwigia polycarpa;* cardinal flower; closed gentian; water hemlock; marsh speedwell and the sedge, *Carex lupulina*. Black alder, the dogwoods and the arrow-woods are the common shrubs of the bottoms. The sumacs, staghorn, smooth and winged, are not confined to the river bottoms but are found in favorable situations throughout the county.

Among the grasses cultivated in the county are sorghum, fox-tail millet, sudan grass and Japanese barnyard millet. The last is freely escaping in the vicinity of New Lisbon and possibly hybridizing with wild species of *Echinochloa* there. The occurrence of timothy as a meadow grass has already been mentioned. In the loam soils of the southwestern portion of the county red top is

common in low pastures, and is an important element in meadows in the sand peat soils west of Necedah. *Panicum Praecocius* is also a common pasture grass and P. sphaerocarpon was observed to grow plentifully with it in Superior sand.

Another group of grasses is composed of those which occur as common field and roadside weeds throughout the county. This group includes *Agropyron*, or quack grass, of which the species *Agropyron caninum* and *A Smithii* are the most common representatives. The finger grass, *Digitaria humifusa*, is common throughout on roadsides and *D. sanguinalis* is occasional in similar situations on the moister richer soils. The barnyard grass, *Echinochloa crus-galli*, is plentiful throughout on roadsides and as a weed in cultivated ground, while another species, *E. muricata* var. *microstachya*, occurs along the Lemonweir and on creek banks near Elroy. Several species of *Eragrostis* appear in a variety of situations. *E. pectinacea* is a common roadside weed throughout. *E. cilianensis* becomes plentiful in Plainfield sand while *E. spectabilis* is the more common species in Boone sand. *E. Frankii* occurs in cultivated soil in the southwest part of the county. Squirrel-tail grass is not common but appears occasionally in the better soils. Old witch grass, *Panicum capillare*, is a common field and roadside weed throughout while the dropseed, *Sporobolus vaginaeflorus*, is plentiful on roadsides in the west and south portions. Occasional stands of another dropseed, *S. cryptandrous*, occur on sand banks and road cuttings. Wild rye is represented in the county by four species of *Elymus* of which *E. diversiglumis* is occasional along shaded roadsides near Elroy and *E. robustus* appears occasionally throughout the county. Other grasses appearing more rarely are wild oat, *Avena fatua*, which was collected in Germantown and Armenia, and *Phalaris arundinacea*, the reed canary grass, which was collected in Cutler. Fescue occurs occasionally and the reed, *Phragmites communis*, was observed once in the northern part of the county; it may occur elsewhere.

Three factors commonly operate in the extension of prairie over any area, these are drainage, fire and cultivation, of which the last is probably the most important. In Juneau county the clearing, cultivation and eventual abandonment of the land has given rise to the broad expanses of prairie in the sand plains of the eastern part of the county while drainage has been conducive to the development of prairie environment and a prairie flora in the peat and sand-peat areas of the west. In both instances these factors have been followed by fire which has materially assisted in the establishing of the prairie conditions. In event of the elimination of the first two of these factors over the areas in which they operate and the control of the third, it seems evident from a consideration of apparent tendencies in the vegetation just described that the forest flora will reassert itself and again become the dominant flora on large areas now given over to prairie.

Appendix to Bulletin

THE COMING OF THE WHITE MAN TO WHAT IS NOW JUNEAU COUNTY

The onward trek of the white man in his migration westward across the continent first brought him in numbers into what is now Juneau county about 1850. Traders and those seeking fine pine had come somewhat earlier but the actual settlement by those seeking permanent homes started close to the middle of the last century. The county, formerly a part of Adams county, was organized in 1856. Eleven hundred ballots were cast at the first county election.

Indian Treaties

That portion of Juneau county south of the Lemonweir River belonged to the Winnebago Indian tribe, and north of this river to the Menomonee tribe. The Winnebagoes relinquished their claim in 1836 in a treaty signed with the United States government at Fort Winnebago. This part of the county was, therefore, opened to the white man earlier than that portion north which was released by the Menomonee tribe twelve years later in the treaty of Poygan Lake.

First Comers

Mr. John T. Kingston after whom the town of Kingston is named, first visited the county in 1836. His mission was scouting for fine pine timber. He traveled up the Lemonweir to about the present site of Mauston. Mr. Kingston, however, never engaged in the lumber business on the Lemonweir, but in 1848 became one of the first operators on the Yellow River. The first logging camp of Mr. Kingston and his associates was built in the winter of 1848 at a point about twelve miles up the river from Necedah. They built a saw mill where Necedah is now located and sawed their first logs into lumber the next year. At this point in 1851 those same operators built the first steam saw mill in the county to mill the fine pine of the Yellow River Valley.

Others who came early in 1838 and remained were Amasco Wilson, C. B. Smith and R. V. Allen. These men located in the southeastern corner of the county near Rocky Glen through which Highway 12 now passes. Four years later, Mr. Wilson, with a Mr. Armstrong and J. H. Findlay, built the first saw mill where New Lisbon is now located. Five years later Andrew Dunn built a saw mill four miles farther up the river near Lone Rock.

In 1836, a man by the name of La Ronde, established a trading post on the present site of Mauston. Six years later a saw mill was built at this point which became the property of General M. M. Maughs of Galena, Wisconsin, after whom Mauston (first spelled Maughston) was named.

The Early Scouts

Many, who first came as woodsmen or mill workers, returned from time to time to their former homes and reported the possibilities

for farming in the Valley of the Lemonweir and the uplands south, and by 1850 the migration for actual land occupancy superceded the former interest of those who came for timber. Some followed the Baraboo River into the present towns of Wonewoc and Plymouth. Others followed the Indian trails from Baraboo and the county to the southeast. These trails converged into one trail somewhere near the present towns of Lyndon and Seven Mile Creek, then followed a northwesterly course up the Lemonweir. These trails seldom followed the higher rugged country and early pioneers, therefore, experienced many hardships when their covered wagons and oxen became stuck in some of the numerous sloughs.

Migration From Whence

The social unrest throughout the white man's world and the urge to seek new land gave Juneau county settlers who came from a wide territory, ranging from Maine to Illinois. Others came from Scotland, Ireland, England and the continent of Europe. Men came with their families. Others came and established themselves and then returned for their families. Two men from the Baraboo Valley settlement walked 150 miles to Milwaukee, were married there, and then with their wives, walked back to their homesteads. One of three Scotch boys by the name of Trainer, who settled on the Lemonweir, returned to Scotland and brought back his Scotch "lassie" whom he had left behind in coming to America. People came from all walks of life. Captain S. T. Hanson, a navigator on the Great Lakes, decided to try farming and settled near Mauston in the Stewart neighborhood in 1853.

Settlement

Settlement started almost simultaneously in those localities which are now Wonewoc, Plymouth, Lyndon, Kildare, Seven Mile Creek, Lemonweir, Lindina and Lisbon towns. Leadership and community development were obviously more marked in some settlements and these naturally progressed most rapidly. The outstanding early community development in the Lemonweir Valley was east and south of the present site of Mauston. Later came the communities west and north. A relatively early start was also made near New Lisbon in what was known as the Webster neighborhood.

Neighborhoods outstanding in the early fifties were the Stewart and Fossbinder communities between Mauston and Lyndon Station. Seven Mile Creek, Webster, Fowler's Prairie and the Potter settlements were equally outstanding in these early days.

The leaders in these various communities were surely endowed with a zealous fervor common to the early pioneers. A Mrs. Powers is said to have carried her infant child forty miles to have it baptized and then forty miles back to her pioneer cabin. That these early settlers had vision and desire for a better life is also obvious from the fact that in every one of these early communities, schools and churches were at once established, frequently at great sacrifice. For example, Mr. J. T. Hanson relates that when a certain Mr.

Green, who built the first St. Bridget's Catholic Church west of Lyndon Station, found that he lacked a bunch of shingles to complete the job and that there was no more money with which to buy shingles, he traded his new hat for the shingles and finished the job. Later, St. Bridget's Catholic Church was moved to its present site in the town of Seven Mile Creek.

Temperance was also one of the early issues among the new settlers, for the first secret order founded in 1855 was the Sons of Temperance.

The Pioneer Teachers and Preachers

George P. Kenyon was the first person to teach school in New Lisbon while Reverend Knapp was the first preacher in this community. Miss Emily Fowler was the first teacher at Fowler's Prairie School; Miss Lydia Nourse was the first teacher in the Fossbinder Community. As many of the new-comers with strong religious convictions settled in this Fossbinder neighborhood, it soon received the name of "Preachers' Rest." Reverend Wm. C. Armstrong, who came as the first mission preacher, sent out by the Methodist church, preached here, as he did later in the other growing communities. Larmon E. Saxton and Lucinda A. Crawford were the first teachers in the Seven Mile Creek School and the Reverend Father Gardner of Sauk City held the first services in St. Bridget's Catholic Church. The school organized in the Stewart neighborhood was taught during the first year by Miss Emeline Cole.

Early Industries

The lumbering industry has already been mentioned. Its function was wholly destructive as far as natural resources are concerned. A very important industry as far as the self sufficiency of a pioneer country is concerned, is milling. On at least two occasions prior to 1855, a famine in the rapidly growing communities, south of the Lemonweir was barely averted by the heroic trek overland under the most adverse conditions, to the mills at Beaver Dam for flour. By 1855 considerable grain was being produced, and that year, Newell Dustin built and started operating the first grist mill on the site of the present Lemonweir Village. The next grist mill was built on the Baraboo at Elroy in 1860. A brick yard was first opened by Mr. Wm. T. Ellsworth near Mauston in 1854.

Honey, Game and Wild Fruits

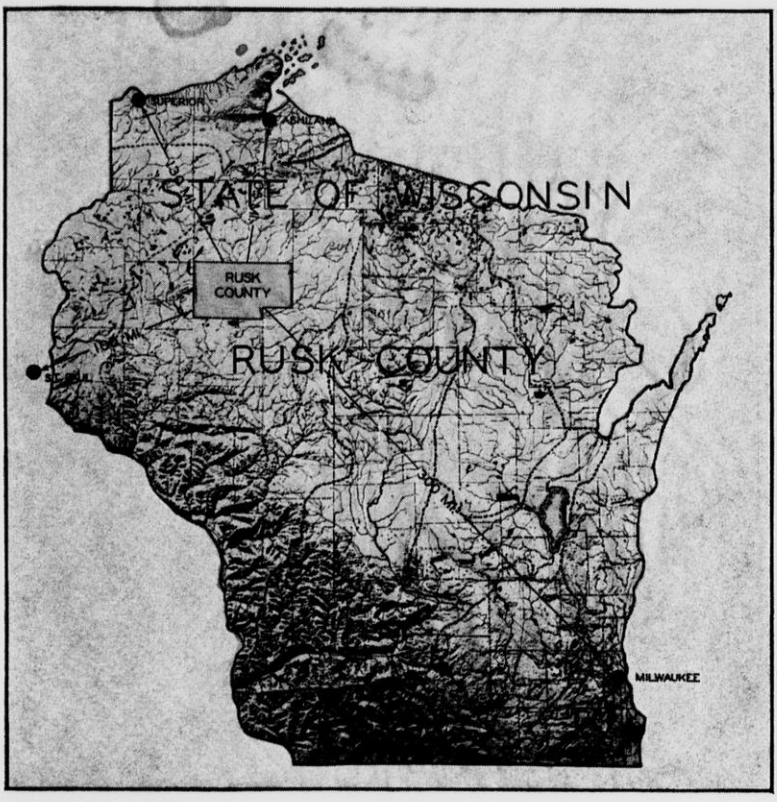
The abundance of game, grouse, wild ducks and geese helped greatly in supplying food for the early settlers. Wild honey was also very abundant in the region south of the Lemonweir. A bee hunter by the name of Zach Sheldon is reported to have gathered eight barrels of strained honey in four weeks during the fall of 1850. Cranberries were brought to settlers by the Winnebago Indians. Mr. Kingston reports having purchased great quantities of cranberries from the Indians in 1849. These berries came from the northwestern sand peat plain.

List of Plates and Tables

JUNEAU COUNTY

Plates

Tables



Land Economic Inventory
of
The State of Wisconsin

Issued by the Executive Office
PHILIP F. LA FOLLETTE
Governor

JOHN S. BORDNER, *In Charge*
WILLIAM W. MORRIS, *Forester*
JOHN H. STEENIS, *Associate*
EARL D. HILBURN, *Engineer and Draftsman*

Division of Land Economic Inventory
411 W. Wing, Capitol Building

STATE OF WISCONSIN

Division of Land Economic Inventory

Entered as 2nd-class matter, January 28, 1915, at the post office at Madison, Wisconsin, under the act of June 6, 1900.

STATE OF WISCONSIN

No. 2

Madison, Wisconsin October, 1935

Land Economic Inventory

of

The State of Wisconsin

RUSK COUNTY

By

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Division of Land Economic Inventory

COOPERATING AGENCIES

We are indebted to the following for assistance given us in the preparation of this bulletin.

E. F. Bean, State Geologist
Walter F. Choinski, Cartographer, Conservation Department
N. C. Fassnett, Botany Department, University of Wisconsin
Wm. F. Grimmer, Game Superintendent, Conservation Department
Earl Hilburn, Draftsman and Engineer, Wis. Land Inventory
Neil Hotchkiss, U. S. Biological Survey, Washington, D. C.
C. Juday, Natural History Survey
Aldo Leopold, Consulting Forester in Game Management
Autie Sanford, Superintendent of Schools, Rusk County
H. W. Mac Kenzie, Director, State Conservation Department
J. O. Moreland, Secretary Rod and Gun Club, Hayward, Wisconsin
F. T. Thwaites, Geology Department, University of Wisconsin
George Wagner, Zoology Department, University of Wisconsin
Bessie Tate, Supervising Teacher, Rusk County
Rusk County Rod and Gun Club
The Botany Department of the University of Wisconsin
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TABLE OF CONTENTS

Tables, Plates, Maps and Figures, Rusk County, Wisconsin

Tables

Plates (All pie maps)

Maps

Figures

INTRODUCTION

Land is the social heritage of each succeeding generation. When wisely used and managed for the public good, its productive value is not impaired. Unwise exploitation generally leaves a depleted heritage. Such was the heritage left to the people of Rusk county, when virgin forests of pine, hardwoods, and hemlock had been slashed and the young growth and forest mould destroyed by fires.

Nature has healing powers that are magical and the wisdom of man can be helpful in assisting nature to heal these scars of ruthless waste. To do so wisdom must, however, be coordinated and brought to those who manage and administer so that they may understand and do constructive work. Charles Darwin once said, "The public is wise enough to follow scientific men when they are agreed."

The Land Economic Inventory of Rusk county is an attempt to bring together for the people of Rusk county the findings of scientific men pertaining to the county's land and its use. While there may be differences of opinion on detail, the major factors, which enter into a constructive land use policy are agreed upon, and the factual data in this report it is hoped may be easily followed.

Creative land use implies the development of a social economy culturally rich and wholesome. The people of Rusk county show initiative and vision in that they are planning to hold much land as public property. Public land is less easily exploited and diversification of its use for forest, game and recreation will be of great value in supplementing agriculture, industry and commerce.

THE EARLY HISTORY OF RUSK COUNTY

The Indians, Explorers and Fur Traders

Rusk county was originally the home of the Ojibwa (Chippewa) Indians. Their Indian villages and camp sites were chiefly in the southwestern part of the county. Known sites are on the Rusk Farm and Ten Mile Creek in the Town of Rusk and Island Lake and Little Rice Lake in the Town of Big Bend. There were also several near the mouth of the Flambeau River in the town of Washington. Two pipestone quarries were used by the Indians in this region, one in the Town of Wilkinson and one in the Town of Stubbs.

Father René Menard, one of the early missionaries to Wisconsin explored the region about 1653-61. He left Chequamegon Bay and traveled overland to Lac Court Oreilles. From there with Indian guides, they embarked in small Indian canoes and went down the Chippewa River.

The next recorded visit to what is now Rusk county was made by Jonathan Carver. He came as a map maker, with a party of explorers to find the north passage from Hudson Bay to the Pacific Ocean. Carver received his commission on August 12, 1766 and traveled by way of Green Bay, the Fox and Wisconsin Rivers to the Mississippi, then to the Falls of St. Anthony, marking down all the Indian towns with the number of inhabitants. Ascending the Mississippi, he turned up the Chippewa to avoid hostile Sioux. It was on this part of his journey that he visited what is now Rusk county. Later Carver claimed title to an area 100 miles square of northern Wisconsin and Minnesota. His claim was never admitted by the United States.

Henry S. Schoolcraft, agent at Sault Ste. Marie, visited this region in 1831 and 32. So far as can be learned Schoolcraft did not enter what is now Rusk county. He did describe conditions in this region, though, and he mentions the fur trader Lyman Warren of La Pointe who was chief trader for the American Fur Company, for the section between the Snake and St. Croix on one side and the Lac Court Oreilles and the Chippewa River on the other.

Lumbering

The period of lumbering began in the Chippewa Valley as early as the eighteen-thirties. Following the Civil War, pine lumbering continued to the end of the nineteenth century. It is estimated that there were in the Chippewa River Valley and its tributaries six million acres of forest containing much fine pine. Rusk county was wholly forested. Little virgin forest was left when it became a county. Lumbering and clearing land for farms in the Chippewa Valley has been so closely related that it is impossible to give a clear account of one without constantly referring to the other. For example, the settling of the land, building of roads, markets for products, labor, and the character of the farmer himself have all been influenced by the existence of the lumber industry. The early history of the lumbering industry in Rusk county is a part of the general history of lumbering in the Chippewa Valley. From 1840 to 1900 it is estimated that the lumbermen cut twenty-five

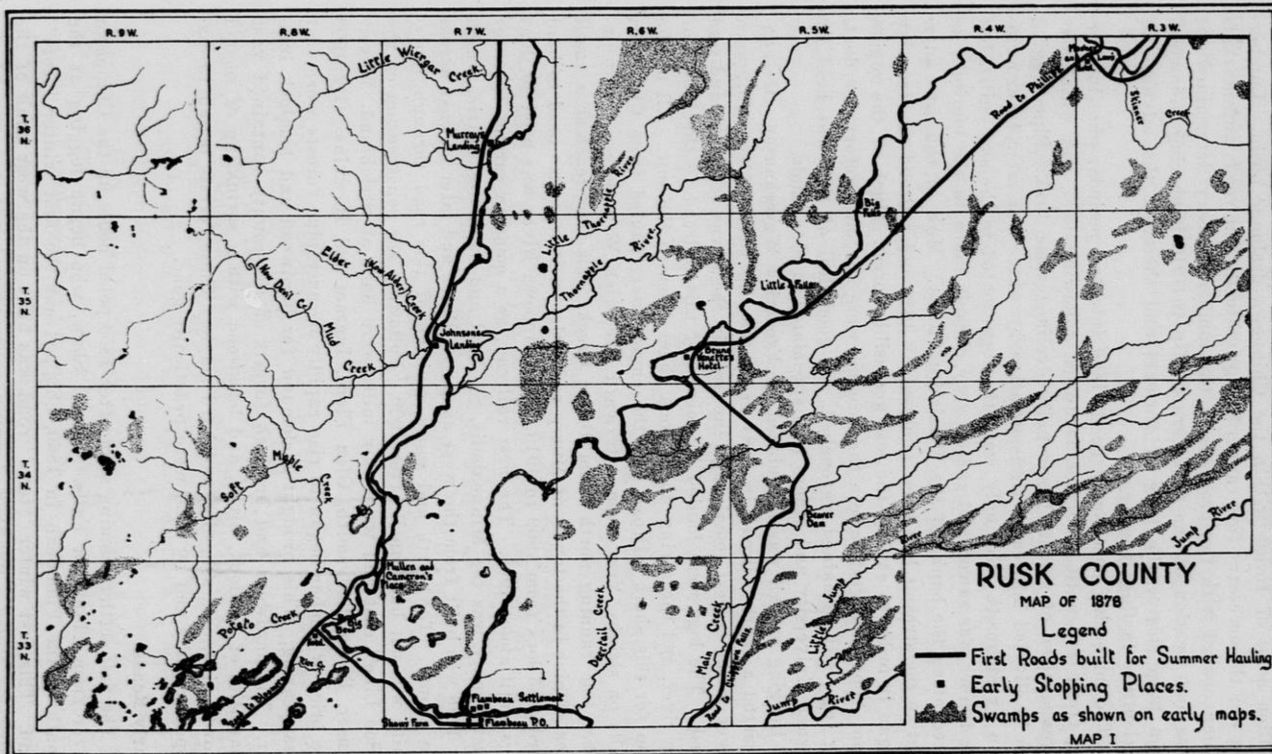
billion feet of white pine and four billion feet of hemlock from the six million acres of forest within the Chippewa drainage basin. Lumbering was the necessary fore-runner of agriculture. The roads and markets which opened with the progress of the lumber industry determined the type and location of the first farms. Up to 1910 lumbering influenced to a large degree the type of farmers and therefore the advance of agriculture in Rusk county.

The lumbering epoch may be divided into two periods; pine lumbering from 1860 until 1900 and hardwood following 1900, and which due to exhaustion of forests has rapidly declined since 1915. Pine logging can be divided into early transportation by water and later transportation by railroads. Not only were the logs floated to the saw mills, but the timber was sawed and rafted very cheaply down to the markets located along the banks of the Mississippi River. Most of the pine adjacent to the streams had been removed by 1880 and railroad construction began in order to exploit the less accessible forest. Much of the region from Appalonia west, where the streams were not satisfactory for floating logs, still remained untouched. A good deal of this was held by Cornell University and others who speculated in pine lands.

Logging by rail was introduced by Frederick Weyerhauser. He constructed a short railroad in 1884 from the Big Bend of the Chippewa River to the largest remaining pine area in the towns of Strickland and Rusk. The logs were hauled by means of this railroad to the banks of the river, and the spring floods took them down to the saw. All of the iron for this short railroad and the engine were hauled from Chippewa Falls on sleighs. Very soon afterward Frederick Weyerhauser built another line running north from Bruce Creek. This line reached a small area of pine in the towns of Murry and Atlanta. It was also used to haul hardwood logs from 1900 to 1910. The Chippewa River was used to float logs until about 1906. The first railroad, as a common carrier to enter Rusk county was the Minneapolis, St. Paul and Sault Ste. Marie, which by 1886 was built from the west as far as Bruce and later on east across the county. The north and south division of this road through Ladysmith was not built until after 1900. Following the construction of the "Soo Line" east and west, saw mills were built at Strickland, Weyerhauser, Bruce, Ladysmith, Glen Flora, Ingram and Hawkins. By 1900 the price of lumber began to rise rapidly because pine forests were fast disappearing. This brought a demand for hardwood and hemlock lumber. The hardwood and hemlock forests of the county contained vast quantities of hemlock, birch, and basswood with a sprinkling of second growth pine, oak, ash, elm, and hard maple. These forests began to disappear rapidly and by 1920 were practically gone.

Early Roads

The first settlers coming soon after 1850 poled boats up the Chippewa River from Chippewa Falls. Daniel Shaw, who began logging at the mouth of the Flambeau in 1860, chopped out the first winter "tote" road. This first winter "tote" road was built on the west bank of the Chippewa River. By 1876, logging contractors began to stay in the woods over the summer. This meant they must construct a road over


R. 9 W.
R. 8 W.
R. 7 W.
R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
T. 36 N.
T. 35 N.
T. 34 N.
T. 33 N.
Little Wiergar Creek
Murray's Landing
Little Thornapple River
Thornapple River
Elder (Now Alder) Creek
(Now Devil Cr.)
Mud Creek
Johnson's Landing
Road to Phillips
Skinner Creek
Big Falls
Little Falls
Soft Maple Creek
Mullen and Cameron's Place
Potato Creek
Flambeau Settlement
Shaw's Farm
Flambeau P.O.
Deertail Creek
Main Creek
Beaver Dam
Jump River
Little Jump River
RUSK COUNTY
MAP OF 1878
Legend
First Roads built for Summer Hauling
Early Stopping Places.
Swamps as shown on early maps.
MAP I

MAP I.

which a load could be hauled during the summer. Supplies had to be brought in for families who remained to care for the oxen and horses and to cut the hay that was found in great abundance on "beaver meadows" along the streams. The marshes were bridged by placing logs side by side as close together as possible. These roads gave rise to the term "corduroy roads." The largest streams were bridged by building plank trestles. Trestles over some of the streams such as Potato, Soft Maple, and Devils Creeks were from 20 to 40 rods in length. The first road improved in this manner was along the Chippewa River and became the great highway for all the men and supplies bound up stream in the fall, and down again to the Shaw farm at the mouth of the Flambeau River in the spring. Roadside taverns or stopping places as they were called, were built at intervals of three to five miles along the river. These taverns accommodated travelers and the teams and men who ran regular freight lines up the river during the winter. The size and importance of these stopping places can be appreciated when we are told that on the Big Bend of the Chippewa River a man named Miles had log barns that accommodated two hundred horses and log sleeping shanties sufficient for three hundred men. Another road was soon built east of the Flambeau River with regular stopping places at similar intervals. From these two main highways, logging roads, branched off in all directions where pine was being harvested. At first ferries were used on the rivers, but about 1900 the Chippewa River was bridged at Bruce. The ferry at Oak Grove above the Big Bend on the Chippewa River was operated as late as 1908. Many of the early stopping places developed farms. These early roads and stopping places are shown on the first map of what is now Rusk county, which was published in 1878. (See map I, page 8.)

The first graded road of importance in the county was built in 1895 when the old Chippewa Road was straightened and graded from the southern to the northern border of the county. For the next fifteen years this comparatively good road was used as a main highway for teams coming in for a winter in the woods as well as for hauling supplies from the prairies of Chippewa county. As late as 1908 long trains of five or six teams, tied one behind the other, would be seen day after day in the late fall moving north. During the winter hundreds of loads of beef, pork, oats and hay were moved in like manner.

Early settlers frequently were compelled to carry supplies long distances. Settlers, still living, tell of carrying flour and other supplies from Bruce to Glen Flora, before the railroad was extended eastward. Trails, "tote" roads and logging roads helped materially in scattering settlers throughout the county. These first settlers soon organized town governments and proceeded to build more adequate roads. From 1895 graded roads were extended throughout the county. By 1910 most of the towns had at least one graded road. Big Falls was the last town to build a graded road, building its first road in 1917.

The First Settlements

The first settlements were made along the old Chippewa and Flambeau roads. After the railroad was built, settlements began to form

around the railroad stations. The oldest farming community is around Bruce where the two lines of advance crossed. Before 1908 local lumber mills and the small towns were the settler's only market for his produce. Hay, potatoes, some beef and butter found the best local market. Farming was a side line for the settlers. The major cash income came from work in the woods and mills during this early period. In fact most farmers were woodsmen who were making their homes upon the land and whose habits of living were largely influenced by the lumber industry. It was only in this manner that these early settlers were able to make a living. By 1905 at least twenty-five per cent of the workers in the logging camps were farmers. This number increased to 50% by 1910.

There were practically no settlements in what is now Rusk county before the advent of the railroad. A map made in 1878 (See Map I, Page 8) gives the following places: (a) Big Bend at the mouth of Potato Creek, T. 33 N. R. 8W, Sec. 11, where D. E. Miles had a camp. (b) Mullen and Cameron were north on Section one of the same town. (c) Johnson's landing T. 35, N. R. 7W. Section 29—now the 4H. Camp, north of Bruce. (d) James Murry's place at the mouth of the Weirgor Creek, T. 36 N. R. 7W, Sec. 22—now Murry. (e) The Flambeau Post Office settlement and hotel with Daniel Shaw's farm near the mouth of the Flambeau River. (f) The Mosher and Law Camp on Section 6, T. 36 N. R. 3W, just below the mouth of the South Fork of the Flambeau River, (the Hackett Farm). (g) The Bruno Vinette Hotel on Sec. 35, T. 35 N. R. 6W (now Ladysmith).

The Growth of Towns

Flambeau was settled in 1868 and by 1890 had a Post Office, school, church, and one hundred inhabitants with mail twice a week from Chippewa Falls. The people were mostly Indians, half-breeds, and French Canadians.

Some of the interesting early settlers were Thomas Butler, who kept Shaw's farm at Flambeau (later called Flambeau Farm) for some years after 1869, and Bruno Vinette, who was born in Canada in 1835, came to the Chippewa Valley in 1855 and was the earliest settler on the spot where Ladysmith is now located. One of the earliest independent farms, not connected with lumber camps was that of John Lyman, who in 1876 took up a homestead of 80 acres near Bruce and in 1896 had a fine farm of nearly 300 acres. Other settlers who came early were M. Brown, C. M. Ford, E. Wilkinson and H. H. Jeffers, all locating near the Barron county line. W. M. Davey, J. Tinor, T. Temper, D. Blackburn and R. W. Reas settled on the north fork of Devils Creek. Others on the Chippewa River were E. Stevens, R. Bates, and B. F. Brainard.

Bruce was platted in 1884 and by 1890 had a post office and two stores. Weyerhauser was platted and surveyed in December 1884, and by 1890 had two saw mills and a mining company. Ladysmith was first known as Flambeau Falls. Rapid growth of this community began in 1885 when the Minneapolis, St. Paul and Sault Ste. Marie Railroad started operating trains between Minneapolis and Deer Tail (now Tony). In March of that year Mr. and Mrs. Robert Corbett arrived. The only

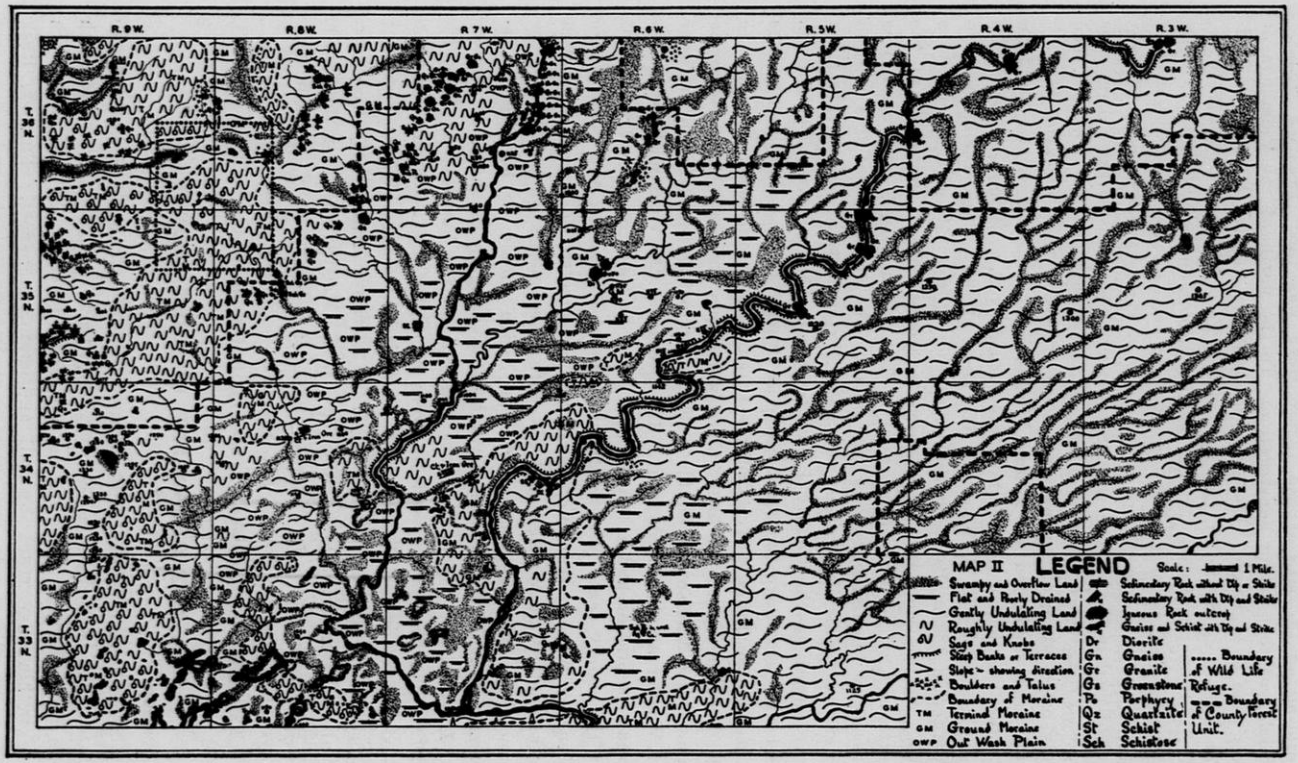
building on the site of the future town was the "Prentice House," which was then under construction. To the north of the Flambeau at this time lived Bruno Vinette, James Malony, Antoine Plaunt and Ludgar Lebarge. South of the river lived Peter Sannes, John McBride, H. E. Hollister, Louis Clouter, Fritz Ducommun and "French" John Murphy. Mr. Corbett, on his arrival, at once erected a small saw mill and the name of the village was changed to Corbett and a post office was established in 1887. The second new settler to come to the village was J. W. Fritz, who opened the first general merchandise store in 1888. The only other place of business for some time was the "Prentice House" built and conducted by Bruno Vinette and a saloon owned by John Lindoo. In 1897, a second store was opened by C. C. Sabin and two years later a third by E. M. Worden. The name of the village was changed to Warner in 1891. By 1900 the population of the village had grown to 200. At this time it was proposed to create Gates County out of the northern part of Chippewa county. The bill for such separation was passed by the Legislature in May, 1901. The construction of a pressed brick court house in Warner was begun the same year, but an injunction was served on the County Board by those who opposed this location, and wished to have the court house at Bruce. Later the injunction was dissolved by Judge Parrish of the Circuit Court and when appealed to the Supreme Court the lower Court's decision was upheld. A telegram came from Madison in October 1901, announcing the decision in favor of Warner as the county seat. The people of the community staged a great celebration and a banquet was given in honor of the establishment of the county seat. Mr. Smith of Neenah, Wisconsin, and head of the Menasha Wooden Ware Company, who had erected the dam and wooden ware factory at Warner, and his wife were guests of honor. At the banquet it was suggested that Mrs. Smith should be honored by renaming Warner for her which resulted in changing the name of Warner to Ladysmith. The court house was opened for business on June 18, 1902. The first county officers were appointed by Governor Jeremiah Rusk. They were: Chairman, J. B. Heimick; Judge, W. S. Manning; Clerk, F. E. Munroe; Treasurer, J. M. Hurless; Register of Deeds, Dr. Walter O'Connor; District Attorney, L. E. McGill; Clerk of the Court, E. Biller; Sheriff, J. E. Pederson; Supt. of Schools, W. N. Mackin; Surveyor, O. C. Savin; Coroner, M. Sergent.

The name of the county was changed from Gates to Rusk in 1903.

THE GEOGRAPHY OF RUSK COUNTY

Location

Rusk county is centrally located in the northwestern part of the state. The twin cities to the west, twin ports and Ashland to the north and the industrial cities on the Wisconsin river to the east and south are within easy reach by rail and motor transport. Further, Rusk county has direct rail connections with Duluth, Chicago and points east and west.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R. 3 W.
T. 36 N.
T. 35 N.
T. 34 N.
T. 33 N.
MAP II
LEGEND
Scale: 1 Mile.
Swampy and Overflow Land
Flat and Poorly Drained
Gently Undulating Land
Roughly Undulating Land
Sags and Knobs
Steep Banks or Terraces
Slope — showing direction
Boulders and Talus
Boundary of Moraine
Terminal Moraine
Ground Moraine
Out Wash Plain
Sedimentary Rock with Dip & Strike
Igneous Rock outcrop
Gneiss and Schist with Dip and Strike
Diorite
Gneiss
Granite
Greenstone
Porphyry
Quartzite
Schist
Schistose
..... Boundary of Wild Life Refuge.
—.— Boundary of County Forest Unit.

MAP II.

Topography

Change of elevation within the county is not great. The Barron Hills known locally as the "Blue Hills," rise about four hundred feet above the general level of the river valleys to the east. The valleys of the Chippewa, Thornapple and Flambeau are relatively without any marked relief except where the Flambeau River has again cut into the glacial drift in its rapid descent from the higher table land to the north and east. From where the south fork of the Flambeau passes through the rocky gorge at the Sawyer-Rusk county line, numerous falls and rapids mark the drop of approximately 260 feet in the river's southwesterly course across the county. The river at numerous places has cut out its channel through the glacial deposit to bed rock, making very high steep banks bordering numerous rapids and falls.

The Barron Hills in the northwestern portion of the county have a relatively rugged topography. These old quartsite elevations resisted glacial action but many of their rugged gaps and valleys were filled with earth material during glaciation. The water gaps leading west toward the Cedar River are filled to a great depth with sand, gravel and rock. Some glacial material covers practically all of the old hills. The old quartsite rock of these hills is exposed in a number of deep ravines largely near the Barron county line and also among the morainic foot hills to the east and south. Late glaciation left earth material in the form of kettles and knobs to the east and south of these old hills. These moraines extend south across the county. (See Map II, page 12.)

Eastward across the county the stream valleys are level to rolling but never hilly. The numerous small streams of the southeastern part of the county are little more than surface drains within what was a large stream bottom carrying the water away from the melting glacier in its last recession. This slightly undulating plain lies considerably above the present bed of the Flambeau river to the north and the Jump river to the south. Back from these river courses, numerous flat areas of considerable size lack adequate drainage. These were former shallow lakes and are now largely shallow peat beds covered with fire-scarred growths of black spruce, tamarack, tag alder, willow, sedges, and leather leaf. The relatively straight and paralleling creeks back from both rivers furnish ample surface drainage for the major portion of this plain, having an approximate fall of 10 feet per mile. Numerous shallow swamps of considerable size also appear north and west of the Flambeau River, and small kettle swamps are common among the moranic hills west of the Chippewa River.

Rock Outcrops

Rusk county has numerous rock outcrops practically all of the older rock formation. Igneous rock of great variety is exposed in river beds and numerous higher places, scoured but not covered by glacial action. The quartsite rock of the Barron Hills has already been mentioned. Here considerable prospecting for mineral bearing rocks has been carried on. A geological survey of the possible mineral bearing rock made by the Wisconsin Geological and Natural History Survey about twenty years ago does not disclose any present day workable mineral deposit.

Though the entire county was not covered in this survey, that portion where mineral bearing rock might be expected was carefully explored and mapped. Both copper and iron have been found in such easily ex-

CLASSIFICATION OF MARSH LAND AND WATER.
TOTAL AREA 108,446 ACRES.
RUSK COUNTY.
1935.

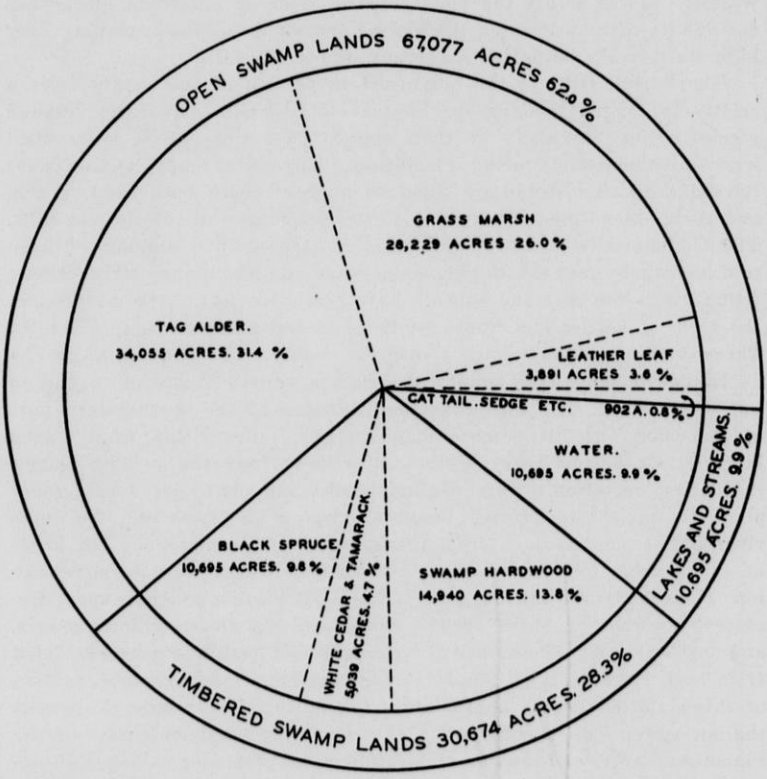


PLATE I

ploited abundance elsewhere that further exploration here is not feasible at present.

The Earth Material

The mantle of earth material, which the glaciers spread over Rusk county is all relatively deep, except over the Barron Hills. Wells in many places indicate depths of several hundred feet to bed rock. Crossing the county from east to west the earth mantle is less evenly as-

sorted, because the last glacier began receding and dropping its earth load near the western part of the county, forming hills and kettles. Some of these kettles are still lakes and others have dried up. The glacial material is largely silt. Considerable areas of sand also appear along the lower Chippewa river. Gravel, boulders, and cobble stones are unevenly scattered over the county. These are more common in the northern part. Margins of swamps and swales usually have more surface stone than the higher land. There is however no fast rule which applies to the distribution of surface stone. Where the surface material is wholly layed down by water very few stone appear and where it is morainic drift as in a hilly formation, stone is very common not only on the surface, but throughout the drift.

Primary Land Divisions

Rusk county does not fall into distinct land provinces as easily as do some other counties. For practical purposes, however, the division may be made as follows: (a) all of the county west of and (b) all of the county east of the Flambeau River. The western province includes nearly all the hilly formation, indicated as terminal moraine in Map II, page 12. This map also shows that all of the large areas of outwash plain, which were laid down by water are in this province, and with one exception, all the lakes are west of the Flambeau river. Numerous large and relatively shallow swamps are common to both provinces though more numerous in the western province. (See Plate I, page 14.) Ground moraine is general in the eastern province and confined to relatively small areas in the western. Most of the ground moraine is known as till which was laid down as a broad sheet of sediment by the melting glacier. A great many areas of alluvial material, largely silt, showing marked stratification, are also located near streams. Some of these are relatively large while others are only a few acres in extent.

Land Adaptation

Land adaptation for use is of course relative to human needs. Its social and economic implication is more than local. The state and nation have something to say about how land in any locality may be used, but the people locally must know and help plan and then administer the use to which the land is best adapted. Three distinct and separate factors enter as determinants in land adaptation to human needs, viz., *market* for its products, which implies that residents on the land may sell what they can produce; *climate*, which limits the kinds and variety of crop that may be grown and lastly *soil*, which due to its many characteristics varies in its capacity to produce a crop.

Markets

The general classification of land for northern Wisconsin as now accepted, is land for *farm*, *forests*, and *recreation*. Rusk county has land well adapted to each of these uses. Markets for the products of each type of land are also relatively good. Dairy products and cattle go to other states where like production is not adequate. The forest land accrual under management may expect continued and an ever increas-

ing market. Rusk county has a paper mill centrally located, which must have wood to continue its existence. Science has not yet found a substitute for wood in fabricating service utensils and pages for news print and books. Chemical conversion of wood for numerous uses is also increasing. Rusk county land, not needed and not suited for farm use, should therefore, under forest management, find a ready market for its forest products.

The recreational use of land implies of course a well balanced and developed farm and forest use. To re-create human beings subjected to the highly specialized type of existence in industrial centers, the re-creating environment can not be sold and marketed as are milk and wood. Those buying recreation must, like Mohammed going to the mountain, return to nature at its best in open fields, forests, placid lakes and the talking water of babbling brooks and noisy rapids.

Rusk county has this balance of farms, forests, lakes, rivers, and brooks. Development of its recreational facilities is progressing rapidly. Good roads, more completely developed farm communities, large areas dedicated to forest use and now under forest management, the creation of a wild game refuge, increasing local interest in the propagation of fish, protection and feeding of game birds and adequate protection against forest fires and poaching, is materially increasing Rusk county's market for its recreational goods.

Further coordination of land use for farms, forests and recreation in Rusk county will therefore continue to improve the market for the products of its land adapted to farm, forest and recreation.

Climate

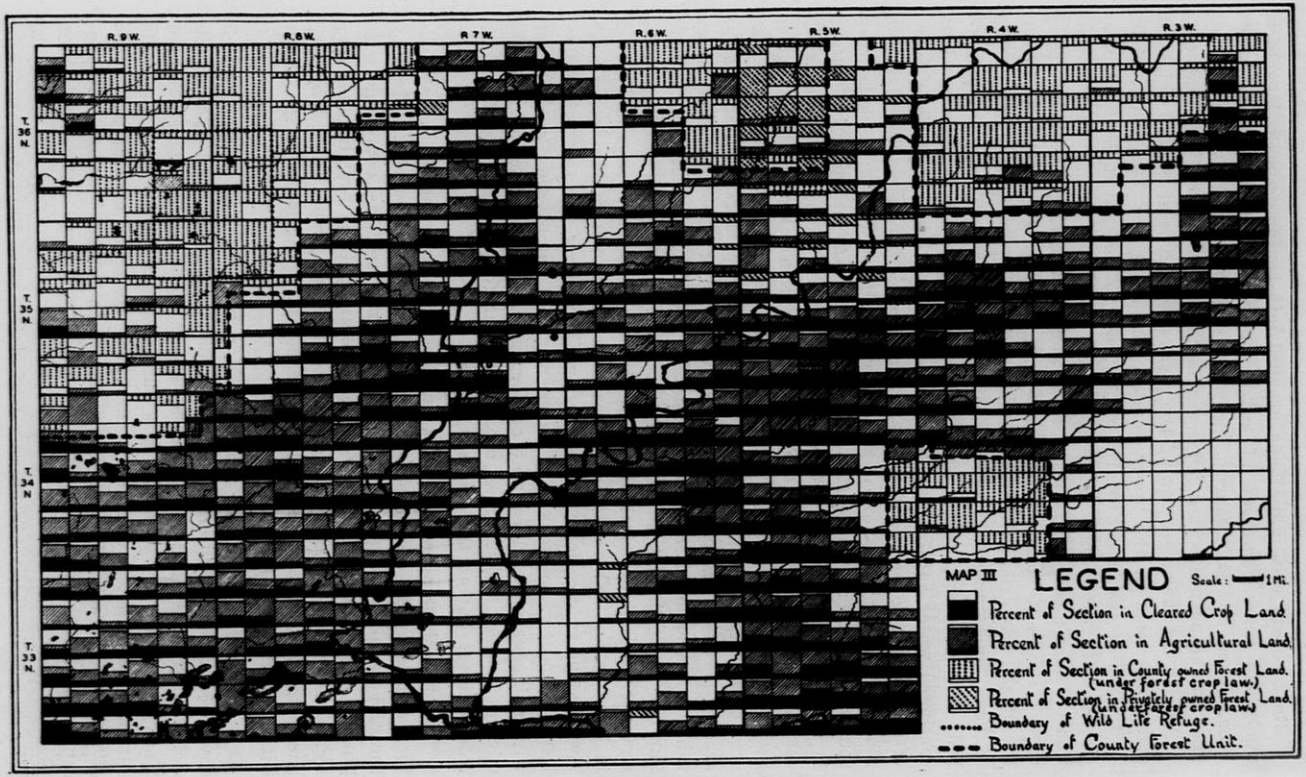
The climate of Rusk county is humid. This implies that annual precipitation is adequate and distribution is sufficiently uniform to maintain a relatively green land cover throughout the summer season. Deep winter snows are common. In melting they usually soak into the earth thus preventing serious spring floods. Precipitation is greatest during the months of May, June and July. Land clearing and fires destroying forest mulch and the peat beds in swamps, with some added drainage have modified climate to some extent and have had a tendency to increase floods and erosion. Carefully planning and managing all land according to its best use will again tend to restore natural conditions. Farm use of land in the production of crops ruined by frost, is limited to an average growing season of about 115 days. Local conditions due to poor air drainage, topography, soil and land cover, frequently reduce the frost free period on low lands. Growing frost tender crops, therefore should not be attempted on such land. When small areas of such land appear on farms, the same should be used for pasture, hay, root crops and small grains. Attempted farming on large areas of swamp land has not been successful. The "Goocher Drainage Project" is a good example of failure. The climate of Rusk county may be summarized as particularly conducive to dairying and forest production. The same may be said of its relation to human health and comfort, for summer and autumn seasons appeal to those seeking recreational environment away from the heat and noise of cities.

Soils

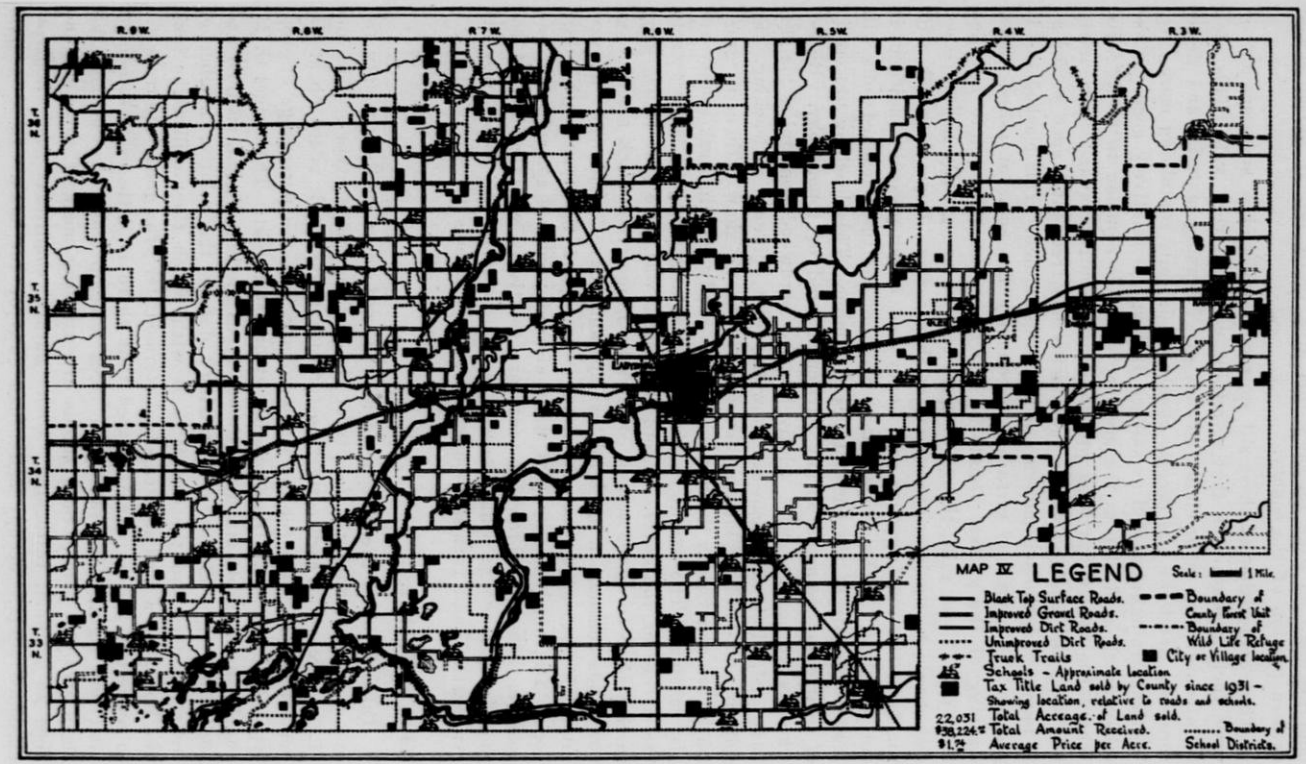
Rusk county soils have been grouped into those composed largely of sands and those composed of silt. Varying phases are sands, sandy loams, loams and silt loams. The sands and most sandy loams are confined to the outwash plain adjacent to the Chippewa River; sands prevailing in the lower portion of the plain east and west of the Chippewa and sandy loam in the upper portion, and along the Thornapple river. In the latter case much of the sandy loam is not outwash but largely glacial drift with some spots of glacial till. This glacial drift formation contains a large amount of stone and is exceedingly variable. Long narrow ridges of boulders and gravel called eskers, extend in the line of the glacial movement. This type of soil is also interspersed with areas of loam, and numerous poorly drained flat areas. These are shallow beds of peat over perched water tables, which have resulted from long continued water saturation. The loams and particularly the silt loams of the county, cover the ground moraine, where the fine sedimentary till runs from a very shallow deposit over ridges to depths of more than four feet on areas where the sedimentary till was dropped and spread in relatively quiet water. Where water currents were stronger, stratification as seen in the outwash plains is common. Vertical drainage is better in this last formation and also where the till is deepest. The borders of swamp areas are marked by numerous boulders. These swamps are on perched water tables. The oxidation of these perched water tables when exposed to air as a result of peat fires or drainage tends to improve the soil. Its effectiveness in rendering the soil productive is, however, limited to relatively small areas such as small sags and draws in large fields. Where drainage has been attempted in the larger shallow swamps it has not proven effective in making the soil productive. Depth of peat in swamps is of course variable but whether shallow and with a higher mineral content or deeper and with practically no free mineral content, these areas are all subject to poor air drainage and frost damage during the summer season.

The initial planless procedure in the attempted use of forest soils for farm use, followed logging operations here as elsewhere. Since all forested regions are disposed to be wet and cold as compared with prairies, sandy forested soils were selected and settled first because they were less wet and cold. These soils soon became impoverished by constant cropping and are going out of farm use, while more of the better silt soils are being cleared for farms.

A study of the land use map (See Map III, page 18) shows the well developed agricultural communities are on the heavier soils. The extension of agricultural development as shown by sales of county owned lands (See Map IV, page 19) is a further index to the fact that this silt loam soil is better adapted to farm use. However, considerable areas of this type of soil will and should remain in forests because of topography and stoniness. Large units are already blocked out for this purpose. Other areas of land with *soil* similar to the best in the county will remain in forest use because there is no immediate demand for its use in agriculture. The physiographic map on page 12 and also the


R. 9 W.
R. 8 W.
R. 7 W.
R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
T. 36 N.
T. 35 N.
T. 34 N.
T. 33 N.
MAP III
LEGEND
Scale: 1 Mi.
Percent of Section in Cleared Crop Land
Percent of Section in Agricultural Land
Percent of Section in County owned Forest Land. (under forest crop law.)
Percent of Section in Privately owned Forest Land. (under forest crop law.)
Boundary of Wild Life Refuge.
Boundary of County Forest Unit.

MAP III.


R.8W.
R.7W.
R.6W.
R.5W.
R.4W.
R.3W.
T.34 N.
T.33 N.
T.32 N.
MAP IV LEGEND
Scale: 1 Mile
Black Top Surface Roads.
Improved Gravel Roads.
Improved Dirt Roads.
Unimproved Dirt Roads.
Truck Trails
Schools - Approximate location.
Tax Title Land sold by County since 1931 - Showing location, relative to roads and schools.
22,031 Total Acreage of Land sold.
$38,224.72 Total Amount Received.
$1.73 Average Price per Acre.
Boundary of County Unit
Boundary of Wild Life Refuge
City or Village location.
Boundary of School Districts.

MAP IV.

land use map on page 18, show this area to lie largely in the southeastern portion of the county.

The composition of these silt soils contains such a large amount of very finely ground rock that it retains moisture very well. This rock flour contains no appreciable amount of cementing material and therefore does not bake and become cloddy as do soils containing more clay. Vertical drainage as well as surface drainage is relatively good. These soils are all acid, due to the presence of acids common to forest soils. Where the forest has been predominantly coniferous and particularly hemlock, soil leaching due to these acids has frequently gone so far as to impoverish the soil underneath the forest mulch. This leached soil is grayish and near the surface is frequently the color of ashes. Such leaching of the surface results in cementing the subsoil into so-called hardpan. These soils, though of good texture are greatly impoverished and should be used for forests rather than farms. Improving such soils for farm use requires time and money and under present conditions is not practical. Under proper forest management these leached soils will produce forests of the better types of timber. This leaching process is of course not common to any particular kind of topography. Ridges which were covered with relatively pure hardwood containing maples, basswood, birch and some oak show the least evidence of leaching. The soils of such land are more mellow and frequently show little or no grayish layers underneath the leaf mold. The sandy soils in Rusk county are also leached. The extent to which the leaching has gone is relative to the nature of the cover. Where the forest was pure pine it has gone farther than in mixed stands. Peat soils range from black mucky over flow lands common in black ash swamps and beaver meadows to the raw brownish peat of spruce and cedar swamps and the open leather leaf bogs. The black mucky peat when cleared produces splendid hay and pasture. The raw brownish peats are relatively worthless except for their natural cover which serves as a protection for game, prevents evaporation, and furnishes pulpwood and Christmas trees.

Notes on Table I.

Table I shows the acreage of all the land cover in Rusk county for each township, with the density of the various timber types. The sum of the acreage of each cover type for each township, is added up at the bottom of the table for the whole county, and the percentage of each type also is shown. Diameters are at breast height. The letters G. M. and P. in the table stand for timber types having a good, medium and poor stocking. The term "stocking" defines the relative number of trees per acre and the completeness with which they utilize the land and light. In a well stocked stand (termed "G" for good) the trees are so numerous and so evenly spaced that there is little or no waste of land and light. The individual trees develop small crowns and tall clean straight boles. Such stands are utilizing most of the light and need no artificial restocking. Under natural conditions good stands as classified seldom occupy more than 80% of the land. In a medium stocked stand (termed "M" for medium) the trees are less numerous

TABLE I RUSK

Town	Range	Towns	Houses Occ.	Houses Unocc.	Summer Homes	Schools	Churches	Cemeteries	Pea Vineries	Dairy Plants	Saw Mills	Fire Towers	Highways: Hard Surface Gravel Imp.	Highways: Dirt Improved	Highways: Dirt Unimp.	Highways: Trails	Highways: Fire Lanes	Telephone L.	Power Lines	Railroads	Strms: Small	Strms: Large
33 N	5 W	1	194	16	1	6	2	2	1	2	1		18.0	37.2	3.4	.5		17.2	8.0	7.2	17.0	18.7
33 N	6 W		92	10		4	1						9.0	24.0	3.0			7.0			5.0	9.8
33 N	7 W		77	16	24	5	1			1			16.5	17.0	14.2			8.3			7.5	14.1
33 N	8 W		120	10	49	4	2	1			1		14.7	19.2	21.2	3.8		11.7			15.9	7.7
33 N	9 W		145	25	27	3	1	1					13.5	27.0	11.0	2.3		9.0			16.2	
34 N	3 W		23	3		1								3.7	20.7	7.4					420	4.1
34 N	4 W		75	12	1	2							13.0	13.5	4.0	2.3	1.5	7.5		.5	59.2	
34 N	5 W		147	8		6	2	1	1	2			9.2	35.7	7.6	.8		12.6		1.6	68.3	
34 N	6 W	1	251	7	1	7			1	1		1	20.0	35.6	10.0			22.0	13.0	11.7	13.0	8.0
34 N	7 W		148	15	1	4	3	1					17.0	27.0	5.0			12.5	11.0	6.2	9.7	13.8
34 N	8 W	1	182	16	23	4	2	2					16.0	31.5	12.0			21.0	5.5	6.0	29.4	1.9
34 N	9 W		132	18	10	5	1	1	2				15.0	20.0	5.0	.9		12.5		6.2	33.2	
35 N	3 W	1	124	15		2	2	1	1	1			14.5	33.3	2.9			20.0		5.0	25.0	
35 N	4 W	2	158	17		3	5	3		2			22.0	20.0	13.9			30.0	8.0	6.0	44.7	
35 N	5 W	1	141	10		2	2	1		1			14.0	30.9	3.0			18.0	12.0	6.2	24.5	10.6
35 N	6 W	1	185	10	4	6		1			1		21.0	25.0	9.0	.7		12.5	4.0	7.2	15.9	13.2
35 N	7 W		144	20	7	6		1		1			17.8	28.0	3.6	.5		19.9			19.3	15.1
35 N	8 W		95	9		5	1					1		38.7	1.5		4.0	15.5			31.1	
35 N	9 W		41	17		2							12.0	6.5	3.0	9.5	1.5	5.0			37.7	
36 N	3 W		82	12		1	1							6.1	20.8			9.0	5.0		16.9	3.5
36 N	4 W		29	8	7	2					1	1	5.0	5.5	7.0	18.5	6.0	9.0	6.5		31.5	6.7
36 N	5 W		42	4	4	3					1		10.5	12.0	2.5	5.1		1.0	1.5	.7	16.0	11.6
36 N	6 W	1	45	12		3				1			6.0	11.0	12.0					7.6	10.1	11.2
36 N	7 W		127	12		5	1	1		1			12.0	22.0	7.7			17.0		6.2	18.6	8.6
36 N	8 W		6	4										6.0	1.0	2.0	8.0				30.2	3.0
36 N	9 W		44	15		2	1					1	7.0	10.0	10.0	8.6	.3	4.2			27.5	.3
Total by Den.																						
Total by Type		9	2849	321	158	93	28	17	6	13	5	4	303.7	546.4	215.0	62.9	21.3	340.2	74.5	78.3	665.4	161.8
% by Type																						

Town	Range	Agricultural: Cleared	Agricultural: Stump Pasture	Agricultural: Cultivated Stump Land	Agricultural: Per. Pasture	Agricultural: Pasture	Abandoned	Open Upland	Urban	Marsh: Tag Alder	Marsh: Grass Marsh	Marsh: Leather Leaf	Marsh: Cat Tail	Marsh: Sedge	Marsh: Cranberry	Water
33 N	5 W	8572	5691		26			1907	131	765	881	18				310
33 N	6 W	3578	3255	251	44		51	2642		1647	910		12			82
33 N	7 W	2842	2190	15	76	5		4746		2393	1835	1259	81			1206
33 N	8 W	4371	1375	105	110		20	751		1497	1513	560	235			1611
33 N	9 W	5704	1375	22	55	23	43	1241		343	689	73	294			1201
34 N	3 W	257	114				13	7454		1637	1611		95			175
34 N	4 W	2353	1605	12		45		2335		2368	1451	63	20			
34 N	5 W	6791	3844	103	27	4		383		1909	1483	150		63		
34 N	6 W	6790	4135	374	172	8		1318	709	1547	1825	18		27		481
34 N	7 W	4196	2082	193	8	21	26	5730	137	1696	1342	253				818
34 N	8 W	5917	3921	360	114	6		953	167	1076	1092	583				445
34 N	9 W	4263	1110	157	1638	35	6	81		415	547	5				218
35 N	3 W	4272	3787	58				2682	124	1429	613	6			20	64
35 N	4 W	6411	3182	25	82	54	10	677	211	1528	788	27	24			
35 N	5 W	5479	4841	150	60	144		2597	80	696	1119	11				571
35 N	6 W	5022	3289	394	13	29		579	646	1590	1498	298				481
35 N	7 W	6673	4321	67	90	10	9	2393	58	1941	842	17				735
35 N	8 W	3721	3072	68	46	3		2069		392	316					
35 N	9 W	614	162	246	51			538		343	174	9	20			88
36 N	3 W	2472	1631	105	23	2	80	660		966	1000	34				208
36 N	4 W	422	809					4384		1202	1486					400
36 N	5 W	793	1220	133		83		5582		1207	1297	249				612
36 N	6 W	754	1023	237				3362		3402	1896	166				276
36 N	7 W	3801	2558	84	58			3751	40	1143	349	73				513
36 N	8 W	132	38			18		305		269	1425		11			10
36 N	9 W	960	1091	63	111		23	3008		654	247	19				190
Total by Den.																
Total by Type		97,160	61,721	3,222	2,804	490	281	62,173	2,303	34,055	28,229	3,891	792	90	20	10,695
% by Type		16.1	10.1	.5	.4	.1	.1	10.3	.4	5.7	4.7	.7	.1			1.8

Acres — Pine Forests

Town	Range	White Pine 0–6 G	White Pine 0–6 M	White Pine 0–6 P	White Pine 6–12 G	White Pine 6–12 M	White Pine 6–12 P	White Pine 12-18 M	White Pine 12-18 P	White Pine 18+ M	White Pine 18+ P	Nor Pine 0-6 M	Nor Pine 0-6 P	Nor Pine 6–12 G	Nor Pine 6–12 M	Nor Pine 6–12 P	Jack Pine 0-6 M	Jack Pine 0-6 P	Jack Pine 6-12 M	Jack Pine 6-12 P	Jack Pine 12+ M	Jack Pine 12+ P
33 N	5 W																					
33 N	6 W			131			22				60							11				
33 N	7 W					24	86					3				15				198		
33 N	8 W		90	190		56	199							4	7	148						
33 N	9 W	6	5	16		92		10	22							4	10		55	16		
34 N	3 W																					
34 N	4 W																					
34 N	5 W				38	92	26															
34 N	6 W					47																
34 N	7 W	9	23	66	15	73	293											2				
34 N	8 W						132															
34 N	9 W		4	28		91	150															
35 N	3 W																					
35 N	4 W																					
35 N	5 W																					
35 N	6 W			19		11	4								151							
35 N	7 W		14									49	30									
35 N	8 W					22																
35 N	9 W		23				148															
36 N	3 W						10		70													
36 N	4 W					14																
36 N	5 W						42															
36 N	6 W									15												
36 N	7 W					75	80		42	32					9	26						
36 N	8 W						5										15				10	31
36 N	9 W					76																
Total by Den.		15	159	450	53	673	1197	10	134	47	60	52	30	4	167	193	25	13	55	214	10	31
Total by Type											2,798					446						348
% by Type											.5					.1						.1

RUSK COUNTY LAND INVENTORY

RES

WOODLANDS

DIAMETERS IN INCHES

PINE FORESTS																		BETTER UPLAND HARDWOODS																		HEMLOCK AND POORER UPLAND HARDWOODS																								
HITE PINE							NOR PINE					JACK PINE						BIRCH AND MAPLE PREDOMINANT												BASSWOOD & OAK						HEMLOCK WITH HARDWOODS											POPPLE & W. BIRCH						SCRUB OAK					SWAM		
6—12			12-18		18+		0-6		6—12			0-6		6-12		12+		0—6			6—12			12—18			18-24		24+	0—6			6—12			0-6		6—12			12—18			18-24		24+	0—6			6—12			0—6			6-12		0—6		
G	M	P	M	P	M	P	M	P	G	M	P	M	P	M	P	M	P	G	M	P	G	M	P	G	M	P	M	P	M	G	M	P	G	M	P	M	P	G	M	P	G	M	P	G	M	G	G	M	P	G	M	P	G	M	P	M	P	G	M	P
																		91	170	204	100	1552	1179		34																							299	767	6	40	129							32	19
		22				60							11					34	1121	712	60	589	532		312	86																					397	1589	2496	525	1199	526					20			8
	24	86					3				15				198			2	453	429	26	313	165	44		125	16	8					8							48							98	1142	878	72	299	106		40	316			20	33	
	56	199							4	7	148							154	722	768	129	556	1184		318	87					56			36	9												188	1590	1778		244	227		301	514	30			42	8
	92		10	22							4	10		55	16				740	1400		560	1651		421	333					120	564															170	591	1362	12	441	128	193	146	1694	44	627		8	
																			673	1125		979	3092			87													514	69								788	582	74	25	125							189	18
																		21	355	1206	19	1812	3227														23		510	342							17	1007	1832	12									224	66
38	92	26																	292	337	303	1283	1257		87						10								186	83		37					138	866	1735		199	14							52	10
	47																	17	415	115	5	238	82																								142	2294	1677										17	6
15	73	293											2					19	272	634	6	298	603													35			8								61	469	2534						57			13	246	10
		132																327	487	366		1134	395		80	350																					76	1408	2034		121				36			10	235	30
	91	150																	580	989		1301	1064							30	143	108	71	1336	439			31	7								316	3420	2513	276	415	26		187	500	4	48		8	
																		114	735	1065	64	1424	1332		19	38						20															239	1799	1965		15	101							165	20
																			895	696	15	1424	954							7				12													47	2068	1886	42	154	22							513	36
																			228	248		360	928		124	79									47			15									232	1478	2447		27	64							14	9
	11	4								151									142	975	84	51	57	56							178	16			12												22	2574	4236	51									33	
							49	30										39	367	1224		225														9											68	680	1781										151	21
	22																		1558	1188		3931	943	40	1109	386																					15	1114	2169		172								188	
		148																1094	2260	1221	644	2703	2908		74						37	56	24	199	194				131			61					1048	2085	2525	383	1307	347	11	951		36		10	72	7
		10		70															619	584	469	1437	1234	179	462	180	69					4	142	300			10		563	137	92	162	64	229	729	158	379	1092	4008		7	250						22		3
	14																	117	1232	4302	22	1107	1958													94	27	189	219	540	330			248	1		126	635	697											18
		42																	1081	870		545	2109			7														162							71	1146	4185										89	17
					15													118	1209	755	107	617	952																	53							513	2507	3493		55									19
	75	80		42	32					9	26							120	846	959	62	1849	1552	475	248	247		32	132			4		11	109							24					61	1212	1075		50	52							51	
		5										15				10	31				231	4083	3580	2837	3250	1733	660												58	51								2035	1629		40									
	76																	429	420	2124	178	2830	2084	9		1003					31																108	3898	1825		436	146		326	69					16
3	673	1197	10	134	47	60	52	30	4	167	193	25	13	55	214	10	31	2,696	17,872	24,436	2,524	33,201	35,022	3,640	6,538	4,741	745	40	132	37	575	772	245	1,894	810	138	60	235	2,196	1,485	422	284	64	477	730	158	4,532	39,786	54,109	1,453	5,246	2,263	204	1,951	3,186	114	695	75	2,362	3,51
						2,798					446						348												131,587						4,333											6,249						107,389					6,150			
						.5					.1						.1												22,0						.8											1.2						18.0					1.1			

ACRES

ORER UPLAND HARDWOODS												SWAMP FORESTS																								DESC.	
POPPLE & W. BIRCH						SCRUB OAK						SWAMP HARDWOODS									W. CEDAR						TAMARACK						BLACK SPRUCE							
0——6			6——12			0——6			6-12			0——6			6——12			12-18		0—6			6—12			0——6			6—12			0——6			6—12			TOTAL	TOWN	RANGE
G	M	P	G	M	P	G	M	P	M	P	G	M	P	G	M	P	M	P	M	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P			
	299	767	6	40	129							32	196		27	32																				23159	33 N	5 W
397	1589	2496	525	1199	526					20			81		27	21										48				32	41				23144	33 N	6 W
98	1142	878	72	299	106		40	316			20	33	8	20	58	223									188	12	5	149	294	95			18	22685	33 N	7 W
188	1590	1778		244	227		301	514	30			42	87	27	5	202	50		32						19	90		15	565	29				22896	33 N	8 W
170	591	1362	12	441	128	193	146	1694	44	627		8			10				91						7			26	172	94	21	345		23270	33 N	9 W
	788	582	74	25	125							189	187		791	1325			97	436	18		305				57	7					83		22984	34 N	3 W
17	1007	1832	12									224	667		300	693						66			124	65			76	34		66		22950	34 N	4 W
138	866	1735		199	14							52	101	22	89	309		12							32	154		47	199	78				22835	34 N	5 W
142	2294	1677										17	69		182	201			15						45			32	8	239				23244	34 N	6 W
61	469	2534						57			13	246	100		502	34									10	25			150	61				23120	34 N	7 W
76	1408	2034		121				36			10	235	306	33	38									11	17	111		87	308	94				22830	34 N	8 W
316	3420	2513	276	415	26		187	500	4	48		8							186					11	18	2		7	84	11		10		22889	34 N	9 W
239	1799	1965		15	101							165	207		146	85								56	71	50			163	143	22	28	40	23101	35 N	3 W
47	2068	1886	42	154	22							513	364	71	336	142						90			20			16	74	33			74	22974	35 N	4 W
232	1478	2447		27	64							14	91		20	72				39					11	37		4	180	412			72	22977	35 N	5 W
22	2574	4236	51									33													32	215		112	145	277				23292	35 N	6 W
68	680	1781										151	212		60										138	36		114	478	229				23060	35 N	7 W
15	1114	2169		172								188			306	13									98				42			36		23017	35 N	8 W
1048	2085	2525	383	1307	347	11	951		36		10	72	74	14					14						19				76					22994	35 N	9 W
379	1092	4008		7	250						22		36	28	153	90			326	22			21					98	494	337		382	84	22913	36 N	3 W
126	635	697											187		425	226			131		43	33	115		51		325	95	458	123				22808	36 N	4 W
71	1146	4185										89	175		379	104				10		30			17	208	45		215	186		44	221	23127	36 N	5 W
513	2507	3493		55									198		198	24									67	138		19	199	760		31	39	23183	36 N	6 W
61	1212	1075		50	52							51	5	17	417	252	61									131			149	201				23038	36 N	7 W
	2035	1629		40											50										83				37	113		12		22751	36N	8 W
108	3898	1825		436	146		326	69					160		24	46										13				18			40	22659	36N	9 W
4,532	39,786	54,109	1,453	5,246	2,263	204	1,951	3,186	114	695	75	2,362	3,511	232	4,543	4,094	111	12	892	507	61	219	441	78	1,067	1,335	432	7	821	4,598	3,608	43	1,037	588				
					107,389					6,150								14,940				2,120					2,919							10,895		597,900		
					18.0					1.1								25				4					.5							1.8		100%		

Insert I, Table I.

and so openly spaced that there is a very material waste of land and light. Some of the individual trees develop rather large, irregular crowns and knotty crooked boles. Artificial restocking of such stands may be needed to fully utilize the land and light. They occupy about one-half the space that is occupied in a good stand. In a poorly stocked stand (termed "P" for poor) the trees are so few and scattered that there is a very considerable waste of land and light. Many individual trees develop spreading limby crowns and short knotty trunks. Such stands need much artificial restocking and underplanting to obtain the full use of the land and light by forest growth. (See Table VI, Page 31.)

A standard cord occupies 4'x4'x8', or 128 cubic feet of space, but contains only 75 to 85 cubic feet of solid wood depending on the size of the logs.

The board foot volume is given in thousands.

Volumes of all trees below 12 inches in diameter are in cords, all above in board feet.

Plate V, page 28 also gives the mileage of roads, railroads, power and telephone lines.

The houses and summer homes listed are outside of towns and villages.

LAND UTILIZATION

Rusk county like other counties of upper Wisconsin has not been successful in converting more than a limited area of its forest land into farms. Rapid conversion of forest land into farm land stopped simultaneously with the end of the timber harvest. Work in forests and mills helped the beginners to obtain cash for needed subsistence until the farm clearing reached some considerable size. When lumbering came to an end, many potential farmers working as mill and woodsmen found themselves industrially stranded, for farm development on forest land is never self sustaining in its early stages. Adjustment to a new labor field caused wholesale abandonment of land, particularly where colonizing projects created paper values for land which the purchasers soon discovered could not be realized. Deluded and disappointed many of these people returned to the cities in search of work. Milwaukee county largely urban, had added to its population 60% of the population increase of the state during the 1920-30 decade and Rusk county lost about 23% of its rural population during this same period. Farm expansion in Rusk county prior to 1920 had created demands for numerous public improvements, primarily roads and schools. Taxation, therefore, was high to meet this demand. When land sales stopped following 1920, land began to lose its private owners, and Rusk county like other northern counties, soon found itself the largest land owner. While this county land is a nonperishable natural resource, conversion of its accrual into cash implies use and where land has been abandoned as private property it is obvious that there is no accrual which can be exploited at present, and that a classification in terms of primary productive uses is important. Such a classification can best be made when based upon a careful inventory showing natural adaptation. Table I, (Insert I), furnishes this classification by survey townships for the entire county.

This inventory gives both the natural and cultural condition of Rusk county land at the present time. Illustrative of what the table contains in detail are the following: Cleared land and cultivated stump

CLASSIFICATION OF TOTAL AREA
TOTAL AREA 597,900 ACRES.
RUSK COUNTY.
1935.

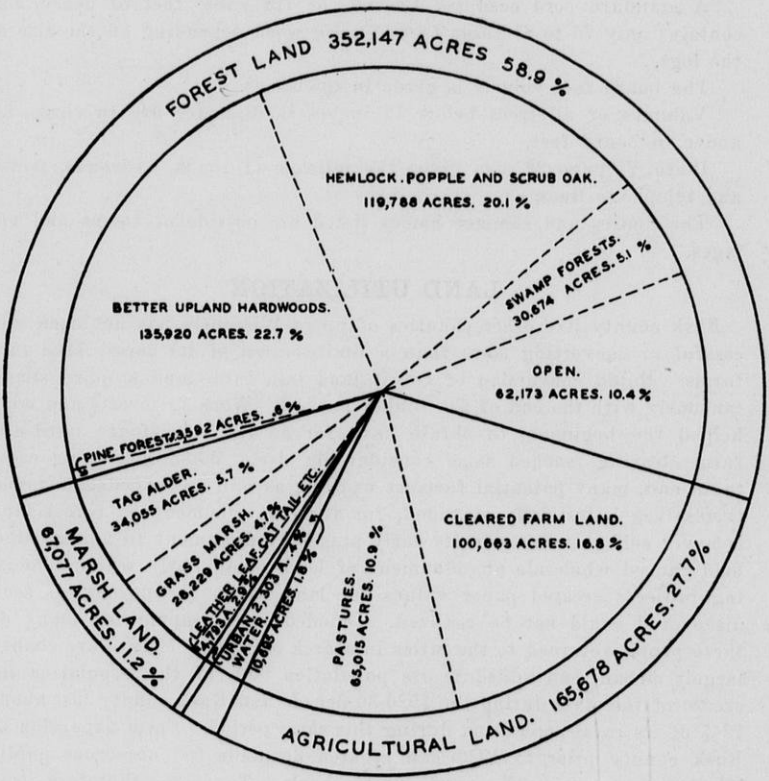


PLATE II

land 100,382 acres with 65,296 acres of all kinds of pasture. This cultivated land covers nearly 17% of the county and the pasture about 11%, making the total land now in agricultural use, other than farm woodlots 28%. Water, treeless marsh and swamp covers about 13% of the county. This leaves approximately 59% of the county to other uses. Urban use is limited to less than 1% and about 10% is classed as open or without any kind of forest cover.

Summarily the land of Rusk county as delineated on the inventory map may be classified into the following main types: (See Table I, Insert I, and Plate II, page 22).

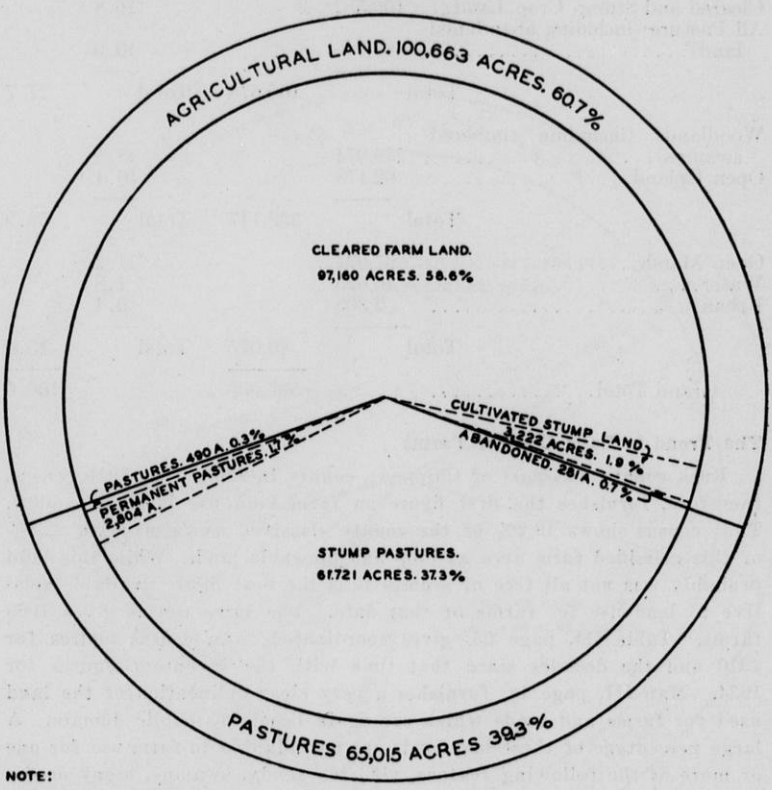
Table II.

TYPES	ACREAGE		PER CENT	
Cleared and Stump Crop Land..	100,382		16.8	
All Pasture (including abandoned land).....	65,296		10.9	
Total		165,678	Total	27.7
Woodlands (including timbered swamps).....	289,974		48.5	
Open Upland.....	62,173		10.4	
Total		352,147	Total	58.9
Open Marsh.....	67,077		11.2	
Water.....	10,695		1.8	
Urban.....	2,303		0.4	
Total		80,075	Total	13.4
Grand Total.....		597,900		100.0

The Trend in Land Use for Farms

Rusk county was part of Chippewa county in 1900. The 1910 census, therefore, furnishes the first figure on farm land use in Rusk county. That census shows 19.2% of the county classified as farms with 22.8% of this classified farm area as crop and plowable land. While this land probably was not all free of stumps it is the best figure available relative to land use for farms of that date. The same census gives 1069 farms. Table III, page 25, gives coordinated farm census figures for 1910 and the decades since that time with the inventory figures for 1934. Map III, page 18, furnishes a very clear delineation of the land used for farms and lands which are again becoming public domain. A large percentage of these last lands are not adapted to farm use for one or more of the following reasons, viz., too sandy, swampy, stony or too rough and hilly (See Plate III, page 24). While the total area where farming has been attempted in Rusk county has been shrinking, the development of the area where farm settlement has been successful shows a marked speeding up of land clearing since 1929. This is obviously due to the ease with which land that has been pastured for a number of years can be cleared. This period has also been almost wholly without opportunity for outside employment for those who formerly spent their winters in logging camps. Comparing the land classified as cropland and plowable pasture with that shown by the 1934 land inventory as cleared, shows an increase over the 1930 census of 38,227 acres of land cleared and prepared for cultivation.

CLASSIFICATION OF AGRICULTURAL LAND
TOTAL AREA 165,678 ACRES.
RUSK COUNTY.
1935.



NOTE:
FARM WOOD LOTS NOT INCLUDED.

PLATE III

Table III.

	CENSUS DATA				INVENTORY DATA
	1910	1920	1925	1930	1934
All farms	1,069	1,946	2,240	2,058	
Total acres in farms	113,638	184,213	203,076	200,049	257,960
Percentage of county in farms	19.2	31.1	34.3	33.8	43.1
Average size of farm	106	94.7	90.7	97.2	
Cropland and plowable pasture	25,869	46,676	53,685	58,835	97,160
Percentage of farmland cleared	22.8	25.39	26.49	29.89	37.6
No. cows and 2 yr. old heifers	3,227	9,616	14,531	16,800	
Pounds of milk produced	7,148,440	32,778,688	54,312,544	90,180,000	
Total population	11,160	16,403		16,081	
Rural population		12,822	10,297	9,844	
Source of gross income from livestock and livestock products				85.5%	
Forest products sold from farms				$66,427	

Farm Population

The 1920-30 decade shows a decrease of about 23% in farm population for Rusk county. Since 1930 an increase in farm population is apparent, for about 22,000 acres of county owned land has been sold for farm use. Map IV, page 21, shows the geographic distribution of this land. This is a splendid example of an intelligent procedure on the part of the county's land committee, since the sales do not require an added public expenditure for roads and schools.

The Growth of the Dairy Industry

The census of 1930 shows that 85.5% of the total gross income of Rusk county farmers is derived from the sale of livestock and livestock products and that sales are almost wholly derived from dairies. The

number of cows and two year old heifers has increased by 74% for this decade and milk production has increased 143% during the same period. These figures are mute evidence of the social adjustment made by the people who are using Rusk county land for farms. Since 1910 the opportunity for cash income from winter work in logging operations and mill work has rapidly decreased while the demand for cash income from farms has increased. Farm development to furnish added cash income has therefore been greatly increased though the farm population during the 1920-30 decade decreased by nearly 3,000.

Eighty-five per cent of the gross farm income from livestock and livestock products (primarily from dairy herds) is a definite index that Rusk county has a soil and climate well adapted to dairying. It also indicates that with no greater spread in the source of farm income, fluctuations in market conditions and prices for livestock and livestock products may lead to over expansion in case of rapidly advancing prices, and on the other hand to excessive exploitation by distributing and processing agencies in time of over production and falling prices. At such times producers all too frequently attempt increased production in order to meet fixed charges which require cash, and by so doing they only add surplus to the existing unconsumed supply.

Diversification within this field of major production should therefore be encouraged. A few less cows, more sheep and added income from poultry would guarantee greater security. Further with a climate and soil conducive to the production of very fine vegetables and particularly small fruits every farm should also produce all the major family needs. Such planning would materially reduce the need for cash. Farm production for family maintenance leaves a larger amount of cash income for fixed farm charges and materially increases the farm buying power for those essentials to farm and home comfort and economy.

Northern Wisconsin is frequently compared with Denmark in climate and general land adaptation. Rusk county has much land that is obviously better adapted to farm use than the Danish land. Denmark, however, has an advantage in nearness to markets. This fact with a relatively harsh environment and dense population has induced Danish farmers to practice mutual aid in all fields of endeavor.

Rusk county farms are many times larger than Danish farms. Our American standard of living requires more land. Whatever the size of the farm unit, Rusk county farmers can well afford to study carefully Denmark's progress in efforts of mutual aid, which have provided the means for Danish farmers to obtain a larger share of the ultimate price paid by the consumers of their produce. Danish farmers have also learned how to use their cash income to buy the greatest amount of goods by cooperative bargaining in the purchase of supplies.

PRESENT STATUS OF FOREST COVER

The total amount of land now growing some type of forest cover in Rusk county is 289,974 acres. Of this 135,920 acres are the better hardwoods; 119,788 acres are hemlock, popple and inferior hardwood, 3,592

acres are pine land, and 30,674 acres are swamp forests. 169,952 acres consist of timber 0-6 inches in diameter. Of this area 8,458 acres are well stocked, 69,477 acres are medium stocked and 92,017 acres are

CLASSIFICATION OF FOREST COVER ACCORDING TO SIZE.

TOTAL FOREST AREA 289,974 ACRES.

RUSK COUNTY.

1935.

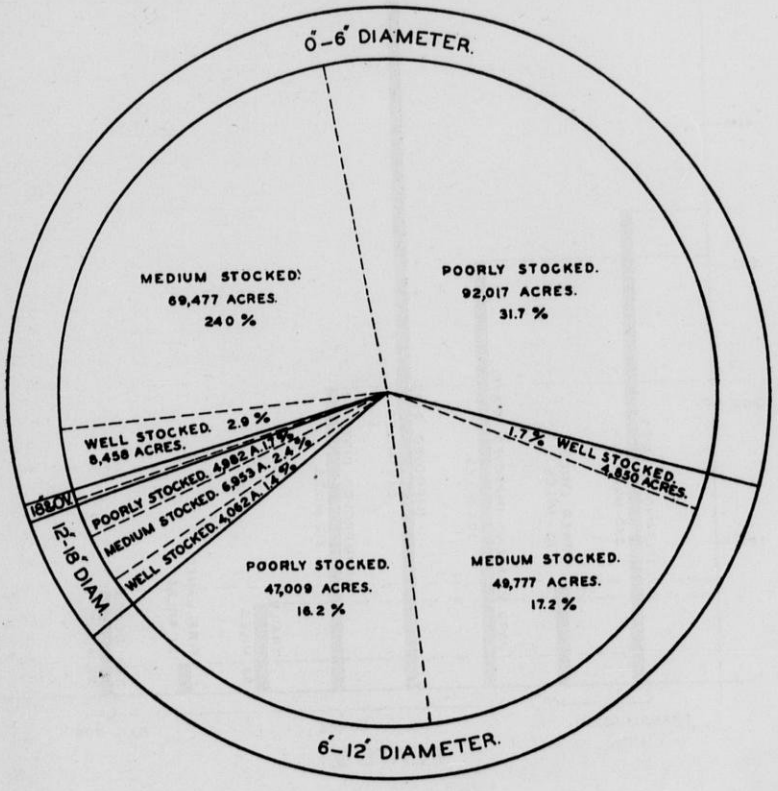


PLATE IV

poorly stocked. There is a total of 101,636 acres composed of timber 6-12 inches in diameter. Of this 4,850 acres are well stocked, 49,777 acres are medium stocked and 47,009 acres are poorly stocked (See Plate IV, page 27). There is a total of 15,997 acres of land with a forest cover averaging 12-18 inches in diameter. Of this, 4,062 acres are good stocking, 6,953 acres are medium stocking and 4,782 acres are poor stocking. (See Table I, Insert I.)

NUMBER OF MILES OF ROADS, RAILROADS POWER AND TELEPHONE LINES.

RUSK COUNTY.

1935.

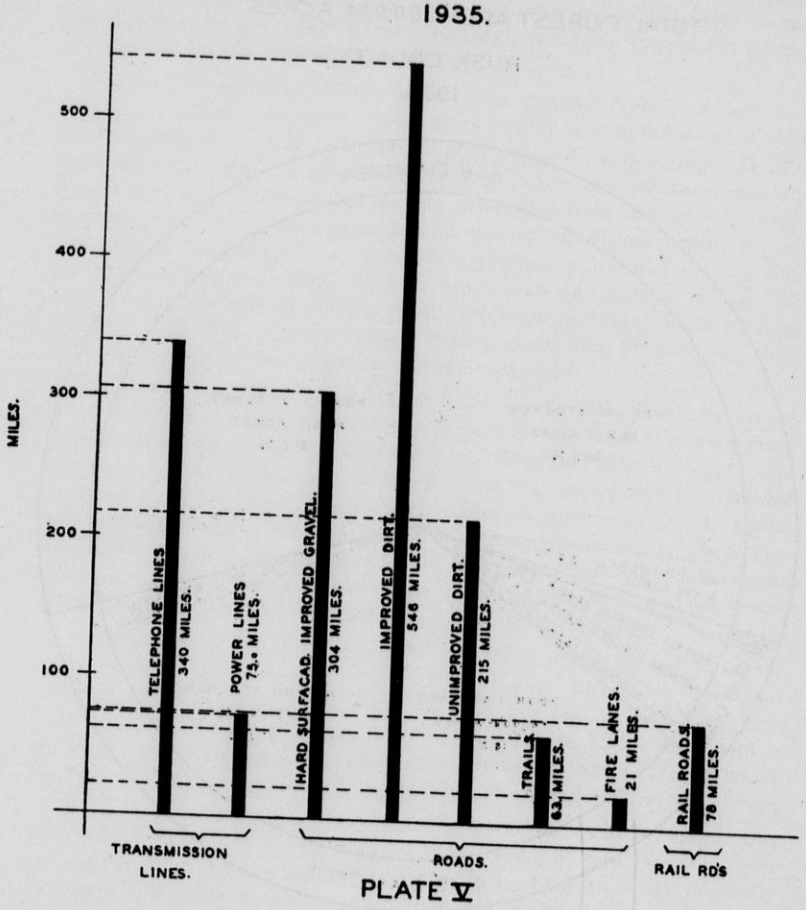


PLATE V

Notes on Table IV.

Table IV shows an estimate of all the forest cover in the county, with stumpage value of the same as based on the stumpage rates, given on page 32. The table also shows the estimated growth in volume production in a period of twenty-five years as based on growth of the present acreage of forest cover, and growth studies made in similar types of timber of different age classes and density. The value of this stand twenty-five years hence is also given.

ESTIMATE AND VALUE OF TIMBER.
PREDICTION OF GROWTH AND POSSIBLE YIELDS FOR
RUSK COUNTY

LAND COVER TYPES.	AT PRESENT TIME.					25 YEARS HENCE			ADDITIONAL POSSIBLE YIELDS IF PLANTED TO PINE AND SPRUCE.	
	DIA. CLASS OF FOR COVER	DEGREE OF STOCKING	AREA OF EACH TYPE OF COVER.	YIELD IN TERMS OF MARKET UNITS	STUMPAGE VALUE (DOLLARS)	DIA. CLASS	YIELD IN MARKET UNITS	STUMPAGE VALUE (DOLLARS)	YIELD IN 50 YEARS AT 50 CDS. PER ACRE	STUMPAGE VALUE IN 50 YEARS. AT $ 2.00 PR. CD.
WHITE PINE.	0-6	GOOD	15	135 CDS.	270	6-12	900 CDS.	1800		
	0-6	MEDIUM	159	795 "	1590	6-12	4770 "	9540		
	0-6	POOR	450	450 "	900	6-12	3600 "	7200		
	6-12	GOOD	53	3445 "	6890	12-18	1060 M.B.F.	10600		
	6-12	MEDIUM	673	26247 "	52494	12-18	8076 "	80760		
	6-12	POOR	1197	11970 "	23940	12-18	3591 "	35910		
	12-18	MEDIUM	10	100 M.B.F.	1000	12-30	170 "	1700		
	12-18	POOR	134	402 "	4020	12-30	536 "	5360		
	18+	MEDIUM	47	799 "	7990	18-30	799 "	7990		
	18+	POOR	60	240 "	2400	18-30	240 "	2400		
NORWAY PINE.	0-6	MEDIUM	52	364 CDS.	728	6-12	2080 CDS.	4160		
	0-6	POOR	30	60 "	120	6-12	450 "	900		
	6-12	GOOD	4	240 "	480	12-18	60 M.B.F.	600		
	6-12	MEDIUM	167	5010 "	10020	12-18	1670 "	16700		
	6-12	POOR	193	1930 "	3860	12-18	579 "	5790		
JACK PINE.	0-6	MEDIUM	25	250 "	500	6-12	375 CDS.	750		
	0-6	POOR	13	39 "	78	6-12	39 "	78		
	6-12	MEDIUM	55	1375 "	2750	9-12	1650 "	3300		
	6-12	POOR	214	1712 "	3424	9-12	2140 "	4280		
	12+	MEDIUM	10	250 "	500	9-12	250 "	500		
	12+	POOR	31	248 "	496	9-12	248 "	496		
HARDWOODS WITH SOME HEMLOCK.	0-6	GOOD	2696	—	—	3-6	24264 "	24264		
	0-6	MEDIUM	17872	—	—	3-6	89360 "	89360		
	0-6	POOR	24436	—	—	3-6	24436 "	24436		
	6-12	GOOD	2524	73196 "	73196	9-12	100960 "	100960		
	6-12	MEDIUM	33201	564417 "	564417	9-12	664020 "	664020		
	6-12	POOR	35022	210132 "	210132	9-12	280176 "	280176		
	12-18	GOOD	3640	43680 M.B.F.	218400	12-24	43680 M.B.F.	218400		
	12-18	MEDIUM	6538	39228 "	196140	12-24	39228 "	196140		
	12-18	POOR	4741	4741 "	23705	12-24	4741 "	23705		
	18-24	MEDIUM	745	4470 "	22350	12-30	4470 "	22350		
	18-24	POOR	40	40 "	200	12-30	40 "	200		
	24+	MEDIUM	132	792 "	3960	24+	792	3960		
HARDWOODS WITH CONSIDERABLE BASSWOOD.	0-6	GOOD	37	—	—	3-6	333 CDS.	333		
	0-6	MEDIUM	575	—	—	3-6	2875 "	2875		
	0-6	POOR	772	—	—	3-6	772 "	772		
	6-12	GOOD	245	7105 CDS.	7105	9-12	9800 "	9800		
	6-12	MEDIUM	1894	32198 "	32198	9-12	37880 "	37880		
	6-12	POOR	810	4860 "	4860	9-12	6480 "	6480		
HEMLOCK WITH SOME HARDWOOD.	0-6	MEDIUM	138	—	—	3-6	1656 "	1656		
	0-6	POOR	60	—	—	3-6	120 "	120		
	6-12	GOOD	235	13865 "	13865	9-12	15745 "	15745		
	6-12	MEDIUM	2198	76860 "	76860	9-12	87840 "	87840		
	6-12	POOR	1485	13365 "	13365	9-12	17820 "	17820		
	12-18	GOOD	422	5064 M.B.F.	17724	15-18	5064 M.B.F.	17724		
	12-18	MEDIUM	284	1704 "	5964	15-18	1704 "	5964		
	12-18	POOR	64	64 "	224	15-18	64 "	224		
	18-24	GOOD	477	5724 "	20034	18-30	5724 "	20034		
	18-24	MEDIUM	730	4380 "	15330	18-30	4380 "	15330		
	24+	GOOD	158	1896	6636	18-30	1896	6636		
POPPLE (ASPEN) WITH SOME WHITE BIRCH	0-6	GOOD	4532	77044 CDS.	77044	6-12	163152 CDS.	163152		
	0-6	MEDIUM	39786	358074 "	358074	6-12	795720 "	795720		
	0-6	POOR	54109	108218 "	108218	6-12	216436 "	216436	2705450 CORDS.	$ 5410900
	6-12	GOOD	1453	52308 "	52308	9-12	58120 "	58120		
	6-12	MEDIUM	5246	104920 "	104920	9-12	131150 "	131150		
	6-12	POOR	2263	9052 "	9052	9-12	18104 "	18104	113150	226300
SCRUB OAK	0-6	GOOD	204	—	—	3-6	2856 "	2856	10200	20400
	0-6	MEDIUM	1951	—	—	3-6	11706 "	11706	97550	195100
	0-6	POOR	3186	—	—	3-6	3186 "	3186	159300	318600
	6-12	MEDIUM	114	1140 "	1140	9-12	1824 "	1824	5700	11400
	6-12	POOR	695	1390 "	1390	9-12	4865 "	4865	34750	69500
SWAMP HARDWOODS.	0-6	GOOD	75	—	—	3-6	600 "	600		
	0-6	MEDIUM	2362	—	—	3-6	9448 "	9448		
	0-6	POOR	3511	—	—	3-6	3511 "	3511		
	6-12	GOOD	232	6960 "	6960	12-18	7424 "	7424		
	6-12	MEDIUM	4543	68145 "	68145	12-18	72688 "	72688		
	6-12	GOOD	4094	20470 "	20470	12-18	24564 "	24564		
	12-18	MEDIUM	111	333 M.B.F.	1665	15-18	333 M.B.F.	1665		
	12-18	POOR.	12	12 "	60	15-18	12 "	60		
WHITE CEDAR	0-6	MEDIUM	892	—	—	6-12	98120 POSTS.	3925		
	0-6	POOR	507	—	—	6-12	16224 "	649		
	6-12	GOOD	61	14152 POSTS.	566	9-12	7076 " 7076 POLES.	2052		
	6-12	MEDIUM	219	24090 "	964	9-12	12045 " 12045 POSTS.	3493		
	6-12	POOR	441	14112 "	564	9-12	7056 " 7056 POLES.	2046		
LARCH (TAMARACK)	0-6	GOOD	78	1248 CDS.	1248	3-6	2028 CDS.	2028		
	0-6	MEDIUM	1067	9603 "	9603	3-6	14938 "	14938		
	0-6	POOR	1335	2670 "	2670	3-6	4005 "	4005		
	6-12	MEDIUM	432	8208 "	8208	9-12	10875 "	10875		
	6-12	POOR	7	35 "	35	9-12	49 "	49		
BLACK SPRUCE	0-6	GOOD	821	8210 "	32840	3-6	21346 "	85384		
	0-6	MEDIUM.	4598	27588 "	110352	3-6	64372 "	257488		
	0-6	POOR	3608	7216 "	28864	3-6	10824 "	43296		
	6-12	GOOD	43	1290 "	5160	9-12	1720 "	6880		
	6-12	MEDIUM	1037	17629 "	70516	9-12	25925 "	103700		
	6-12	POOR	588	2940 "	11760	9-12	4116 "	16464		
OPEN.	—	—	62173	—	—	—	—	—	3108650	6217300
CROPLAND AND PASTURE.	—	—	165678	—	—	—	—	—		
OPEN MARSH LAND.	—	—	67077	—	—	—	—	—		
WATER.	—	—	10695	—	—	—	—	—		
URBAN.	—	—	2303	—	—	—	—	—		
TOTALS.....				1,944,876 CDS. 113669 M.B.F. 52354 POSTS. TOTAL.....	2,194,015 547802 2094 $ 2,743,911		3,039,504 CDS. 137716 M.B.F. 140521 POSTS. 26177 POLES. TOTAL.....	3,379,766 698272 5621 6544 $ 4,090,203	6,234,730 CORDS.	$ 12,469,500

TABLE IV

Insert II, Table IV.

In the older stands of 12-30 inches it is assumed that death, decay and windfall offset growth, and therefore their value is considered the same twenty-five years from now as at present and no increased growth is shown.

AREA IN NEED OF IMMEDIATE TREE PLANTING.
TOTAL FOREST LAND 352,147 ACRES.
RUSK COUNTY.
1935.

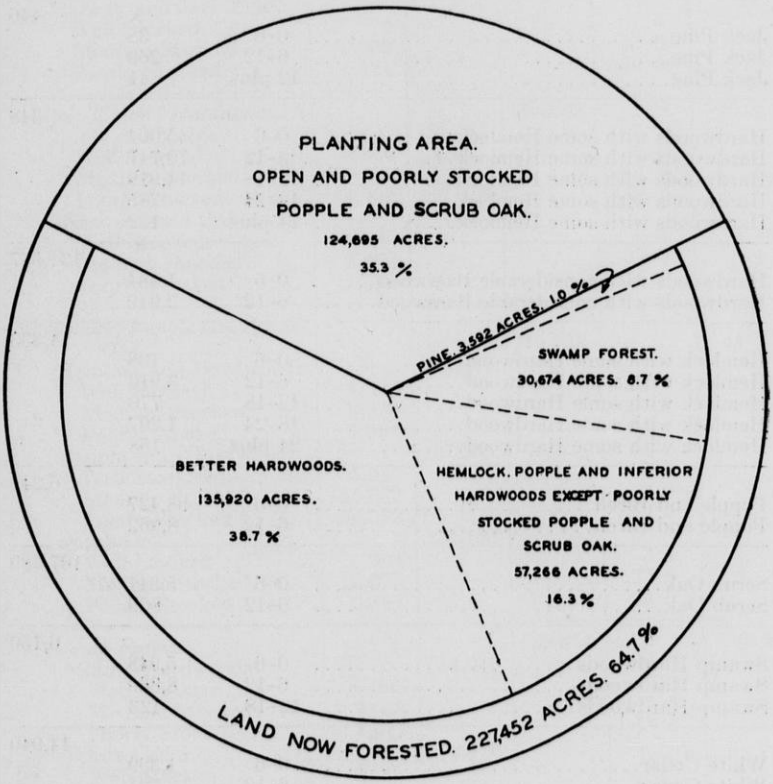


PLATE VI

In the twenty-five years of growth the volume of the present natural stand of timber under twelve inches in diameter, occupying an area of 270,717 acres, increases in value $1,346,292 or at the rate of approximately $53,852 per year. This is an increased value per acre, per year for this present young stand of only twenty cents. A planted stand of pine would increase in gross value at the rate of about $2.00 per acre per year.

Table V.

CLASSIFICATION OF THE FOREST COVER ACCORDING TO SIZE

SPECIES	DIAMETER CLASS	ACRES	TOTALS
White Pine	0–6	624	
White Pine	6–12	1,923	
White Pine	12–18	144	
White Pine	18 plus	107	
Norway Pine			2,798
Norway Pine	0–6	82	
Norway Pine	6–12	364	
Jack Pine			446
Jack Pine	0–6	38	
Jack Pine	6–12	269	
Jack Pine	12 plus	41	
Hardwoods with some Hemlock			348
Hardwoods with some Hemlock	0–6	45,004	
Hardwoods with some Hemlock	6–12	70,747	
Hardwoods with some Hemlock	12–18	14,919	
Hardwoods with some Hemlock	18–24	785	
Hardwoods with some Hemlock	24 plus	132	
Hardwoods with considerable Basswood			131,587
Hardwoods with considerable Basswood	0–6	1,384	
Hardwoods with considerable Basswood	6–12	2,949	
Hemlock with some Hardwood			4,333
Hemlock with some Hardwood	0–6	198	
Hemlock with some Hardwood	6–12	3,916	
Hemlock with some Hardwood	12–18	770	
Hemlock with some Hardwood	18–24	1,207	
Hemlock with some Hardwood	24 plus	158	
Popple and Birch			6,249
Popple and Birch	0–6	98,427	
Popple and Birch	6–12	8,962	
Scrub Oak			107,389
Scrub Oak	0–6	5,341	
Scrub Oak	6–12	809	
Swamp Hardwoods			6,150
Swamp Hardwoods	0–6	5,948	
Swamp Hardwoods	6–12	8,869	
Swamp Hardwoods	12–18	123	
White Cedar			14,940
White Cedar	0–6	1,399	
White Cedar	6–12	721	
Tamarack			22,120
Tamarack	0–6	2,480	
Tamarack	6–12	439	
Black Spruce			2,919
Black Spruce	0–6	9,027	
Black Spruce	6–12	1,668	
			10,695
		Grand Total	289,974

Table VI.

CLASSIFICATION OF FOREST COVER ACCORDING TO DENSITY
RUSK COUNTY, WISCONSIN

	TOTAL BY DENSITY ACRES	TOTAL BY SPECIES ACRES	GRAND TOTAL BY TYPES ACRES	% DENSITY IN TYPES	% BY TYPES
Pine Forests			3,592		1.2
White Pine		2,798			
Well Stocked	68			2.6	
Medium Stocked	889			31.4	
Poorly Stocked	1,841			66.0	
Norway and Jack Pine		794			
Well Stocked	4			.6	
Medium Stocked	309			38.9	
Poorly Stocked	481			60.5	
Better Upland Hardwoods			135,920		46.9
Birch and Maple		131,587			
Well Stocked	8860			6.8	
Medium Stocked	58,488			44.5	
Poorly Stocked	64,239			48.7	
Basswood and Oak		4,333			
Well Stocked	282			6.5	
Medium Stocked	2,469			57.0	
Poorly Stocked	1,582			36.5	
Hemlock, Popple and Scrub Oak			119,788		41.3
Hemlock and Hardwoods		6,249			
Well Stocked	1,292			20.6	
Medium Stocked	3,348			53.6	
Poorly Stocked	1,609			25.8	
Popple and White Birch		107,389			
Well Stocked	5,985			5.6	
Medium Stocked	45,032			42.0	
Poorly Stocked	56,372			52.4	
Scrub Oak		6,150			
Well Stocked	204			3.4	
Medium Stocked	2,065			33.6	
Poorly Stocked	3,881			63.0	
Swamp Forests			30,674		10.6
Swamp Hardwoods		14,940			
Well Stocked	307			2.0	
Medium Stocked	7,016			47.0	
Poorly Stocked	7,617			51.0	
White Cedar		2,120			
Well Stocked	61			3.0	
Medium Stocked	1,111			52.4	
Poorly Stocked	948			44.6	
Larch (Tamarack)		2,919			
Well Stocked	78			2.6	
Medium Stocked	1,499			51.5	
Poorly Stocked	1,342			45.9	
Black Spruce		10,695			
Well Stocked	864			8.2	
Medium Stocked	5,635			52.6	
Poorly Stocked	4,196			39.2	
Total		289,974	289,974		100%

The last two columns in the table show the forest planting possibilities when planted to a desirable species of timber such as pine and spruce and the accrued volume and value of this stand in a period of fifty years. The area of 124,695 acres which probably could be planted in Rusk county (see Plate VI, page 29) includes all the poorly stocked popple land, all the scrub oak land, and all the non agricultural open land.

The figures on yield of forest plantations are based on the above acreage for planting and on a yield of fifty cords per acre in fifty years for mixtures of white and Norway pine and spruce. Studies made in all the plantations of the state indicate that all these species when correctly planted will produce 50 cords per acre in 30 or 40 years.

The table shows a possible production of 6,234,750 cords of pine and spruce in fifty years on the 124,695 acres of land recommended for tree planting. At $2.00 per cord, this planted forest would have a stumpage value of $12,469,500 at the end of fifty years.

Note.—Stumpage prices used as basis for estimates.

Hardwoods	$ 1.00 per cord.
Hardwoods	5.00 per M. bd. ft.
Hemlock	1.00 per cord.
Hemlock	3.50 per M. bd. ft.
Pine	2.00 per cord.
Pine	10.00 per M. bd. ft.
Aspen "Popple"	1.00 per cord.
Spruce	4.00 per cord.
Cedar	posts 4 cents each.
	poles $25.00 per hundred.
Larch (Tamarack)	$1.00 per cord.

THE TREND IN FOREST LAND USE

An analysis of the land not in farm use indicates that about 124,695 acres should probably be reforested by planting to a more valuable species of timber. This includes 62,173 acres of open land, 56,372 acres of poorly stocked popple and birch land, and 6,150 acres of scrub oak. (See Plate VI, page 29.)

THE LAKES OF RUSK COUNTY

Lakes cover an area of approximately 10,700 acres in Rusk county. Island Lake is the largest covering approximately 520 acres, while Sand Lake is the deepest, with a maximum of 99 feet.

The Lake Survey

A survey of the lakes of Rusk county was made in the summer of 1934 for the purpose of effecting a better understanding of them so that they can be developed and utilized in the best way, for many of the lakes of this county have excellent environment for fish life and a proper fish stocking program will greatly improve them.

The data tabulated in *Table VII "Lakes of Rusk County"* (See Insert III) are the results of field study and information gathered from people living in the vicinity of the lakes. From a comparative study of lake conditions, it was possible to determine environmental requirements

TABLE VII. LAKES OF RUSK COUNTY

Name of Lake	LOCATION OF LAKE			Date Visited	Appr. Lake Area in Acres	Max. Depth in Feet	Drainage	Appearance of Water	Water Level During Year	Water Level During Period of Years	Nature of Lake Bottom in Deep Water	Nature of Lake Bottom in Shoal Water	Plant Duck Foods	Lake Vegetation as to Abundance and Variety	WATER ANALYSIS			Fish Common in Lake Before Lake was Stocked	Lake Has Been Stocked with	Fish Common in Lake at Present	Rough Fish	Fish Suitable for Stocking	Other Data
	Township N.	Range W.	Section												Appr. Pts. per Mil. of Bound CO_3 at Surface	Appr. pH at Surface	Water as to Hardness and Softness						
AMACOY	34	8	25, 26, 35, 36	July 6	316	20	Inlet and outlet	Green due to plankton	Slightly periodic	Fairly constant	Mucky	Sandy and gravelly, mucky	Abundant	Abundant and varied	21	Above 9.6	M. H.	Muskellunge, L. M. bass, N. pike, sunfish, perch, bullheads	Crappies 1928–34, W. E. pike, muskellunge	Muskellunge, L. M. bass, N. pike, crappies, sunfish, perch, bullheads	Suckers, redhorse	Muskellunge, W. E. pike, N. pike	
ATWOOD	33	9	27	July 28	7	22	Landlocked	Clear	Slightly periodic	Dropped	Mucky	Mucky	Scarce	Scarce and not varied	4	6.8	V. S.	L. M. bass, bluegills, bullheads	W. E. pike 1928	Bullheads	Suckers	L. M. bass	
BASS	34	9	16	July 13	92	26	Landlocked	Clear	Slightly periodic, dropped	Dropped 4 feet, 1932–34	Mucky	Mucky, sandy and gravelly in spots	Scarce	Scarce and not varied	4	6.8	V. S.	L. M. bass, bluegills, perch, bullheads	L. M. bass, W. E. pike, crappies	L. M. bass, W. E. pike, crappies, bluegills, perch, bullheads	Suckers	L. M. bass, S. M. bass	
BASS (Lower Bass)	34	7	20, 21, 28, 29	July 6	25	17	Periodic outlet	Brown stain	Slightly periodic	Dropped	Mucky	Mucky, sandy and gravelly in spots	Fairly abundant	Fairly abundant and varied	10	8	M.	Muskellunge, L. M. bass, W. E. pike, bluegills, perch, bullheads		Muskellunge, L. M. bass, W. E. pike, bluegills, perch, bullheads	Suckers, redhorse	L. M. bass	
BASS (Upper Bass)	35	7	12, 13	July 6	45	19	Periodic outlet	Clear	Slightly periodic	Fairly constant	Mucky	Mucky, sandy and gravelly in spots	Fairly abundant	Fairly abundant and varied	14	8.2	M.	L. M. bass, bluegills, bullheads	L. M. bass	L. M. bass, bluegills, bullheads	Suckers	L. M. bass	
BIG FALLS FLOWAGE	36	5	25, 26, 35	June 20	110	53	Inlet and outlet dammed	Brown stain	Periodic due to dam	Periodic due to dam	Mucky, sandy and gravelly, woody debris	Mucky, sandy and gravelly, woody debris	Scarce	Scarce and not varied	18	8.3	M.	Muskellunge, L. M. bass, S. M. bass, W. E. pike, rock bass, bluegills		Muskellunge, L. M. bass, S. M. bass, W. E. pike, rock bass, bluegills	Suckers, redhorse, sturgeon	Muskellunge, W. E. pike	
BOG	33	8	3	July 3	41	8	Periodic outlet	Green due to plankton	Slightly periodic	Dropped	Mucky	Mucky, sandy and gravelly in spots	Scarce	Scarce and not varied	26	Above 9.6	M. H.	Muskellunge, L. M. bass, W. E. pike, bluegills, perch, bullheads		Muskellunge, L. M. bass, W. E. pike, bluegills, perch, bullheads	Suckers	Stocking not recommended	
BOOT	33	7	16, 17, 20	July 5	94	35	Landlocked	Clear	Slightly periodic	Dropped	Mucky	Sandy, mucky	Scarce	Scarce and not varied	4	7.2	V. S.	L. M. bass, bluegills, perch, bullheads		L. M. bass, bluegills, perch, bullheads	Suckers	L. M. bass	
BUCK'S (Hemlock)	36	9	23, 26, 27	July 13	89	15	Outlet dammed	Brown stain	Fairly constant	Fairly constant	Mucky, sandy and gravelly, woody debris	Mucky, sandy and gravelly, woody debris	Fairly abundant	Fairly abundant and varied	13	7.4	M.	N. pike, perch		N. pike, perch	Suckers	L. M. bass, N. pike	
BUCK'S (Star)	36	8	19, 30	July 16	25	35	Periodic	Slight brown stain	Slightly periodic	Fairly constant	Mucky	Mucky, sandy and gravelly	Scarce	Scarce and not varied	Under 5	7.4	V. S.	L. M. bass, bluegills, bullheads	L. M. bass, crappies	L. M. bass, crappies, bluegills, bullheads	Suckers	L. M. bass, S. M. bass	
CADDOT	33	8	32	July 2	29	28	Landlocked	Clear	Slightly periodic	Dropped	Mucky	Mucky	Scarce	Scarce and not varied	3.5	6.7	V. S.	L. M. bass, bluegills, perch, bullheads	L. M. bass, bluegills	L. M. bass, bluegills, perch, bullheads	Suckers	L. M. bass	
CHAIN (Partly in Chippewa County)	33	9	35, 36	June 26	310	71	Inlet and outlet	Clear	Slightly periodic	Fairly constant	Mucky	Sandy and gravelly, mucky	Abundant	Abundant and varied	32	7.5	H.	Muskellunge, L. M. bass, S. M. bass, rock bass, bluegills, sunfish	Muskellunge, L. M. bass, S. M. bass, W. E. pike, rock bass, bluegills	Muskellunge, L. M. bass, S. M. bass, rock bass, bluegills, sunfish	Gar, suckers, redhorse	Muskellunge with L. M. bass, S. M. bass or W. E. pike	
CLEAR	33 33	8 9	31 36	June 26	170	70	Inlet and outlet	Clear	Fairly constant	Fairly constant	Mucky	Sandy and gravelly	Abundant	Abundant and varied	33	8.6	H.	Muskellunge, L. M. bass, S. M. bass, rock bass, bluegills, sunfish	Muskellunge, L. M. bass, S. M. bass, W. E. pike, rock bass, bluegills	Muskellunge, L. M. bass, S. M. bass, rock bass, bluegills, sunfish	Suckers, redhorse, gar	Muskellunge with L. M. bass, S. M. bass or W. E. pike	
FISH	33	9	28, 29. 32, 33	June 28	147	28	Landlocked	Clear	Slightly periodic, dropped	Dropped	Mucky	Mucky, sandy and gravelly	Scarce	Scarce and not varied	3	7.1	V. S.	L. M. bass, N. pike, bluegills, perch, bullheads	L. M. bass, W. E. pike, bluegills	L. M. bass, N. pike, bluegills, perch, bullheads	Suckers	L. M. bass, S. M. bass	
FOURTH	33	9	26	June 27	4	58	Inlet and outlet	Slight brown stain	Slightly periodic	Fairly constant	Mucky	Mucky	Fairly abundant	Fairly abundant and varied	14.5	8.4	M.	Muskellunge, L. M. bass, S. M. bass, bluegills, perch		Muskellunge, L. M. bass, S. M. bass, bluegills, perch	Suckers, redhorse	L. M. bass	
GOOSE	33	8	27, 34	July 3	21	51	Periodic outlet	Clear	Slightly periodic	Fairly constant	Mucky	Sandy and gravelly, mucky	Scarce	Scarce but varied	21	7.6	M. H.	Muskellunge, L. M. bass, W. E. pike, crappies, ciscoes		Muskellunge, L. M. bass, W. E. pike, crappies, ciscoes	Suckers, redhorse	L. M. bass, S. M. bass	
HORSESHOE	33	9	5	June 29	22	35	Periodic inlet and outlet	Clear	Dropped	Dropped	Mucky	Mucky	Scarce	Scarce and not varied	7	7.7	S.	L. M. bass, N. pike, bluegills, bullheads	Crappies, W. E. pike	L. M. bass, N. pike, crappies, bluegills, bullheads	Suckers, redhorse	L. M. bass	
ISLAND	33	8	20, 21, 28, 29, 30	June 27	520	50	Outlet	Clear	Slightly periodic	Fairly constant	Mucky	Sandy and gravelly, mucky	Abundant	Abundant and varied	31	Above 9.6	H.	Muskellunge, L. M. bass, S. M. bass, rock bass, bluegills, perch	W. E. pike, muskellunge, L. M. bass	Muskellunge, perch, L. M. bass, S. M. bass, rock bass, bluegills	Suckers, redhorse, gar	Muskellunge, L. M. bass, S. M. bass	
McCANN	33	8	30, 31	June 26	127	37	Inlet and outlet	Clear	Slightly periodic	Fairly constant	Mucky	Sandy and gravelly, mucky	Abundant	Abundant and varied	33	8.4	H.	Muskellunge, L. M. bass, S. M. bass, rock bass, sunfish, bluegills		Muskellunge, L. M. bass, S. M. bass, rock bass, sunfish, bluegills	Suckers, redhorse, gar	Muskellunge with L. M. bass, S. M. bass or W. E. pike	
MUD	33	8	20, 26, 27	June 20	70	12	Inlet and outlet	Cloudy due to plankton	Slightly periodic	Fairly constant	Mucky	Mucky, sandy	Abundant	Abundant and varied	36	9.3	H.	Muskellunge, L. M. bass, rock bass, crappies, bluegills, sunfish, bullheads	L. M. bass, bluegills '28, W. E. pike '28–34, Muskellunge 1934	Muskellunge, L. M. bass, W.E. pike, crappies, rock bass, bluegills, sunfish, bullheads	Suckers, redhorse, gar	Muskellunge, W. E. pike	
NORTH	34	9	3, 10	July 16	18	20	Landlocked	Brown stain	Slightly periodic	Fairly constant	Mucky	Mucky, sandy and gravelly in spots	Scarce	Fairly abundant and not varied	4	6.8	V. S.	L. M. bass, N. pike, bluegills, perch, bullheads		L. M. bass, N. pike, bluegills, perch, bullheads	Suckers	L. M. bass	
PICKEREL (East Pickerel)	34	9	15, 16	July 16	8	12	Landlocked	Slight brown stain	Dropped	Dropped	Mucky	Mucky, sandy and gravelly in spots	Scarce	Scarce and not varied	3	6.8	V. S.	L. M. bass, N. pike, bluegills, perch, bullheads	Crappies	L. M. bass, N. pike, crappies, bluegills, perch, bullheads	Suckers	Stocking not recommended	
PICKEREL (Central Pickerel)	34	9	16	July 16	12	15	Landlocked	Slight brown stain	Dropped	Dropped	Mucky	Mucky, sandy and gravelly in spots	Scarce	Scarce and not varied	3	6.2	V. S.	N. pike, bluegills, perch, bullheads		N. pike, bluegills, perch, bullheads	Suckers	L. M. bass	
PICKEREL (West Pickerel)	34	9	16	July 16	7	23	Landlocked	Slight brown stain	Dropped	Dropped	Mucky	Mucky	Scarce	Scarce and not varied			V. S.	N. pike, bluegills, perch, bullheads		N. pike, bluegills, perch, bullheads	Suckers	L. M. bass	
PINE (Partly in Chippewa County)	33	9	34, 35	June 27	465	96	Landlocked	Clear	Dropped	Dropped	Mucky	Sandy and gravelly, mucky	Scarce	Scarce and not varied	4	7.3	V. S.	L. M. bass, N. pike, bluegills, perch	L. M. bass, bluegills	L. M. bass, N. pike, bluegills, perch	Suckers	L. M. bass, S. M. bass	
PULASKI	33	7	17, 18, 19	July 5	110	39	Landlocked	Clear	Dropped	Dropped	Mucky	Sandy, mucky in spots	Scarce	Scarce and not varied	5	7.7	S.	L. M. bass, bluegills, perch, bullheads	W. E. pike	L. M. bass, bluegills, perch, bullheads	Suckers	L. M. bass	
POTATO	33 33	9 8	23, 24, 25, 26 19	June 26	489	25	Inlet and outlet	Clear	Periodic due to dam	Periodic due to dam	Mucky	Sandy and gravelly, mucky	Abundant	Abundant and varied	32	9.4	H.	Muskellunge, L. M. bass, W. E. pike, rock bass, bluegills, bullheads, ciscoes	L. M. bass '16, S. M. bass '32, W. E. pike '16–'34, crappies '21	Muskellunge, L. M. bass, ciscoes, S. M. bass, W. E. pike, crappies, rock bass, bluegills, bullheads	Suckers, redhorse	Muskellunge with L. M. bass, S. M. bass or W. E. pike	
RICE	33	8	23, 26	June 20	175	38	Inlet and outlet	Cloudy due to plankton	Slightly periodic	Fairly constant	Mucky	Mucky, sandy and gravelly	Abundant	Abundant and varied	36	9.4	H.	Muskellunge, L. M. bass, crappies, rock bass, bluegills, sunfish, bullheads	L. M. bass, bluegills '28, W. E. pike '28–'34, Muskellunge '34	Muskellunge, L. M. bass, W.E. pike, crappies, rock bass, bluegills, sunfish, bullheads	Suckers, redhorse	Muskellunge with L. M. bass, S. M. bass or W. E. pike	
ROUND	33	7	7, 8, 17, 18	July 5	98	8	Landlocked	Clear	Dropped	Dropped	Mucky	Mucky, sandy in spots	Scarce	Scarce and not varied	3	6.7	V. S.	L. M. bass, bluegills, perch		L. M. bass, bluegills, perch	Suckers	Stocking not recommended	
RUSK (Dall, Buck)	33	9	15	June 28	10	61	Landlocked	Clear	Slightly periodic	Dropped	Mucky	Mucky	Scarce	Scarce and not varied	7	7.3	S.	N. pike, rock bass, bluegills, bullheads	W. E. pike	W. E. pike, N. pike, rock bass, bluegills, bullheads	Suckers	W. E. pike or L. M. bass	
SAND (Partly in Chippewa County)	33	8	33, 34	June 21	189	99	Periodic inlet and outlet	Clear	Slightly periodic	Fairly constant	Mucky	Sandy and gravelly, mucky	Abundant	Abundant and varied	36	8.5	H.	Muskellunge, L. M. bass, S. M. bass, bluegills, sunfish, ciscoes		Muskellunge, L. M. bass, S. M. bass, bluegills, sunfish, ciscoes	Suckers, redhorse, gar	Muskellunge, L. M. bass, S. M. bass	
SAXTEN	34	7	28, 33	July 5	5	20	Landlocked	Brown stain	Slightly periodic	Fairly constant	Mucky	Mucky	Scarce	Scarce and not varied		6.5	V. S.	L. M. bass, bluegills, perch, bullheads		L. M. bass, bluegills, perch, bullheads	Suckers	L. M. bass	
SECOND	33	9	26	June 27	20	23	Inlet and outlet	Slight brown stain	Slightly periodic	Fairly constant	Mucky	Mucky	Fairly abundant	Abundant and varied	17	7.5	M.	Muskellunge, L. M. bass, bluegills, perch		Muskellunge, L. M. bass, bluegills, perch	Suckers, redhorse	L. M. bass	
STAR (Sunfish)	35	7	25	July 16	31	47	Landlocked	Clear	Slightly periodic	Fairly constant	Mucky	Mucky, sandy and gravelly in spots	Fairly abundant	Abundant and varied	6	6.7	S.	Bluegills	L. M. bass, W. E. pike	L. M. bass, bluegills	Suckers	L. M. bass	
STORE	33	8	28	July 3	6	34	Landlocked	Brown stain	Slightly periodic	Fairly constant	Mucky	Mucky	Scarce	Scarce and not varied	2.5		V. S.	L. M. bass, bluegills, bullheads		L. M. bass, bluegills, bullheads	Suckers	L. M. bass	
STYLES	34	8	7, 18	July 3	12	35	Landlocked	Brown stain	Slightly periodic	Dropped	Mucky	Mucky	Scarce	Scarce and not varied	2	6.8	V. S.	Bullheads	W. E. pike	W. E. pike, bullheads	Suckers	L. M. bass	
SUGAR	33	9	15, 22	June 27	39	16	Outlet periodic	Green due to plankton	Slightly periodic	Dropped	Mucky	Sandy and gravelly, mucky	Scarce	Scarce and not varied	4.3	Above 9.6	V. S.	L. M. bass, perch, bullheads	W. E. pike	L. M. bass, perch, bullheads	Suckers	L. M. bass	
THIRD	33	9	26	July 27	4	27	Inlet and outlet	Brown stain	Slightly periodic	Fairly constant	Mucky	Mucky	Fairly abundant	Fairly abundant and varied	17	7.8	M.	Muskellunge, L. M. bass, rock bass, bluegills, perch		Muskellunge, L. M. bass, rock bass, bluegills, perch	Suckers, redhorse	L. M. bass	
TWO BEAR	33	9	4	June 29	31	48	Periodic inlet and outlet	Green due to plankton	Slightly periodic	Dropped	Mucky	Mucky, sandy in spots	Scarce	Scarce and not varied	2.5		V. S.	L. M. bass, N. pike, bluegills		L. M. bass, N. pike, bluegills	Suckers	L. M. bass	

Insert III, Table VII.

for the various species of game fish. The conclusion of this study results in the suggestions for fish stocking in each of the lakes studied. Suggestions for fish planting are made for the larger game fish and not for pan fish since pan fish seem to be able to adapt themselves to a variety of conditions. This fish planting program is made to serve as a guide but not necessarily to indicate that the lakes need stocking. Conservation groups that have knowledge of the abundance and scarcity of fish in lakes should supervise fish stocking.

Three important factors to consider when planting fish in lakes are: (1) That environmental conditions of very soft and soft water lakes are not desirable for wall-eyed pike but are suitable for large mouth bass, and if the lakes have gravelly shoal water areas, for smallmouth bass. (2) That conservationists should choose between having wall-eyed pike or bass in other than very soft or soft water lakes because wall-eyed pike are harmful to bass. (3) That very soft or soft water lakes should not be too heavily stocked since they do not furnish adequate food and protection for the development of a large number of fish.

A better understanding of lakes can be had by analyzing the various phases of the field work with reference to its relative importance to fish, water fowl, and other game.

Water Analysis

Conditions associated with the hardness and softness of lake water are of basic importance for fish. The analysis of lake water as to its hardness and softness is based on the bound carbon dioxide content rather than on the pH since the pH is more variable. (1) The bound carbon dioxide content of water was determined by Seyler's method. (2)

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(1) A pH 0-|-7 is neutral, below 7 is acid, and above 7 is alkaline.

(2) Seyler, C. A.
1894, Chemical News, Vol. 70.

Birge, E. A. and Juday, C.
1911, Inland Lakes of Wisconsin, Wisconsin Geological and Natural History Survey, Bulletin 22.

Sixth edition, 1925, Standard Methods of Water Analysis, American Public Health Association, 370 Seventh Avenue, New York, N. Y.

Professor C. Juday of the Wisconsin Geological and Natural History Survey furnished the following table from which the nature of the lake water was determined.

0- 5 parts per million of bound carbon dioxide yields a very soft water (V.S.)
5-10 parts per million of bound carbon dioxide yields a soft water (S)
10-20 parts per million of bound dioxide yields a medium water (M)
20-30 parts per million of bound carbon dioxide yields a medium hard water (M.H.)

Over 30 parts per million of bound carbon dioxide yields a hard water (H)

Drainage and Depth

No study was made of the oxygen content of the lakes, but rather of the conditions that govern the oxygen content necessary for aquatic life. The presence of inlets and outlets in lakes results in an exchange of water and aids in keeping the water supplied with oxygen. If this exchange of water is not adequate or if the lakes are landlocked, they must have sufficient depth to maintain enough oxygen for fish life. If the lake is too shallow, the oxygen will be consumed due to decay and the respiratory processes of aquatic life during the winter freeze over. A prolonged hot weather period in the summer may also cause a depletion of oxygen in shallow lakes due to excessive decay. Landlocked lakes having very soft water should be at least twelve feet deep in order that oxygen will not be used up during the winter freeze over. If such lakes "bloom" i. e., become green due to Plankton they should be still deeper. This also applies to landlocked lakes of higher lime or bound carbon dioxide content because of the corresponding greater abundance of vegetative matter laid down to decay and use up the oxygen during the winter.

Appearance of Lake Water

Most of the lakes in Rusk county, particularly the landlocked lakes with sandy beaches, have clear water. This means that the sunlight can penetrate to greater depths which makes it possible for aquatic plants to grow in deeper water. Consequently the zone of aquatic plants and corresponding animal life is wider than it would have been if the water had been turbid. Clear lakes with very soft and soft water have a sparse growth of plant life, and other forms of life are also relatively scarce, due to the lack of essential mineral nutrients necessary for plants. Stained water of lakes is due chiefly to organic matter held in suspension or solution. In such lakes plants are found only in shallow water since light does not penetrate to great depths. During the summer many lakes (such as Amacoy Lake) bloom or become green due to the abundance of microscopic plants known as phytoplankton, which absorb free carbon dioxide and to some extent the half bound carbon dioxide. (3) The absence of free carbon dioxide from water results in a much higher pH than would have existed if the phytoplankton were not present, but the half bound carbon dioxide or carbonate content is not already altered by the presence of this kind of algae. For example on June 21 Sugar Lake (T. 33 N. R. 9 W., Sec. 15, 22) had a bound carbon dioxide content of 4.3 parts per million, but the pH was above 9.6. In the early spring the pH would be about 7 or below. Other plants use free carbon dioxide but do not have such a noticeable effect on the water.

(3) Free carbon dioxide is the carbon dioxide dissolved in the water that exists in a free state.

Half bound carbon dioxide is a carbon dioxide that is loosely combined with carbonates to form bicarbonates.

Water Levels of Lakes

A constant water level is *essential for* aquatic plants and animals. Lowered water levels due to the drouths of the last few years have damaged fishing conditions because desirable habitats that serve as shelter for fish, harbor for fish foods, and spawning grounds, such as former aquatic plant areas, snags, and like debris, and sandy and gravelly bottoms are all left exposed. In such lakes improvement work similar to that done by Mr. Sid W. Gordon and Mr. Ottis Bersing of the Wisconsin Conservation Department in state E. C. W. projects tends to rectify much of the injurious effect of lowered water levels. In this work, brush and wood refuges are sunk in lakes to serve as fish shelter and harbor for fish foods.

Lakes that are flowages or lakes having dammed outlets should have a constant water level. If the water level fluctuates due to varied levels of the dam, fishing will not be so good and planting aquatic plants would be useless until a constant dam level is established.

Lake Soils

The lake bottoms of deeper water areas with the exception of flowage lakes are composed of a greenish black organic matter termed muck. Professor E. A. Birge and C. Juday of the Wisconsin Geological and Natural History Survey have found that this mucky matter is composed chiefly of plankton remains with a variable amount of mineral soil.

The varied nature of the soils in shoal waters offers a corresponding diversified environment for water life. Gravelly areas that are somewhat sheltered from heavy wave action serve as a harbor for the nymphs of the caddis (*Trichoptera*) and fly (*Plecoptera*). Pure sand has little to offer for sustaining life, but if overlaid with a thin layer of organic matter, usually furnishes desirable environment for aquatic plants and for other life, particularly in the lakes with the higher lime content. Most lakes have large areas of mucky organic soils in the shoal water region. Some fishermen further divide these organic deposits by classifying them as muck and as loon bottom or silt. Much is physically and chemically broken down matter which furnishes desirable soils for plant life in the medium to hard water lakes. Loon bottom or silt is of fine texture but only partially broken down and often has an abundance of food nutrients necessary for minute forms of animal life. Silt is a poor name for this kind of organic matter since it is usually used to denote a type of mineral soil of fine texture.

In hard water lakes of Rusk County considerable amounts of marl are laid down with the organic matter. However, it is doubtful that the marl content is sufficient to warrant removing this mixture for agricultural use.

Survey of Aquatic Plants

A plant survey for each lake that was studied is tabulated in the Table "Aquatic Vegetation of Lakes in Rusk County." (See Table VIII page 36.) Various plant associations can be correlated with different fishing conditions. This fact is very important in determining the species of game fish desirable for stocking lakes, and the table illustrates the relative importance of the hardness and softness of lake water. The very

TABLE VII

AQUATIC VEGETATION OF LAKES IN RUSK COUNTY.

★ PARTLY IN CHIPPEWA CO.

WHERE MORE THAN ONE SCIENTIFIC NAME IS USED, NAMES FROM GRAY'S MANUAL ED. 7 ARE PLACED IN PARENTHESIS.

LAKE	LOCATION: TOWNSHIP N.	RANGE W.	SECTIONS
VERY SOFT WATER			
STYLES	34	8	7-18
STONE	33	6	28
SAXTON	34	7	28-33
TWO BEAR	33	9	4
CENTRAL PICKEREL	34	9	6
EAST PICKEREL	34	9	15-16
WEST PICKEREL	34	9	16
ROUND	33	7	7-8-17-18
FISH	33	9	28-29-32-33
CADOTT	33	8	32
ATWOOD	33	9	27
BASS	34	9	18-21
WENORTH	34	9	3-10
BOOT	33	7	18-17-20
PINE ★	33	9	34-35
SUGAR	33	9	15-22
SOFT WATER			
BUCK'S (STAR)	36	8	19-30
PULASKI	33	7	17-18-19
STAR (SUNFISH)	35	7	25
RUSK (DALL)	33	9	15
HORSESHOE	33	9	2
WELL WATER			
FLOWER, BASS	34	7	20-21-28-29
BUCK'S (HEMLOCK)	36	9	23-26-27
UPPER BASS	35	7	12-13
FOURTH	33	9	26
SOFT WATER			
BIG FALLS FLOWAGE	36	5	23-26-35
SECOND	33	9	28
THIRD	33	9	26
HARD WATER			
GOOSE	33	8	27-34
AMACOY	34	8	25-26-35-36
MOC	33	8	1
ISLAND	33	8	20-21-28-29-30
CHAIN ★	33	9	35-36
POTATO	35	9	23-24-25-26
	33	8	19
CLEAR	33	9	31
	33	9	36
MC CANN	33	8	30-31
SAND ★	33	8	33-34
RICE	33	8	25-36
MUD	33	8	20-28-27

SHORT STIFF STEM, LEAF OR ROSSETTE TYPE	LONG LAX STEM AND LEAF TYPE: BROAD LEAFED PONDWEEDS	LONG LAX STEM AND LEAF TYPE: RIBBON LEAFED PONDWEEDS	LONG LAX STEM AND LEAF TYPE: NARROW LEAFED PONDWEEDS	LONG LAX STEM AND LEAF TYPE: COMPOUND LEAFED PLANTS	LONG LAX STEM AND LEAF TYPE: OTHER PLANTS	PAD AND RIBBON LEAF TYPE	UPRIGHT EMERSED TYPE
FLAT NEEDLE RUSH	FLAT STEMMED OR STALKED PONDWEED (P. ZOSTERIFORMIS)	RIBBON WEED OR RIBBON LEAFED BUR-REED	BIG SPIKED RUSH (E. FUNIWTILE)				
SMALL SPIKED RUSH (E. SUBMERSUS)	POTAMOGETON ZOSTERIFORMIS (P. ZOSTERIFORMIS)	SPARGANIUM FLUCTUANS & S. ANGUSTIFOLIUM	ELEOCHARIS PALUSTRIS VAR. MAJOR				
NEEDLE RUSH (E. F. SUBMERSUS)	FLOATING BROWN LEAF POTAMOGETON NATANS	WATER SHIELD BRASENIA SCHREBERI	BULRUSH SCIRPUS ACUTUS (S. OCCIDENTALIS)				
ELEOCHARIS ACICULARIS	LARGE LEAFED BASS WEED POTAMOGETON AMPLIFOLIUS	WATER LILY NYMPHAEA TUBEROSA	BULRUSH SCIRPUS ATROVIRENS				
PIPEWORT ERIOCAULON SEPTANGULARE (E. ARTICULATUM)	MUSKEE WEED POTAMOGETON PRAELONGUS	WILLOW LEAF POTAMOGETON AMERICANA (P. SPIRALIS)	SPARGANIUM CHLOROCARPUM (S. DIVERSIFOLIUM)				
QUILLWORT ISOETES SPP.	VARIABLE BASS WEED POTAMOGETON HETEROPHYLLUS	WHITE WATER LILY CASTALIA TUBEROSA	CAT-TAIL TYPHA LATIFOLIA				
STUBBY WEED MYRIOPHYLLUM TENELLUM	POTAMOGETON NODOSUS	YELLOW WATER LILY OR COW LILY NUPHAR ADVENA VARIEGATUS (NYMPHAEA ADENA)	GIANT BUR-REED SPARGANIUM EURYCARPUM				
STUBBY WAPATO SAGITTARIA CUNEATA & S. HETEROPHYLLA	P. GRAMINEUS VAR. GRAMINIFOLIUS (P. HETEROPHYLLUS)		LADDER GRASS OR BOG PLANT DULICHIUM ARUNDINACEUM				
WATER LOBELIA LOBELIA DORTMANNA	POTAMOGETON ROBBINSII		LEATHER LEAF CHAMAEDAPHNE CALYCULATA				
WATERWORT ELATINE MINIMA	FLAT STEMMED OR STALKED PONDWEED POTAMOGETON ZOSTERIFORMIS (P. ZOSTERIFORMIS)		PICKEREL WEED POTENTILLA PALUSTRIS				
	POTAMOGETON HYBRIDS		PICKEREL WEED PONTEDERIA CORDATA				
	WATER FERN OR ROBBINS PONDWEED POTAMOGETON ROBBINSII		PIPES EQUISETUM LIMOSUM (E. FLUVIATILE)				
	BUSHY PONDWEED POTAMOGETON DIVERSIFOLIUS		SEDGE CAREX SPP.				
	NARROW LEAFED PONDWEEDS POTAMOGETON PUSILLUS TYPE		SOFT STEM BULRUSH SCIRPUS VALIDUS				
	SAGO OR FENNEL LEAFED PONDWEED POTAMOGETON PECTINATUS		SPIKE RUSH ELEOCHARIS SP.				
	COMMON BLADDERWORT UTRICULARIA VULGARIS		SCIRPUS AMERICANUS				
	COMMON WATER MILFOIL MYRIOPHYLLUM SPICATUM		WAPATO, DUCK POTATO SAGITTARIA LATIFOLIA & S. HETEROPHYLLA				
	COONTAIL OR HORNWORT CERATOPHYLLUM DEMERSUM		WILD OR INDIAN RICE ZIZANIA AQUATICA				
	WATER MILFOIL MYRIOPHYLLUM						
	CHARA SPP.						
	PURPLE FLOWERED BLADDERWORT UTRICULARIA PURPUREA						
	SOFT WATER MILFOIL MYRIOPHYLLUM HETEROPHYLLUM						
	STIFF WATER CROWFOOT RANUNCULUS LONGIROSTRIS (R. CYMOSUS)						
	EEL GRASS VALLISNERIA SPIRALIS						
	NAIAS NAJAS						
	MUD WATER SMARTWEED POLYGONUM NATANS						
	WATER-WEED ELODEA CANADENSIS						

soft water lakes are named first, and the plants are divided into groups similar to those used in Professor N. C. Fassett's paper, "*Plants of Some Northeastern Wisconsin Lakes.*" (4) These plant divisions were further altered in part to promote a better understanding.

(4) Fassett, N. C.
1930, Plants of some Northeastern Wisconsin Lakes, The Transaction of the Wisconsin Academy of Science, Arts and Letters, Vol. XXV.

The Short Stiff Stem Leaf, or Rosette Type

The Short Stiff Stem, Leaf, or Rosette Plants (Fig. 1) are small inconspicuous and of little consequence for fish life. The tubers of stubby wapato (*Sagittaria graminea* & *S. cuneata*) are of some value as duck foods. The presence of these plants plus a lack of the more conspicuous submerged flexuous vegetation, such as the different pondweeds indicate very soft water lakes. Such lakes do not have a desirable environment for wall-eyed pike, but are suitable for bass.

FIGURE I.

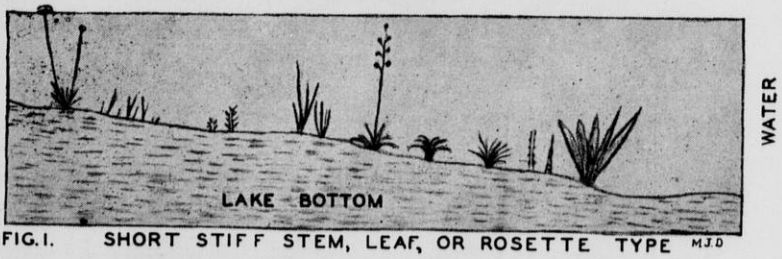
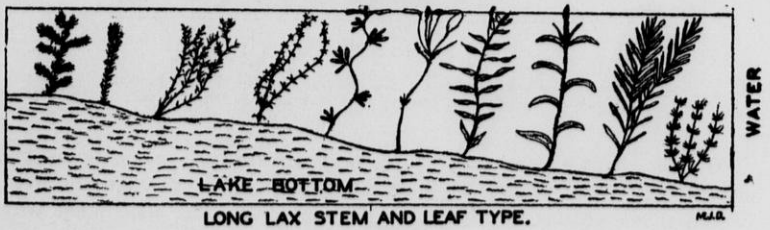


FIG. I. SHORT STIFF STEM, LEAF, OR ROSETTE TYPE MJD

The Long Lax Stem and Leaf Type

The long lax stem and leaf plants (Fig. 2) are mostly submerged and have always been associated with game fish because they serve as the ultimate source of food for fish, since diverse kinds of animal life that live

FIGURE II.



LONG LAX STEM AND LEAF TYPE. MJD

on these plants are used as food directly and indirectly by game fish. Professor Juday summarized this inter-relation between plant and fish life by pointing out that "the complicated chain between plant and animal life may have a dozen links in it." (5) This type of plants with a few

exceptions is conspicuously lacking in very soft and soft water lakes, but is usually abundant and varied in lakes of higher lime content. The majority of these plants are also duck foods. The seeds, leaves, and in some cases, the winter buds, and tubers are desirable foods for water-fowl. Moreover, these submerged plants are important because they effect lake environment by utilizing the carbon dioxide and liberating oxygen which is so essential for aquatic animal life. A further division of this plant type into groups should aid conservationists to have a better understanding of these desirable plants.

FIGURE III.

MUSKIE WEED

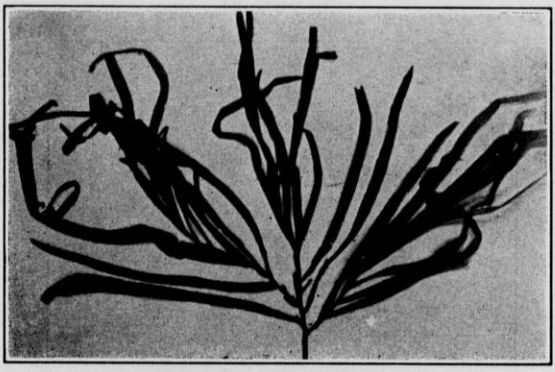
(*Potamogeton praelongus*) An example of the broad leafed pondweeds; note the boat-shaped leaf tip. Natural size.

Of these long lax flexuous plants, *the broad leaved pondweeds* are the most conspicuous. A typical plant of this group is the muskie weed (*Potamogeton praelongus*) (Fig 3). This weed is a lax stem plant with broad submerged leaves, that has a small flower or seed bearing spike protruding upright out of the water. The distinctive feature that separates the muskie weed from other broad leaved pondweeds is the boat-shaped leaf tip. Beds of this plant have been observed to be the favorite feeding grounds for the muskellunge. This does not mean that if muskie weeds

are found, the muskellunge are in that water, but rather, that in "muskie waters" this giant fish is often among the weed beds of this plant.

Other broad leaved pondweeds are the bass weed (*Potamogeton Richardsonii*) with its crisp, curly, clasping leaves; the large leafed bass weed

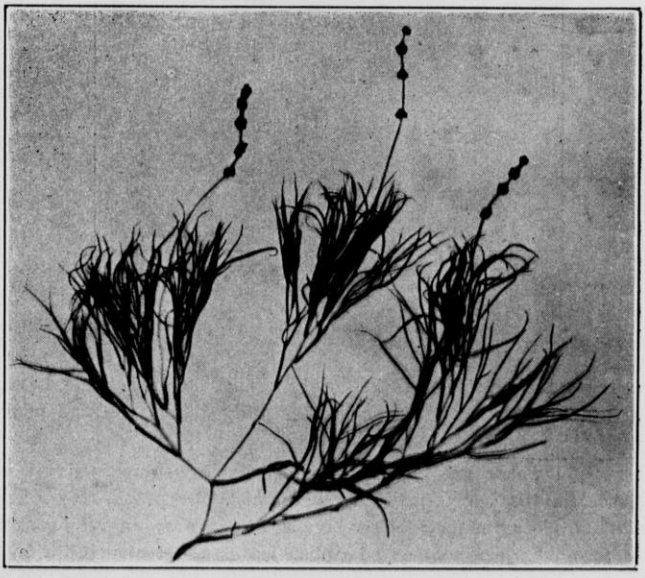
FIGURE IV.



LEAFY PONDWEED

(*Potamogeton epihydrus*) An example of the ribbon leafed pondweeds. One-half natural size.

FIGURE V.



SAGO PONDWEED

(*Potamogeton pectinatus*) An example of the thread or narrow leaved pondweeds. One-third natural size.

(*Potamogeton amplifolius*) with its large and very broad submerged leaves and also conspicuous floating leaves, and the floating brown leaf (*Potamogeton natans*) with its prominent floating leaves and usually lacking inconspicuous flexuous linear leaves. Of these plants the large leaved bass weed and the floating brown leaf are of particular value for water-fowl

FIGURE VI.

COONTAIL

(*Ceratophyllum dermersum*) Another compound leaved plant.

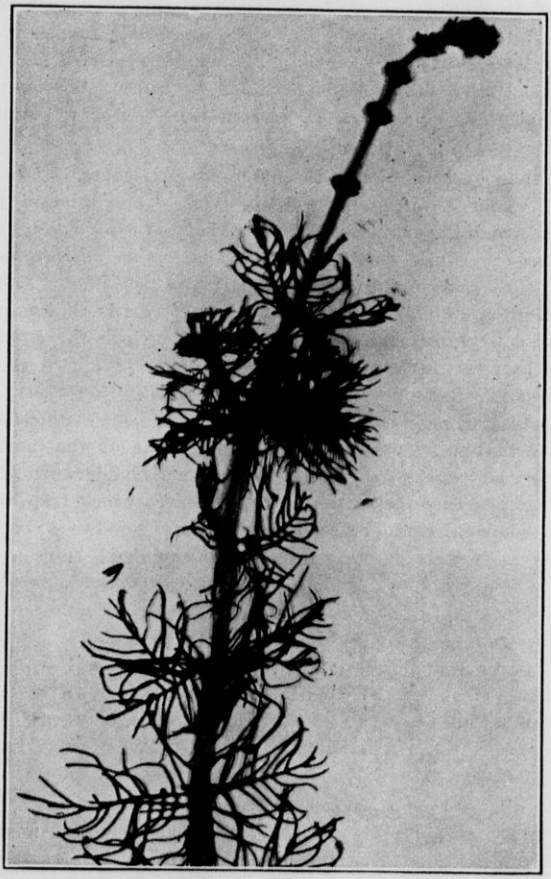
because the spike clusters of the bright orange colored seeds have been reported as desirable food for ducks, especially during the fall migratory flight.

Other pond weeds are characterized by having submerged lax ribbon leaves, such as the leafy pondweed (*Potamogeton epihydrous*) (Fig. 4). This plant is of particular interest because it can grow in very soft water. It has a flexuous stem, submerged ribbon leaves about one-eighth to three-eighths of an inch in width and of varied length, and also often has spatulate floating leaves. The feature that separates this plant from other ribbon leaved pondweeds is the smooth slippery nature of its delicate submerged

leaves. The spiked clusters of the clam shaped rim edged seeds of this plant are desirable duck food.

Other ribbon leaved pondweeds are the flat stemmed pondweed (*Potamogeton zosteriformis*) adequately described by its name, and the water

FIGURE VII.



COMMON WATER MILFOIL

(*Myriophyllum spicatum*) An example of the compound leaved plants: note the compound pinnated thread leaves. Natural size.

fern or Robbin's pondweed that has a round stem, and semi bristled fern-like arranged leaves. Dense beds of the water fern are a favorite haunt for northern pike.

The third and last division of the pondweeds is the narrow or thread leaved plants which are usually less conspicuous than the other groups. The most important of this group is the sago pondweed (*Potamogeton*

pectinatus) (Fig. 5). It is characterized by having a much forked stem with somewhat bristly linear leaves. The sago pondweed serves as a food and shelter plant for fish and is also one of the most important duck foods. It is fairly common in the hard water lakes, such as Island Lake.

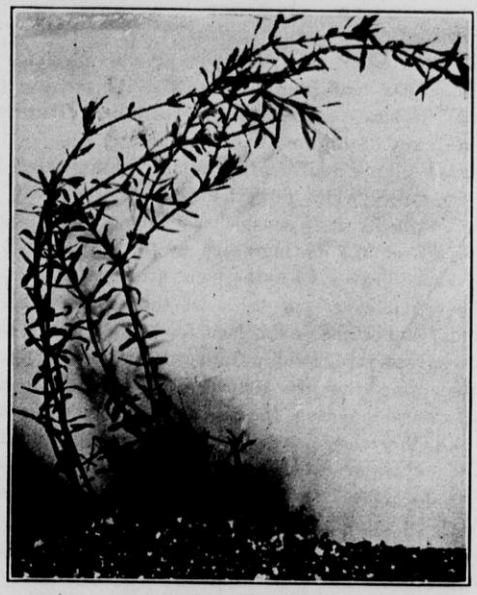
The bushy pondweed (*Najas flexilis*) is often abundant in lakes of medium to hard water. This plant is distinguished by its slender branching stem and the abundance of linear somewhat tapered leaves, which give the plant a bushy appearance. The seeds are small, inconspicuous, and born solitary at the base of the leaf. Mr. N. Hotchkiss of the Biological Survey of the United States Department of Agriculture has observed beds of bushy pondweeds being torn up and probably eaten by mallards and teal. (6)

For the sake of convenience the other narrow leaved pondweeds have been classed under *Potamogeton pusillus* type. These plants are similar in appearance and importance for fish. The following species of plants were observed in Rusk county lakes: *Potamogeton dimorphus, P. P. Friesii, P. foliosus, P. Oakesianus* (rare), and *P. pusillus.* Another long lax stemmed group of plants, that are not pondweeds, is the compound leaf group. The most prominent plants of this group are the bristly leaved coontail or hornwort (*Ceratophyllum demersum*) (Fig. 6) the common pinnated thread leaved water milfoils. (*Myriophyllum spicatum*) (Fig. 7), the foul smelling muskgrass or stonewort (*Chara spp.*) which often carpets the lake bottom in part and is considered one of the most valuable plants for fish and ducks and lastly, the common bladderwort (*Utricularis vulgaris*) that has tiny sacs attached to the leaves which trap minute animals. The common bladderwort like the leafy pondweed is sometimes found in very soft water lakes growing in mucky shoal water areas. Other bladderworts found are the small bladderwort (*Utricularia minor*) a rare inconspicuous plant of little significance and the purple flowered bladderwort (*Utricularia purpurea*). This purple flowered bladderwort is an extremely lax flexuous stemmed plant with prominent doubly compound filamentous leaves which furnish the much desired harbor and cover for fish and fish foods. This plant is very rare in Wisconsin, but was found growing in abundance in North Lake (T. 33 N. R. 9 W., Sec. 3, 10) and sparingly in Bass Lake (T. 33 N. R. 9 W., Section 16, 21).

The coontail deserves special consideration because it is one of the most important duck foods. In the spring of the year the tender bristly leaved bud like shoots growing from the old stem are among the first available duck foods, and in the fall when most aquatic plants have died and broken down, this bristled leaved plant is still available. The mallard, black duck, coot and blue and green winged teals have been observed to eat this plant.

Other long lax plants not included in the above groups are the following: water star grass (*Heterantheta dubia*) which is somewhat similar to the ribbon leaved pondweeds but does not bear spiked clusters of seeds; the water smartweed (*Polygonum natans*) and the water-weed (*Elodea canadensia*) (Fig. 8). The water smartweed has much in common with the various smartweeds of our gardens. It has a pink spiked flower, and floating leaves that become a bright maroon in late summer and early fall. The waterweed is a submerged branch stemmed plant with small sharp

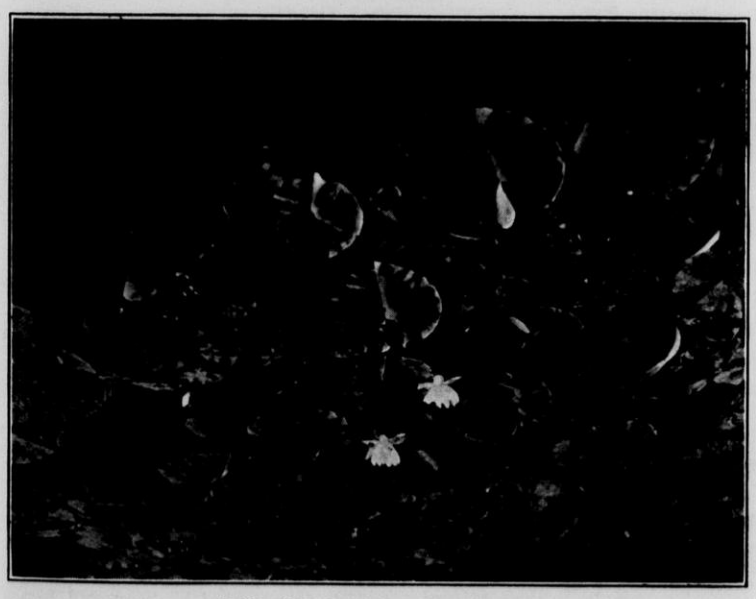
FIGURE VIII.



WATER WEED

(*Elodea canadensis*) One-third natural size.

FIGURE IX.



PAD AND RIBBON LEAF TYPE

pointed leaves usually borne in groups of three on the stem. Cultivated forms of water-weed or Elodea are present in most aquaria.

Pad and Ribbon Leaf Type

The pad and ribbon leaf plants (Fig. 9) with the exception of wild celery are found in lakes of varied lime content. However, they are more tolerant to lakes of higher lime content.

The pad leaved plants represented by the white water lily (*Castalia tuberosa*) with its showy white flower, the yellow water lily (*Nymphozanthus variegatus*) with its less conspicuous yellow flower, and the water shield (*Brasenia Schreberi*) distinguished by its jelly coated stem and its smaller oblong shaped leaves with the stem attached at the center of the leaf furnish shade and cover for fish. Of these plants the yellow water lily is of particular importance as a duck food. Later in the season at the time of the fall migratory flight of water-fowl, the stem of the yellow water lily droops, submerging the urn shaped seed bearing fruit. The tough cover and structure surrounding the seeds partially breaks down and the seeds jell out. Of the many marsh and aquatic plants used by muskrats the white and yellow water lilies are much desired. It is a common sight in many lakes to find the large underground stems or rhizomes of these plants that have been uprooted by the muskrats.

The ribbon leaved plants are represented by the ribbon weed, or floating leafed bur-reed (*Sparganium angustifolium & S. fluctuana*) and wild celery (*Vallisneria americana*). Wild celery is a valuable fish and duck food. It is the favorite food for diving ducks, viz., the canvas backs and redheads.

Free Floating Type

The duckweeds (*Lemna minor & Spirodela polyrhiza*) are small, inconspicuous, and of little or no consequence and have not been tabulated on the table of aquatic plants. (Fig. 10). Though these plants are duck foods, they are not important because they are not quantitatively abundant, in the lakes of Rusk county.

FIGURE X.

FIG. 4. FREE FLOATING AND SINKING TYPE.

Upright Emersed Type

The upright emersed vegetation has prominent parts protruding out of the water. (Fig. 11). Several of these plants are sometimes found in marsh and shoreline habitats. This type is represented by reed and blade

leaved plants such as bulrushes (*Scirpus spp.*) cat tail (*Typha latifolia*), sedges, mostly (*Carex comosa*), and wild rice (*Zizania aquatica*). Prominent broad leaved plants are the following: pickerel weed (*Pontedora cordata*) identified by its large blunt heart-shaped leaves and conspicuous violet-blue spiked flower; wapato or duck potato (*Sagittaria latifolia*) usually having arrow heart-shaped leaves and (*S. heterophylla*) usually having spatulate

FIGURE XI.

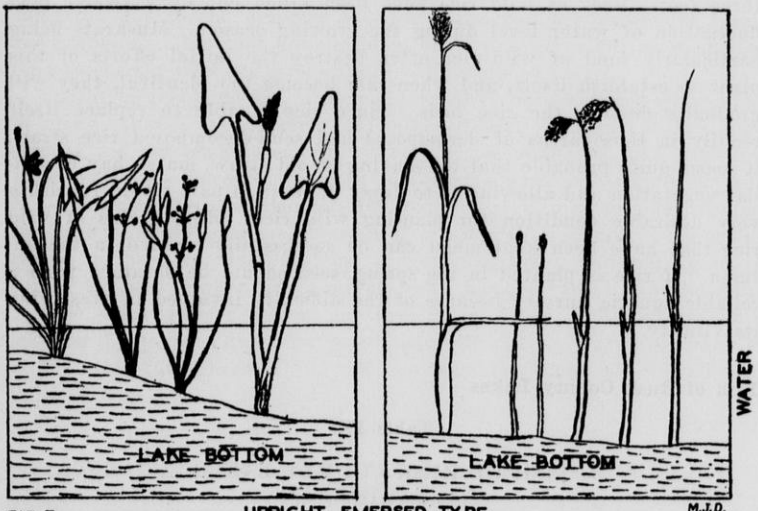


FIG. 5. UPRIGHT EMERSED TYPE. M.J.D.

shaped leaves. The tubers of this plant are an important duck food. The heath plants such as leather leaf (*Chamaedaphne calyculate*) and pale laurel (*Kalmia polifolia*) are valuable shelter plants for fish where lakes are completely or partly surrounded by bogs. Though the upright emersed plants are not so important for fish life, they furnish necessary cover for ducks when of sizeable area. Muskrats use these plants, particularly the blade leaved plants, of which wild rice is the most desirable when available for shelter, food and for building their houses.

Wild Rice

Wild rice deserves special consideration. No other plant seems to have such a magnetic attraction for ducks. It furnishes excellent cover and shelter for water-fowl and its grains are a much sought for food. Even after the ducks and particularly the black birds have eaten considerable quantities of rice and the wind has whipped, thrashed, and sown wild rice seed for the next year's crop, ducks continue to linger and to be attracted to rice beds rather than to other locations possessing equally desirable cover. This is probably due to the fact that the rice grains are still available on lake bottoms and that the beds of this blade leaved plant are associated with those long lax submerged food plants, such as the pondweeds with their edible spiked clusters of seeds,

the bristled leaved coontail and other like plants that are usually found in abundance in the open water margins of wild rice beds.

It is unfortunate that efforts to propagate this plant have been only partially successful. Wild rice requires: (1) a constant water level particularly during the late spring and summer, (2) an exchange of water due to drainage, (3) a medium to hard water, (4) a shoal water bottom of a somewhat broken down peat or muck or a layer of thin peat or muck over sand, and (5) a depth of water not to exceed approximately three feet. Beds of wild rice have been killed out by a twelve inch fluctuation of water level during the growing season. Muskrats being particularly fond of wild rice often destroy the initial efforts of this plant to establish itself, and when rats become too plentiful, they will gradually destroy the rice beds. Since rice is able to replace itself readily in those areas of decomposed and semi-decomposed rice straw, it seems quite probable that the sinking of old straw, marsh hay or similar vegetation and allowing it to decay at least in part would furnish a very desirable condition for planting wild rice. Ripe grains of wild rice that have been kept moist can be successfully planted in the autumn. If rice is planted in the spring, seed should be obtained from a reliable aquatic nursery because of the difficulty involved in preserving its vitality.

Fish of Rusk County Lakes

Table IX.

FISH OF RUSK COUNTY LAKES

Common Name	Scientific Name
LARGER GAME FISH	
Large mouth (L. M.) bass, L. M. black bass, L. M. green bass	*Micropteris salmoides* or *Huro floridana*
Small mouth (S. M.) bass, S. M. black bass, S. M. Oswego bass, yellow bass	*Micropteris dolomieu*
Wall-eyed (W. E.) pike, W. E. perch, pike, perch	*Stizostedion spp.*
Pickerel, northern (N.) pike	*Esox lucius* or *E. americanus*
Muskellunge, musky, tiger musky, northern musky	*Esox masquinongy*
PAN FISH	
Common crappie or croppie, white crappie, white bass	*Pomoxis annularis*
Black crappie or croppie, spotted crappie, calico bass	*Pomoxis sparoides*
Rock bass, red-eye	*Ambloplites rupeatris*
Bluegill, blue sunfish	*Lopomis pallidus*
Sunfish, pumpkin seed	*Eupomotis spp*
Perch, yellow perch, ringed perch	*Perca flavescens*
Bullhead	*Ameiurus spp*
ROUGH FISH	
Red horse	*Moxostoma aureolum*
Suckers	*Catostomus spp*
Gar	*Lepisosteus spp*

Conditions associated with the carbonate content of lake water particularly with reference to depth and drainage, lake soils, and nature of aquatic plants are a deciding factor used for determining the nature of lake environment suitable for different fish associations (See Table X, page 47).

Pan fish are able to adapt themselves to a variety of conditions providing that the water does not become deoxygenated. In lakes where the larger game fish population has been depleted, restocking will be hampered due to the presence of carnivorous pan fish especially perch and crappies. Abundant aquatic plant cover and other forms of shelter tend to correct this evil. (See Table VIII, page 36.)

Of the larger game fish, wall-eyed pike have been extensively planted in many lakes. The planting of wall-eyed pike in lakes of low lime content has not been successful. Where a few wall-eyed pike have developed in these lakes, they do not add to the game fish population but rather lower it because they destroy young bass. In some lakes, fishing has been ruined due to the presence of a few wall-eyed pike. These fish thrive in lakes of river systems and often develop and propagate in deeper lakes of higher lime content which have a varied and abundant aquatic plant growth. Even in these lakes where wall-eyed pike are successfully planted the bass population will suffer. For this reason it is advisable for fishermen and resort owners to choose either wall-eyed pike or bass.

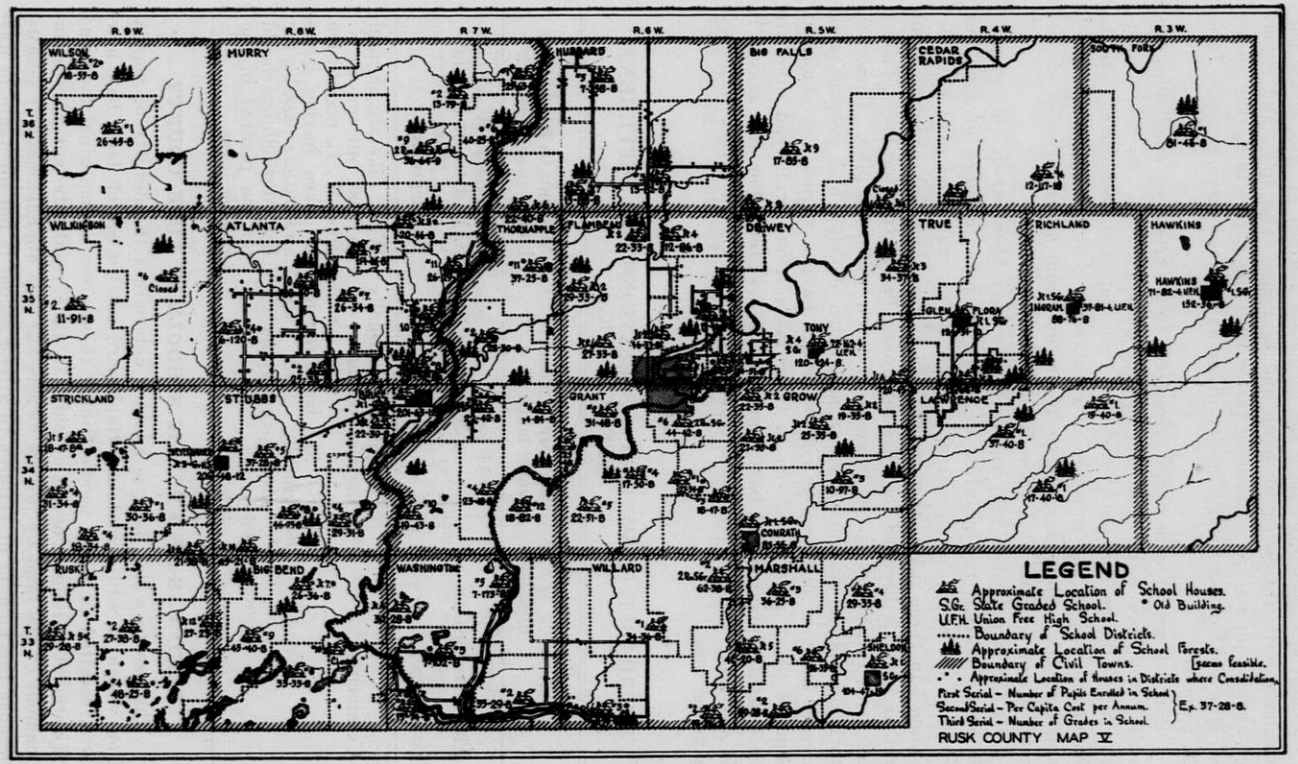
Table X.

DESIRABLE GAME FISH ASSOCIATIONS FOR DIFFERENT TYPES OF LAKES

	Very soft and soft water lakes.	Medium to hard water lakes.
Fish Associations	L. M. bass or N. pike S. M. bass	L. M. bass W. E. pike S. M. bass or N. pike N. pike Muskellunge Muskellunge
Comments	N. pike are usually harmful to bass. S. M. bass require gravelly shoal water areas for spawning.	W. E. pike are harmful to bass but not to N. pike. W. E. pike thrive in lakes having inlets and outlets passable for fish. Muskellunge should not be planted in the smaller lakes.

LAND USE AND PUBLIC SCHOOLS IN RUSK COUNTY

The use to which land is adapted determines the density of population which it will maintain. Haphazard settlement of land has, however, resulted in many people finding themselves on marginal land and adjustment through population shift in time results in not only abandonment of the land by private owners but also abandonment of schools, because the number of children to attend school is not adequate to warrant maintenance of the school.


R. 9 W.
R. 8 W.
R. 7 W.
R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
T. 36 N.
T. 35 N.
T. 34 N.
T. 33 N.
WILSON
MURRY
HUBBARD
BIG FALLS
CEDAR RAPIDS
SOUTH FORK
WILKINSON
ATLANTA
THORNAPPLE
FLAMBEAU
DEWEY
TRUE
RICHLAND
HAWKINS
STRICKLAND
STUBBS
GRANT
GROW
LAWRENCE
RUSK
BIG BEND
WASHINGTON
WILLARD
MARSHALL
CONRATH
SHELDON
TONY
GLEN FLORA
NORMAN
LEGEND
Approximate Location of School Houses.
S.G. State Graded School. * Old Building.
U.F.H. Union Free High School.
..... Boundary of School Districts.
Approximate Location of School Forests.
Boundary of Civil Towns. Seems feasible.
Approximate Location of Houses in Districts where Consolidation
First Serial – Number of Pupils Enrolled in School
Second Serial – Per Capita Cost per Annum.
Third Serial – Number of Grades in School.
Ex. 37-28-8.
RUSK COUNTY MAP V.

MAP V.

The formation of school districts in pioneer days in Rusk county very frequently resulted in the location of schools to meet the needs of a small community group isolated within the fading forest, and practically cut off from other similar communities on nearby land. Roads were inadequate but the total property valuation was still adequate to support a small school. The removal of the timber crop changed the property value as has farm development. Some communities still have an adequate tax base; others have not. Free educational opportunities for all children have become a cherished American tradition. A study of the present status of schools in Rusk county in relation to social and economic trends in land use is therefore important. Map V, page 48, shows very clearly the present condition of public schools in this county. The boundaries of school districts suggest patterns for jig saw puzzles.

Relative locations of school houses, indicate that in many districts schools were located before roads and particularly the roads which now obtain in these communities. Cost per pupil, and pupils per school likewise show where the school is a burden to the taxpayers and whether the children are given the educational facilities to be desired. It is not the purpose of this school survey to answer these questions but merely to present them as clearly as possible so that the voters of these widely varying school districts can make comparisons.

Education in Rusk county is administered through seventy-five rural districts with eighty-five operating and three closed schools, nine state graded schools, two district high schools, (Bruce and Weyerhauser) and three union free high schools (Tony, Ingram and Hawkins). At the present time there is one abandoned school caused by the consolidation of the Pioneer and Maple Crest districts in the town of Cedar Rapids. The present closed schools are West Chippewa in district number ten, town of Big Bend, Frontier in district number six, town of Wilkinson, and Big Falls in joint district number four, village of Tony and towns of Dewey and Big Falls. The children of these closed schools are being transported to other schools at a cost far below that of operation.

The per capita cost in rural schools of Rusk county for the year 1933-34 ranged from $20.44 in a school with forty-seven pupils to $173.12 in a school of seven pupils. The average per capita cost of all rural schools in the county was $46.27. The high cost per pupil in this county is associated with schools having small enrollments. School officials agree that a poorer quality of work is evident in schools with small enrollments and it is generally conceded that the best type of work is done in schools having from twenty to thirty-five pupils.

Size of Districts and Number of Pupils in Districts

The Hawkins graded school district embraces the entire civil town of Hawkins. The Ingram graded school district embraces the whole town of Richland plus four sections in the town of South Fork. The remainder of the town of South Fork lies in the South Fork state graded school district. Each of these districts has one school. The Pioneer school district number one, town of Cedar Rapids embraces almost all of the civil town and operates one school. Likewise district number one

in the town of Lawrence comprises almost the entire town. This district operates three schools. In all other towns, there are from two to nine districts to the civil town. The town of Atlanta has eight whole districts and two districts joint with other towns.)

Examples of more than one school operating under a single board are:

Joint district number 2—Flambeau	4 schools
Joint district number 2—Grow	4 schools
Joint district number 2—Grant	2 schools
Joint district number 4—Strickland	2 schools
Joint district number 9—Big Falls	2 schools
District number 1—Lawrence	3 schools

Number of Teachers and School Board Members

Rusk county schools employ eighty-six rural and fifty-five state graded and high school teachers. At the present time 267 school board members are responsible for 99 schools. It is interesting to note that Rusk county has a school board member for every fourteen pupils.

Districts Where Consolidations Seem Feasible

Feasible consolidations seem to appear in the town of Washington where three schools are now operating with enrollments of *9, 8 and 5* pupils. These schools could consolidate with the Riverview school, district No. 2. It would also seem feasible that school district No. 3, in the town of Willard, with an enrollment of eight pupils could be closed and the pupils transported to the Riverview School.

The Riverview schoolhouse is a modern building of two rooms, with only one in use. Such a consolidation with the Riverview school would make possible a state graded school with two teachers.

By the consolidation of these five schools certain economies would result for the districts involved and also for the county and the state. Saying it with figures it would be something like this, viz.: (figures from Dept. of Public Instruction) It has been found that the average Wisconsin school of ten pupils with a slight variable of more or less, costs from $850 to $900 per year to operate with minimum efficiency. It has also been found that the pupils of the average small school can be transported to and tuition paid in another school for $500.00. This would make possible a saving of from $350.00 to $400.00 to the district, county and state and in the event that the amount for transportation and tuition does not exceed $500.00 the total sum will be paid by the state, relieving the district and county from any school levy. Carefully coordinated these figures would appear for these five schools as follows:

Table XI.

DISTRIBUTION OF PRESENT COST

TOWN OF	DIS-TRICT NO.	AVERAGE ATTEND-ANCE	ASSESSED VALUATION OF DISTRICT	TAX FROM DISTRICT LEVY	COUNTY AID	STATE AID
Washington	2	35	$87,000	$ 403.00	$ 250.00	$ 516.00
Washington	3	5	68,000	100.00	250.00	381.87
Washington	5	8	70,000	300.00	250.00	516.00
Washington	6	9	43,000	300.00	250.00	516.00
Willard	3	8	49,000	300.00	250.00	516.00
		65		$1403.00	$1250.00	$2445.87

DISTRIBUTION OF COST UNDER PROPOSED CHANGES

*

Washington	2	35		$ 403.00	$ 500.00	$1032.00
Washington	3	5				500.00
Washington	5	8				500.00
Washington	6	9				500.00
Willard	3	8				500.00
		65		$ 403.00	$ 500.00	$3032.00

**

Washington	2	35		$ 403.00	$ 500.00	$1032.00
Washington	3	5			250.00	400.00
Washington	5	8			250.00	400.00
Washington	6	9			250.00	400.00
Willard	3	8			250.00	400.00
		65		$ 403.00	$1500.00	$2632.00

Note.—If the tuition of the last four schools, at the state average of $35 per pupil and transportation aid would not exceed $500 per school, the distribution of cost would be as *. This would give district No. 2 a budget of $3985. If the total cost of tuition and transportation would be $650 per school the distribution of cost would be as **. District No. 2 could reduce its tax to $300 and still have adequate funds to maintain a state graded school.

Other consolidations which seem feasible are Poplar Grove District No. 3, town of True with Glen Flora; Elder Creek, District No. 1 in the town of Atlanta with Districts Nos. 8 and 11 (Atlanta and Edgewood) and Maple Valley District No. 4 in Atlanta with Districts No. 2 and No. 10 (Sunny Hill and Blue Hills) in the same town.

Conditions in the town of Hubbard where the whole school census is 102, the number of families thirty-four and the combined enrollment in the four schools is fifty-one would also it appears warrant careful study since the Hilltop school building in District No. 7 has two rooms and with little additional expense could accommodate all of the children in the town.

Another study which it appears would be worthwhile from the standpoint of efficiency and economy would be the possibility of using the very fine building on the north side of the Flambeau River near Federal Highway No. 8 in the city of Ladysmith as the center for a state graded school to which the pupils of two or more of the following schools could be transported viz., schools of Joint District No. 2, town of Flambeau. A similar study discloses a material improvement might be made possible in school efficiency and economy for the schools in the vicinity of Bruce where numerous schools are relatively close by. Added economy might also result from consolidation of districts which would materially reduce the total number of school boards. Future trends in settlement and land abandonment will quite logically lead to changing boundaries of school districts. In this connection the following census may be indicative of the future school needs:

TABLE XII.

COMMON SCHOOL ENROLLMENT AND COST PER PUPIL FOR THE YEARS 1931-32 1932-33 1933-34 AND THE ENROLLMEN FOR 1934-35, THE SCHOOL AND FAMILY CENSUS OF 1933-34 FOR SCHOOLS IN EACH CIVIL TOWN AND THE 1920-1930 POPULATION.

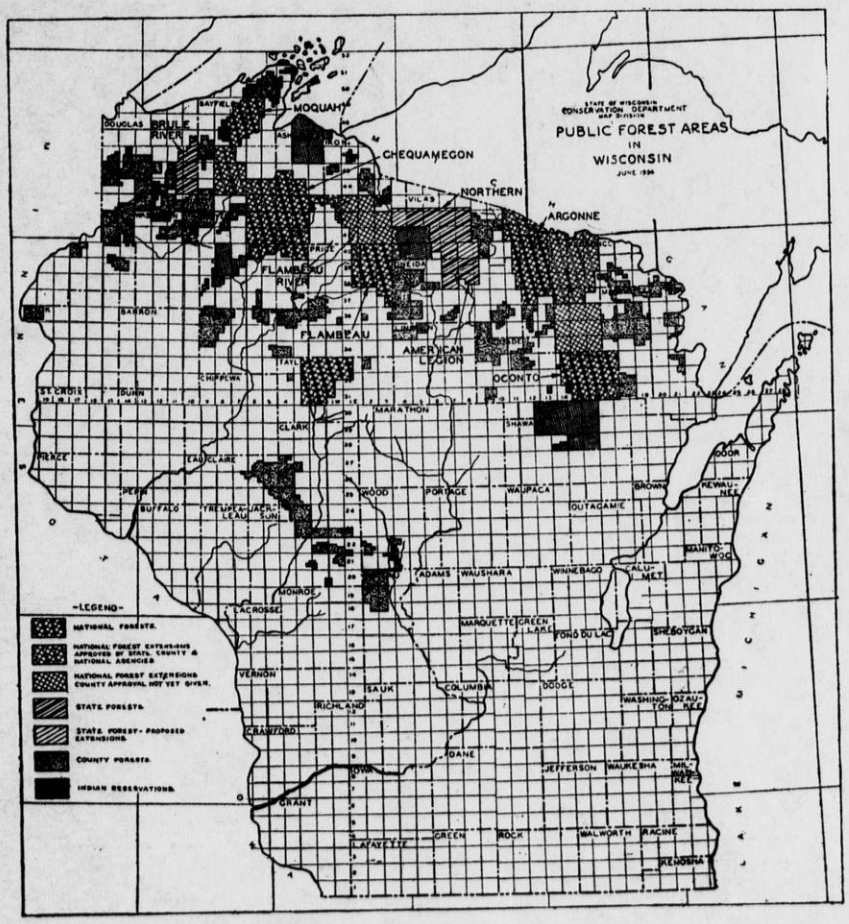
TABLE XII NAME OF CIVIL TOWN	TOTAL SCHOOL ENROLLMENT				AVERAGE COST PER PUPIL ($)			1933-34 SCHOOL CENSUS	1933-34 FAMILY CENSUS	1920 TOTAL POPULATION CENSUS	1930 TOTAL POPULATION CENSUS
	1931-32	1932-33	1933-34	1934-35	1931-32	1932-33	1933-34				
ATLANTA	161	173	175	163	74.3	55.4	42.3	294	112	747	614
BIG BEND	87	114	108	99	49.5	44.4	40.4	156	59	622	459
BIG FALLS	28	26	28	22	128.1	89.5	85.4	45	20	90	79
CEDAR RAPIDS	27	19	12	13	76.8	69.3	117.4	21	7	174	74
DEWEY	68	55	54	46	41.4	39.2	40.1	94	33	429	526
FLAMBEAU	225	225	223	183	50.7	40.5	40.1	334	83	972	900
GRANT	141	129	140	136	52.6	52.0	45.7	270	107	954	1014
GROW	99	102	108	90	59.0	51.1	40.9	178	57	521	620
HUBBARD	54	58	57	51	93.3	73.7	76.7	102	33	243	167
LAWRENCE	57	66	73	63	70.2	50.7	39.8	116	45	114	265
MARSHALL	192	186	167	166	34.8	28.7	27.2	301	105	616	825
MURRY	132	125	114	98	57.0	53.9	51.9	173	57	585	494
RUSK	130	145	131	116	42.1	31.2	28.2	226	74	700	633
STRICKLAND	130	119	118	117	53.1	45.9	37.3	231	89	573	567
STUBBS	197	196	179	166	36.5	31.6	26.9	313	111	831	769
THORNAPPLE	139	173	161	150	63.7	49.9	45.2	274	86	658	637
TRUE	8	11	12	14	120.5	86.0	66.1	17	7	467	433
WASHINGTON	81	90	92	81	89.8	63.2	50.7	119	44	240	205
WILLARD	65	71	64	67	68.4	61.0	52.6	94	31	371	360
WILKINSON	11	9	17	11	210.8	194.8	109.7	44	14		85
WILSON	33	38	44	29	74.1	60.2	49.1	75	28	107	135
1ST. CLASS ST. GRADE	786	779	755	493	75.0	72.0	65.8	1164	432		
2ND. " " "	97	98	106	94	56.7	49.4	39.8	188	71		

SCHOOLS OF WAYERHAUSER, BRUCE, LADYSMITH AND GLENFLORA ARE NOT INCLUDED.

STATE OF WISCONSIN
Executive Office

BULLETIN NO. 3

Madison, Wisconsin **January 1936**



Philip F. La Follette, Governor

DIVISION OF LAND ECONOMIC INVENTORY

JOHN S. BORDNER, *in charge*
WM. W. MORRIS, *Forester*
JOHN H. STEENIS, *Biologist*
EARL D. HILBURN, *Engineer and Draftsman*

ORIGINAL PINE STAND

FOUND ON THE VARIOUS

DRAINAGE BASINS

OF

NORTHERN WISCONSIN.

① CHIPPEWA DRAINAGE.
Acreage stocked ——— 175 Townships.
Total stand Pine ——— 35 Billion Bd. ft.

② WISCONSIN DRAINAGE.
Acreage stocked ——— 172 Townships.
Total stand Pine ——— 30.1 Billion Bd. ft.

③ ST CROIX DRAINAGE.
Acreage stocked ——— 100 Townships.
Total stand Pine ——— 12.5 Billion Bd. ft.

④ RIVERS TO LAKE SUPERIOR.
Acreage stocked ——— 76 Townships.
Total stand Pine ——— 11.4 Billion Bd. ft.

⑤ BLACK DRAINAGE.
Acreage stocked ——— 40 Townships.
Total stand Pine ——— 9 Billion Bd. ft.

⑥ RED CEDAR DRAINAGE.
Acreage stocked ——— 40 Townships.
Total stand Pine ——— 8 Billion Bd. ft.

⑦ WOLF DRAINAGE.
Acreage stocked ——— 60 Townships.
Total stand Pine ——— 7.5 Billion Bd. ft.

⑧ MENOMINEE DRAINAGE.
Acreage stocked ——— 47 Townships.
Total stand Pine ——— 7.1 Billion Bd. ft.

⑨ PESHTIGO DRAINAGE.
Acreage stocked ——— 27 Townships.
Total stand Pine ——— 4.1 Billion Bd. ft.

⑩ OCONTO DRAINAGE.
Acreage stocked ——— 28 Townships.
Total stand Pine ——— 3.5 Billion Bd. ft.

Other timber around Green Bay.
Acreage stocked ——— 7 Townships.
Total stand Pine ——— 1.4 Billion Bd. ft.

Grand Total 129.4 Billion Bd. ft.

SUMMATION.

Probable cut 1840 - 1873 ——— 20 Billion Bd. ft.
Cut between 1873 - 1898 ——— 66 Billion Bd. ft.
Cut since 1898 ——— 17.4 Billion Bd. ft.
Destroyed by fire ——— 26 Billion Bd. ft.
Grand Total ——— 129.4 Billion Bd. ft.

Figures taken from Bul. 2 Wisconsin Geological and Natural History Survey, 1904.

Grateful acknowledgment is hereby made to the following for assistance given us in the preparation of these lessons: the Wisconsin Department of Agriculture and Markets; the Wisconsin State Board of Control; the U. S. Biological Survey; the Botany Department of the University of Wisconsin; the Wisconsin Department of Conservation; the Wisconsin Geological and Natural History Survey; E. L. Chambers, State Entomologist of Wisconsin; Michael Drohomer, Forester; Ivan Hassler, Wisconsin Department of Conservation; Theodore Kouba, in charge White Pine Blister Rust Control in Wisconsin, and Lamar Wood, U. S. Forest Service.

JOHN S. BORDNER, In Charge.

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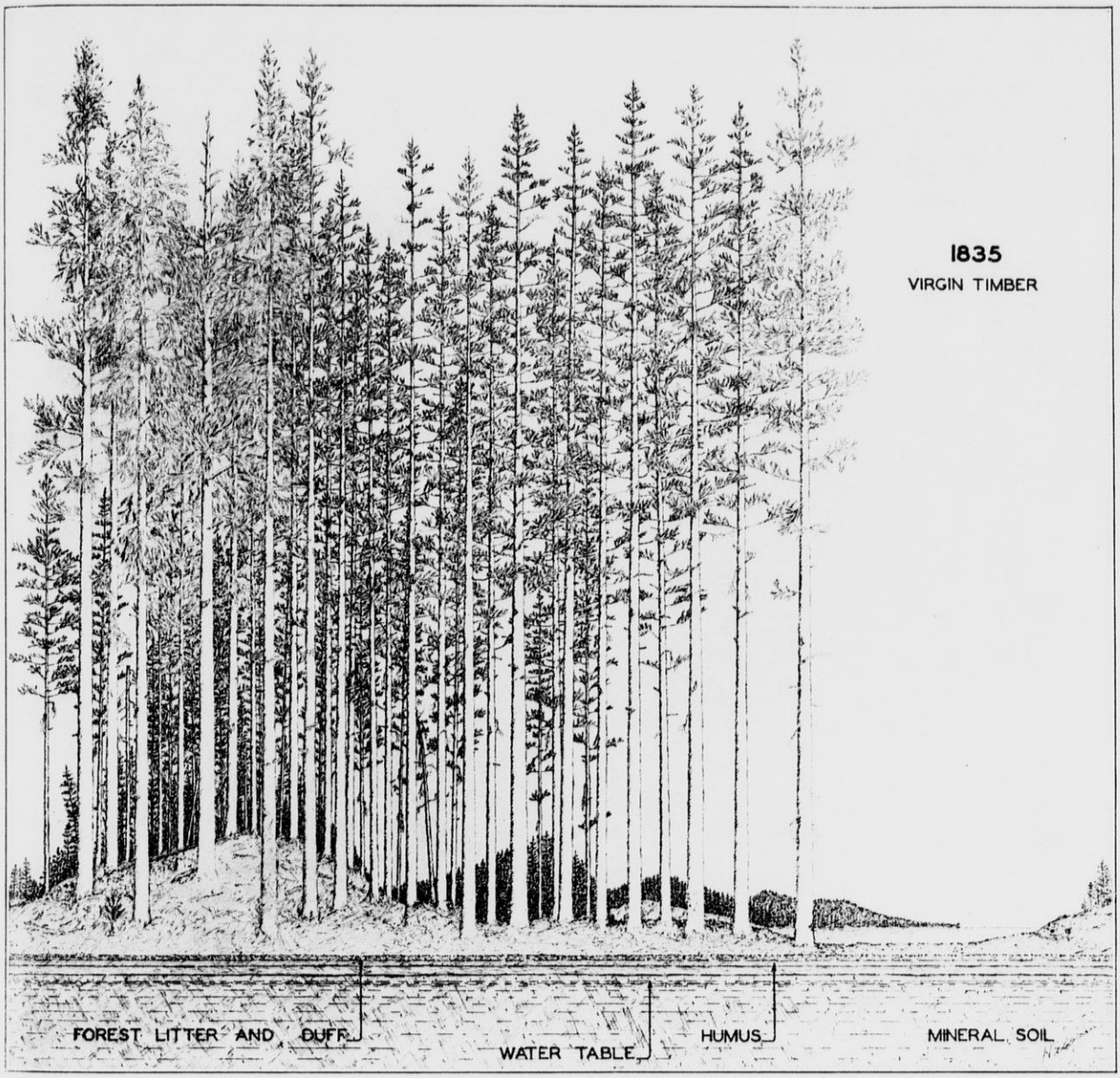
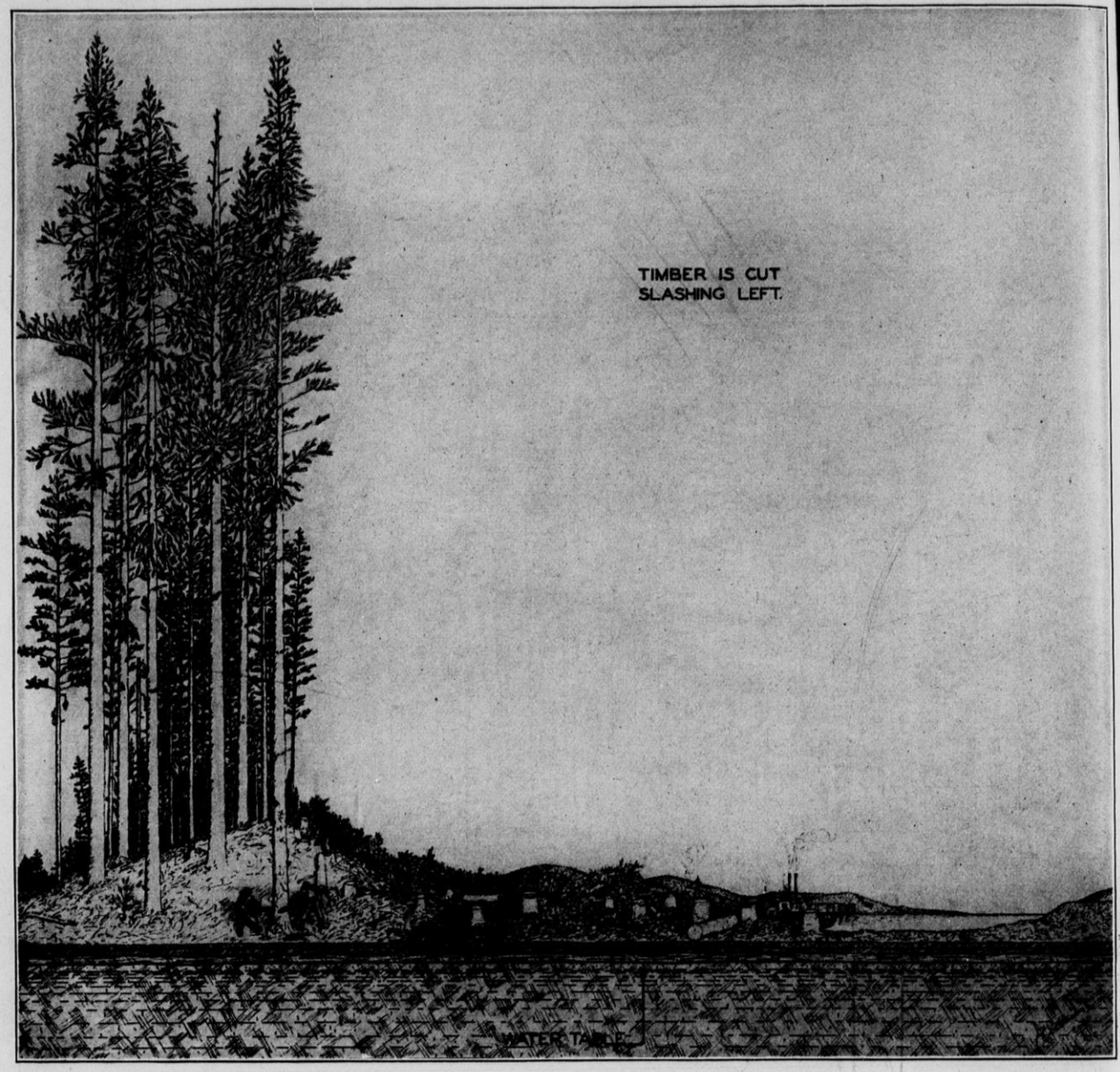


Table of Contents

Introduction

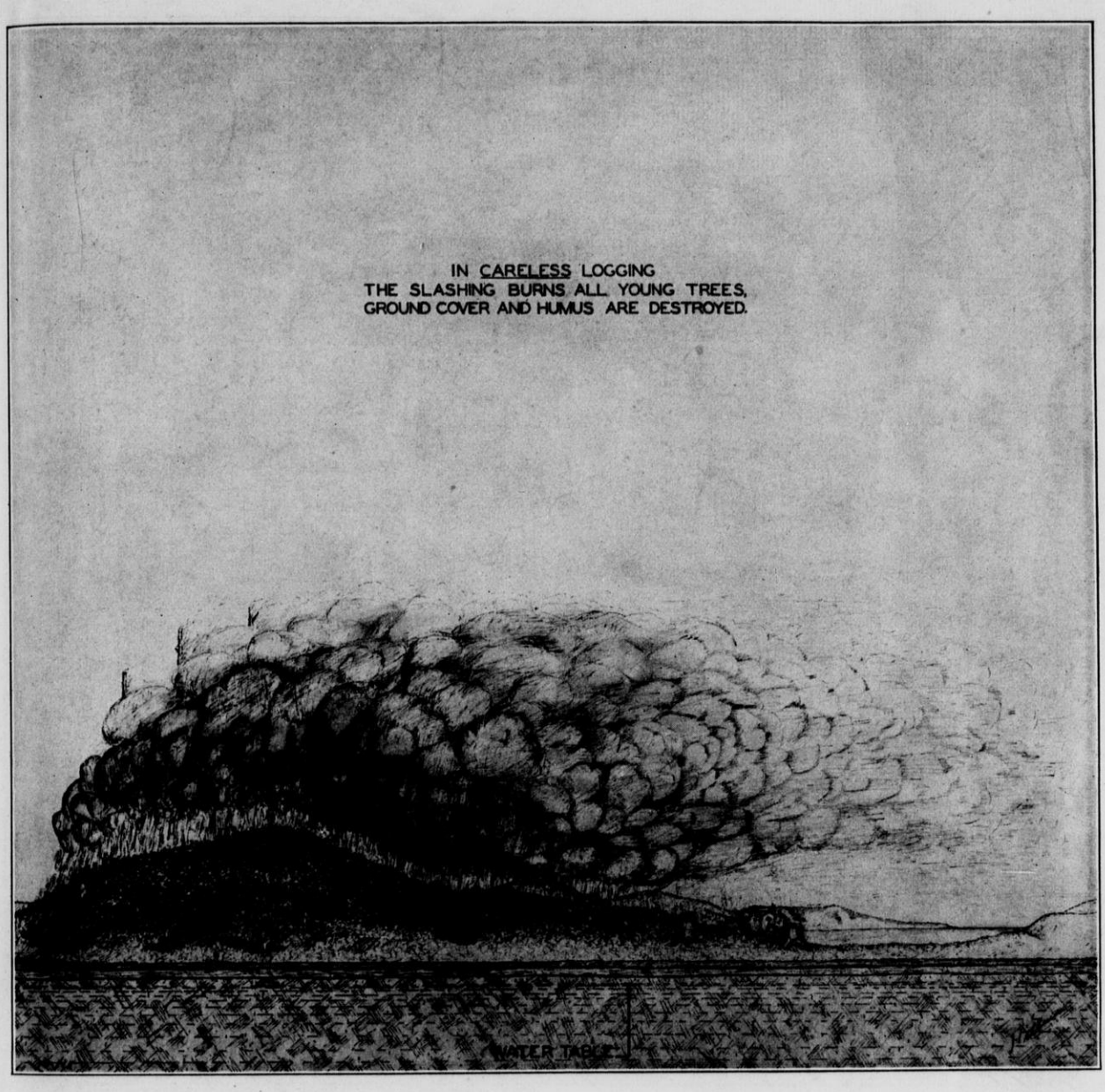
In recurrent waves, migration moved westward from the Atlantic to the Pacific. Through the 19th century, frontiersmen, adventurers, speculators and settlers followed this unplanned course. The ruthless slaughter of wild life, (example the wild pigeon) wastage of prairie sod and virgin forest, and the resources of oil fields and mines, have at last brought America in one short century to the age of social and economic planning. In this manner, America may establish a more adequate social economy for her now almost stationary population in her different geographic regions and bring about a more useful and friendly relationship between the people of these regions. Planning requires an



inventory and a careful analysis of the potential possibilities of these different geographic areas. The Lake States comprise one of these areas, and since the resources which may be restored are a part of what is generally known as land, a land economic inventory has been in progress in these states for some years. Millions of acres have been carefully mapped and large areas have been definitely classified and zoned against occupation for other than public or semi-public uses, such as forests, wild life refuges, parks, and general recreational activities, so that now the waste of the planless policy of the past century is gradually fading. Resettlement of families stranded and frequently isolated on land ill adapted to farm use is being made in communities where the land and the community needs in the form of good roads, markets, schools and telephone service are adequate. In this process of change, the public is becoming socially conscious of the true meaning of conservation, now gradually replacing the exploitation of the past century.

The elementary technique of taking a land inventory and of planning and administering uses of land has been in such constant demand on the part of the general public in recent years that the following lessons have been prepared. They were first prepared in mimeographed form some years back for the use of Forest Prison Labor Camps of Wisconsin, that the men who were doing such splendid work in these camps might learn more about practical conservation. The recent rapid expansion of the federal and state conservation programs in the Lake States has created a new demand. Requests from public schools and junior forest rangers are also increasing the need. These lessons are dedicated therefore to the young people who must carry on this splendid work through the coming years, and for whom it is hoped they may be helpful.

Each lesson is numbered. This does not mean that there is a direct continuity and that they are to be used as a textbook to be followed from cover to cover. The numbers are used merely as a means of simplifying the table of contents. Any lesson or set of lessons may be used separately. For example, Boy and Girl Scouts will probably find the lesson on the compass particularly



useful before they start blazing trails through an unknown region. Junior foresters may find the lessons which have to do with the direct management of forests and particularly forest plantations most helpful, and the 4-H boy may find the lessons on agriculture and forestry more to his liking.

LESSON I
TAKING A LAND ECONOMIC INVENTORY

The field work in taking a land economic inventory consists of carefully placing on a map sheet all data that can readily be collected by an experienced worker as he crosses land at intervals of one-quarter or one-half mile. It is undertaken to determine what the nature of this land is, and what it is now producing, and in most cases, why in its present use it is not producing enough to guarantee the owner an income at least sufficient to pay taxes. At the same time that the information on the soil and land cover is being gathered, data is also collected to serve as a measuring stick with which the owner can determine what his land will do, if used to produce a crop of timber or some other crop. For example, this shows what the owner may expect from his land if accepted by the state as forest crop land, as in Wisconsin, where he is then protected against an increasing tax for a period of fifty years. It also shows what will be required of him in the way of work and added investment to improve the earnings of his land if held as a forest or a farm. The further need of a land inventory at this time is due to the fact that a great deal of cheap wood is required to furnish raw material for the hundreds of pulp and paper mills and other wood using industries of the Lake States. The high cost of wood, due to greater distance from the mills, and therefore higher freight rates, has already caused some of these pulp and paper mills and many other industries using wood to cease operations. As these industries close the earnings of the men and women who worked in these mills cease, and these workers must either seek other employment or leave. In either event their ability to purchase the products of farms and industries is reduced. Wood produced near these mills means a cheaper supply of raw material. It means not only work for additional

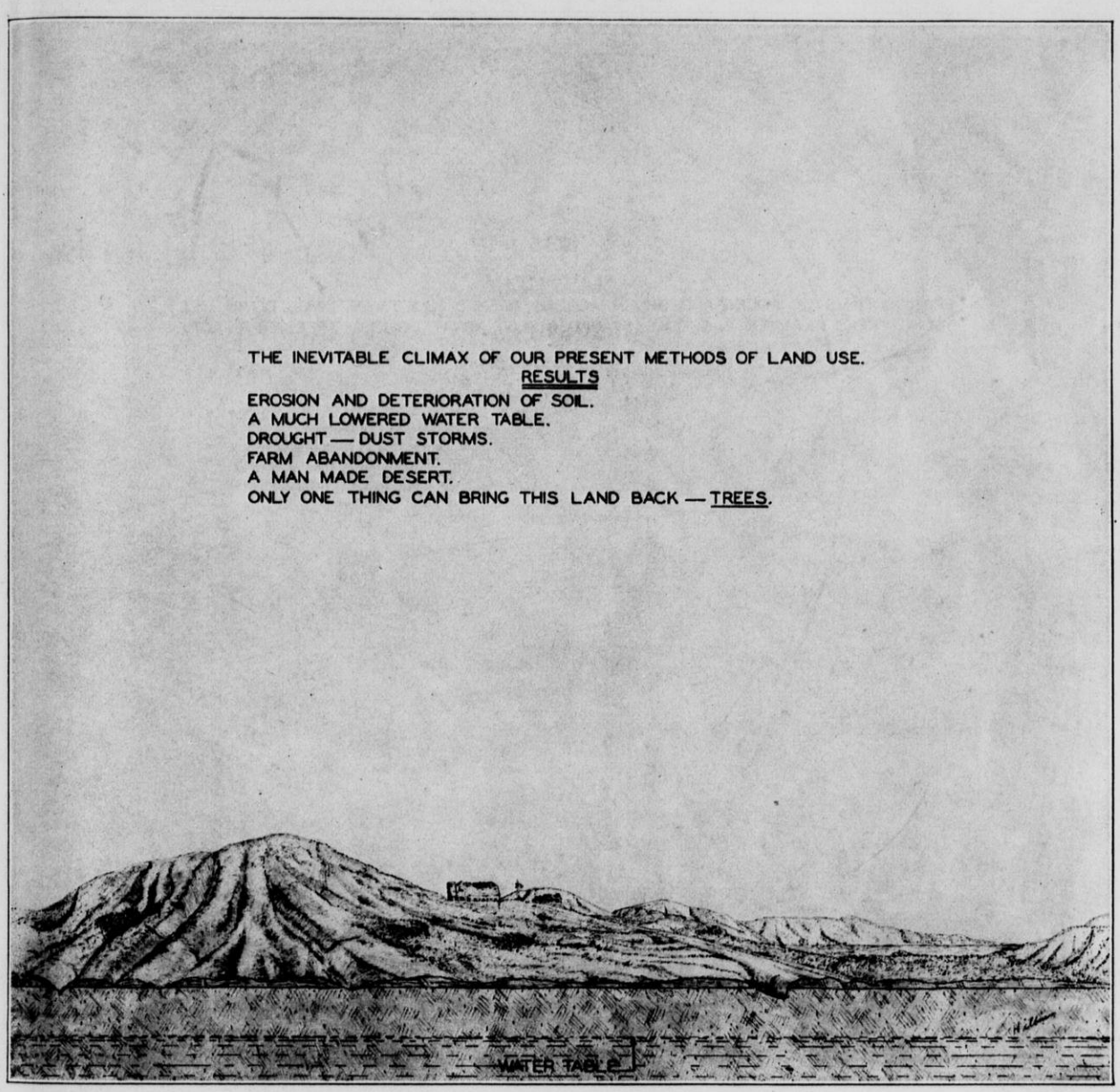
people on the land, but continuous work for those employed in the mills, and an increased purchasing power for farm and factory products. The inventory also shows the recreational use of land and how this value may be improved.

In making the cover map (see Map, page 8), the mapper begins mapping a strip from a known point, and marks down on his map sheet every type of land cover, the approximate stocking (timber density) of the area, if timbered, and the size and diameter of the trees. He also maps all the open land, farms, swamps, lakes, etc. On strips one-half mile apart, the mapper travels on one side of every forty and frequently offsets from his line for more information when uncertain of the type, or in mapping a lake. When the strips are only one-fourth mile apart the mapper travels on two side of each forty. After the area of all these types according to kinds of timber, size, density, cleared land, etc., is computed in the office, tables of yields for the various kinds of timber are used to compute the amount of timber. In this manner the total estimate of timber per acre and also the land's potential possibilities are obtained by sections and townships for the whole county. How yield tables are made is explained in Lesson XIV, page 24.

The essential information obtained by the inventory follows: (a) The total acreage and location of all timber land by type, size and density; (b) The total acreage and location of all swamp land by types; (c) The total acreage and nature of water in lakes and large streams; (d) The total acreage and location of agricultural land classified as to its use; (e) The acreage and location of all urban land; (f) The total mileage of roads, trails, telephone and power lines, fire lanes, and the miles of shore line of lakes; (g) The number of occupied and unoccupied houses, stores, schools, churches, filling stations, summer homes, grist mills, saw mills, gravel pits, springs, fur farms, towers, beaver dams, etc.; (h) a game count, showing location and number of all game seen by the mappers.

LESSON II
LAND USE PLANNING

After the field work of the inventory is finished and the final maps are made and types of cover, roads, schools, etc., carefully tabulated, these data often show



the existence of one or more of the following conditions: (a) that the population in a certain locality is inadequate to maintain efficient schools; (b) that the land is not adapted to farm use for which it is now being occupied; (c) that the conversion of the land from its natural use to farm use has proven unprofitable (a condition particularly true of cut-over forest land in recent years); (d) that winter work in the woods has stopped due to an exhaustion of the timber supply and (e) that large areas of land are reverting to public ownership. All this data is helpful to governmental agencies whose duty it is to administer local, county and state government and it will be of value in guiding them to plan intelligently their program of future land use.

How interdependent the development of good forest land into farms with logging operations has been in the past is well illustrated by the fact that in one county in North Central Wisconsin, 25 per cent of the men classified as farmers in 1905 worked in the woods part of the year, and by 1910 the number had increased to 50%. This same county lost 25% of its farm population in the 1920-30 decade. Although the undeveloped and partially cleared land on which these farmers lived was relatively good they were unable to make a living from the farm alone. Some of these communities now have only a few people left, and others on better land need more people to produce an adequate income to maintain family and community life. If the land is not suitable for agriculture, or even if the land has good quality soil, and is too hard to clear because of stone and stumps, or if the land has largely reverted to public ownership for non-payment of taxes, it is the duty of the county, state and nation to block out relatively large areas of this land for other use, and to regulate its use according to its best adaptation. Land planning in some states is under county land use zoning committees and state planning boards.

The National Resources Board is the federal planning agency that works with the state and county. Large areas of land, which may be called a new public domain are being acquired by the counties, states and the nation. Some of it is now used for forests. Other areas not so well adapted to forest production,

but well adapted to the propagation of wild life is acquired for wild life refuges and still other public lands, usually smaller in area, for parks. The Federal Government now maintains a resettlement service in the Lake States. It is the duty of this service to buy the land shown by the inventory as not adequate for farm use and assist the stranded and isolated families on this land to go elsewhere, where the land is better adapted to farming, and roads, markets and schools are adequate.

The management and proper development of the non-agricultural land requires an increasing amount of labor, and some of the isolated families moving into village communities near forests will of course be retained on at least part time employment in forest work, deriving only their family supply of fuel and as much of their food as possible from the land. Small wood working plants such as toy and novelty works may also furnish part time employment in such communities. The social economy of these forest communities, as in North Europe, will have to do almost wholly with the conservation and management of forests and wild life.

These lessons are planned to be helpful in carrying out the public policy that has to do primarily with forests, lakes, streams, fish and game of the Lake States. The workers in the forest communities, and the numerous conservation camps, and the boys and girls in the schools who may use these lessons are first introduced to the tree, because forests are only associations of trees. The following lessons are designed to give an understanding of forests, swamps, lakes and streams in their relation to mankind and animal life. An intelligent understanding of this relationship makes men, women and children conservationists and gives them the largest use of nature's resources.

LESSON III. WHAT ARE TREES?

Trees are plants, like wheat and corn, but their life continues for many years instead of one year. Mature trees of the United States range in age from 40 to more than 4,000 years. The aspen (popple) of the Lake States is short lived, while the big trees and redwoods of California are our longest lived trees. Trees are roughly distinguished from shrubs by their size and form. Hazelnut

and elder are common shrubs. The common tag alder of our swamps is usually not classed as a tree but the service berry or June berry is occasionally called a tree.

How do trees grow in height and diameter? An old stock question frequently asked beginners in forestry runs something like this: "If a nail is driven into a young tree 2 feet from the ground how high will the nail be in fifty years?" The nail will be exactly the same height in fifty years because the tree grows in height every year only from the terminal or top bud. Between the bark and the wood of a tree is a growing layer of cells known as cambium. Here is where diameter growth takes place. Each year these cells divide and grow, forming wood and bark. Thus every year is added to the wood what is known as an "annual ring." By counting these rings carefully the age of the tree at any point on the diameter can be ascertained. A new layer is also put on the inside of the bark. As the trunk of the tree becomes larger the bark is forced outward, resulting in breakage and roughening of the outer bark. The new wood inside of the cambium for a time serves as a channel for water and food materials coming from the roots of the tree. This part is called sapwood. It finally dies and becomes part of what is called the heart-wood. This is a darker, heavier and harder wood and makes the best lumber.

The diameter and height of a tree determine its volume and therefore its money value. (See diagram, page 19). When trees reach the size necessary for lumber they begin to have real commercial value. The volume of a tree or a stand of trees is measured in cubic feet, board feet or cords. Early merchantable volume should be the aim in all forest plantations.

Primary essentials for tree growth are moisture, light and soil. Moisture is largely responsible for trees growing where they do. Some trees require much more moisture than others, and some even can grow in water. Some hardwood trees in summer will give off from their leaves large quantities of water per day, while a pine tree will give off very little. This process is called transpiration. Placed in order of their ability to stand dry conditions and still make some growth, the trees of the Lake

States may be classified as follows:

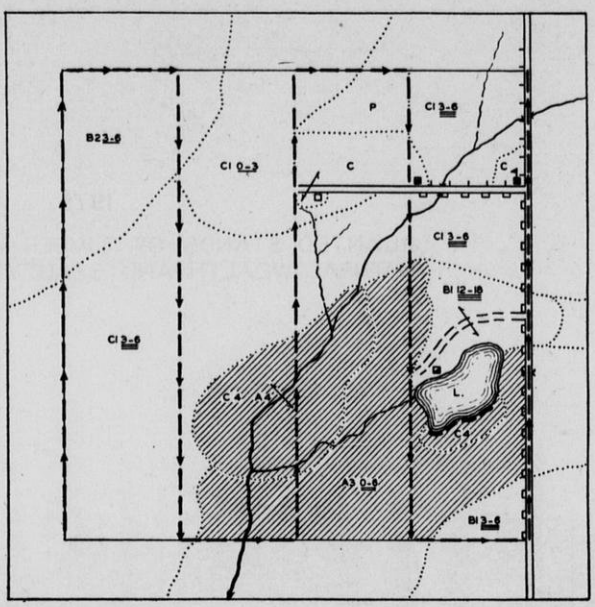
Evergreens	*Hardwoods*
1. Jack pine	1. Scrub oak
2. Norway pine	2. White birch
3. White pine	3. Soft maple
4. White spruce	4. Popple
5. Hemlock	5. Ironwood
6. Balsam	6. Red oak
7. Black spruce	7. Basswood
8. Cedar	8. Hard maple
9. Tamarack (deciduous)	9. Yellow birch
	10. White ash
	11. Elm
	12. Black ash

Trees which can endure considerable shade are called tolerant to shade. Some of our most valuable trees, such as pines, basswood, yellow birch, etc., need plenty of light and therefore, in order to favor these light loving and rapid growing trees, our forests should not be kept too dark. In some cases clear cutting and planting is the best way to grow such a forest. Spruce is a good tree for underplanting in aspen (popple) or open hardwood stands, because it can endure considerable shade. A list of the important timber species in the Lake States arranged in order of their ability to endure shade is as follows:

Evergreens	*Hardwoods*
1. Hemlock	1. Ironwood
2. Balsam	2. Hard maple
3. Spruce	3. Soft maple
4. White pine	4. Red oak
5. Norway pine	5. Black ash
6. Jack pine	6. Elm
	7. Yellow birch
	8. Basswood
	9. White birch
	10. Popple

The shape of a young tree trunk is somewhat like a cone. As the tree grows older the trunk becomes more cylindrical. The mature Douglas fir of the Pacific coast maintains a cylindrical trunk or bole to a great height, some of them having a diameter of about five feet for a height of more than one hundred feet. Mature white and Norway pine also maintain a very uniform bole to a great height. Trees growing in the open will always taper more than those growing in dense stands. The white pine grows to the largest size of any of our Lake State trees. Some white pine have been found over seven feet in diameter and one hundred and fifty feet tall. The average run of maximum mature white pine is about five feet in diameter and one hundred and twenty-five to one hundred and fifty feet in height. White spruce has attained a height of one hundred feet but does not attain the diameter of white pine. Norway pine does not grow much over one hundred feet in height, and does not reach the diameter of white pine, although it grows faster than white pine for the first seventy-five years of its life. The largest hardwoods in the forest region of the Lake States attain an average height of about ninety-five feet, and a diameter of about forty inches. Basswood and elm probably attain the greatest size.

A TYPICAL FIELD MAP OF A SECTION OF LAND, PLUS TEN CHAINS ON ALL SIDES AS MAPPED BY THE WISCONSIN LAND INIVENTORY.



THE HEAVY BROKEN ARROW (——→) IS NOT A PART OF THE MAP - IT SIMPLY SHOWS THE COURSE FOLLOWED BY THE FIELD MAN — MAPPING THE COVER ETC. FOR A DISTANCE OF TEN CHAINS ON EITHER SIDE OF HIM AS HE PACES THE DISTANCE BACK AND FORTH ACROSS THE SECTION.

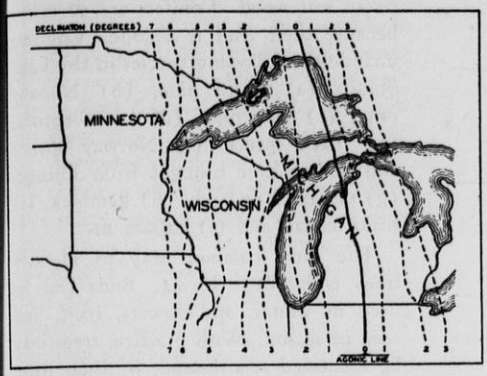
The tallest known tree now living is a California redwood, 364 feet in height. The largest tree, the "General Sherman" of California is 35 feet in diameter at its base. It is said to contain 600,000 board feet of lumber. There are recorded measurements of Douglas fir of the northwest that exceeded the present living redwoods in height. A Douglas fir on the west coast near Vancouver, British Columbia, cut about forty years ago, is reported to have had a height of 417 feet and a diameter of 25 feet. If the measurements of this tree are correct this would make it the tallest known tree for this country. It is possible that some of the trees of Australia, New Zealand or Tasmania may have been taller.

Some trees are very much shorter lived than others. Aspen (popple) begins to deteriorate at forty years or less, balsam after fifty or sixty years, and white birch at about the same age. On the other hand, white pine will grow on and on, at least in diameter, after it is two hundred years old. The oldest tree found in the study of tree growth made in connection with the land economic inventory of Northern Wisconsin was a hemlock 365 years old. The oldest white pine studied was about 222 years and the oldest white spruce about 140 years. Our hardwoods also grow to a good old age, but usually begin to deteriorate after two hundred years. One hard maple studied was about two hundred and sixty years of age. The big tree (General Sherman) is estimated to be 4,000 years old.

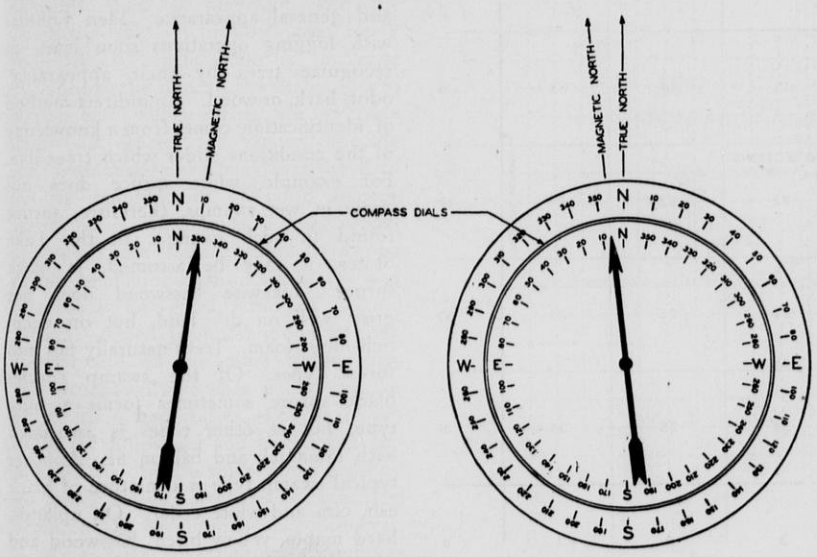
LESSON IV
THE COMPASS AND ITS USE

There are several type of compasses now in use. The box, prismatic, solar and surveyors or Forest Service type, are different kinds of compasses. The box compass most commonly used is a small hand instrument, the box being made of wood or aluminum. The needle is balanced at its center on a pivot so that it swings freely on a horizontal plane. The pivot is at the center of a circle which is graduated in degrees, 0 being North, 90° East, 180° South, and 270° West. Some box compasses are also divided into quadrants. A "sight" line is drawn on the inside of the cover. In taking a line due west, the pole or north end of the needle swings directly over the letter "W" on the compass dial, and due east, it swings over the letter "E." This requires numbering the circle on the dial counter clockwise. If there is a magnetic declination, a correction is made according to the declination. This will be explained later. In the prismatic compass

DIAGRAM SHOWING TRUE NORTH AND MAGNETIC NORTH ON THE COMPASS DIAL, AND THE DECLINATION.



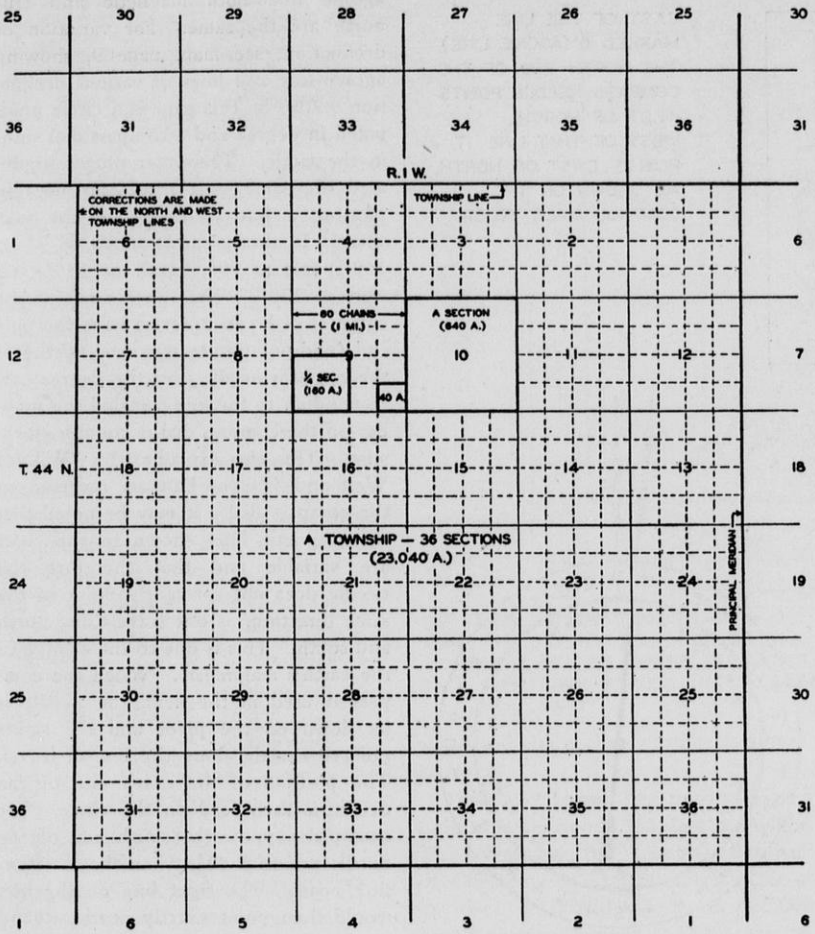
EAST OF THE LINE MARKED 0° (AGONIC LINE) THE NORTH END OF THE COMPASS NEEDLE POINTS WEST OF NORTH. WEST OF THAT LINE IT POINTS EAST OF NORTH, AS SHOWN ON THE COMPASS DIALS BELOW.



the graduations, instead of being on the circle of the compass box are on a card which is fastened on the needle and moves with it. This compass is provided with two sights and the bearing of the line can be read by means of a prism, at the same instant that the compass is sighted along the line of travel. Greater accuracy can be obtained with this compass than the box. The prismatic compass reads zero North, 90° East, 180° South and 270° West. In the surveyors or Forest Service type both the circle and the pivot are secured to a brass frame, on which two vertical sights are so placed that the plane through them also passes through the two zero points on the circle, (north and south read zero). This frame rests on a wooden staff, and is fastened to it by means of a ball and socket joint. On the frame are two spirit levels at right angles to each other, which afford a means of telling when the instrument is level. Greater accuracy can be obtained than with either the box or prismatic compass, but where there is dense brush, it is not practical because too much time is required to set it up. In regions of great magnetic disturbance, a magnetic compass cannot be used with any degree of accuracy. Here the solar compass is used instead. This instrument makes use of the position of the sun at an exact instant of time. A chronometer, sunshine, and an understanding of surveying methods are necessary before this compass can be used. A knowledge of variation of declination is required in running lines. Because the earth is a great magnet, a permanent magnet, such as a compass needle, when freely suspended will take a definite direction depending on the direction of the lines of magnetic force at any given place and time, i. e., the compass needle points to the magnetic north pole, unless there is a local disturbance. This angle that the needle makes between the magnetic north pole is called the angle of declination. When the north end of the needle points east of true north, it is an east declination. Such is the case west of the agonic line, (line of zero declination) which runs north and south through Lansing, Michigan. On the agonic line both magnetic and true north are the same. For variation of declination, see map, page 9, showing agonic line and lines of various declination. Also on this page is a circle graduated in degree and a compass dial within the circle. The outer one is graduated the same as a protractor used in plotting a line of travel on the map sheet. It always shows north as 0° or 360°, east as 90°, south as 180° and west as 270°. The inner circle is the compass dial. In order to have the pole end (end pointing to magnetic north) of the compass needle over the degree corresponding to the line traveled the number on the compass dial is counter clockwise. This also explains why "W" for West and "E" for East are reversed on the compass dial. It may be noted that the magnetic lines shown in the chart are variable and that therefore the needle does not constantly point in the same direction, as one travels due north and south. This is due to the change in the earth's magnetism. When the compass is used in the field, the needle is let down on the pivot and the sights pointed exactly along the line of travel. The position of the north end of the needle is then read on the circle. For example, suppose the north end of the needle points at 42°, when the variation is 3° east. The sight line on the box would then point exactly northeast and would be plotted on the map sheet at 45°. Suppose the magnetic declination is three degrees east and the compass man desires to travel true south, the pole or north end of the needle would then be exactly over 177°. Since iron or steel near the instrument may affect the position of the needle great care should be taken to keep some distance from these metals. Any person who thoroughly masters these fundamentals, can then take any direction desired, and with care rest assured that he will reach his destination.

Other points concerning land surveying which should be known are: (a) 43,560 square feet make one acre; (b) 10 square chains make an acre; (c) a chain is 66 feet or four rods; (d) 80 chains equal one mile; (e) a township is a tract of land containing approximately 36 square miles or 36 sections, having a 6 mile linear measurement on each of its four sides. (See diagram showing subdivision of townships into sections, p. 10); (f) a section is a tract of land containing 640 acres or less according to

DIAGRAM SHOWING SUBDIVISION OF TOWNSHIP INTO SECTIONS AND IT'S RELATIONSHIP TO THE ADJOINING TOWNSHIPS ALSO THE AREAS AND LEGAL DESCRIPTIONS — AS SEC. 10, S.W. ¼ OF SEC. 9, S.E ¼ OF THE S.E. ¼ OF SECTION 9 ETC.



government survey, and (g) a forty or 1/16 section is a tract of land containing forty acres, and having a linear measurement of 20 chains on each of its four sides.

LESSON V

IMPORTANT TREES OF THE LAKE STATES

Each kind or species of tree has one or more common names and one scientific name. For example: Common name—White pine, Scientific name—Pinus strobus; pinus meaning pine, and strobus meaning that particular kind or species of pine. The scientific name is part of a regular classification and is stable, while common names are often confusing because the same species of tree may be known by several names. As an example of this, although only white pine is now in common usage, cork pine was a common name for this tree which brought fame to the Lake States 50 years ago. Characters and conditions which may be used for tree identification are: (a) leaves or needles, (b) buds, (c) bark, (d) flowers, (e) fruit, (f) seed, (g) general form or habit of growth, (h) wood and (i) indirectly by type of soil, distribution or location, moisture conditions, climate, etc.

Two large general classes of trees are recognized; viz., broadleaved trees or hardwoods, and needle-leaved trees or conifers. All conifers in the Lake States are evergreens, except tamarack, which sheds its needles in the fall. Conifers are commonly called softwood. All Wisconsin broadleaved trees shed their leaves annually. Broad-leaved trees include the following in the Lake States: (a) the maples, (b) the birches, (c) basswood, (d) the aspen (popple), (e) beech (not found west of eastern Wisconsin), (f) the scrub oaks, (g) the white and red oaks growing on good soil, (h) black and white ash, (i) the elms (American and rock), (j) the cherries (black, pin and choke), (k) several kinds of hickory, and (l) numerous kinds of willow. All so called hard woods do not have harder wood than conifers, but most of them do. Basswood and aspen (popple) have relatively soft wood. Conifers are so called because their fruit is a cone. Conifers include the following species in the Lake States: (a) white pine, (b) Norway pine, (c) jack pine, (d) white spruce, (e) black spruce, (f) Norway spruce and Scotch pine brought from Europe, (g) tamarack or larch, (h) hemlock, (i) white cedar, and (j) balsam fir.

The most common way to identify trees is by their leaves. Buds can be used in winter, and flowers, fruit, and seed in season. With practice, trees may be identified at a distance by their form and general appearance. Men familiar with logging operations soon learn to recognize trees by their appearance, odor, bark, or wood. An indirect method of identification comes from a knowledge of the conditions under which trees live. For example, white spruce does not grow in wet swamps, therefore, spruce found in such swamps, in the Lake States, it may be assumed, is black spruce. Likewise basswood does not grow well on dry land, but on deep, rich moist loam. Trees naturally fall into forest types. Of the swamp species black spruce sometimes forms a pure type, but at other times is associated with tamarack and balsam fir. Another typical swamp type is a mixture of black ash, elm and white cedar. On uplands, hard maple, yellow birch, basswood and white pine are often associated on fairly good, moist, well drained soil in the Upper Lake States. Beech is found in a similar association within its range. Aspen (popple) is found growing at its best on moist sites, formerly occupied by white pine and hardwood, the popple coming in after fires. White and Norway pine are commonly associated,—likewise Norway pine and jack pine on still drier sites. Jack pine following fires often forms dense, pure stands on sandy plains. Hemlock is generally associated with hardwoods (hard maple and yellow birch) and frequently in almost pure stands on the poorer moist sites.

The commercial value of white pine (see diagram on back cover), Norway pine, jack pine, and upland spruce makes these species some of the most important forest trees of the Lake States, at the present time. They show greatest promise in pulp wood production White and Norway pine are also valuable when left to reach saw log size. The black spruce remaining in our swamps is still a large source of pulp wood, but its

growth is very slow, and after the pulp wood is cut out, there will be very little more for forty or fifty years. Black spruce also supplies many of our Christmas trees.

Remaining stands of old hemlock are of value for lumber and pulpwood. White cedar is valuable for poles and posts. Both hemlock and cedar are slow growing, and natural reproduction must be depended upon for future forests. Tamarack is often used for mine timbers and piling because its wood is very durable in contact with the ground. About twenty-five years ago most of our tamarack was killed by the larch (tamarack) saw-fly, but some vigorous young stands are now springing up. Balsam fir is considerably used as pulpwood and for Christmas trees. It produces seed freely and natural reproduction is universal throughout the upper Lake States. Hard maple and yellow birch are valuable hardwood species for veneer, flooring and woodenware and may even be used in the manufacture of bond papers. Basswood is valuable as a filler under veneer. There is some virgin hardwood timber remaining in the Lake States, and occasionally a good stand of second growth. Aspen (popple) grows to commercial size on the more fertile soils, and occasionally reaches a diameter of twelve to fifteen inches. Popple is valuable for pulpwood and box board material. It is of little value when growing on sandy soils. Scrub oak is worthless commercially except for fuel. However, it offers game cover, protects seedlings and improves the soil. Red and bur oak are of considerable importance on the better soils and have produced good saw log material. Elm and black ash are sometimes plentiful enough to be worth cutting, and the wood is valuable for various purposes. The remaining species listed are in general not plentiful enough to be of material commercial value and probably will not be planted much except for specific purposes.

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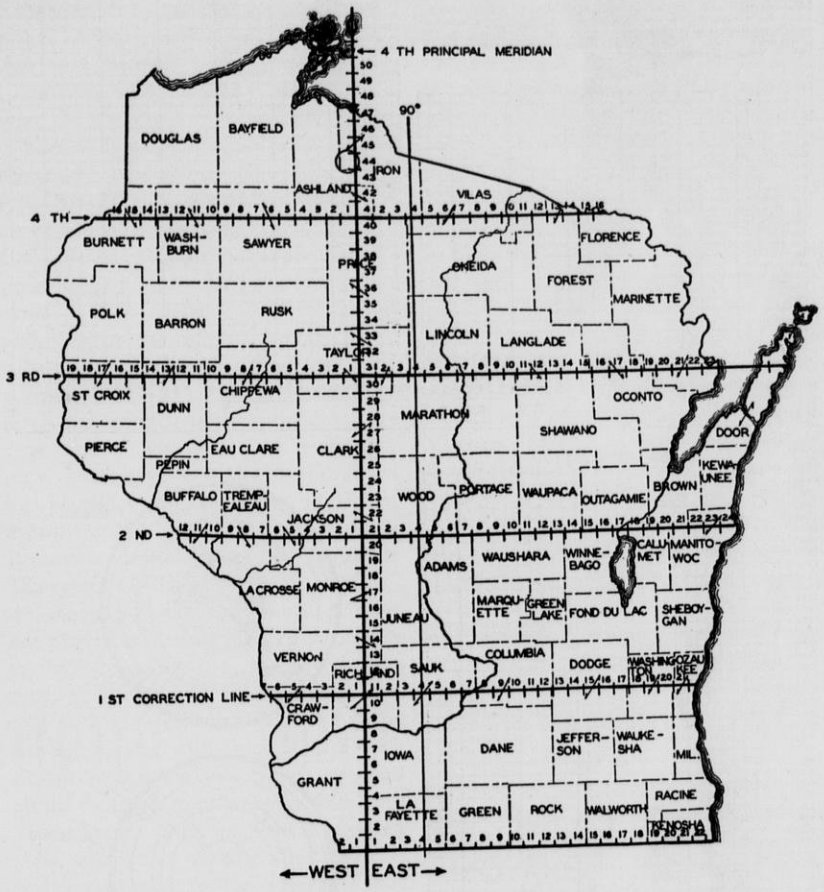
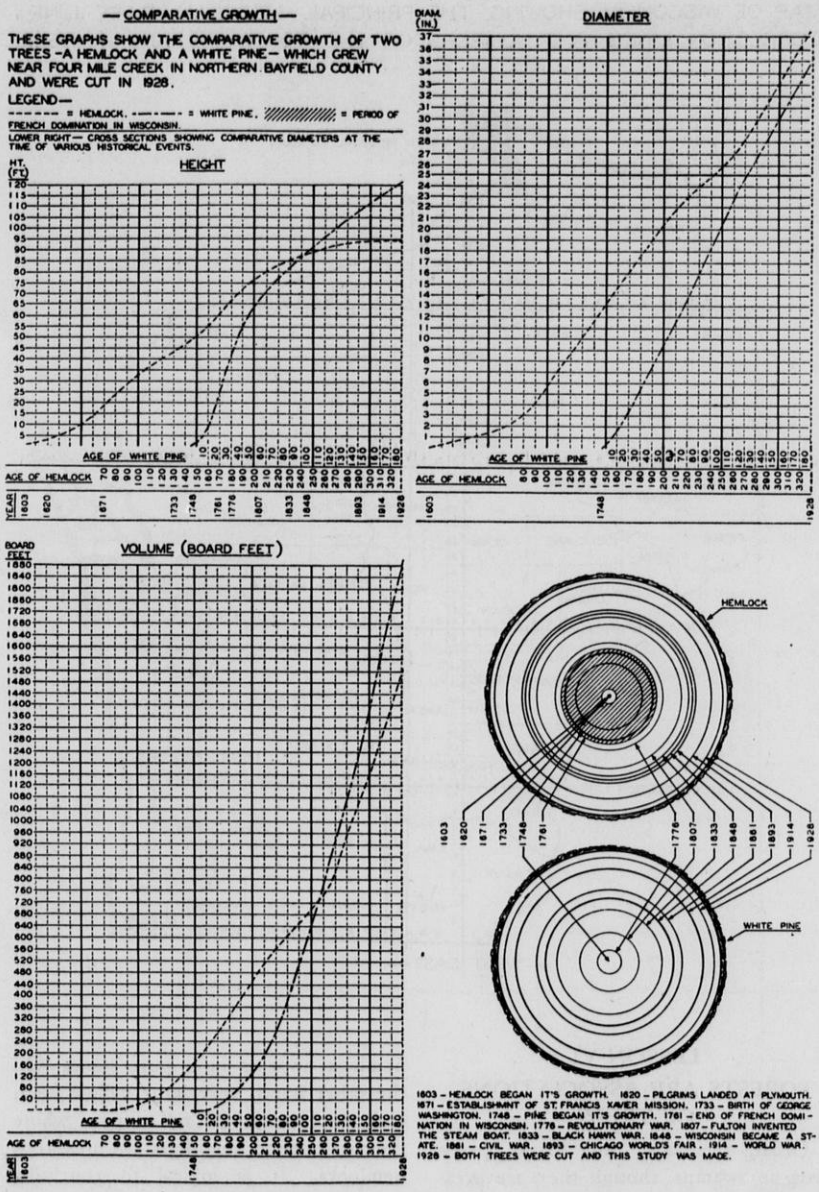
MAP OF WISCONSIN, SHOWING THE PRINCIPAL MERIDIAN, BASE LINE, CORRECTION LINES AND NUMBERS OF THE TOWNSHIPS AND RANGES.



LESSON VI
FORESTS ARE ASSOCIATIONS OF TREES

Cedar, tamarack, and black spruce grow in swamps, though they are occasionally found growing elsewhere. White, Norway and jack pine are often found growing in practically pure stands on sandy soils. Hemlock and yellow birch grow on cool, damp soils. It is apparent, therefore, that these different trees have a way of growing better on some soils than do certain other trees. There are also trees like the aspen (popple) which may appear almost anywhere, where its seed (a very tiny speck carried on a cottony wing) happens to strike damp soil. Practically pure stands of aspen (popple) frequently appear after severe fires. Trees, therefore, grow as they do largely because of their nature, though pure stands seldom appear naturally except following fires. Under natural conditions, very large hemlock trees are nearly always found where their neighbors are birch and maple, and seldom where hemlock appears in a pure stand. On the other hand, very large yellow birch and maple trees do not appear where their immediate neighbors are numerous hemlocks. It is logical to conclude, therefore, that the influence of hemlock upon the soil is not good, and that the decaying leaves of birch and maple tend to improve the soil. Birch, maple and hemlock may make similar demands upon the soil, but their influence upon it is not the same. Birch and maple do improve the soil and hemlock apparently does not. Oak and pine are frequently found growing together on sandy soil. The oak may be scrubby and the pine very fine, in fact better than where the oak is not present. The oaks improve the soil for the pine. Their scrubby nature indicates that they require more food and moisture than the sandy soil on which they grow can give them. On the other hand, the pine requires less food and moisture in order to make a given amount of wood, and therefore grows more rapidly. Sometimes the forest of some region changes suddenly,



that is, the forest cover may be completely destroyed by fire or a tornado. Then trees, which produce an abundance of seed and require a great deal of light from the start, seed the devastated area, and the result is a relatively pure stand. Aspen (popple) and white birch frequently seed in such areas in the northern Lake States. Where there has been an abundance of jack pine seed jack pine may also appear as a pure stand, following a severe burn of a pine area.

Most hardwoods or broad-leaved trees are slow growers under natural conditions. There are some, however, which have soft wood that grow rather rapidly. Examples are the basswood and the cottonwood or Carolina poplar. As a rule pine and upland spruce grow faster than any of the hardwoods. Hemlock generally grows more slowly. This difference in rate of growth depends partly upon the life habits of the tree, and partly to lack of light, moisture, and food. For example, a hard maple and also a hemlock grow best on a rich, moist, cool soil; but even on such a soil, these trees will grow much more slowly than basswood. Some of these natural traits of certain kinds of trees may be explained by the fact that in their growth with other kinds of trees, they usually start in dense shade, where they may wait without making scarcely any growth for a long time, or until such time as the larger trees, which receive most of the light, die. Maple, hemlock, spruce and balsam fir can do this waiting very well. They have even been called shade loving trees. This statement is not exactly true. It would be much better to say that they are shade tolerant. Hemlock and maple frequently live to be very old. For example, one hemlock was found in southern Ashland county, Wisconsin, to be 365 years old, and even at that age, was only twenty-two inches in diameter, and seventy-nine feet in height. Comparison of this tree with the oldest white pine tree both of which were found in taking the land inventory of Northern Wisconsin, shows that this hemlock grew very slowly and probably spent much of this time growing where it had very little light. This oldest pine grew in northern Vilas county, Wisconsin, on soil similar to where the hemlock was growing. It was 44 inches in diameter, 126 feet tall, and 222 years old. This shows that white pine grows much more rapidly, and that hemlock can do what white pine can not, i. e., grow in the shade for a long period of time. (See graph page 12 showing comparative growth of a white pine and hemlock which grew only a few feet apart in Bayfield County, Wisconsin.) Rapidly growing trees, such as basswood, elm, oak, birch and aspen (popple), among the broad-leaved trees, and white, Norway and jack pine among the needle leaved, can not endure heavy shading.

The needs of different trees can be summed up as follows: (1) i. e., soil, moisture and light, slope and altitude also play an important part. The demand for food made upon the soil can be measured largely by the amount of ash resulting in burning the wood. This shows the broad-leaved as demanding more plant food from the soil than the needle leaved trees. (2) The demand for light of different kinds of trees is based directly upon their nature and rate of growth, i. e., the pine and better hardwoods such as basswood and yellow birch require relatively strong light. Maple and hemlock do not demand such strong light, and will of course grow more slowly. Others with similar natures have already been mentioned. (3) The amount of moisture required is also dependent upon the nature of the tree. For example, a pine will grow rapidly on a soil which holds only a small amount of moisture. A hard maple, on the other hand, would not do well on such a soil because it requires more water. As a general rule, the hardwoods require more water than does pine, but the short needle evergreens, balsam, hemlock and native spruce, all require a relatively moist soil. Of the pines, white pine does its best on moist soil, for white pine of immense

size grew with hardwoods on such soil. Some of the trees designated as swamp species are capable of thriving in an over abundance of water. Examples of these trees are tamarack, cedar and black ash. Soil and climate therefore are important factors in determining forest sites. Topography and altitude also affect site. In a mountainous country, a north slope, usually has a different type of forest than a south slope. The same slope may have different types of forest at different altitudes.

Some natural forest types are oak and hickory, beech and maple, pine, spruce, etc. These are given to illustrate how forests are generally classified. For example, a black ash type of forest also frequently called a swamp hardwood type, is seldom found where the swamp soil does not dry out fairly well at certain times of the year. In such a swamp the soil becomes warm in the summer time. A cedar type grows where the water is fresh and pure and the swamp soil remains fairly cold throughout the summer season, and drainage is fairly constant. Sphagnum in time may make this swamp soil an unfavorable site for cedar and then only swamp (black) spruce will be the forest type. Finally, this type may disappear and only the open (leather leaf-sphagnum) swamp remains. This in time may dry out or burn and again becomes a swamp forest site. It is obvious that some forest types sometimes appear on sites where they do not belong, if growing where they can do their best is taken as an index of where they belong. For example in 1929, 29.2 per cent of Vilas county, Wisconsin, had aspen (popple) growing on a pine site, and 5.7 per cent on a hardwood site. On the pine site, aspen (popple) seldom reaches a size over four inches in diameter before it becomes diseased and begins to die while on a hardwood site it grows to commercial size.

The upland hardwood forest type in the Lake States is composed of oak and basswood, maple, birch, elm and, in the eastern part, some beech. Such a type grows on a deep mellow well-decayed soil. Where this soil is a fine loam, the forest makes its maximum growth with a considerable percentage of the stand made up of oak, basswood and maple. Where the type is on a sandy loam soil, this forest does not do so well. There are fewer good oak, maple, and basswood trees, and very frequently white pine appears. This forest type then becomes a mixed hardwood-pine type. The other general upland hardwood type appears on the more poorly drained and colder soil. Generally this type is known as a hardwood-hemlock type. Basswood and oak rarely appear in this forest. Yellow birch is the best growing hardwood. A considerable amount of hemlock and balsam, both short needled evergreens, also help to make up this type.

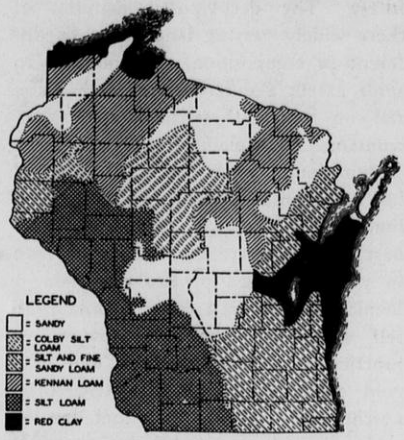
Nature very seldom has produced an absolutely pure forest. Though certain types are called pure, they usually have a considerable percentage of other species. Probably the nearest approach to a pure forest type in the Lake States is a stand of jack pine on a soil too sandy and dry to produce hardwoods other than a growth of scrub oak. Where such a forest grows to considerable size, the scrub oak growth is overtopped by the pine and finally dies. An absolutely pure forest type can also be produced by planting. Investigations of forest growth made by the Wisconsin Land Economic Inventory in the so-called "Barrens" of Bayfield county, Wisconsin, have shown that forest fires have not proven so destructive to jack pine as to white pine. The undecayed tree roots of the former forest, where now only jack pine grows, were found to be largely those of white pine, and of such size as to indicate that white pine had produced large sized trees on this land. These barren lands are logical planting areas, where tree planting should be carried on to add to the present forest growth in the Lake States.

LESSON VII—FOREST SOILS AND WHY THEY DIFFER FROM PRAIRIE SOILS

Forest soils differ from prairie soils because they have been developed under a different climate and from different vegetation and earth material. Four primary climatic factors are water, air, heat and light. The soil building work of these factors has gone much farther with prairie soils than it has with forest soils, because forest soils are always more or less mulched with litter and shaded by trees, and never get as hot as prairie soils. The litter acts as a mulch and the shade checks evaporation. (See page 1.) Litter also prevents the deep penetration of air into the soil. Water, air and heat therefore do not work so freely in a forest soil, and tend to make it acid, and the minute soil organisms important in building a fertile soil less active. Soil weathering is also greatly influenced by the kind of vegetation, which grows on the land. Four widely differing types of vegetation are: (a) prairie grass, (b) maple-beech forest, (c) birch-hemlock forest, (d) pine forest. The decomposed material of these widely varying land covers is different in composition, and indicates to some extent a difference in earth material on which these land covers are common. A maple-beech forest cover is seldom found where the earth material has not been influenced by disintegrated limestone. A prairie land cover does best on soil where the earth is at least in part composed of this material. A hemlock-birch forest cover maintains itself well where the earth material is practically without limestone and in a cold climate. This is also true of a northern pine forest. Soils that develop under these last named forest covers in the climate of the northern Lake States in time become greatly impoverished just beneath the needle duff, because the solubles resulting from the decay of the pine and hemlock forest litter are strongly acid and dissolve the mineral plant food, which in soluble form is carried to a lower level in the soil by the downward movement of the water. This leaching in time produces an ash color below the forest duff. This soil is known as a podsol, which means ash colored.

Another very important factor which influences the soil found in any particular place is the fineness of the earth material and the natural drainage. For example, sandy soils are usually composed of relatively coarse sand grains, while silt and clay soils are composed of fine earth flour. Natural drainage depends upon the slope and how readily water passes downward in the soil until it reaches a plane of permanent saturation. This plane of saturation is commonly called the ground water table. If this ground water table is too close to the surface, the soil is referred to as a swamp soil. If the ground water table is very deep and the earth material is composed of sand, the soil is usually dry and is referred to in the forest regions of the Lake States as a barren soil. A clay or very fine silt soil may also be in part swampy because the downward movement of the water is very slow. On rolling land with such a soil the surface run off aids materially in reducing the excessive wetness. A well aerated forest soil is usually reddish or yellow brown from below the duff to the depth to which air penetrates freely. Some soils are saturated with water practically to the surface. These soils are bluish in color because of too much water and insufficient air. The so-called blue clays in swamp areas are caused by water sat-

GENERAL SOIL TYPES OF WISCONSIN



uration, which shuts out the air, and in time become a perched water-table. A consideration of all the above factors therefore is necessary in order to classify the soils of the Lake States. The best indicator is the cover.

The upland forest soils are: (a) pine soils—(usually sandy and therefore lowest in fertility and most subject to drouth. Scrub oak also grows on these pine soils but moisture and plant food are not adequate to grow good oak.) (b) oak-hickory soils—(of finer texture and higher fertility than the pine soils) (c) maple-beech soils—(of good texture and fertility, derived at least in part from limestone which has materially aided in making a better soil. In northern forests, basswood generally replaces the beech on this soil). (d) birch-hemlock soils (colder and usually not so well drained, and frequently badly leached by the acid of decaying duff.)

The swamp soils are: (a) swamp hardwood soil—(earth material forming this soil frequently mixed with much decayed vegetable matter, which makes a black mucky cover over a blue clay or claylike subsoil.) (b) tamarack swamp soil—(less mineral earth material in this soil; plant material not so well decayed as in the swamp hardwood soils; usually deeper and coarser in texture and not so dark in color.) (c) cedar swamp soil—(less mineral earth, and plant material less decayed than in tamarack swamp soil; remains cold through out the summer season, and the water in it is seldom, if ever stagnant) and (d) black spruce soil—(mostly undecomposed peat, produced largely from sphagnum moss. This sphagnum packs down and continues cold throughout the summer season. Poor drainage and the bad influence of the sphagnum eventually makes this soil unfavorable to the growth of black spruce, and the soil may be called a leatherleaf bog-soil.)

General soil types of the Lake States may be located by referring to any state soil map or to a physical geography. (For general soils map of Wisconsin see page 14.) The physical geography will also explain the geological formation. The pine forest soils in Wisconsin (see soil map page 14) lie within sandy regions and adjoining them. Adjacent to, as well as westward and southward from Green Bay in eastern Wisconsin, is an area where glacial movement has mixed some limestone with the earth material. There are some maple-beech soils in this region and eastward. Here maple, associated with birch, elm, basswood, white pine, and some hemlock have grown at their best. Marginal to these soils and extending in a northwesterly direction across the state are the birch-hemlock soils. There are of course areas throughout this region and outside of the pine soils where basswood, maple, birch, and elm grow in relatively pure hardwood stands,—that is, with little pine or hemlock present—but these areas are not numerous outside of the regions influenced by some limestone. Little or no beech is found west of the Wolf River in Wisconsin. Interspersed throughout these upland forest soils of the northern part of the upper Lake States are the major areas of swamp forest soil.

The oak-hickory forest soils are scattered throughout the southern half of the Lake States and extend northward along the Mississippi river. These soils are adjacent to the prairie soils. There are small areas of other forest soils scattered throughout the southern portion. This is especially true in that portion of Wisconsin which was not glaciated. In that region small patches of birch-hemlock forests are found on cold northern exposures or adjoining cold swamp soils. References: Soil maps and bulletins of Wisconsin, Minnesota and Michigan.

LESSON VIII

THE FOREST TREE NURSERY

The forest tree nursery is necessary in any program of reforestation. It provides trees in large numbers under the most favorable conditions. The tiny seedlings can be cared for so that the maximum number survive, and finally the young trees may be quickly taken from the nursery beds and transported to the planting area. The forest tree nursery need not cover a large area. As many as five million trees can be produced in one year in a nursery of 10 to 15 acres. A nursery should be located close to the planting area, thus saving transportation charges and reducing losses.

It is important to understand the meaning of certain nursery terms. A **seedling** is a small tree which is grown from a seed and has not been transplanted. In nursery practice a seedling is either 1, 2, 3, or 4 years old. A transplant is a seedling which has been taken up and planted in nursery rows where it has more room to grow. A transplant is usually either 2, 3, or 4 years old (including the years as a seedling). Transplanting is laborious and expensive, but the trees produced are more vigorous than seedlings. However, transplanting is often considered not worth the cost, and vigorous seedlings 2 or 3 years of age are often used in forest planting. The ordinary way of designating the age of nursery stock is as follows: 2-1 means 2 years as a seedling and 1 year as a transplant; 1-2 means 1 year as a seedling and 2 years as a transplant. The Lake States now have state and federal owned forest tree nurseries producing millions of trees.[1]

Administration and supervision of forest tree nurseries is very important. Success hinges on good management. Plans are often made years in advance for the distribution of the output by seasons, species and classes of stock. An inventory should be made at least once a year. One man must be held responsible for all necessary operations. Nursery work is very exacting in the order in which the many operations are performed and in the time of their execution. A delay of two weeks in spring transplanting may cause a very large loss in the transplant beds.

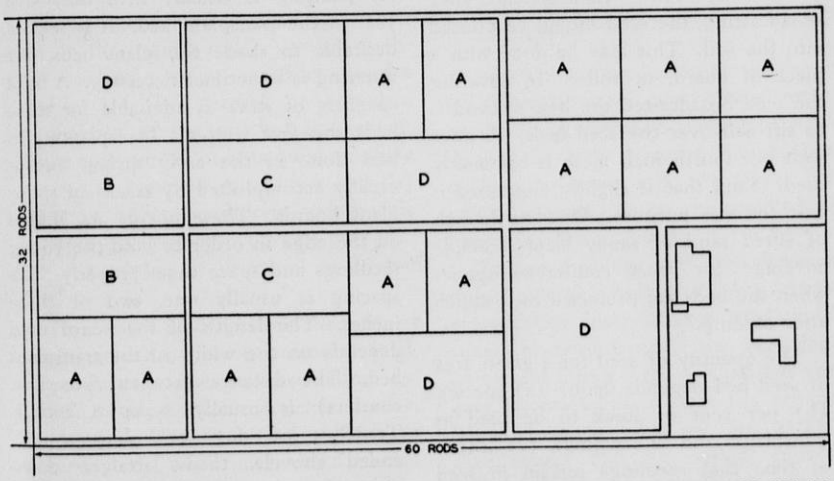
The location of the nursery must be suitable for the growing of the particular species that are required. It is not often possible to select an ideal site for all species and grow only that particular one. Therefore, a site of average conditions should be selected where the soil is suitable for the growth of several different species. A nursery must be located near an **adequate supply of water,** because frequent watering is essential. The soil that is best suited for growing a variety of species of varying requirements is a **sandy loam.** It should be deep and fresh. A heavy clay should be avoided. A deep, good quality soil produces seedlings that are thrifty and have well developed roots. Too light or too heavy soils produce seedlings with small and rambling root systems, which are difficult to lift and set in the plant-

[1] Wisconsin also maintains transplant nurseries of pine and spruce at each of its Forest Prison Labor Camps.

ing area without great loss. Trees should be as vigorous and as well developed as possible when taken from the nursery. A "runty" seedling is like a "runty" half-starved animal. It never fully recovers. A gentle slope just sufficient to permit some surface drainage, is best suited for the average nursery site but a slope of more than five degrees is likely to invite erosion. A northern slope is probably best for the Lake States. Here growth starts later in the spring, and therefore escapes frost, and evaporation from the surface is not so rapid as from a southern slope. However, with a very slight slope, change of slope should not be very important. In order to prevent excessive evaporation a windbreak is necessary. An adjoining woodland may provide this protection.

The following plan shows a good nursery arrangement.

NURSERY PLAN



LEGEND — A - TRANSPLANT BEDS. B - 1 YEAR SEEDBEDS. C - 2 YEAR SEEDBEDS. D - SOILING CROPS. TOT AREA 12A.
ANNUAL CAPACITY — 1,000,000 WHITE PINE TRANSPLANTS (2 – 1) AND 1,000,000 WHITE PINE SEEDLINGS (2 – 0)

Main roads should be 10 or 12 feet wide, and others 8 feet. Seed beds and transplant beds should be surrounded by temporary paths from 1½ to 2½ feet wide. **Seed beds** are usually **four feet wide** and **twelve feet** or more in length. In nurseries where the drill method of seeding is used, the beds are much longer, sometimes extending entirely across the nursery. Transplant beds are from 4 to 6 feet or more wide, and as long as may be desired. Seed beds and transplant beds should not be used year after year, but should be rotated with soiling crops such as soy beans, clover, rye, and buckwheat. Nursery buildings should be conveniently located and the superintendent should live on or near the ground in order to be within reach at all times. Labor employed at the nursery should also be close at hand. Fencing the nursery is advisable, particularly to protect it from cattle and other animals. Culture of the soil should be intensive to produce the most vigorous young trees at the least cost. This involves green manuring, fertilizing, plowing, harrowing and working the surface soil to a fine texture. Water may be distributed to the nursery beds in one of the following four ways: (a)sprinkling, (b) flooding, (c) percolation from furrows, (d) subirrigation.

An overhead system of irrigation, by pipe lines is used very generally now in permanent nurseries. It is costly to install, but in the end is cheaper than any other system, and has proven most successful. Water should be distributed freely and only when needed. Lack of water often results in the death of the plants in entire seed beds. The man in charge must therefore always be alert to determine what the requirements are for the young trees.

LESSON IX

COLLECTION AND STORAGE OF SEED FOR THE NURSERY

Seed may be obtained: (a) from responsible seed dealers; (b) direct from seed collectors and (c) through personal collection. The number of seed dealers is limited, but usually their seed is clean and of good quality. A list of reliable seed dealers may be obtained from the United States Forest Service or any state forest service. The quality of tree seed determines to a large degree the success or failure of nurseries. It is important to know: (1) the origin; (2) the size and weight; (3) the degree of ripeness and age and (4) how the seed was stored. The origin of seed is important because the characteristics of the parent tree are transmitted through the seed. It is safer to select tree seed near the place where the reforesting is to be done, than to obtain it from regions having different climatic and soil conditions. Large seed of a given species, is as a rule, higher in quality than small seed. Weight of good quality seed is usually greater, for a given volume, than weight of poor quality seed. The following table shows the average number of forest tree seeds per pound for species common to the Lake States (page 100, Toumey's "Seeding and Planting"):

Species	*No. Clean Seeds per pound*
White Pine	26,800
Norway Pine	61,420
Jack Pine	108,200
Balsam Fir	43,800
Norway Spruce	59,400
Yellow Birch	424,600
Red Oak	128
American Elm	94,600
Hard Maple	7,160
Basswood	5,950
White Ash	6,240
White Oak	208
Beech	1,440

The time to collect tree seed depends upon: (1) the time the seed matures and (2) the character of the seed and fruit. With most species the best time to collect is immediately after the seed matures. This is particularly true when the seed scatters shortly after ripening, or when it is likely to be destroyed by birds and rodents. The collecting of coniferous seed can be safely begun as soon as the squirrels begin to store their winter's food supply. When the fruit is large and heavy, as is the case with walnut, hickory, chestnut, beech and oak, it falls to the ground shortly after maturing. The first fruits to fall are invariably wormy or otherwise inferior. Gathering should be delayed until after the first heavy frost, or until a large part of the fruit has fallen. If delayed too long, however, squirrels and other rodents destroy the best. Nuts and cones are usually collected in sacks. When left in sacks for more than a few days, molding or rotting may take place. The seed of the conifers has to be treated before the seed can be successfully extracted. Direct exposure to the sun is enough to open the cones of most species and allow the seed to fall out. Drying cones by artificial heat is sometimes practiced or drying may be accomplished by exposure to free air circulation in the building. Seed is shaken from the open cones by means of the "cone churn", a box-like arrangement which is pivoted and is revolved by

means of a crank. The wings on the seeds of conifers are removed in order to make clean seed. The dry removal of the wings may be accomplished by means of a hand sieve or by a large machine consisting of a revolving cylinder of heavy wire with stiff brushes within, which rub against the drum. In both cases the mesh of the wire is sufficiently small to prevent the passage of seed with the attached wings. Another method is to flail the seed in partially filled sacks. In the wet process the seed is spread out on the floor and sprinkled with water, until the whole mass is slightly moist. Light leather flails are then used to free the seed from the wings. Care must be taken not to allow the seed to remain in a moist condition until fermentation takes place. Following this process the seed can be separated from detached wings and other waste matter by running it through a fanning mill, or by winnowing it in the wind. All seed that is not sown immediately after cleaning must be carefully stored. The seeds of pine and most other conifers, as well as those of hardwoods like the black locust are **stored dry** in a cool place, while the seeds of the less dry resistant species, such as walnut, hickory, beech, chestnut, and oak, should be stratified in thin layers with damp sand. (Layers, not over 2 or 3 seeds deep, to prevent heating.)

LESSON X

WORK IN THE NURSERY

Seed beds are usually made by plowing furrows, the requisite distance apart to form a bed of the desired width, when smoothed off between the furrows. The furrows are used for paths, with the beds raised several inches above them. The surface of the seed beds is raked over with ordinary garden rakes, all stones and clods removed, and the soil carefully pulverized. The beds must be level or slightly rounded but should never be lower in the center than at the sides. (Low centers retard drainage and cause "damping off" disease.) The soil should be thoroughly worked to a depth of about 10 inches, and then rolled before seeding. Seeding may be done in either spring or fall. Spring seeding should be late enough so that the seedlings escape frosts, but not so late as to subject tender seedlings to intense summer heat. Fall seeding should be late enough to prevent fall germinating, otherwise the tender plants will be killed by frost. Fall is a good time for seeding, for labor is not needed so much on other work, and results are fully as satisfactory. Seed beds are sown **broadcast** or in **drills.** Usually the small seeded species (such as pine) are broadcast, while large-seeded broad-leaved species like oak, hickory or walnut are sown in drills. Many of the large nurseries are now using the drill methods for all seeds.

Many tools have been devised for drill seeding, but any good garden drill may be used. Drill rows may be anywhere from 4 to 18 inches apart. Covering the seed in the drills is now generally accomplished by the drill tool used. If not the seed is covered with a rake or a hoe. Seed should be covered from 1 to 4 times the diameter of the seed. Lighter soils allow deeper covering than the heavy soils. Broadcast seeding is usually done by hand, scattering the seed as evenly as possible. If the bed has previously been rolled, the top soil should be raked over in order to prevent the seed from moving after it strikes the soil. Immediately after broadcasting, the seed should be pressed into the soil. This may be done with a piece of board, or roller. In covering the seed broadcasted the best method is to **sift soil** over the seed beds. A sieve with one-fourth inch mesh is commonly used. Sand that is slightly moistened is best for this purpose. One-fourth inch of sifted sand or sandy loam is ample coverage for most coniferous species when the beds are protected by a mulch after seeding.

The quantity of seed for a given area of seed bed depends upon: (a) species, (b) per cent of stock to be used as transplants and as seedlings, (c) length of time that seedlings remain in seed beds, (d) quality and size of stock required and (e) method of seeding. From one-half to one-third as much seed is used in drill seeding as in broadcast seeding. (For a nursery bed of 100 square feet about 12 ounces of seed is used by the broadcast method when white pine is sown.) The seed beds should be mulched with about an inch of straw free from weed seed. Leaves, bracken fern, or pine needles can also be used. The mulch should be removed in the spring when about one-half of the seed has begun to send up sprouts. Seed beds must be carefully watched during this period and not allowed to dry out or to be soaked with water. Any sprinkling should be in the nature of a light shower. As soon as the mulch is removed, some method of partial shading must be applied. This is a duplication of natural forest conditions, for a tender seedling requires partial shading. Lath screens, with the laths spaced their own width apart, so that if necessary extra laths can be placed between them, are commonly used. In this manner half shade or full shade is possible. These screens are placed at one and one-half or two feet above the seed beds. Shading is often continued until late in September. Exposure to full sunlight and frost then checks growth and hardens the wood in preparation for winter. After a few frosts and when the first leaves have fallen, the seed beds should be covered with a light mulch, to be removed when growth starts in the spring. After the first year artificial shading is not needed, as the seedlings shade the ground quite completely, and are hardy enough to withstand full sunlight. Careful weeding is necessary.

Trees may be transplanted one or more times. As a rule they are transplanted only once. Stock grown for forest planting is usually held only one year in the transplant bed. It is seldom desirable to shade transplant beds, but watering is sometimes necessary. A light covering of straw is advisable for these beds the first winter. Transplanting is best done in the early spring, and is usually accomplished by means of transplant boards. These boards are slotted on the edge in order to hold the young seedlings and space them properly. The spacing is usually one, two or three inches. The length of the board used depends on the width of the transplant bed. The distance between rows (for conifers) is usually 6 or 8 inches. Trenches are dug with short square-ended shovels, thrust straight down along the edge of a board. The transplant board is placed at the edge of the trench with the seedlings upright and at the proper depth in the trench. Earth is then pressed and tamped about the

A June bug about twice natural size. This is the adult of the white grub.

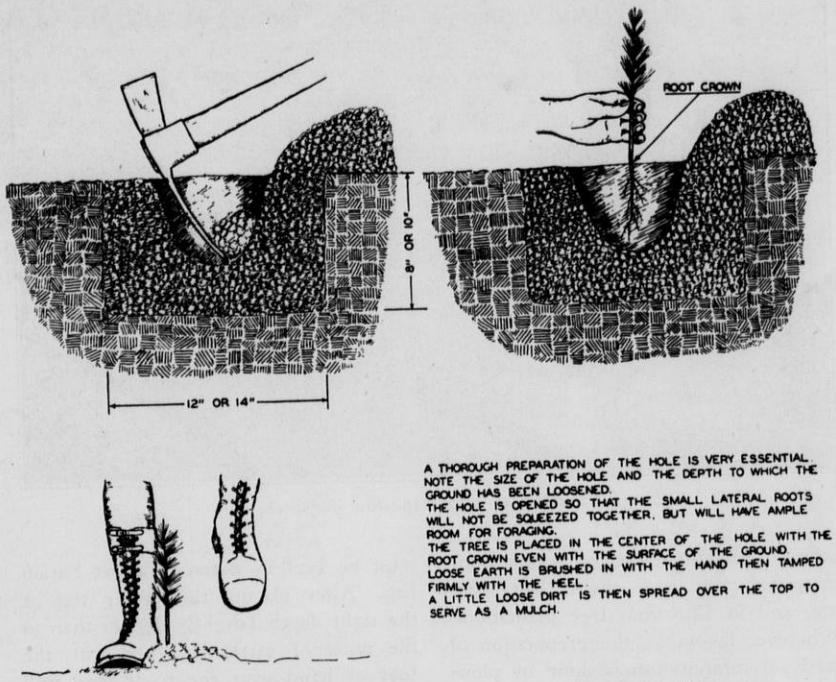
roots, and the trees are released from the board. The roots of the little plants, particularly conifers, must be kept moist at all times.

Insects which may damage a nursery are controlled by various sprays. However other methods of control are helpful. For example—the larvae of the May-beetle (or June bug) are controlled by keeping the soil in the nursery, and adjacent to it, free from sod or weeds, in which eggs may be laid. Five pounds of arsenate of lead mixed with one bushel of dry sand and broadcasted evenly over 1,000 square feet is very effective in destroying white grubs. **Parasitic fungi** are represented by several diseases, the most serious of which are **"damping off"** and white pine **blister rust.** "Damping off" is a general term applied to the destruction of young plants by parasitic fungi immediately after germination. This disease is generally most destructive under moist conditions, particularly when the air is hot and humid, and is more apt to occur on the heavier soils. Various methods used to prevent or overcome this disease are: (a) partial or complete sterilization of the soil before seeding, using nine ounces of aluminum sulphate applied to every 48 square feet and (b) bringing about conditions unfavorable to rapid development. (White pine blister rust control is discussed in Lesson XIII.)

The loss of seed between the time of sowing and complete germination is almost entirely due to seed-eating rodents, (chipmunks, squirrels, mice, gophers, and moles.) All rubbish or other material which may afford nesting places and retreats for rodents should be kept away from the nursery. Birds are also harmful at germination time as they nip the seed while still attached to the tiny seedling.

Adverse weather conditions may cause drying out, sun scorch, winter killing, frost damage, and root rot. Sun scorch is most likely to occur in dense stands of 2-year seedlings in midsummer, when the ground is the driest and the loss of moisture is greatest. The leaves become straw-colored, finally deep brown, after which some of the trees die. Sun scorch is entirely prevented by thoroughly watering the beds during these dry periods. Winter killing can be prevented by protecting the nursery with windbreaks and mulching the beds. Frost damage may occur when seed beds are sown too late in the spring resulting in freezing of soft tissues in the fall before they have hardened sufficiently, or from fall sowing before all danger of fall germination is past. **Root rot** is caused by an excessive amount of water during the early growing season, particularly on heavy soil, and where irrigation is used. It can be avoided by improving the drainage.

PROPER METHOD OF PLANTING



A THOROUGH PREPARATION OF THE HOLE IS VERY ESSENTIAL. NOTE THE SIZE OF THE HOLE AND THE DEPTH TO WHICH THE GROUND HAS BEEN LOOSENED. THE HOLE IS OPENED SO THAT THE SMALL LATERAL ROOTS WILL NOT BE SQUEEZED TOGETHER, BUT WILL HAVE AMPLE ROOM FOR FORAGING. THE TREE IS PLACED IN THE CENTER OF THE HOLE WITH THE ROOT CROWN EVEN WITH THE SURFACE OF THE GROUND. LOOSE EARTH IS BRUSHED IN WITH THE HAND THEN TAMPED FIRMLY WITH THE HEEL. A LITTLE LOOSE DIRT IS THEN SPREAD OVER THE TOP TO SERVE AS A MULCH.

Digging seedlings and transplants requires a large amount of labor. However, a tree lifter is now used which runs a blade underneath the trees, loosening and lifting them so that it is very easy to remove them from the ground. They are then taken to the packing shed, where they are sorted, counted and made into bundles. With conifers 50 to 100 trees are put in a bundle. Hardwood seedlings often are so large that only 25 are placed in a bundle. It is sometimes necessary to keep stock over winter, after being lifted in the late fall. In this case three methods of storage are used: (a) heeling-in in the open, (b) heeling-in under cover, and (c) cold storage. Trees heeled-in are buried in moist soil to prevent the roots from becoming dry. Hardwood species can be completely covered with soil, but a portion of the tops of coniferous (evergreens) species must be exposed to the air, but not to direct sunlight. When heeled-in in the open, a trench is dug in loose, well drained soil. The plants are arranged at an angle of about 45°, in a thin layer against the wall of the trench and the earth packed against them. Heeling-in in the packing shed is done in a similar manner.

LESSON XI

PLANTING NURSERY TREES AND THE FOREST PLANTATION

The tools required in planting a considerable acreage of land, such as is being done by pulp and paper companies, and by the state and federal governments may be enumerated as follows: (a) tractor, (b) plow, (c) mattock, (d) spud, and (e) spade. For all uses a caterpillar type of tractor seems preferable. To serve to the best advantage under varied conditions the treads should be reasonably close, so that less difficulty will result in getting around stumps, trees and debris. The tractor should also have a reasonable clearance to avoid inconvenience in passing over stumps and stones. The rough usage to which a plow is subjected in plowing furrows necessitates a very strong construction. There are several so called new ground or brush plows which are adequate. The mattock is a strongly constructed hoe with a cutting blade over the hoe. (See fig. on page 17.) It is used where sod and brush removal with a plow is impractical. A spud is a tool having a sharp blade about four inches in width with a straight handle. When thrust into a light soil, it makes a suitable slit into which the young seedling may be planted. A long handled spade may also be used in a similar manner.

When practicable in planting forest trees the soil may be plowed as for any

Planting in wide, shallow furrows.

other crop. This, however, is only done in special cases, as in shelter belt planting, and in Christmas tree plantations. Wherever favorable, the preparation of land for reforestation is done by plowing wide furrows in which the trees are planted. These furrows should be at least 20 inches in width and as shallow as it is possible to plow. (See illustration on page 18.) This gives the trees a chance to establish themselves without competing with a thick mat of fibrous roots. The spot method of planting is used on areas too brushy and stony for plowing. In this method, the sod on an area 18 to 24 inches square is removed with a mattock to a depth of about 2 inches, and the young tree is planted in the center of this spot. It is well to loosen the ground with a mattock as deeply as possible before planting, especially in heavy soil. (See illustration on page 17.) The planting of young trees without any soil preparation is not advisable, because grass and shrub roots retard the early growth and cause loss of trees. The slit (spud) method of planting is usually used where trees are set in furrows or in sod scalped spots. The first thing to consider in a planting operation is the care of the young trees, from the moment they are lifted from the nursery beds or transplant rows to the time they are planted in the forest plantation. This is a critical time for them. The most serious danger is from drying out due to improper packing, long shipments, and exposure in planting. Trees should be bundled in small lots, and carefully wrapped in wet sphagnum moss for shipment. While carried in the field during the planting operation the roots must be kept in water or a wet burlap bag. After placing the young tree at the right depth (slightly deeper than in the nursery) earth is sraped with the foot or hand over the roots, and well **firmed down with hands or heel.** This is very important. (See illustration on page 17.) Loose earth or other material around the tree will serve as a mulch. Where labor is available cultivation of the young trees in windbreaks or Christmas tree plantations is desirable for the first few years. Wherever this is practiced, it has resulted in greatly increased growth. Spacing in a forest plantation is a term used to indicate the distance at which trees are planted from each other. In a 10′ x 10′ spacing there are 435 trees per acre. For general purposes a 6′ x 6′ spacing is good practice. This spacing requires 1209 trees to the acre.

In planting trees for commercial purposes, those trees should be recommended that are most needed, will produce volume rapidly and are suitable to the site. The most important conifers for this purpose are white and Norway pine and white and Norway spruce. As a rule the use of imported forest trees is not advisable, but where they have proven satisfactory for certain sites it is desirable to use them. Such imported species are the Norway spruce and the Scotch pine. The Norway spruce may not be superior to our native spruce but it has the ability to grow on drier sites and further south. The Scotch pine can grow on a very poor site, and therefore may be a tree desirable for our poorest areas. However, those planted so far are very crooked and much disposed to grow into branches, rather than bole wood. (See diagram page 21 for growth of these two species.)

LESSON XII
GROWTH OF FOREST PLANTATIONS

In twenty-five years Wisconsin forest plantations of white pine average 6.4 inches in diameter breast high; Norway pine 6.9 inches; Scotch pine 7.2 inches; and Norway spruce 4.7 inches. When the planted stands average four inches in diameter, merchantable material first begins to appear in the larger trees. A tree is considered merchantable for pulp when it is six inches or more in diameter breast high, and will make a pulp stick eigh feet in length and four inches in diameter at the top, inside bark. Merchantable timber begins to appear in a white pine plantation at about the age of 18 years, and in a Norway or Scotch pine plantation at about 17 years after these trees are set out. At the above ages these trees will average approximately 4 inches in diameter breast height.

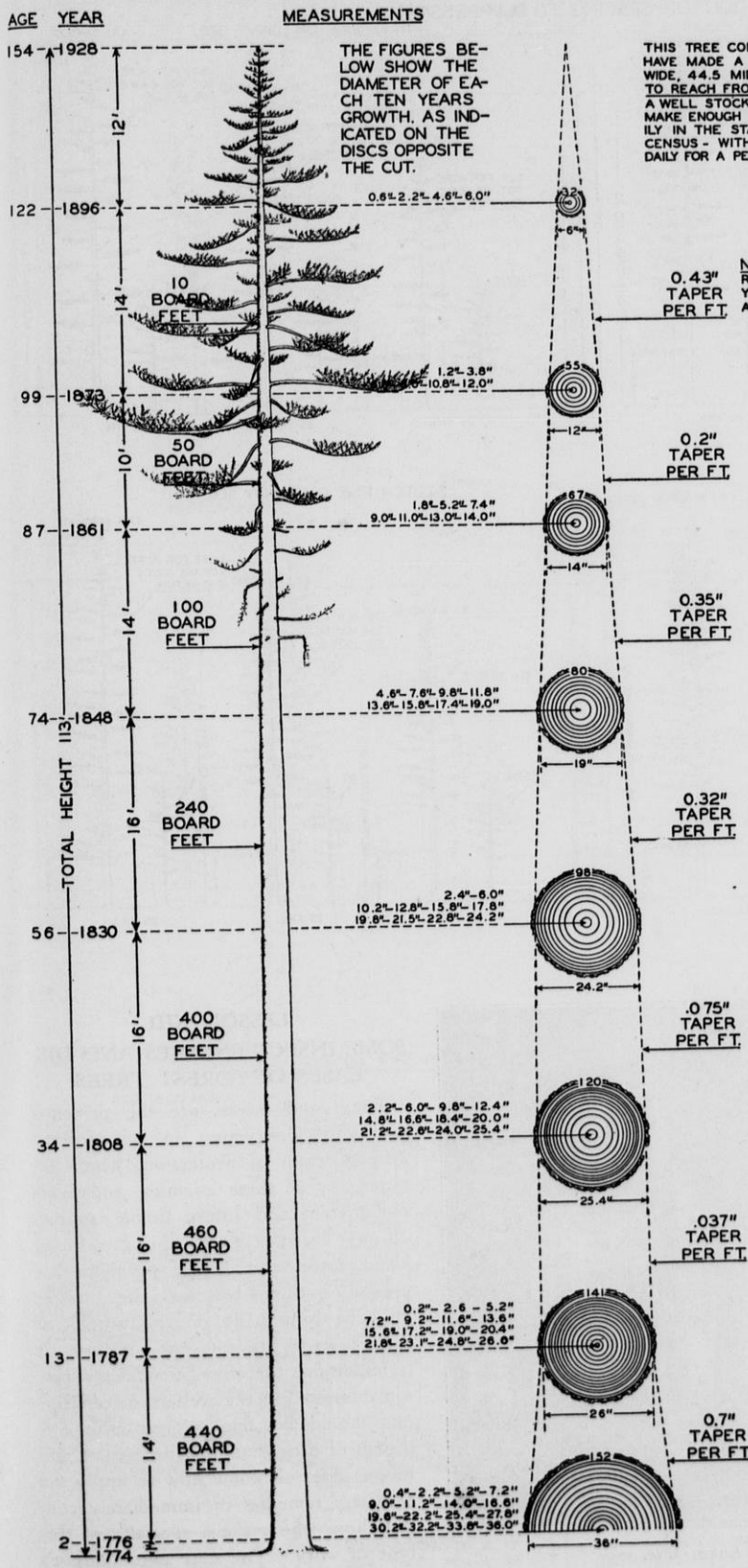
The following table shows the average height growth in feet for white, Norway and Scotch pine in 38 known forest plantations of Wisconsin up to an age of twenty-one years. (Study made in 1931 — see diagram on page 21. For the pines two years are deducted from "age from seed" for "plantation age.")

Age From Seed Years	*White Pine Height Feet*	*Norway Pine Height Feet*	*Scotch Pine Height Feet*
1	0.2	0.24	0.24
2	0.6	0.6	0.6
3	1.1	1.1	1.1
4	1.9	1.8	1.4
5	2.5	2.4	2.5
6	3.2	3.1	3.3
7	4.1	4.1	4.4
8	5.3	5.4	5.5
9	6.7	6.6	6.8
10	8.5	8.1	8.4
11	10.3	9.7	9.9
12	12.1	11.3	11.4
13	13.8	13.1	12.9
14	15.5	14.9	14.5
15	17.2	16.7	16.2
16	18.5	18.4	17.8
17	19.9	20.0	19.5
18	21.1	21.6	21.3
19	22.4	23.3	23.0
20	23.6	25.4	24.7
21	24.8	27.4	26.0

(Norway spruce does not grow as fast as the pines at first. After ten years in the plantation, Norway spruce is not much over 5 feet in height; at twenty-five years about thirty-eight feet, and at forty-five years, sixty feet. For spruce three or four years must be added to the "plantation age" to obtain "age from seed").

(See Forest Planting Handbook, pages 38-41). These same pine plantations show an average volume at twenty-five years, in fully stocked stands on sandy soils and all spacings, of approximately 30 cords to the acre.

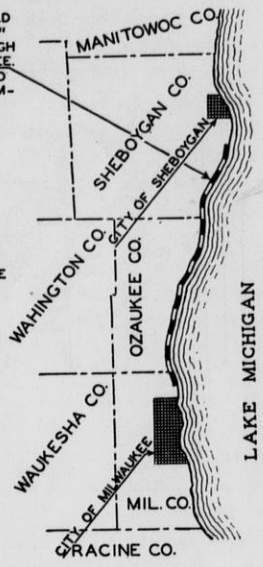
INFORMATION DERIVED FROM A COMPLETE STEM ANALYSIS.



NOTE – THE NUMBER ON THE RIM OF EACH DISC TELLS (IN YEARS) THE AGE OF THE TREE AT THAT POINT.

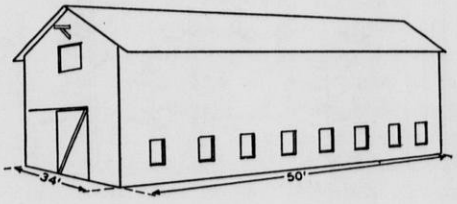
PULP WOOD

THIS TREE CONVERTED INTO PAPER WOULD HAVE MADE A STRIP OF NEWS PAPER 23" WIDE, 44.5 MILES LONG OR NEARLY ENOUGH TO REACH FROM SHEBOYGAN TO MILWAUKEE. A WELL STOCKED ACRE (44) TREES WOULD MAKE ENOUGH PAPER TO SUPPLY EACH FAMILY IN THE STATE OF WISCONSIN - 1930 CENSUS - WITH A TEN PAGE NEWS PAPER DAILY FOR A PERIOD OF 14 DAYS.

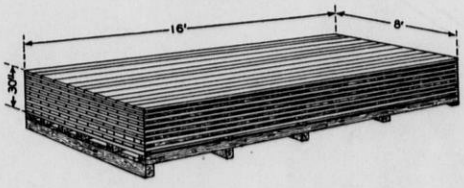


SHINGLES

IF THIS TREE HAD BEEN MADE INTO SHINGLES IT WOULD HAVE COVERED A BARN 34' X 50' (24.7 SQUARES OF SHINGLES)
ONE ACRE OF SUCH TREES WOULD COVER 44 BARNS OF THIS SIZE.

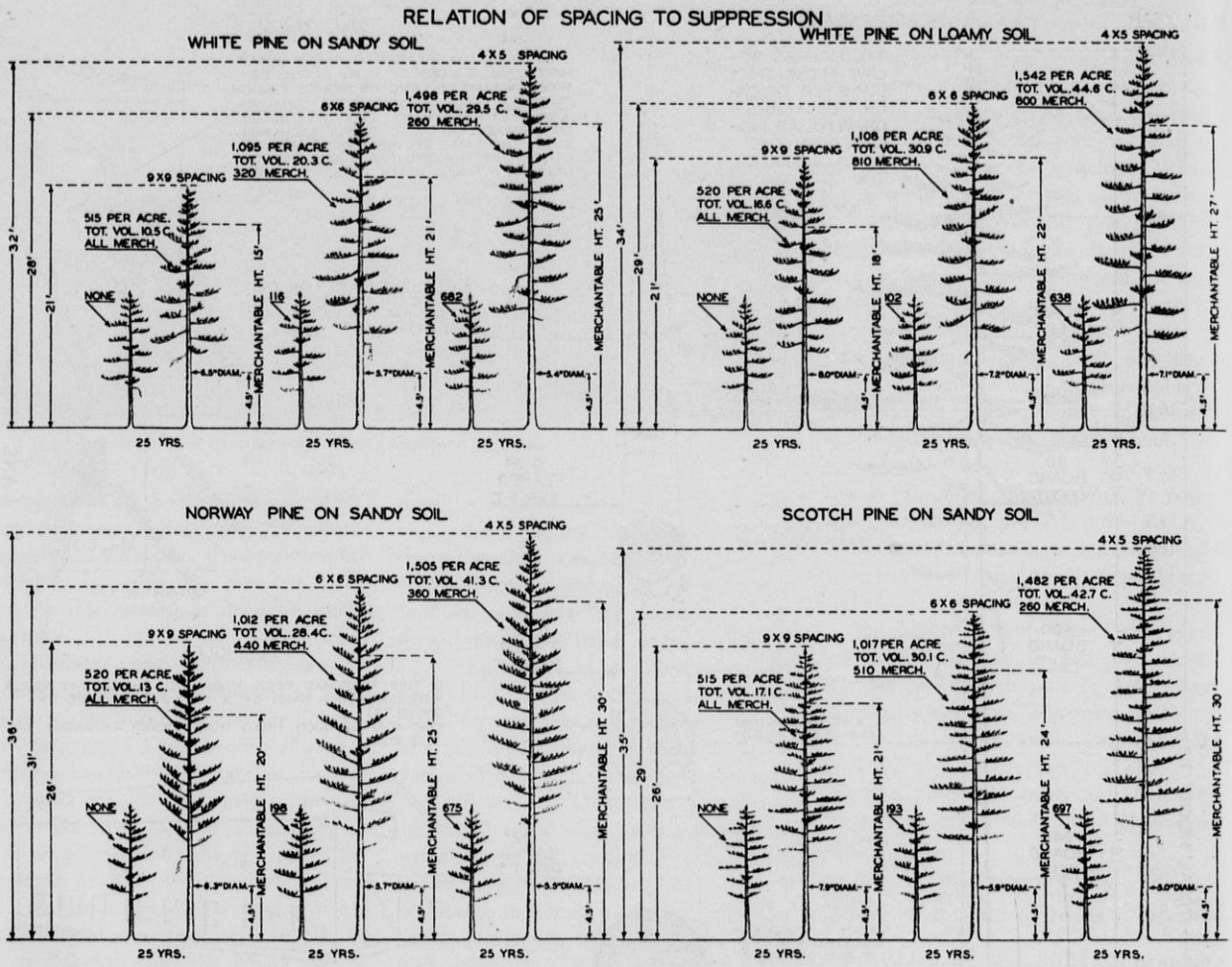


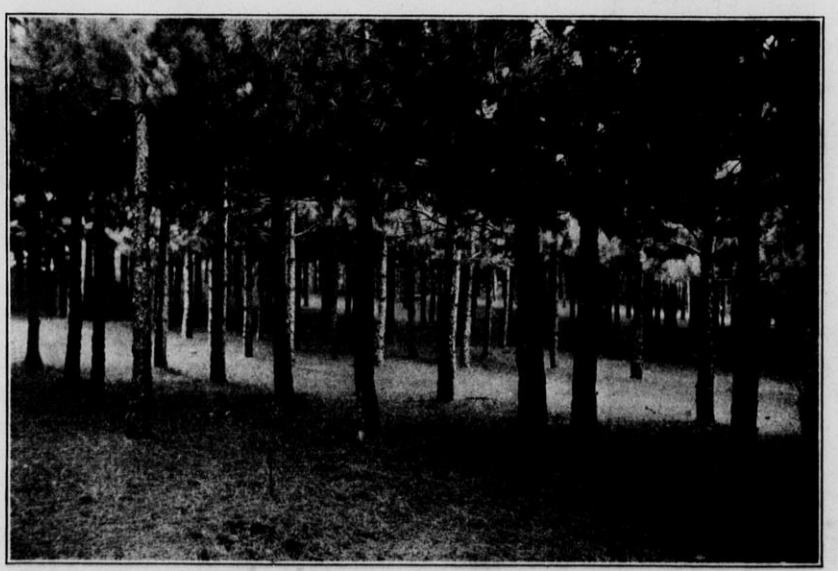
LUMBER



THIS TREE (AN AVERAGE WHITE PINE,) CUT IN VILAS CO. IN 1929, SCALED 1,700 BOARD FEET, WHEN SAWN INTO LUMBER IT MADE A STACK 8' WIDE, 16' LONG AND 30" HIGH.
THE COMMERCIAL VALUE OF THE TREE AS LUMBER AT $90.00 PER M. WAS $153.00.
THE VALUE OF A WELL STOCKED ACRE OF SIMILAR TREES, IN LUMBER FORM WOULD BE $6,732.00

VIRGIN WHITE PINE — THE FOLLOWING IS AN ACTUAL SCALE OF WHITE PINE TIMBER — BY FORTIES — CUT IN 1921 FROM SECTION 23, T. 45 N. R. 8 W. BY THE RUST-OWEN LBR. CO. OF DRUMMOND, BAYFIELD CO. WIS. N.W. N.W. 1,100,000 – N.E.N.W. 1,100,000 – S.W.N.W. 1,400,000 – S.E.N.W. 1,270,000-N.W.N.E. 2,800,000-N.E.N.E. 1,275,000 – S.W.N.E. 2,000,000 – S.E. N.E. 1,100,000 – N.W.S.W. 370,000 – N.E.S.W. 850,000 – S.W.S.W. 900,000 S.E.S.W. 500,000 – N.W.S.E. 1,500,000 – N.E.S.E. 1,975,000 – S.W.S.E. 1,300,000 – S.E.S.E. 1,800,000 — TOTAL 21,240,000 BOARD FT.





Norway Pine Plantation, Star Lake, Wis.

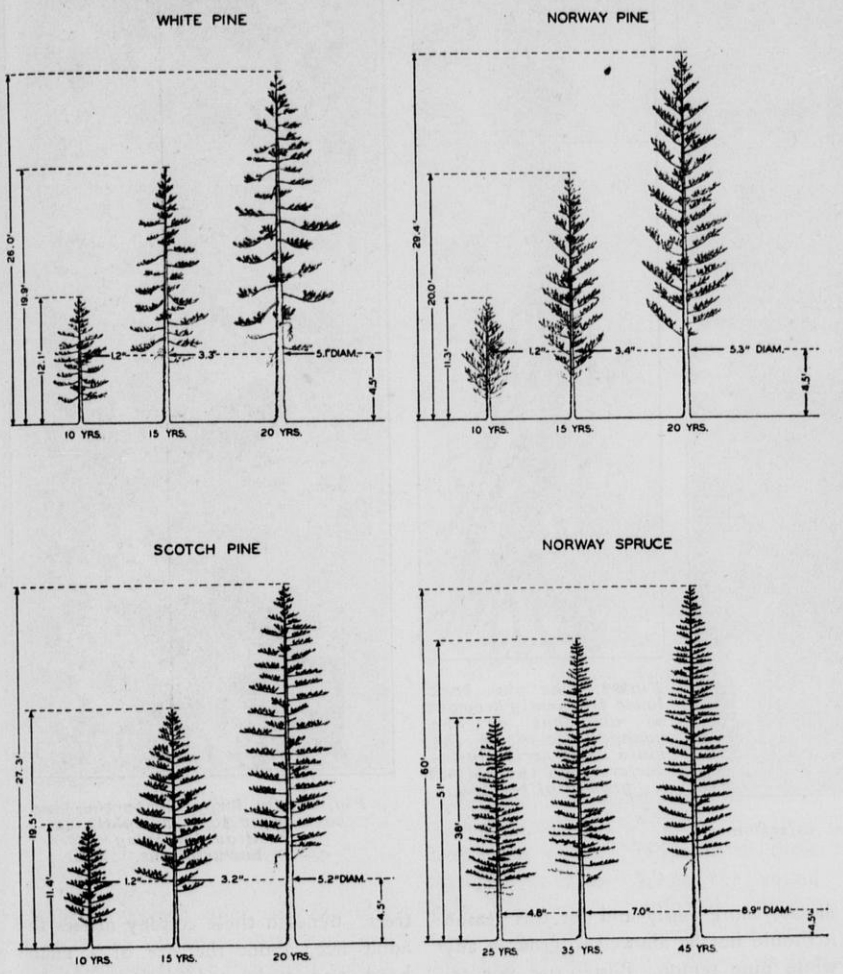
LESSON XIII

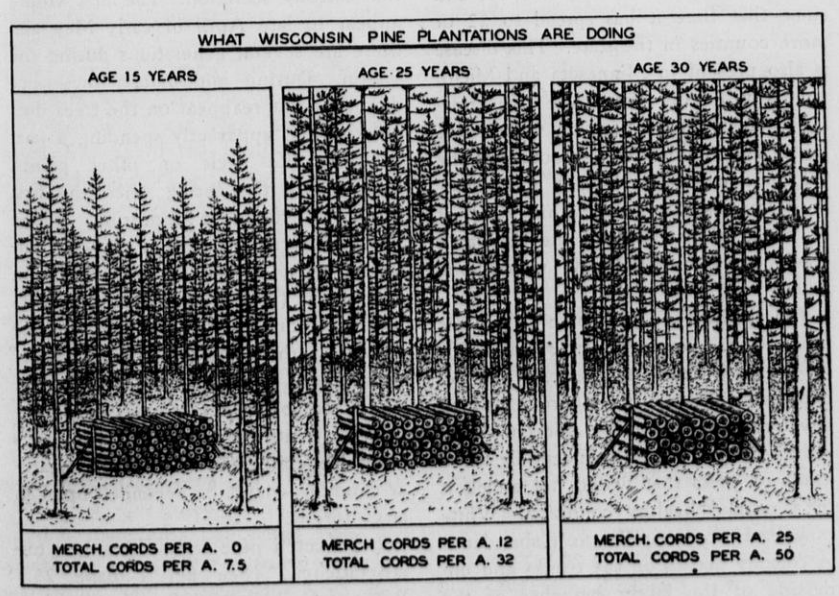
SOME INSECT ENEMIES AND DISEASES OF FOREST TREES

Fungi and insects are the principal agents of destruction in our forests. Any program of protection, which ignores any of these enemies, endangers our present and future timber supply. During every stage in the growth of wood, insect and disease problems are presenting themselves and the forester must be continually on the watch for these pests to prevent serious injury. It is important, therefore, that every person interested in the welfare of our forests should be able to recognize evidences of dangerous insect activities and fungus diseases; know how to apply the necessary remedies or immediately contact those who make a specialty of this type of work. The state entomologist's

— DIAGRAM SHOWING AGE, DIAMETER AND HEIGHT. —

THE FOLLOWING IS BASED ON A STUDY OF THE FOREST PLANTATIONS OF WISCONSIN. THE DIAMETER IS AT BREAST HEIGHT. (4.5') AGE MEANS PLANTATION AGE.





office in the different states will be glad to identify any insect pest or plant disease found doing injury in the forests and to prescribe methods for their control. In the limited space allotted to this subject in these lessons, it will be possible only to mention half a dozen of the more common pests encountered and to furnish briefly, methods of their control. These are: (1) White pine weevil (Pissodes strobi) (See figure 2 page 23). When the leaders or topmost shoots of young white pine trees wilt, turn brown or die, careful examination usually reveals small white grubs or worms within. These grubs or larvae are the young of a reddish brown beetle. This beetle is one-fourth of an inch long with a whitish spot on each side of the back near the posterior end. These beetles will be found on the sunny side of white pine shoots from which they have emerged or on which they are about to lay eggs. The egg laying occurs in the early spring, at which time most of the eggs are deposited on the leading shoots of pine, one egg being placed at a time at regular intervals throughout the length of the leader. The grub after hatching eats inward and obliquely downward into the pith. After it has fed here all summer it loses its worm-like appearance and passes through an inactive period known as the pupal stage. It passes the winter as a pupa, and with the coming of the spring emerges as a fully developed beetle. While the birds and certain insect enemies keep this pest in check, these alone can not be depended upon to protect young white pine stands. In limited ornamental plantings this pest can be controlled by pruning out and burning the injured shoots when they appear, and by spraying the remaining leaders with arsenate of lead, used at the rate of 1½ pound to 50 gallons of water or by dusting with calcium arsenate during the early part of May. White pine in mixed stands with hardwoods is usually not attacked by this insect. The planting of white pine in mixtures with other pines also has been found to discourage weevil attack.

(2) White Pine Blister Rust—(Cronartium ribicola) (See figure 1 page 22) — This disease is a fungus that lives on white pine trees and on the leaves of currant and gooseberry bushes. Ordinarily it does not kill the bushes, but it does kill the trees because it stops the flow of sap. Blister rust spreads by means of spores. These correspond to the seed of our more common plants and are carried about by the wind. For

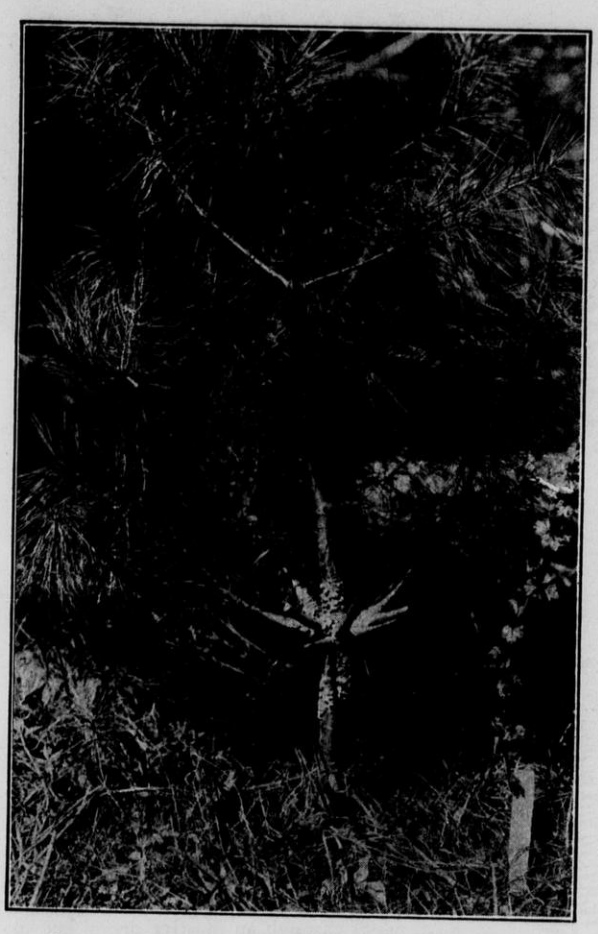


Fig. 1. White pine showing blister rust infection.

Fig. 2. The pine bark louse frequently becomes so abundant on the younger twigs of the pines as to seriously interfere with the normal growth of the tree.

Fig. 3. On larger limbs the pine bark louse form unsightly as well as damaging incrustations.

tunately the disease cannot spread from one pine directly to another pine but must pass from pine tree to a currant or gooseberry bush and then back to white pine. In early spring groups of orange-yellow blisters about the size of a pea, burst through the outer bark of infected white pine. These blisters can be seen on the trees in late April and during May. When they burst open the spores are scattered over the surrounding area. They will grow only when they fall on the leaves of a currant or gooseberry bush. During the remainder of the year no blisters are visible on the pine, but the fungus continues growing in the live bark as long as any bark remains. The next spring another group of blisters will appear and this will continue until the tree is eventually killed. During late spring, summer and autumn, until the leaves shed, infected currant and gooseberry leaves show orange-yellow rust spots on their under surface. The spore from these leaves is very short lived and therefore, will not live if carried far. This distance seldom exceeds 900 feet. The cultivated black currant is also susceptible. It takes the disease more easily and for this reason it should not be allowed to grow in any white pine region. Blister rust was accidentally brought from Europe on white pine trees purchased through an Illinois nursery. It was discovered in Wisconsin in Polk county in 1915, and since that time it has spread to 22 or more counties in the state. This disease is also present in Minnesota and Michigan as well as in other white pine growing states. Prevention of white pine blister rust requires the uprooting of the wild and cultivated currant and gooseberry bushes that grow within 900 feet of white pine trees and the cultivated black currants that grow within one mile.

(3) White Pine bark louse—(Adelges pinicorticis. (See figs. 2 and 3, page 22). A lousy white pine tree can not be expected to retain its vigorous growth any longer than a lousy chicken. With reduced vigor a tree is susceptible to all kinds of pests that would not attack it in a normal healthy condition. White pine bark lice occur in great abundance as cottony masses on the trunks and underside of the larger branches of the trees. Beneath these cottony masses the adult lice, about the size of a match head, and dusky reddish in color may be found. Some are winged and others wingless. The winter is spent by the partially developed female louse within this cottony secretion. The first young appear in late April or early May and there are several generations during the season. During mid-summer these lice disappear but reappear on the trees during the fall, apparently spending a part of their life cycle on other plants. Spraying in the spring when the first brood of young is appearing, is the most satisfactory time and the most effective spray consists of a combination of penetrol (1-200) and derrisol (1-400) mixed in equal parts. Nicotine sulphate (1-300) with potash fish oil soap or any strong soap solution, is also effective. These methods are, of course, only practical for treating a few trees. The pest's natural enemies and unfavorable weather conditions must be depended upon in large forests.

(4) Scotch pine scale—Lecanium numismaticum. (See fig. 1 page 23.) When jack pine and Scotch pine lose

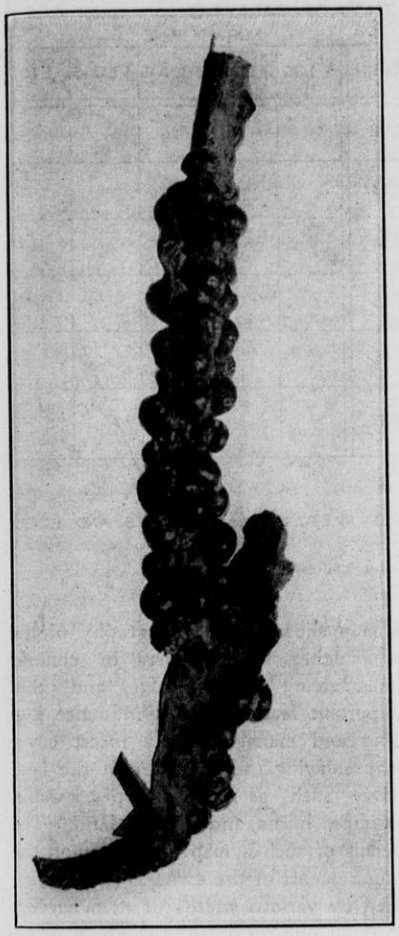


Fig. 1. Scotch pine scale.

Fig. 2. A portion of a tip of a white pine with the exit holes of the white pine weevil. An adult weevil is on the twig.

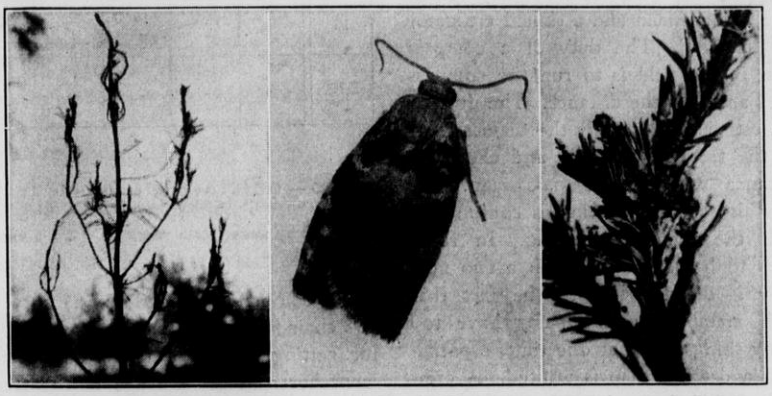


Fig. 3. The spruce bud worm. An enlarged view of the adult is shown in the center. On the left is a young white pine practically defoliated. On the right a larva is shown at work and also a pupa.

their healthy green color and the foliage assumes a yellowish-brown cast, and the bark appears to be covered with a black soot, close examination will likely reveal the presence of an insect in large numbers encrusted on the needles and twigs. This insect very probably is the Scotch pine or pine tortoise scale, obtaining its name from the fact that it is turtle-shaped, the outer covering being a scale or waxy secretion under which the soft-bodied insect lives. The scale is about the size of the head of an old fashioned match. The female scales winter over on the trees in a half grown condition while the male scales apparently emerge in the fall, their white cocoons being conspicuous on the infested branches at that time. The first crawlers, as the young scales are called, appear around the first week in June and hatching continues for about a month. These mite like forms crawl about and many are blown to other trees by the wind, or carried on the feet of birds.

(5) Jack pine rust—(Cronartum cerebrum). Jack pine like white pine is subject to a rust, but fortunately this one, while very conspicuous with its characteristic spindle-shaped swellings on the twigs, sometimes as large as a fist, is not generally distributed and causes no very great loss. A single tree may have from one to hundreds of these swellings or galls. When the young leafy branches are infected "witch's broom" growths are found. An alternate host of this fungus disease is the oak tree and the disease is sometimes spoken of as the oak rust. The leaves of many species of oak are affected by this rust. During the summer small yellowish or reddish postules are formed on the underside of the oak leaves. These postules are caused by the spores liberated from the galls on the jack pine. They in turn produce other spores, which again infect jack pine and also the Scotch pine. There is no practical control for this disease, other than removing the oak from valuable Scotch and jack pine stands.

(6) Spruce budworm — (Cacoecia fumiferana) (See fig. 3 page 23.) When spruce and balsam trees over a considerable area show browned tips during the latter part of June and July, appearing very much as though a light fire had run through the crowns, an inspection will likely disclose defoliation by an insect known as the spruce bud worm. In more advanced infestations the trees become covered with dead and dying twigs and frequently the whole top of the tree may be killed. The injury is done by the larva or worm. The adult of the spruce bud worm is a moth having a wing spread of about ¾ of an inch, and varying in color from gray to copper. The worms at first are pale yellowish-green in color with black heads and as they mature they assume a brownish color with black markings. The eggs are laid by the moth in late summer and these masses of from 10 to 30 eggs hatch in about a week into larvae which do no feeding until the following spring when they leave the web, just as the new growth appears. Three successive years of defoliation are sufficient to kill some balsam fir. Pure stands of spruce are for the most part exempt from budworm injury. In mixed stands containing a large proportion of balsam fir, spruce is also likely to be defoliated. Spruce as a rule is better able to recover from defoliation than balsam fir. Unfortunately trees thus weakened usually succumb to the attack of bark beetles and weevil. Dusting the foliage with calcium arsenate at the time the new growth is appearing in the spring, will give adequate control of the pest, and where the cost of airplane dusting of large forest areas is justified, it can be quickly and effectively applied by this method. Since this pest does not migrate great distances it usually eats itself out of house and home and

starves out after a limited tract of timber has been destroyed. In large tracts the natural insect parasites also become established in the course of several years and keep the pest under control.

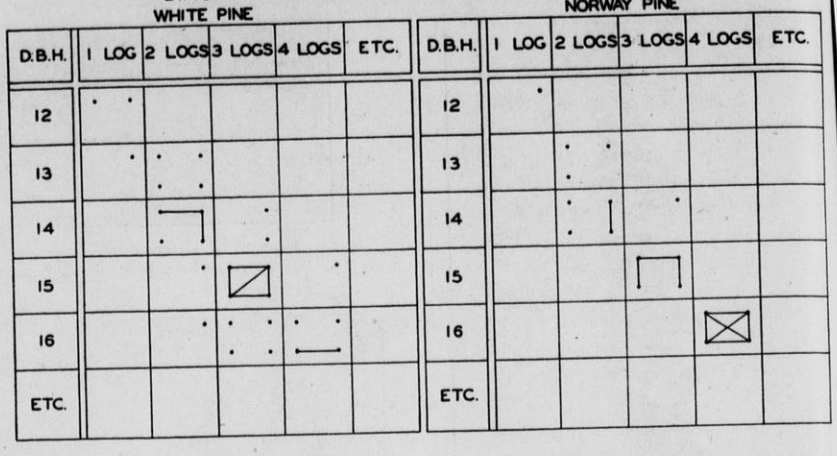
LESSON XIV

ESTIMATING TIMBER

Timber is usually estimated by running strips or by the sample plot method. When the strip method of estimating timber is used the crew may consist of a compassman and a skilled estimator or "cruiser". The duty of a compass man in the field is to run the compass lines and tally the distance. The duty of the estimator is to tally the diameters of all the trees in the strip and check on distance with the compass man. He may also do the mapping in conjunction with the timber estimating. In some cases timber estimating with a two man crew is difficult, due to the fact that both members of the party have too many things to do at one time, especially if a detailed map is wanted. A crew of four skilled men in such cases is used, members of which consist of a compassman, rear chain and tally man, and two caliper men or estimators. The compass man runs the line, carries the front end of the chain, records the distance and does the mapping. The rear chainman carries the rear end of the chain, checks the distance and tallies the trees, as their diameters are called to him by the caliper men. These two men work on opposite sides of the chain, and measure the diameters of the trees at breast height, on a given width of strip, usually one chain, i. e., one-half chain (33 feet) on both sides of the line travelled. When the strips are completed the total yield of the area is computed from volume tables showing the volume, usually in cubic or board feet, for individual trees of a given species and diameter. (Volume tables are made by complete measurements of felled trees and should, where possible, be made from trees in the region to be estimated. Yield tables show the yield of timber per acre, at different ages, and are made by an accurate measurement of many sample plots.) (See Graves Forest Mensuration page 323.)

The type of instruments used in timber estimating vary with the degree of accuracy required. For rough estimating, an ordinary box compass is adequate to run lines, but for more exact work where timber is of great commercial importance or where an accurate map is desired, either a prismatic or Forest Service type of compass should be used.

DIAGRAM SHOWING METHOD OF TALLYING



LEGEND — D.B.H. = DIAMETER BREAST HIGH (4.5'). 12 - 13 - 14 ETC. = INCHES (") DOTS AND LINES (⊠) = 10 TREES. . = 1 TREE. . . = 2 TREES. □ = 8 TREES ETC.

Other equipment needed is: (a) surveyor's chain, (b) calipers, (c) Abney level for getting height of trees, (d) increment borer to get the age of the trees where growth data is desired, and (e) tally sheets. Trees are tallied separately by species in inch classes using dots and lines in blocks of ten, as indicated on sample tally sheet page 24. The trees estimated may have one or more merchantable logs which should be tallied separately.

Another method of estimating timber is by sample plots. The plot is generally from one-fourth to one acre in size, and is carefully laid out and measured. (A one-fourth acre plot may be 150 feet by 72.6 feet or it may be circular with a radius of 59 feet. The trees in the plot are measured and tallied as in the strip system. In order to avoid calipering and tallying the same tree twice, each tree calipered is marked. When a sufficient number of average plots have been tallied, the average yield in material per acre can be determined by means of volume tables. A two man crew is adequate for sample plot estimating.

Though timber estimating may be undertaken for the sole purpose of determining the yield of the tract, running of numerous definitely located compass lines, affords the opportunity to collect a large amount of additional data required in the permanent management, and in the logging of the area. The collection of this additional data with the timber estimate, constitutes what is termed a forest survey. Even the crudest work of the timber cruisers embraces some elements of such a survey. The main features of such surveys are: a map showing the topography of the area either by hatchures or contour lines, giving streams, ridges and other important features which influence logging and management; a forest cover map showing the character of the land cover such as timber types, water, swamps, burns and barren land. The details of such a map depend upon the requirements of the owners. (Areas covered by various widths of strip surveys through one forty are: (a) For a width of ½ chain, one acre is covered. This is known as a 2½ per cent cruise and (b) For a width of one chain, 2 acres are covered. This is known as a 5 per cent cruise.)

A timber estimator familiar with what the various stands of timber will cut out, can tell the approximate per cent of stocking of a forest area by simply going through it. With this knowledge and a yield table for fully stocked stands, the yield of the stand in question can readily be computed in any market unit desired. Rule of thumb methods are frequently used. These are simple rules which can be memorized and by the use of which the approximate contents of the trees of any diameter and height may be computed by the cruiser without referring to tables. Some such rules are: (a) to obtain the cubic feet in any tree, multiply the basal area in square feet by the height and divide by two, (Fernow) and (b) to obtain the volume of a log, take the diameter of the small end in inches, deduct 4" and square the remainder. The result gives the board foot content for a 16 foot log.

Units of measurements and converting factors used in measuring timber are: (a) A cord is a unit of measure four

feet wide, four feet high, and eight feet long (128 cubic feet); (b) A cubic foot is a unit of measure having six faces all of which are one foot square, and (c) A board foot is a unit of measure one inch thick and one foot square. A cord of wood contains 128 cubic feet consisting of wood and air spaces. The actual solid content of wood in a cord varies from 51 to 102 cubic feet depending upon the size and shape of the sticks. A pile of wood having large sticks has a greater wood content than a pile having smaller sticks. A cord of pulpwood sticks having an average diameter of 8 inches contains about 75 cubic feet of solid wood. A general average often used is 90 cubic feet. If it were not for saw kerf and slabs every cubic foot of wood would have 12 board feet, but owing to this fact, this figure is usually reduced more than one-half. The converting factor of cubic feet is variable due to the difference in the size of the logs. With larger sizes up to a certain point, the converting factor becomes larger, that is, not such a large percentage of the log is used up in slabs. In a 6" log the converting factor is about 2½ board feet, and in a 36" log the converting factor is about 7 board feet. Five is commonly used as an average converting factor. The converting factor of cords to board feet varies from 300 to 600. This also depends on the size and shape of the sticks, i. e., the larger the sticks the more board foot volume per cord of wood. 500 is often used as the average number of board feet in a cord.

LESSON XV—FIRE CONTROL

Prevention is always better than cure, and this is especially true with forest fires. The best way to prevent large fires in our forests is to extinguish them when small. This necessitates an early spotting of fires, speed in getting to them and extreme care in their complete extinction. Fires should never be allowed to burn unguarded, no matter how safe the situation appears to be. Education of the public to the damage done by forest fires, and training in the proper handling of fire, whether forest camp fires, burning brush, smoking, or in the use of locomotives is important. General instruction in forestry in schools so that people may become forest minded and know the value of a forest is necessary.

Fire hazards are always dangerous and therefore they should be eliminated by keeping forests clean. Brush and other debris along roads and trails should be cleaned up. A large accumulation ot brush from logging operations has always been dangerous and this should be lopped, piled and burned. Fire hazards of dry grass in swamps and along roads should be eliminated by burning at a seasonable time, when fire can be controlled. Fire towers and airplanes are the eyes of the fire fighting organizations. From the towers fires are spotted and their direction telephoned to headquarters. The airplane is also useful in spotting fires and especially in reporting the headway a fire is making. They are also used to check the lay of the land, locating the best points at which to fight the fire, and to transport fire fighters and equipment.

Fire lines (also called lanes, fire breaks, and truck trails) are indispensible. We have not had experience enough in this country to agree on exactly what width they should be, their distance, etc. However, in forest plantations a fire lane of some size should be put around every forty acres. In France the fire breaks are 132 feet wide around the outer boundaries of the forest area, with a width of 33 feet between compartments within the area. It would seem advisable to have the fire breaks around each timbered forty at least 33 feet wide, with a 10 foot plowed strip in the center. This strip should be disced every year. (See "Studies in French Forestry" by Theodore S. Woolsey, Jr., Bul. 82 U. S. Forest Service Fire Manual Rocky Mountain District.) Fire lines can not always be constructed around forties by following cardinal directions, though where possible this is a practical thing to do. Other determining factors in the placing of fire lines are the locations of old roads and the topography. Strategic ridges that run through an area often decide the location of the fire line, especially where by such means good protection is given in the direction from which the prevailing winds blow. Rough topography creates irregular forest units having protective districts with natural boundaries as in a watershed. If the watershed is considered as the protective unit, fire lines should be constructed on the main ridges within the area and possibly along some of the stream bottoms.

LESSON XVI
FIGHTING THE FOREST FIRE

Essentials to be considered in providing fire fighting equipment for any specific regions are: topography, roads, nature of inflammable material and presence or absence of water. For example, there are areas inaccessible due to lack of roads and truck trails where trucks with water tanks, and even knapsack fire pumps can not be used to any advantage. Long handled shovels, axes, and mattocks would be far more useful under such conditions. The equipment whatever it may be, must be checked at freqeunt intervals and kept in a good state of repair. A thorough knowledge of fire hazards, the kind of forest cover, natural fire barriers, best means of reaching the fire, and the kinds of tools usable when the fire is reached are essential in fire fighting. It follows therefore that a well organized and efficient functioning fire prevention and fire fighting organization has much work to perform in those seasonal periods when there is no danger from fire, as well as in dry periods when the fire hazard is greatest.

Trucks used in fire control work are built with special bodies, divided into compartments for hand and power pumps, shovels, axes, mattocks, etc. Trucks can only be used where truck trails are fairly good. Hand pumps are exceptionally good equipment with which to extinguish small fires. They can be carried a reasonable distance. Keeping them filled and in first class working order is very important. Power pumps have an advantage over any other form of pump for forest fire fighting, wherever there is an abundance of water and where conditions are favorable for their transportation. As forests are improved and managed more intensively with a system of strategically located truck trails, larger power pumps may be used more and more effectively over ever increasing distances. There are a number of very efficient power pumps now in use. Many of these pumps can be carried by two men. When a water supply is available, the amount of hose will determine the distance at which it may be used. Some of these pumps will allow the use of several thousand feet of hose. One centrifugal pump weighs only 92 pounds, is capable of producing a pressure of 130 pounds per square inch and discharging 50 gallons of water per minute. This and similar pumps have been very successfully used in extinguishing peat fires.

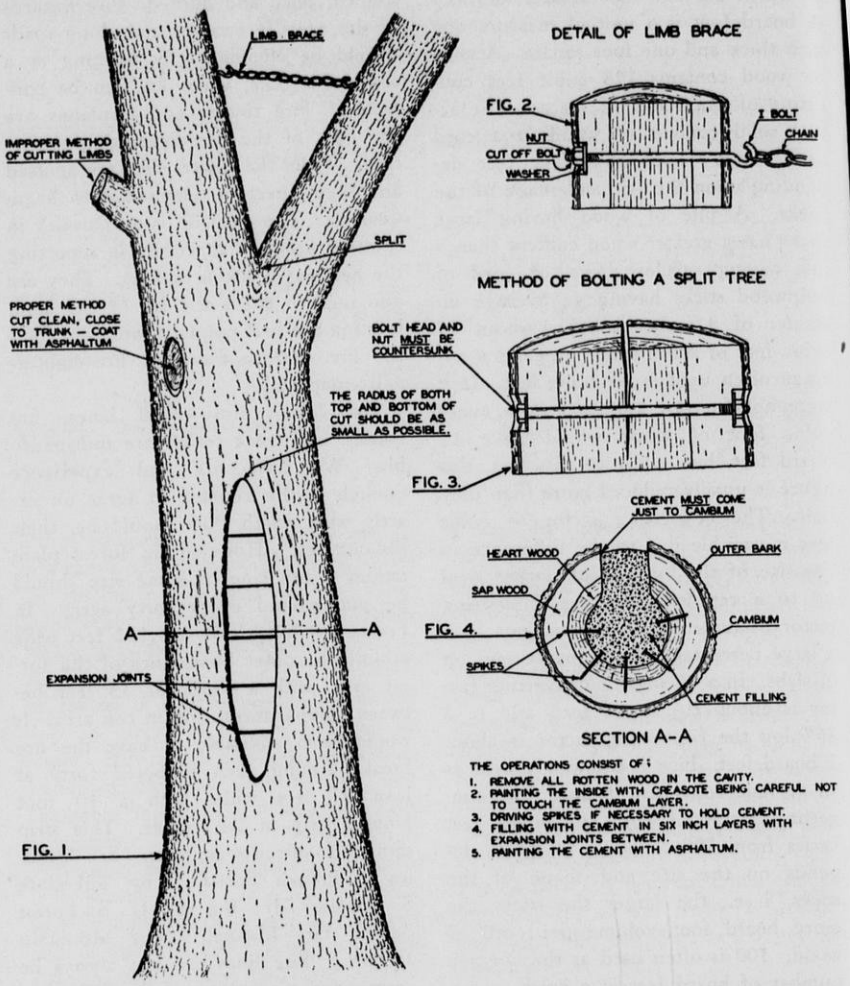
When a fire district is well organized, boxes known as caches are placed where they are easily accessible to the public. Where the people have been properly educated as to the value of forests and the need of quick action in case of fire, this equipment will not be molested. The equipment usually stored in such

caches are shovels, mattocks, axes, water buckets, cross cut saws, and in some cases hand pumps. Logically such caches should be located where fire hazards are greatest.

When fighting the fire where water is not available or where only a limited amount can be obtained, earth must be used. This means that a barrier free of all inflammable material must be prepared as quickly as possible to stop the spread of the fire. The construction of such a line is dependent upon the nature of the ground cover, and the amount of inflammable material. A tractor and plow, or team and plow may be used. There are, of course, areas on which plows can not be used, and here axes, brush hooks and saws may be required to remove the brush and larger debris. Men with mattocks then follow to cut a clean line exposing the mineral earth. Others with shovels must guard this line and stop the fire, as it comes up to the line. This is done by throwing the mineral earth on to the fire and smothering it. As a general thing when only a ground fire is burning, it will stop when it comes up to this line of mineral soil, but shovel men should always guard the hottest points because every precaution must be taken to keep the fire from crossing the line, and when it does, those on the line must extinguish it either with earth or by beating it out before it commences to spread. The location of a small fire line depends largely upon the nature of the fire and the rapidity at which the fire travels. Where the actual front is not very wide, a small fire line directly ahead of the path of the fire supported by heroic shovel men and where possible by men with knapsack pumps, may stop a very bad fire. Sometimes a fire will be too hot to stop it directly at the front. In that case it is necessary to work from either side as well up to the front, as possible and gradually close in on its farthest point of advance. The best time for fighting fire is early in the morning when humidity is greatest, the temperature lowest, and when there is little wind.

A backfire is used as a last resort, usually for the protection of a village or a camp site, or to save a valuable tract of timber. It should never be attempted by any one unfamiliar with the method, or with prevailing conditions, because a back fire often results in only adding to the intensity of the main fire. A back fire should be started from some base line, such as a road, fire line or body of water.

DIAGRAM SHOWING THE PROPER METHODS OF PRUNING, BRACING AND FILLING TREES



LESSON XVII—TREE SURGERY

Just as the dentist repairs cavities in the teeth, cleaning out and cutting the hole with chisels and drills, using antiseptics to prevent further decay and filling with cement or some other material to prevent moisture from getting into the cavity; so the tree surgeon performs a like operation in filling the cavity of a tree. Since this work requires care and time, tree surgery is more or less expensive and large operations should be performed only on those trees which have great beauty or sentimental value, such as valuable park and street trees, or trees on home grounds where the owner feels that the expense is justifiable. Long lived trees, such as the oaks, elms, and hard maples naturally have preference over short lived trees, such as soft maples, aspen (popple) and willows.

The equipment used by tree surgeons for cutting cavities and other repair work is as follows: gouges, chisels, a wooden mallet, a light extension ladder, a sharp knife, a light hand axe, a set of dies, vise, hacksaw, machine bolts, ropes, planks for scaffolds and a safety belt. Materials required are: creosote, asphaltum, shellac, cement, sand and gravel. Gouges and chisels should be in various sizes from one-half inch to two inches in width. A long handled gouge is required for a deep cavity. All the rotten wood in the cavity is first removed by the use of gouges and chisels until the remaining wood surrounding the cavity is quite sound. Sometimes with a long cavity, several holes are opened along the trunk of the tree so that the cavity can be cleaned easily without removing all the side of the tree. These holes must be kept as small as possible to admit of a thorough cleaning and should be elliptical in shape to permit the growing wood to cover over the ends of the filling more readily and thus make the cavity more nearly water proof. A square or round shaped hole

does not heal over so readily. (See figure 1 page 26.) After the cavity has been thoroughly cleaned out, it should be well painted with creosote to prevent further decay. The cambium must not be creosoted because creosote will kill the growing cells. It is a very good plan, however, to paint the sap wood, cambium, and edges of the bark with shellac, to prevent excessive drying. In large fillings spikes are sometimes driven into the walls of the cavity before the filling is placed. These spikes hold the concrete in place and give it something to tie to. This is especially useful where the cavity gets larger toward the outside, and has no good margin to hold concrete. (See figure 4 page 26.) This shows a cross section of the cavity. A good margin is shown in this particular filling. In large fillings, bracing with machine bolts through the tree is also resorted to at times. This greatly strengthens the tree and also holds the concrete in place. Concrete is the common material used for making the filling, though asphalt and wood may also be used. One part of Portland cement must be thoroughly mixed with three parts of sharp sand and placed in the cavity with a trowel. For a very large filling, a mixture of one part cement, two of sharp sand and three of gravel is often used. The gravel adds much to the strength of the concrete, and makes the filling much cheaper. If a long filling is being made, after it has reached the height of about six inches, it should be smoothed out on top, and a piece of tar paper or other suitable material placed on the top to separate it from the next six inch layer. By a series of layers placed in this manner in the filling, the filling gives slightly with the swaying of the tree and thus prevents breakage of the concrete. Referring again to figure 1 page 26 it can be seen how these expansion joints are arranged. As the concrete is placed in the cavity, it should be thoroughly tamped in. The outer layer of the filling is usually finished off with a mixture of one part of cement to two of sharp sand. The important part of the whole process of filling tree cavities is to bring the filling out just to the growing layer, so that the new wood can readily grow over it as shown in Fig. 4 page 26. If the cement is brought out beyond this point, more harm is often done than if the cavity had been left alone, because the new wood can not grow over the edge of the concrete, and decay may start around the filling. After the filling is in place, it is best to paint it carefully with asphalt paint, which will keep out moisture and prevent weathering.

Pruning shade and ornamental trees if not overdone is very desirable. Proper pruning of trees on streets, in parks and private grounds tends to increase an open view underneath the trees, improve their form, and stimulate their growth. Trees can be pruned satisfactorily at nearly all times of the year; the most unsatisfactory time being in the spring and early summer, when the sap is running freely and there is danger of the bark peeling. If the tree is in leaf it is easier to locate the dead and diseased branches and to determine which limbs should be removed. Many kinds of pruning saws are now on the market. It is essential to have several sizes for different branches. In removing a limb, the cut should always be made parallel and close to the parent limb or trunk of the tree. An undercut should first be made either close up to the trunk or parent limb or in removing a large heavy branch, out a few inches. Then the limb may be cut from the top close in and parallel to the trunk or parent limb. After cutting from the top to about the point of the undercut, the limb will break off without tearing or splitting, after which the small remaining stub can be cut clean. It is well to smooth the cut around the edges, and paint its surface carefully with asphalt paint. This surface must be painted more heavily in the center, as this portion has to go for the longest time before it is covered over by the growing layer. In case of a very large cut, it is well to repaint the surface every year or two, so that it can be kept completely free from decay. (See Fig. 1 page 26 for right and wrong methods.) It frequently happens that large limbs of valuable trees are broken by the wind or weakened by decay. It is often possible to save such a limb if taken in time by pulling it in place with a block and tackle and bolting and supporting it as shown in (Figs. 1, 2, and 3 page 26). Bands around the trunk or limbs should never be used, because they constrict the growth. There are many cases in which tree surgery should be employed. It must be borne in mind, however, that preventive measures against decay should have first consideration. Such methods are feeding, watering and spraying trees. Thrifty trees will not often need a doctor. (Reference—"Peet's Practical Tree Repair" and U. S. Dept. of Agriculture, Farmers' Bulletin 1178.)

LESSON XVIII
FORESTRY AND THE CITY

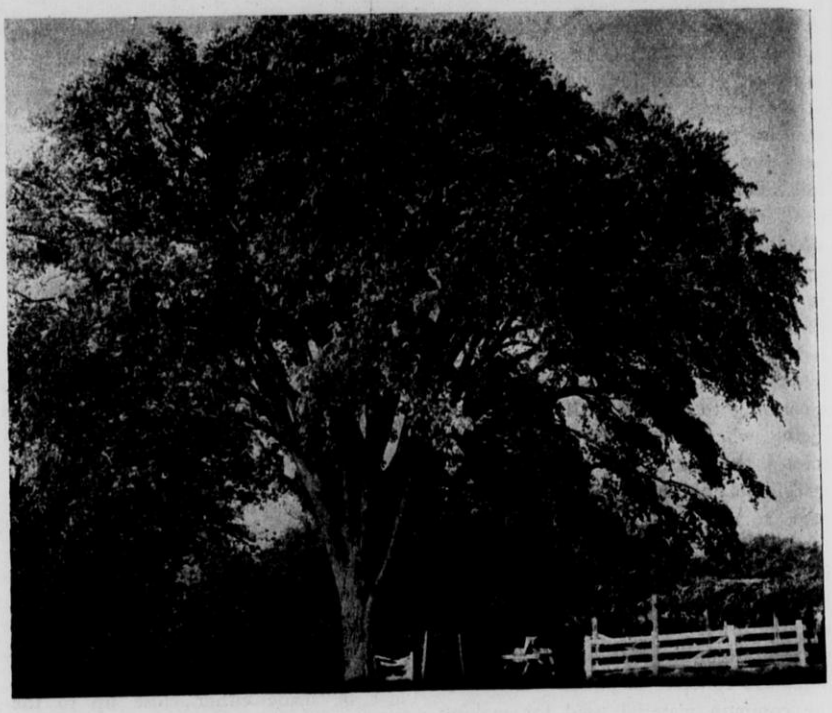
City forestry deals with the beautification of our cities, as compared with commercial forestry, which has to do with growing forests to produce wood. Well planted streets, parks and play grounds add much to the appearance, comfort and health of cities, and bring a touch of nature to these densely populated areas. The city forester must know about trees and landscape designing so that he can lay out attractive parks, park ways and play grounds. He must be able to properly arrange trees and shrubs so that they will add as much as possible to the beauty and value of property. It is a well known fact that property with beautiful trees or facing a well planted street is much more desirable. Trees along our streets and parks give shade in summer, and break the force of the wind at all times. People living in a community with beautiful trees usually have well kept lawns. "Show me the trees of a city, and I can tell you the character of the inhabitants," although not always infallible is very often true. There is no question but that the inspiration derived from a beautiful street or park will encourage civic pride, and be instrumental in character building.

A good tree for street and park planting must have a shapely crown and be attractive at all seasons. (See illustration on page 28.) Such a tree must be hardy, not too susceptible to insects and fungus disease, and able to endure city smoke. The elm, hard maple, and several varieties of oaks are good trees. The American elm is probably the best all around street tree for the Lake States. It is a tree of great beauty, withstands windstorms well, and is a fairly rapid grower, and its very finely divided branches give it a striking appearance even in winter. The vase and Moline type of American elm have an improved form and are varieties which are immune from most diseases and insect pests. The red oak grows rapidly and withstands windstorms well. The white oak is highly desirable for its beauty, fall coloring and longevity, but is a slow grower. The hard maple is a very fine street tree. It has beautiful fall coloring and a splendidly shaped crown. The Norway maple, though not a native tree, is a good street tree because of its shapely crown and rapid growth. The white ash is also a good street tree, but does not possess the grace and beauty of the elm. The hackberry does well as a street tree in the drier areas of the Lake

States. The basswood or linden is also very desirable on the better soils.

Evergreen trees are not used to a great extent as street trees because they can not endure the smoke and dust of the cities as well as hardwoods. They seem to prefer their own natural environment. In parks or along highways away from smoke and dust, evergreens may be used. Of course these trees would have to be planted where conditions of soil and moisture are favorable to their growth. A good sized tree for planting along the streets is one with a diameter of two to two and one-half inches at the base. When the larger trees such as those four inches in diameter or more are used, it is hard to get as good a root system. By planting a tree two inches in diameter with a good root system its roots will become established and though costing much less it will develop as fast as will a larger tree. Street trees for planting are usually obtained from nurseries, because a nursery grown tree, on account of its superior root system, is better than one taken from the woods. Nursery grown trees have had their roots pruned and this causes them to produce many small rootlets which are the feeders for the tree.

Street trees must be planted with great care. When a two or four inch tree is to be planted, it is customary, especially on poor soil, to dig a hole six feet in diameter, and three feet deep, and fill this hole with good top soil. Under these conditions the trees will usually grow rapidly, and be more free from disease and insect pests. When there is good soil along the parkway it is not necessary to dig so large a hole. Fertilizing with good, well-rotted barnyard manure is helpful, but the manure must be well mixed with the earth and not allowed to come in direct contact with the roots. Barnyard manure should never be used in evergreen plantings as it is too strong for evergreens, especially if used near the roots. Trees growing on very poor soil, especially where it is packed, should be cultivated as deeply as possible without injuring their roots. Fertilizing the top soil with well-rotted barnyard manure is also very beneficial. Large trees may be fertilized by digging a trench around the tree and three or four feet out from it. Trenches are then dug radiating out from the tree to the circular trench. Well-rotted manure is put in these trenches and soaks into the ground and feeds the tree. Improvement on an old tree can be noted usually in a very short time.



The stately elm.

Trees should be watched carefully, especially in the summer, for insect pests and fungus diseases, and as soon as any such are noted, they should be eradicated as quickly as possible. Spraying trees is the usual method of control. A few of the most common insect enemies of the important street trees are the tussock moth, bronze birch borer and scale insects, especially the cottony maple scale and the European elm scale. The tussock moth (see fig. 1 page 29) defoliates maples, basswood, and especially elm trees. In the spring and early summer, the caterpillars work on the leaves of the tree. They are conspicuous, striped lengthwise with yellow and brown. They have a red head and three long, black tufts or pencils of hair, two near the head, and one at the tail. They lay their eggs in the fall or late summer, and these eggs hatch in the spring. The egg masses are white in color and are covered with a frothy white substance. The total mass is about one-half inch in diameter. The egg masses can be removed by hand, or by long poles with forks attached. During the caterpillar stage the leaves should be sprayed with arsenate of lead as a control measure. The bronze birch borer (see fig. 2 page 29) has killed many of our birch trees and has become such a menace that it is considered unsafe to recommend planting birch, especially in the southern half of the Lake States. The adult borer is a slender bronze colored beetle about one-half inch in length. It lays its eggs in the bark of the upper branches. When the larvae hatch they tunnel into the bark and sapwood until finally the tree is girdled and killed. The only method of control is to cut and burn the infected parts. The cottony maple scale (see fig. 3 page 29) is destroying a great many of the soft maples and box elders in the south portion of the Lake States. The eggs are secreted in cotton like masses of wax under the scale, 1500 to 2000 eggs being laid by each female. These masses covered by a cottony wax like material are several times the size of the winter scale and quite conspicuous. The eggs hatch in June or July, and the young scales crawl to the underside of twigs and leaves where they suck the juices and remain permanently established. A dormant spray of lime sulphur just before the tree comes into leaf or summer spraying with nicotine solution, is recommended for their control. The elm canker has become quite a serious menace to many of the American elms. (See fig. 2 page 30.) Certain of the horticultural varieties, such as the vase type and Moline elm seem to be almost immune. The disease makes its appearance by wilting of the leaves on a twig or branch. The inside of the bark at the base of the limb is usually discolored, and this may continue down to the limb for several feet. Cutting out these dis-

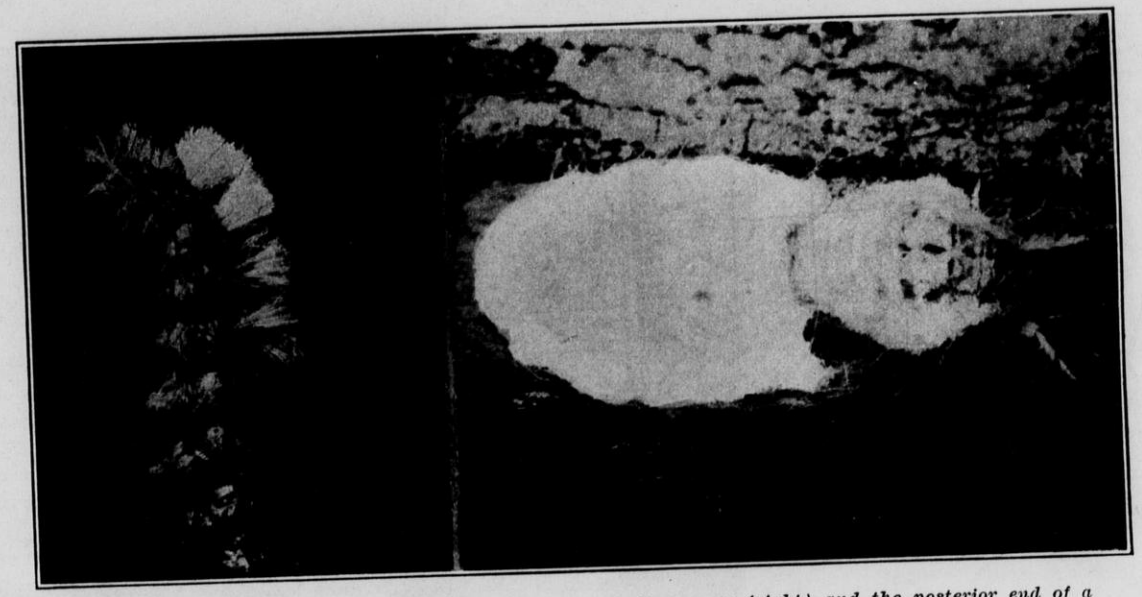


Fig. 1. A white marked tussock moth emerging from its cocoon (right) and the posterior end of a caterpillar showing the characteristic tufts of hair (left). Considerably enlarged.

eased limbs and burning is the only known control. Small trees affected should be grubbed out and burned. In cities, where box elder trees are common, the box elder bug (fig. 1 page 30) has become not only a pest to these trees but a nuisance to homes. As the box elder is an inferior tree, the best means of eliminating this pest is to remove the infested trees and replace with a more desirable species.

LESSON XIX
FORESTRY AND AGRICULTURE

In the past century the farm woodlot furnished the annual supply of fuel and fence posts. Cash income from the sale of logs was also not uncommon. Those settlers, who came from wooded regions of Europe were the most considerate of their woodlots. Few, however, managed their woodlots wisely. As animal husbandry replaced grain farming in the Lake States, woodlots became pasture and shade lots, and live stock browsing and tramping destroyed reproduction, and also the leaf mould of the woodlot. Years with prolonged dry periods have taken heavy toll of older trees in these opened and exposed areas. The drouths of the 1932-34 period killed 50% of the trees in some of the heavily pastured woodlots on dry sites.

Interest in the use and value of the farm woodlot is almost as recent as that in general forestry and wild life management. In fact the attention of the public has been centered on the need of farm forests by the recent erosion control work and the very excellent work done by extension foresters. Now millions of trees are furnished by state nurseries annually for farm planting. The percentage used in farm woodlots is not large but shelter belt and erosion control planting is now quite common and indicates that farmers are becoming forest minded. A study recently made by Purdue University of farm woodlots in Indiana should be of interest to farmers of the Lake States because conditions are similar. This study shows (see chart page 31) that under the practice of grazing farm woodlots, the

Fig. 2. The bronze birch borer and its work. The adult, on the left, is greatly enlarged. On the right the tunnels of the borer are shown as they appear after the bark is removed.

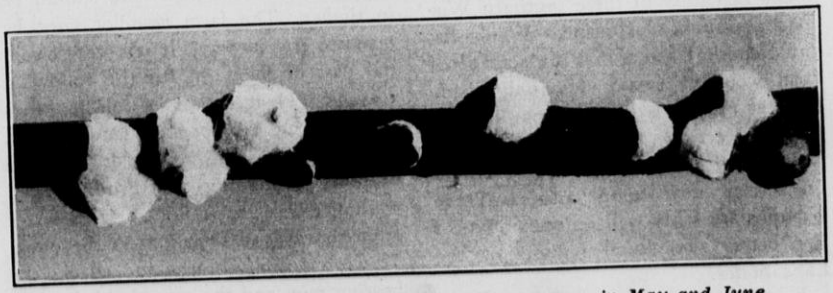


Fig. 3. Female cottony maple scales as they appear in May and June with the large cottony egg masses.

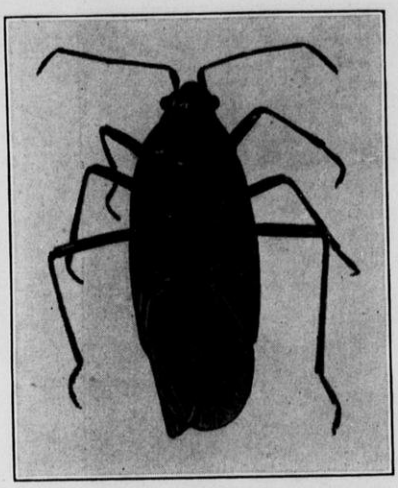


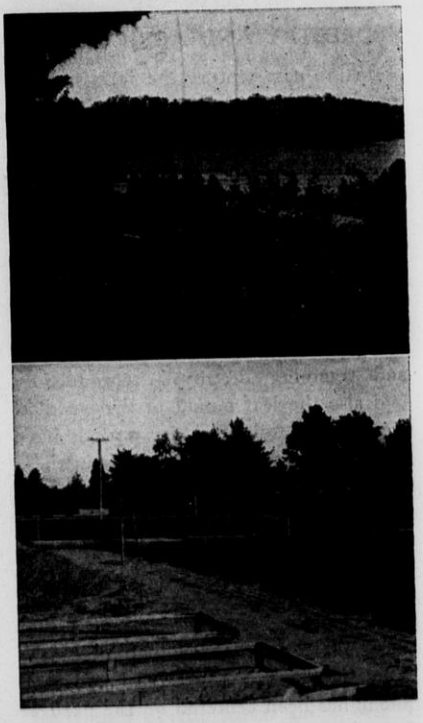
Fig. 1. Box elder bug (enlarged five times).

Fig. 2. The elm shown in this picture represents an advanced stage of elm canker. The larger limbs have been killed and the tree reduced to a bushy stump.

growth of forage plants is not sufficient to maintain animal weights over a period of six months; that the capacity of the farm woodlot to produce new timber is destroyed by the browsing, tramping, and breaking down of young tree growth, upon which the woodlot is dependant for permanent maintenance, and that the better forage plants are also destroyed by close grazing. Why should live stock be allowed to run in woodlots, if nothing is to be gained in animal returns and destruction of the woodlots is the inevitable? The answer might be that the area is needed for crop land. But this is not true, because millions of excess acres of potential plow land now exist and the remaining woodlots are usually on the rougher land ill adapted to farm crops. The disappearing farm woodlot means exposure of the soil to sun and wind, damage by erosion, and loss of the home fuel supply, fence posts and other wood products. (See illustration on page 32.) The land economic inventory of three southern Wisconsin counties (Racine, Waukesha, and Kenosha) shows that the acreage of farm woodlots (many now only shade lots) at present is but 10.4 per cent of the total acreage. 6.4 per cent of the woodlots of five years ago have been cut off and are now stump pasture. These counties are fairly well representative of the better agricultural regions of the Lake States.

Windbreak plantations of forest trees have been given much publicity since 1933 by the endeavor of the Federal Government to create a forest shelter belt from the Canadian frontier to the Rio Grande. This project will have an immeasurable value because all wind breaks reduce evaporation, conserve the top soil, and make living conditions more desirable.

With farming growing more intensive and only the best land on the farm being used for regular farm crops, the tendency is for more and more of the so-called marginal land, such as steep, stony or wet land, to be neglected and remain idle. A farm is not operated at its maximum efficiency, unless all its lands are producing to capacity, and therefore such marginal land should be in timber. The farm woodlot must be made to pay its way. It is a very essential part of the farm for the following reasons: (1) it conserves soil moisture not only on the forested land, but in adjacent open fields. (2) It prevents erosion by holding the ground from washing. The forest floor retards water from running off as fast as in the open. The forest itself absorbs and checks the beating rain, and the roots hold the soil. (3) It acts as a wind break and reduces evaporation. (4) It provides fuel, lumber, fence posts, poles, ties and pulp wood as well as maple sugar and other products. (5) It provides lucrative work for winter and late fall. (6) By utilizing the poorer lands it increases the farm's value. (7) It provides a refuge for



Above—Nurseries provide inspected stock for plantings.

Lower—A reforestation nursery in Wood county.

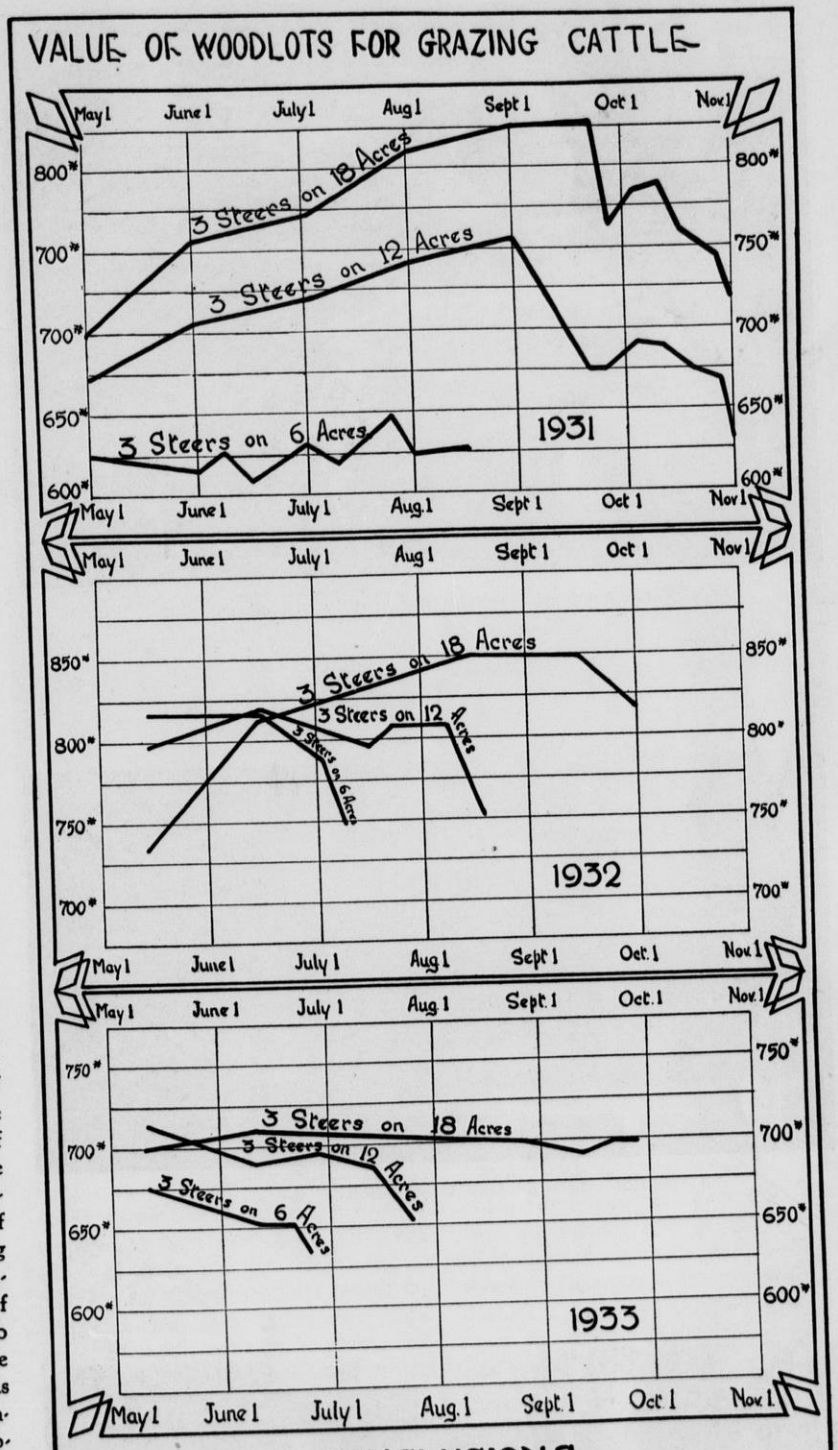
game, song birds and other forms of wild life. (8) It adds much to the beauty of the locality, and is valuable therefore for recreation.

One of the first things necessary in the proper care of a woodlot is a cleaning or improvement cutting. This consists of cutting out the defective and weed trees or those trees of inferior species that may be crowding the better ones. This cutting opens up the stand enough to give the remaining trees light and space that they may grow more rapidly. Steep slopes where erosion is liable to occur should never be cut clear. Large open spaces should be planted with young trees, and open stands underplanted with desirable shade tolerant species.

Managed Woodlots Now Exempt from Taxation

In order to promote the expansion of better woodlots, laws have recently been enacted, exempting them from taxation under certain restrictions. The new law in Wisconsin relating to woodlots, exempts the following type of land from taxation. (a) "Any woodlot or woodlots forming an integral even though detached part of any improved and regularly operated farm, and not exceeding one-fifth of the total area of such farm, if the same is enclosed with a legal fence sufficient to keep out horses, cattle, sheep, hogs, or other grazing animals." (b) "In addition to the land described in paragraph (a) any portion of a regularly operated farm, the slopes of which are of a gradient of more than thirty per cent, if the same is enclosed with a fence consisting of not less than three barbed wires and the owner refrains from cultivating or mowing such portion, grazing any type of livestock thereon, and from burning over such land or takes reasonable precaution to prevent such burning; and if the owner makes a reasonable effort to reforest such portion or to revegetate the same with grass or shrubs such as will prevent erosion or excessive runoff". In order to obtain such an exemption the owner will file with the town clerk a sketch of the property to be exempted, with a legal description of the same, certifying that the land will not be grazed, and that he will endeavor to practice forestry upon the land or otherwise revegetate with grass or shrubs the sloped portions liable to erosion.

The following table, taken from bulletin No. 148, Extension Service, University of Maine, (reprint from Farmers' Bulletin No. 1210) is of value in estimating timber in woodlots.

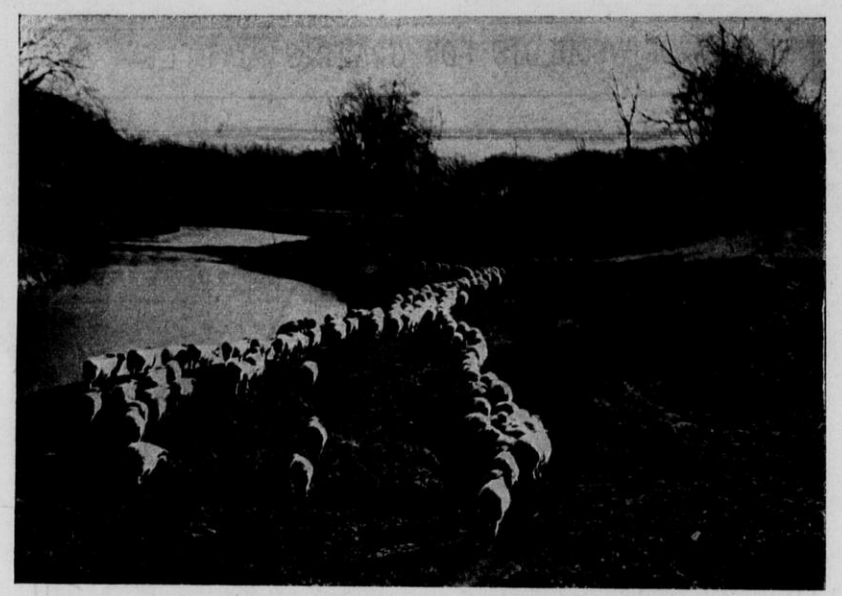


CONCLUSIONS

Under the practice of grazing farm woodlots:

1. The growth of forage plants alone is NOT sufficient to maintain animal weights over a six months' season.
2. The capacity of the woodlot to produce new timber is destroyed by the browsing, trampling and breaking down of young tree growth, upon which the woodlot is dependent for permanent maintenance.
3. The better forage plants are destroyed by the close grazing.

From Bulletin No 391 Purdue University - Lafayette Indiana.



Note the dead trees in this heavily grazed woodlot.

A woodlot where grazing is not allowed. Note contrast.

Veneer logs from an ungrazed farm woodlot.

LESSON XX

THE RELATION OF FORESTRY TO WILD LIFE

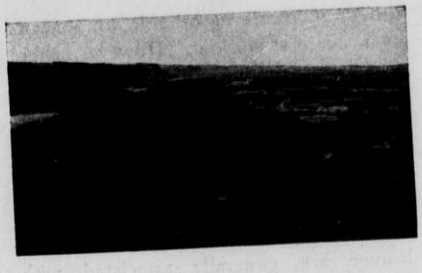
The management of fish, game, and fur-bearing animals is sometimes referred to as a specialized branch of forestry because an intelligent interest in wild life by the hunter, fisherman and lover of nature is important in the use and development of forest land for recreational purposes. The planless utilization of land by man in the past has often altered natural environment in a way harmful to fish and game. Sportsmen have also exacted a heavy toll of fish and game which conservation movements so far have restored with little success. In fact many species of game and fish are extinct or decreasing very rapidly and desirable hunting and fishing regions are still being reduced. Therefore, forestry in relation to wild life should receive more consideration.

Forest land in its relation to wild life may be classified as follows: (a) Upland forests, (b) Swamps, and (c) Lakes and streams. The upland forest areas have varied game conditions. The destruction of the virgin timber, and particularly destructive forest fires, have had a marked effect on wild life. Cut-over and burned over land lacks cover for deer and other game. Where a second growth of deciduous forest becomes established deer seem to again thrive very well. In fact some claim that second growth timber is more desirable for deer than the original stands. The old pine sites where the scattered jack pine scrub oak type of cover exists at present have least to offer for game. However, game tallies conducted by the Wisconsin Land Economic Inventory showed that sharptail grouse, and occasionally deer, frequent such areas. Stands of aspen (popple), white birch, and other hardwoods, often with an understory of spruce and balsam, as well as the few remaining stands of virgin timber, furnish desirable cover for deer and partridge. The black bear, though rare, are still

Wooded hills are beautiful and do not erode so freely.

Diameter of tree (Breast Height)	Number of Trees of Each Size Required to Yield			
	1 Cord		1000 feet of lumber	
	Hardwoods	Softwoods	Hardwoods	Softwoods
4	35			
5	20			
6	15	20		25
7	11	13		20
8	8	10	85	15
9	6	8	45	10
10	5	7	28	8
11	4	6	19	7
12	3.5	4.5	14	6
13	3.0	3.7	11	5
14	2.5	3.0	8	4
15	2.0	2.5	7	3.1
16	1.7	2.1	6	2.6
17	1.5	1.9	5	2.4
18	1.3	1.6	4	2.1
19	1.2	1.5	3.5	1.8
20	1.0	1.4	3.1	1.7
21	.9	1.2	2.7	1.6
22	.8	1.1	2.3	1.5
23	.7	1.0	2.0	
24				

Note: Softwoods and Hardwoods (beech, birch and maple) taken to four inches top diameter.



Wild life country along the Mississippi.

found in some forest regions. Predatory animals, particularly timber wolves, have been relentlessly hunted for their bounty and pelts and have become quite scarce. As a result the snowshoe rabbits, one of the main foods for wolves, are becoming very abundant. (As many as fifty pairs of the hind legs of the snowshoe rabbits in one pile, the remains of one wolf cache, have been found in early spring.) (The heavy, bristly fur on the hind legs of these rabbits is probably the reason they were left.) An over population of rabbits has already caused considerable damage to newly planted white pine and other conifers. However, if wolves become too abundant, deer would suffer. This shows that predatory animals have a part to play in maintaining a balanced wild-life condition. A better understanding of predators in relation to game can be acquired by reading Aldo Leopold's recent book, "Game Management", particularly Chapter X on "Predator Control".

Swamps also have diversified types of game environment. Pure and mixed stands of cedar, balsam, spruce, and tamarack offer necessary brousing and shelter for deer during the winter, and forests particularly of the black ash type are suitable for partridge. Often open swamps are divided into two groups with reference to game conditions, bog swamps where leather leaf and other heath plants are predominant, and marshes with wire grass, coarse sedges, and blue-joint grass mixed with willows. The bog type of flora has little to offer to wild life, but marsh areas are much frequented by different species of game. Prairie chickens are particularly fond of the blue-joint willow type of marsh. These fine birds (see illustration on page

33) originally inhabited the extensive prairies where corn, wheat and dairy products are now produced. The plow and the gun have forced surviving prairie chickens to seek a different environment,—that of the blue-joint willow marsh type. The late Mr. F. Schmidt, specialist on upland game birds, says that these birds could fittingly be called marsh chickens in the Lake States. Unfortunately for prairie chickens, marshes of the willow blue-joint type have or are supposed to have agricultural value and efforts to drain and use marsh areas of this type for agriculture have caused the prairie chicken to abandon even these sites. However, attempts to utilize this kind of swamp land for farming has proven generally unsuccessful. The natural adaptation of these areas makes them more desirable for game and state and federal agencies are beginning to use them for wild life refuges.

Other game and fur-bearing animals which frequent these marsh areas, particularly when bordering open waters, are ducks and muskrats. Though the drainage of such marshes particularly in central Wisconsin destroyed these regions for waterfowl, damming drainage ditches is restoring the former condition. The marsh flora readily responds to this restoration of a wet condition, but aquatic plants that serve as duck foods are slow to come back, and the planting of these plants, particularly: (a) the pondweeds commonly known as bass weeds or fish weeds; (b) the rosette clustered flexuous ribbon leaved wild celery; (c) the bristled thread leaved coontail, and (d) the yellow water lily, is recommended for the improvement of waterfowl environment in these marshes.

Wild rice is another aquatic plant which should be planted where conditions are suitable since it is one of the most useful duck foods. No other plant seems to have such an attraction for ducks. It furnishes excellent cover for them and other waterfowl. The seed of wild rice is also a much sought for food. Wild rice to be grown successfully requires: (a) a constant water level during its growing season (late spring and summer), (b) an exchange of water due to drainage, (c) a medium to alkaline water, and (d) shallow water having a bottom soil of somewhat broken down peat or muck or a layer of decayed plant life over sand. It will not grow where water levels rise or drop suddenly. Since muskrat are very fond of wild rice and often destroy initial efforts of this plant to establish itself, they should not be too numerous where rice is desired. In those places where it is already well estab-

lished, it seems to be able to hold its own against muskrat. However, there are places where an over population of muskrat is gradually reducing the wild rice beds.

Streams and lakes furnish suitable habitats for fur-bearing animals, waterfowl and fish. Valuable fur-bearing animals mainly muskrat, mink, otter and beaver are generally associated with streams. The most common of these are muskrat. They are often abundant in flowages and stream areas adjoining marsh lands. These animals are very prolific and under favorable conditions multiply rapidly. (See illustration on page 34.) Their food consists mainly of marsh and aquatic plants, and also of clams. The otter and mink are flesh eaters. The otter, now quite rare, is a fisherman, and the mink, which is more common, kills and eats fish, muskrat, ducks, and other forms of animal life.

Beaver deserve special consideration because of their relation to waterfowl and fish life. Protection of beaver has resulted in a considerable increase of their number. These animals live on the bark of trees, principally that of aspen (popple) and also of willow, birch, and tag alder. Beaver dams cause flowages and partial stagnation of water, which kills spruce, cedar, balsam and other trees within the flowages. Tamarack can stand the varied water level due to beaver activities. For this reason there are streams running through swamps where tamarack are the only trees to be found. These open water swamps of beaver flowages are desirable for waterfowl, and the mallard and black duck find this type of habitat suitable for nesting. The effect of beaver dams on trout streams is usually harmful. In most beaver flowages the water becomes too warm, and the excessive decay of vegetation uses the oxygen in the water. This change of conditions makes the water unfavorable for trout. Many trout streams in the Lake States have been at least temporarily ruined by beaver dams. However, there are examples where beaver activity is not unfavorable to trout. Spring fed streams that have considerable fall are not materially affected by beaver dams. Ducks, chiefly mallard, black duck, and blue winged teal find suitable nesting grounds along the more secluded streams of the upper Lake States. The wood duck, one of the most beautiful members of the duck family, also finds the wooded stream to its liking. This unusual bird is protected by a closed season the year round.

The cutting of the virgin timber has also been harmful to fish, because forest cover serves as a regulator of stream flow and reduces excessive evaporation. Under present conditions the water level of the streams in denuded forest regions fluctuates and considerable sediment is washed down in flood time. Water plants and other intermediate forms of life which are directly and indirectly used by game fish for food have also suffered from this change. The conservation and development of new forests will again materially improve streams for fish and game. This is especially true of the streams where the waters are kept cool by seepage and springs, a condition which makes them suitable for brook and speckled trout.

Typical muskrat environment.

Stream improvement work such as is carried on by the State Emergency Conservation Service of the Lake States is also a very effective means of improving trout streams. This work consists primarily of placing water deflectors and small dams in streams in order to hasten the current, aerate the water, make deep pools and improve stream bottoms. Water temperatures and aeration is important in determining what species of trout may be successfully planted and propagated in these streams. For example brook or speckled trout require streams where the water in deep pools does not rise above 68 to 70° F. Rainbow trout, introduced from the West, are found in streams of higher temperatures particularly if the water is well aerated by ripples and rapids. The brown trout introduced from Europe, can live in still warmer streams. Some of the literature written on trout, states that brown and rainbow trout are harmful to brook trout. It is true that these trout now inhabit streams that were originally brook trout waters, but it must not be forgotten that removal of forests has changed many of these streams and that they do not now have desirable environment for brook trout. Mr. Sid Gordon, working on stream improvement in Wisconsin, believes that the brook trout will hold its own under suitable conditions. Stream studies made by the Wisconsin Land Economic Inventory tend to verify Mr. Gordon's conclusion. For example—there are streams where brown and rainbow trout are caught, that have colder stream feeders inhabited by brook trout, but brown and rainbow trout are rarely caught in these stream feeders. (Such a stream is the Namakagon River of Wisconsin.)

LESSON XXI

FORESTS AND LAKES

The importance of a forest cover in a lake region can not be over emphasized, because it makes the lake region more attractive for game, and lessens the evaporation of water, thus increasing the supply for lakes. This is particularly true in sandy regions, where many lakes have dried up entirely. The thousands of lakes remaining in Minnesota, Wisconsin and Michigan offer a variety of environments for fish and game. The shores of these lakes provide habitats suitable for the different animals already mentioned. Observation of ducks on lakes indicate that the presence of cover, such as sedges, rushes and wild rice is as important for attracting ducks as is food. Some aquatic plants such as wild rice furnish both food and protection. Many lakes possessing abundant duck foods, such as the numerous pond weeds are not good duck lakes because these plants do not furnish the necessary cover.

The cause of this difference in lakes is directly associated with such factors as the hardness and softness of water. Lakes surveyed by the Wisconsin Land Economic Inventory have been classified as having very soft, soft, medium, medium hard, and hard water. In the

very soft and soft water lakes there is usually a lack of necessary mineral nutrients required for a desirable aquatic plant growth and corresponding animal life. These lakes are generally clear and have no drainage. Lakes of higher lime content have the essential mineral nutrients and contain a great variety of plant life.

The aquatic vegetation of lakes as correlated with the hardness and softness of water may be divided into the following types: (a) "The Short, Stiff Stem, Leaf or Rosette Type" (Fig. 1 page 35) characterized by such inconspicuous plants as the needle rush and quillwort, which sometimes form grass like mats on the lake bottom; (b) "The Pad and Ribbon Type" (Fig. 2 page 35), represented by the water lilies and wild celery, the latter a rosette long ribbon leaved plant that is desirable for fish and also an excellent food for diving ducks; (c) "The Upright Emersed Type" (Fig. 3 page 35), such as wapato, wild rice, and bullrushes which are more conspicuous because they extend upright out of the water; (d) "The Long Lax Stem and Leaf Type". (Fig. 4 page 36) such as pondweeds which are of particular value to fish. These pondweeds are usually not found in the soft water lakes. They are very important because of the interdependence that exists between them and animal life. Minute animals, such as snails and water insects, seek food and shelter on these plants. These small herbivorous animals in their turn are eaten by carnivorous animals, such as minnows, frequently termed forage fish, which in turn become the food of game fish. These long, lax plants can be grouped with relation to fish environment as follows: (1) The broad leaved pondweeds which are the most conspicuous plants of this long, lax type. Fishermen frequently speak of one of these as "muskie" weed. The muskie weed (Fig. 5 page 36) is a flexuous stemmed plant with broad, submerged leaves and a small flower or seed bearing spike that protrudes upright out of the water. The distinctive feature that separates the muskie weed from other broad leaved pondweeds is the boat-shaped leaf tip. Beds of this plant have been observed to be the favorite feeding ground for muskellunge. This does not mean that if muskie weeds are found in a lake, that muskellunge are present, but rather, that in "muskie" waters this giant fish is often found among the weed beds of this plant. (2) The leafy pond weed (Fig. 6 page 36) is typical of those pondweeds with submerged ribbon leaves. This plant has a flexuous, round stem and lax submerged leaves about one-eighth to three-eighths of an inch in width. The characteristic that separates the leafy pondweed from other ribbon leaved pondweeds is the smooth, slippery nature of its delicate ribbon leaves. This plant also often has spatulate floating leaves. (3) The third and last division of these pondweeds has narrower threadlike leaves. These pondweeds are usually less conspicuous than the other groups. The best known of these is the sago pondweed (Fig. 7 page

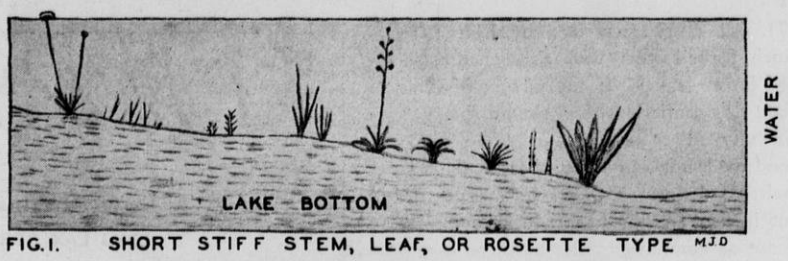
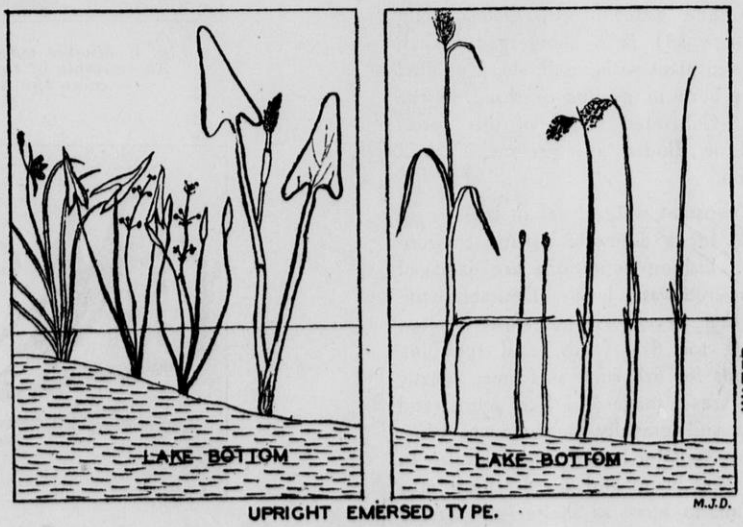


FIG. 1. SHORT STIFF STEM, LEAF, OR ROSETTE TYPE MJD

Fig. 1. Short stiff stem, leaf, or rosette type.

Fig. 2. The pad and ribbon type.



UPRIGHT EMERSED TYPE. M.J.D.

Fig. 3. Upright emersed type.

37). It is characterized by having a much forked stem with somewhat bristled linear leaves. If the picture of this plant is studied, there should be no difficulty in recognizing it. The sago pondweed not only furnishes food and shelter for various forms of water life, but is also an important duck food. It is not as common in the northern lakes as in lakes further south. It is, however, often quite abundant in northern lakes of high lime content, such as lakes with a marl bottom.

Another lax type of plants that are not botanically known as pondweeds, is the flexuous stemmed compound leaf group. Of this group, the bristly leaved coontail is a good example (Fig. 8 page 37); the pinnated thread leaved water milfoils (Fig. 9 page 38). The common bladderwort, that has tiny sacs attached to the leaves which trap minute water animals, and the foul smelling muskgrass also known as Chara or stonewort are other examples. The last named plant is one of the most important fish plants. The other long, lax plants are not classified. The most conspicuous of these plants are the water smartweed and the waterweed. The water smartweed has much in common with the various smartweeds of our fields. It has a pink spiked flower, and floating leaves that become a bright maroon in the late summer and early fall. The water-weed, Elodea (Fig. 10 page 38) is a submerged branch stemmed plant with small, sharp pointed leaves born in groups of three on the stem. Cultivated forms of this waterweed or Elodea are present in most aquaria.

A constant water level in lakes is essential for a desirable aquatic environment. Fishing conditions are damaged by lowered water levels. Desirable habitats that serve as waterfowl shelter, harbor for fish foods, and spawning grounds for fish such as former aquatic plant areas, snags and like debris, and sandy and gravelly bottoms are often left exposed by lowered waterlevels. In such lakes brush and wood refuges may be sunk to serve as shelter and harbor for fish and fish foods.

Most of the landlocked lakes, particularly those with sandy beaches, have clear and very soft water. This means that the turbidity of this soft water is low, and that the sunlight can penetrate to greater depths. This makes it possible for aquatic plants to grow in deeper water. Consequently, the zone of aquatic plant and corresponding animal life is wider in such lakes than it would be if the turbidity of the water is high. However, in many clear water lakes, there is a sparse growth of plant life, and other forms of life are relatively scarce, due to the lack of essential mineral nutrients necessary for plants. Stained or turbid water of lakes is due chiefly to organic matter held in suspension and in solution. In turbid water lakes, plants are found only in the shallow waters, since enough light does not penetrate the deeper water. During the summer, some lakes "bloom" or become green due to the abundance of microscopic plants known as phytoplankton.

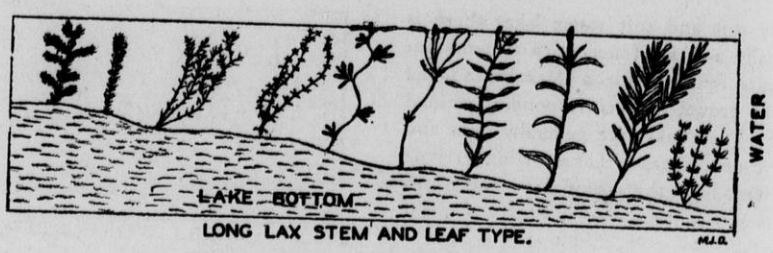


Fig. 4. Long lax stem and leaf type.

Fig. 5. Muskie weed (potamogeton praelongus). An example of the broad leafed pondweeds; note the boat-shaped leaf tip. Natural size.

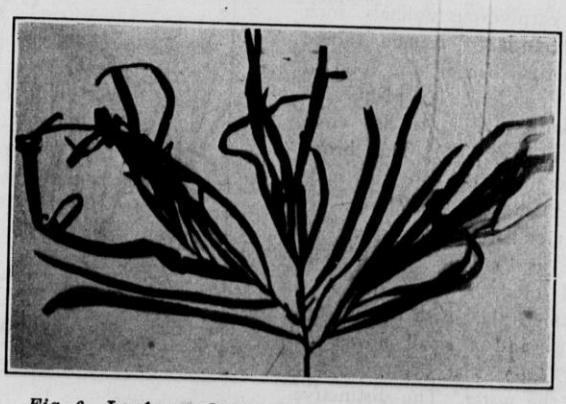


Fig. 6. Leafy pondweed (potamogeton epihydrus). An example of ribbon leafed pondweeds. One-half natural size.

Oxygen is very essential to aquatic life. The presence of inlets and outlets in lakes results in an exchange and aeration of water. This aids in keeping the water supplied with oxygen. If this exchange of water is not adequate, or if the lakes are landlocked, they must have sufficient depth to maintain enough oxygen for fish life. If lakes are too shallow, the oxygen will be consumed due to the decay and respiratory processes of aquatic life during the winter freeze over. A prolonged hot weather period in the summer may also cause a depletion of oxygen due to excessive decay in shallow water lakes. Landlocked lakes with very soft water should be at least twelve feet deep in order that oxygen will not be used up during the winter freeze over. Landlocked lakes that "bloom" in the summer should be deeper, because of the greater abundance of vegetative matter laid down to decay and use up the oxygen during the winter.

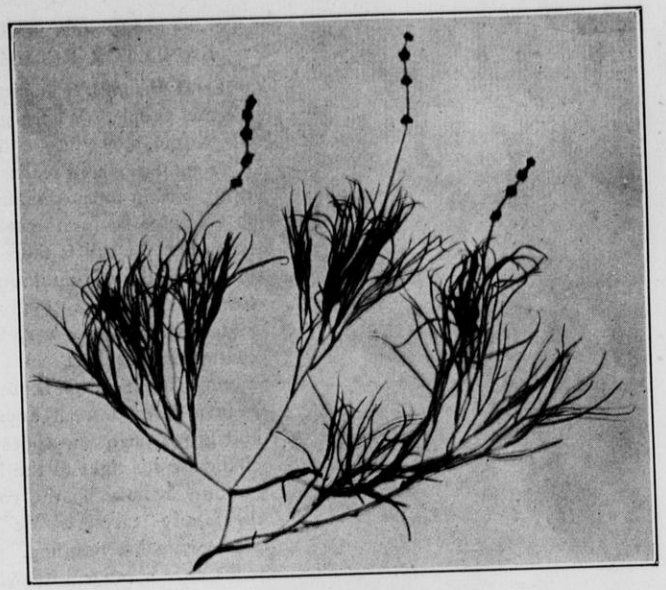


Fig. 7. Sago pondweed (potamogeton pectinatus). An example of the thread or narrow leaved pondweeds. One-third natural size.

Fig. 8. Coontail (ceratophyllum dermersum). Another compound leaved plant.

Intensive fishing of particularly soft and very soft water lakes has resulted in many instances in a scarcity of game fish. Efforts have been made to conserve good fishing by fish protection laws and by stocking lakes with fish. Fish laws have done much to retard fish depletion. However, the violations of the game laws can still be decreased and law enforcement made easier by the public giving their fullest cooperation to conservation officers. Fish laws not only protect and conserve game fish, but tend to preserve the attractiveness of lake regions for recreational use in much the same manner that laws against theft and abuse of property protect the farmer's crop and livestock and the urban dweller's property. Stocking lakes also helps to offset fish depletion. The planting of fish in inland lakes has however been ineffective in many cases. A redeeming feature about this stocking of lakes with fish in the past is that it has brought out the right and wrong ways of stocking, which serve as a guide to a more efficient and systematic program. Important factors to consider in planting fish in lakes are : (1) that the environmental conditions of very soft and soft water lakes are not adequate for wall-eyed pike but are suitable for large mouth bass; (2) that conservationists should choose between wall-eyed pike or bass in stocking other than the very soft and soft water lakes, because wall-eyed pike are harmful to the bass; (3) that very soft or soft water lakes should not be heavily stocked since they do not furnish adequate food and protection for the development of a large number of game fish; (4) that since pan fish are able to adapt themselves to a variety of conditions, providing that the water does not become deoxygenated, in lakes where the larger game fish population has been depleted, restocking with game fish may be hampered due to the presence of a large number of carnivorous pan fish such as perch and crappies. Increasing the aquatic plant cover and other forms of shelter tends to correct this evil. In some cases some of these pan fish, particularly perch, should be seined out before minnows, or especially fry of game fish are released in these lakes.

Fig. 9. Common water milfoil (myriophyllum spicatum). An example of the compound leaved plants: note the compound pinnated thread leaves. Natural size.

Fig. 10. Water weed (elodea canadensis). One-third natural size.

LESSON XXII
LAND FOR RECREATION

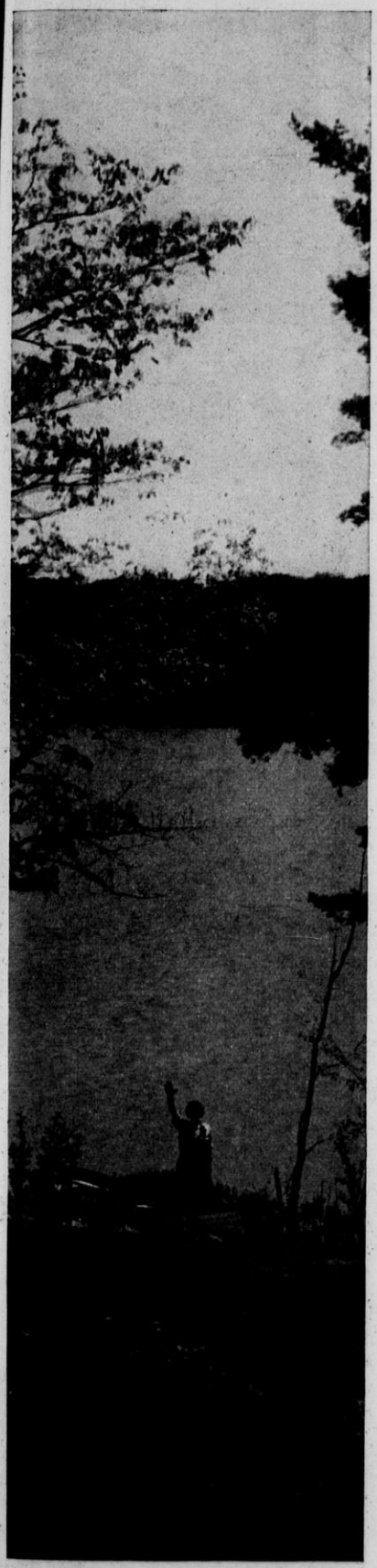
Land belongs to society, i. e., to all the people. Where great groups of people move into cities to work, they soon begin to realize that something within them is calling for land. It may not be for the same kind of land, but the call is there. The rippling brook of childhood beckons for a return with rod and fly to match wits with the wary trout. The chattering squirrel in his forest haunts gathering his winter's food, is ever a lure to small boys for nuts, and grown men sometimes with guns challenge his right to the land. The budding willows by the road side to the family "taking a ride" announce that spring has returned. The hiker seeks the by-ways with vine grown fences and friendly birds. Even chipmunks are friendly to such places. Others seek the high lands where sight has a far range. The clouds and the shimmering haze over distant fields, the cattle in the pastures and fields of growing grain are restful to the eyes, that daily stare at columns of figures, black and often red; or in the grimy noisy factory must keep machines working and materials in place. Some distant lake, the home of the loon, calls alike the family from the densely populated city and isolated farm. It is their lake for the day. The row boat carries young and old over the rippling waters. Some follow the loon; others row to the beds of "muskie" weeds; and why? Youth and maiden seek the lily beds, where immaculate blossoms of pure creamy white ride the water. As the sun slowly drops from sight and the twilight deepens over the lilies, the trumpet note of the bronzed frog on a nearby lily pad, announces that this is his home, and the lovers talk of their home which is yet to be. What is this, but recreation of that in the lives of people, which combined, these people cherish, almost as much as life itself.

The "century of evasion" graphically depicted on the first six pages of these lessons led to a denuded landscape, erosion by wind and water, a lowered water table, streams and lakes drying up, and the general disturbance of plant and animal life. The recent years have sobered people, so that now we are not thinking of taking and destroying but of conserving and improving. The map on the outside of the front cover shows the public forests in Wisconsin where truck trails, fire towers, and telephone systems now make it possible to conserve against fire; rescue fish stranded by floods in bayous and swales, and with hay and grain, protect deer and birds from the rigors of severe cold and deep snow. We are now becoming intelligent builders of better recreational land.

Looking farther into what we are doing, observe the river valleys on the map on the inside of the front cover. These river valleys have a circulatory system that leads from clouds to streams to the larger bodies of water and back again. These streams in Wisconsin have their sources in highlands where lakes and streamlets fed by bubbling springs furnish pure water. Time was when this water was polluted with sewage and industrial waste. Is this continuing? Not any more. Wisconsin's State Committee on stream pollution has been quietly working on the improvement of stream sanitation. Nearly one-half of all the Wisconsin incorporated villages, towns and cities now have sewage disposal plants. Great progress has been made in stopping stream pollution by industrial plants, and now many canneries, milk plants and paper and pulp mills are purifying their waste. Soon the Fox River Valley, and its numerous industrial cities from Fond du Lac to Green Bay will be America's first river valley to have completed this job, and sturgeon once abundant may again find the water of Lake Winnebago and the Fox River a place where they can live and multiply.

But where in Wisconsin for example is the major portion of her population? Look at the map on the inside of the back cover. What! Milwaukee county with 3,047 per square mile, yet the map on the outside of the front cover shows no public forests in this region! Here then is need for more public land, —at least 50,000 acres of recreational forest land should supplement the very limited park areas along this Lake Michigan industrial water front; for many thousands must find recreation in this out-of-doors near at home. The far sighted planners of this region are already working to this end.

Recreational land use, therefore, implies that the best land for such use is the land where **nature is conserved** and **managed** by man and kept at its best. This is now being done in the Lake States.



Welcome to woods and waters.

LAND

and

RECREATION

Good Roads

Lakes

Streams

Forests

Meadows

Open Fields

Hills

Valleys

Pure Water

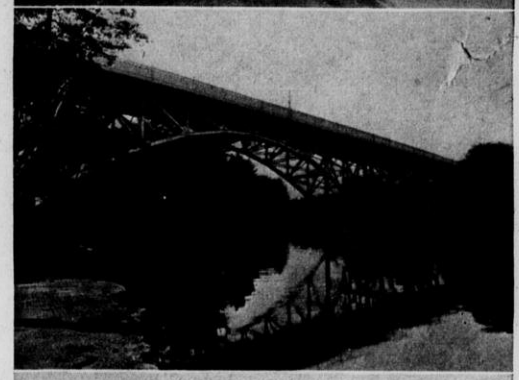
Pure Air

and

The

Limitless

Sky



Good roads and nature.

Trying his rod and reel.

OUTSIDE OF BACK COVER

1. *Graph showing growth and value of white pine.*

2. *School forest plantation in Juneau county.*

INSIDE OF BACK COVER

3. *Map of Wisconsin showing physiographical features and primary roads.*

4. *Map of Wisconsin showing distribution of total population.*

5. *Dalles of the St. Croix, Interstate Park.*

6. *Vacation Time in Sawyer Co.*

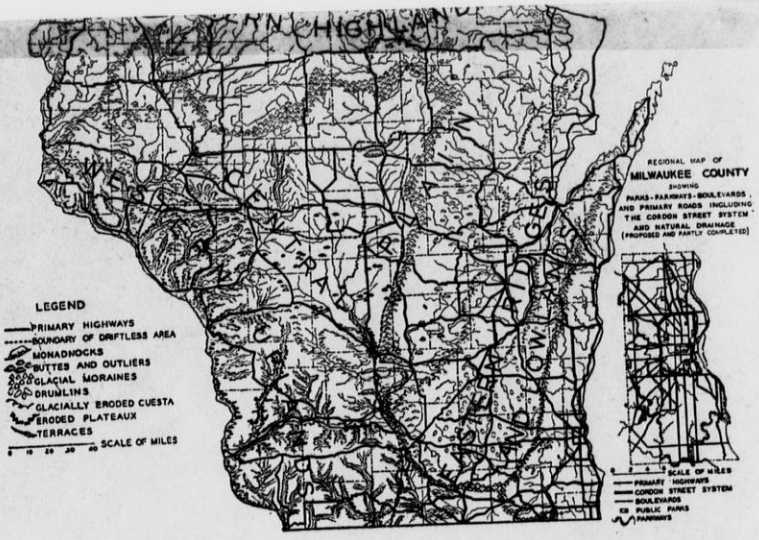
7. *Front porch on a lake.*

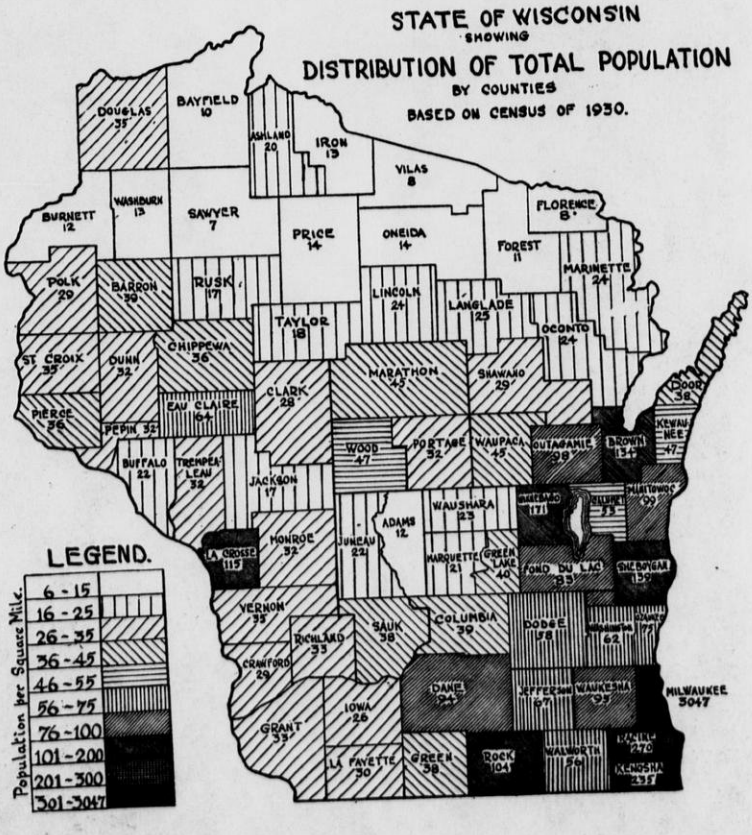
8. *Taking the rapids on the Flambeau.*

9. *Wave-cut arches along the Apostle Islands.*

10. *In Copper Falls State Park*

11. *Summer cottagers find the peace and quiet of Wisconsin's thousands of lakes an ever-compelling lure. This scene is one in Bayfield county.*


REGIONAL MAP OF
MILWAUKEE COUNTY
SHOWING
PARKS - PARKWAYS - BOULEVARDS,
AND PRIMARY ROADS INCLUDING
THE GORDON STREET SYSTEM
AND NATURAL DRAINAGE
(PROPOSED AND PARTLY COMPLETED)
SCALE OF MILES
PRIMARY HIGHWAYS
GORDON STREET SYSTEM
BOULEVARDS
PUBLIC PARKS
PARKWAYS
LEGEND
PRIMARY HIGHWAYS
BOUNDARY OF DRIFTLESS AREA
MONADNOCKS
BUTTES AND OUTLIERS
GLACIAL MORAINES
DRUMLINS
GLACIALLY ERODED CUESTA
ERODED PLATEAUX
TERRACES
SCALE OF MILES


STATE OF WISCONSIN
SHOWING
DISTRIBUTION OF TOTAL POPULATION
BY COUNTIES
BASED ON CENSUS OF 1930.
DOUGLAS 35
BAYFIELD 10
ASHLAND 20
IRON 13
VILAS 8
FLORENCE 8
BURNETT 12
WASHBURN 13
SAWYER 7
PRICE 14
ONEIDA 14
FOREST 11
MARINETTE 24
POLK 29
BARRON 39
RUSK 17
TAYLOR 18
LINCOLN 24
LANGLADE 23
OCONTO 24
ST CROIX 35
DUNN 32
CHIPPEWA 36
EAU CLAIRE 164
CLARK 28
MARATHON 45
SHAWANO 29
DOOR 38
PIERCE 36
PEPIN 32
BUFFALO 22
TREMPEALEAU 32
JACKSON 17
WOOD 47
PORTAGE 32
WAUPACA 45
OUTAGAMIE 98
BROWN 134
KEWAUNEE 47
MANITOWOC 99
WAUSHARA 23
WINNEBAGO 171
LA CROSSE 119
MONROE 32
JUNEAU 22
ADAMS 12
MARQUETTE 21
GREEN LAKE 40
FOND DU LAC 83
SHEBOYGAN 139
LEGEND.
Population per Square Mile.
6 - 15
16 - 25
26 - 35
36 - 45
46 - 55
56 - 75
76 - 100
101 - 200
201 - 300
301 - 3047
VERNON 35
RICHLAND 33
SAUK 38
COLUMBIA 39
DODGE 58
WASHINGTON 62
OZAUKEE 71
CRAWFORD 29
DANE 104
JEFFERSON 67
WAUKESHA 97
MILWAUKEE 3047
GRANT 39
IOWA 26
LA FAYETTE 30
GREEN 38
ROCK 104
WALWORTH 54
RACINE 270
KENOSHA 237

GROWTH AND VALUE OF WHITE PINE

(FOR PULP OR BOX BOARD)

BASED ON GROWTH STUDIES OF PLANTED STANDS ON GOOD SITES IN BAYFIELD COUNTY AND ON THE FOLLOWING VALUES.

VALUE OF LAND $ 2.00 PER ACRE

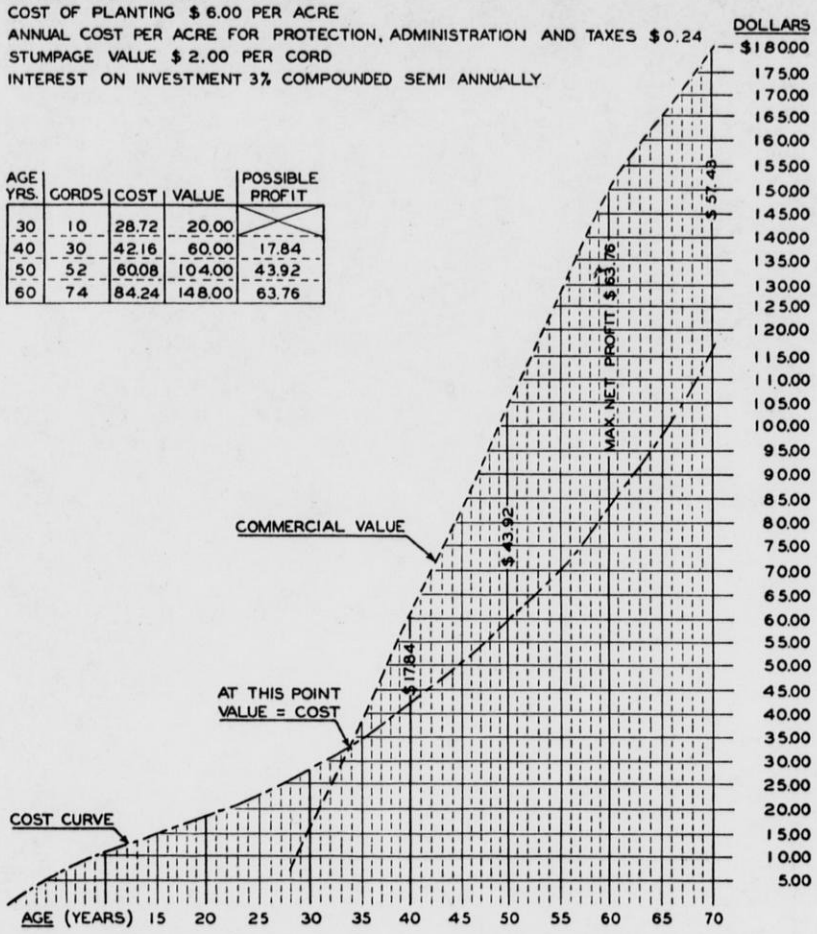
COST OF PLANTING $ 6.00 PER ACRE

ANNUAL COST PER ACRE FOR PROTECTION, ADMINISTRATION AND TAXES $0.24

STUMPAGE VALUE $ 2.00 PER CORD

INTEREST ON INVESTMENT 3% COMPOUNDED SEMI ANNUALLY

AGE YRS.	CORDS	COST	VALUE	POSSIBLE PROFIT
30	10	28.72	20.00	
40	30	42.16	60.00	17.84
50	52	60.08	104.00	43.92
60	74	84.24	148.00	63.76



"RELAX IN WISCONSIN, WHERE FRIENDS AND NATURE MEET"

Frank C. Thiessen · 2-18-1937

Land Economic Inventory
of
The State of Wisconsin

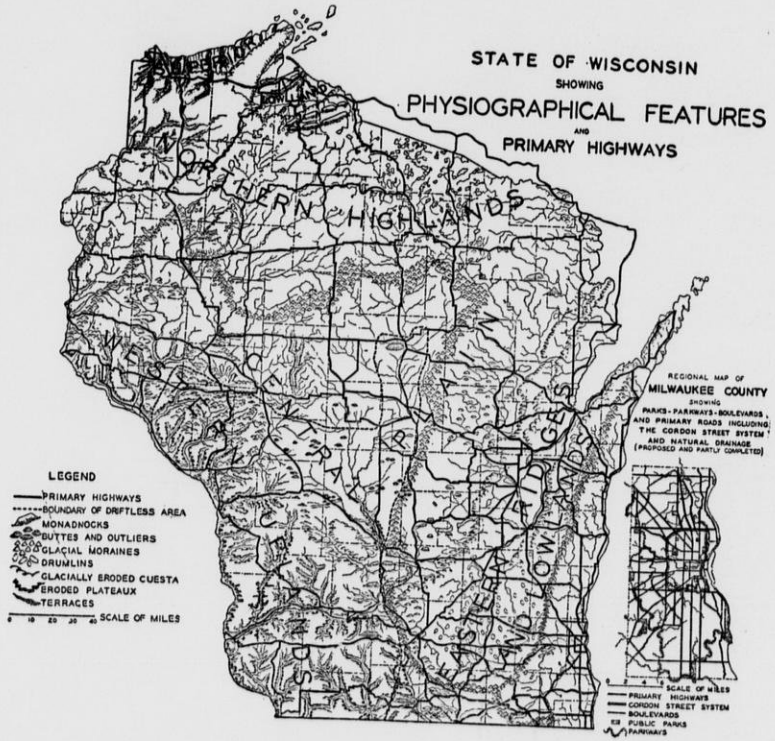
Issued by the Executive Office
PHILIP F. LA FOLLETTE
Governor

JOHN S. BORDNER, *In charge*
WILLIAM W. MORRIS, *Forester*
EARL D. HILBURN, *Engineer and Draftsman*

Division of Land Economic Inventory
411 W. Wing, Capitol Building

STATE OF WISCONSIN

Division of Land Economic Inventory



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Land Economic Inventory

of

The State of Wisconsin

WAUKESHA, RACINE AND KENOSHA COUNTIES

By

JOHN S. BORDNER, *In charge*

WILLIAM W. MORRIS, *Forester*

EARL D. HILBURN, *Engineer and Draftsman*

Division of Land Economic Inventory

COOPERATING AGENCIES

We are indebted to the following for assistance given us in the preparation of this bulletin.

Martin W. Torkelson, Director of Regional Planning
E. F. Bean, State Geologist
Walter F. Choinski, Cartographer, Conservation Commission
N. C. Fassett, Botany Department, University of Wisconsin
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F. T. Thwaites, Geology Department, University of Wisconsin
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The State Conservation Department
The Wisconsin Geological and Natural History Survey
The Wisconsin Historical Library
The State Land Office

TABLE OF CONTENTS

TABLES, PLATES, MAPS AND FIGURES

INTRODUCTION

The primary need for a Land Economic Inventory of the counties in the south eastern Wisconsin industrial area is to determine what lands are better adapted to non agricultural uses. In the early occupation of this region, population density was as low as it still remains in non industrial areas. Concentration of industry and commerce along the Lake Michigan waterfront has increasingly required more land for urban and recreational use. The time has therefore arrived when planless procedure in land use is no longer feasible and is becoming less and less economic. Haphazard urban development, undue exploitation of forested areas, pollution of water supply and water courses, drainage of spongy swamp areas, and unnecessary extension of cultural services in streets, roads, etc., have depleted the land resources of this region, and made it increasingly difficult for the owners to pay the taxes made necessary by such an unplanned procedure.

In order that the County Planning Commissions, in conjunction with the State Planning Board, may proceed intelligently with a planned use of land and that the National Resources Board may know with definiteness the present status of Wisconsin's Land Resources, the Land Economic Division of the Executive Office of the State of Wisconsin submits the following Land Economic Inventory of Waukesha, Racine and Kenosha counties.

Planting trees in wide shallow furrows.

A LAND INVENTORY OF WAUKESHA, RACINE AND KENOSHA COUNTIES

EARLY HISTORY

Evidence of Early Occupation

Implements of copper, stone, bits of pottery and numerous mounds are mute evidence of the occupation of this region for a long time prior to the discovery of America. Deep worn trails leading to the mineral springs in what are now Waukesha, Racine and Kenosha counties, indicate that the region was possibly a mecca for medicine men and the afflicted of many tribes.

First Explorers and the Indians

The first white men to paddle their canoes along the Lake Michigan shore line are supposed to have been Louis Joliet and Father James Marquette. This was about 1673 and approximately 40 years after Nicollet's first visit to the state. Nicollet, himself, may have been in this region, for it is known that he went up the Fox River to within about three days journey of the Wisconsin River. These first visitors found the region inhabited by bands of Indian tribes. The Foxes, Sacs, and Pottawattamies predominated. Of these the Foxes and Sacs were the better farmers, raising large quantities of corn and vegetables. They were also more experienced in the arts of war, because they had been in long and continuous conflict with Iroquois tribes to the east, by whom they were forced westward into Wisconsin.

Traders

When traders first entered this region the Pottawattamies were in possession and the Winnebagoes and Menominees were living with them in friendly relations. Indian villages surrounded by cornfields were scattered from Lake Pewaukee south along the Fox River. The last chief with this band before its removal to the region of the Missouri river was Chief Leatherstrap, who is buried in what is now the city of Waukesha.

Little is known of the traders who visited this region prior to 1800, except that long before this territory passed from French into British control, traders from Mackinaw annually came this far south with liquor, hatchets, cloth and trinkets. The earliest trader and adventurer known to have remained was the Frenchman Jok Jambeau, who married an Indian woman, and operated a trading post in the Indian settlement near Skunk Grove in the northwestern part of the present town of Mount Pleasant, Racine county. Jambeau had been here a long time prior to 1834.

Early Settlement

White settlers began to arrive in this territory following the Blackhawk war. Among the earliest settlers were Morris D. and Alonzo R. Cutler who in 1834 settled where Waukesha is now located. Here the first school house was erected in 1836, and the Waukesha Congregational Church was organized in 1838. Waukesha at this early date was known as Prairieville. This village was granted a post office in 1837.

Settlement in Racine and Kenosha counties also dates from 1834. The first permanent settler was Captain Gilbert Knapp, who with William and A. J. Luce rode up along the Indian trail from Chicago and located near the mouth of the Root River. Here Captain Knapp built a log cabin and named the place Fort Gilbert. A little later this name was changed to Racine.

Saw mills and planing mills were the first industries to appear and grist mills soon followed. Flour and other food supplies were obtained with great difficulty during these early years. Records show that during the winter of 1837; Andrew Place, Alva and Zadock Newman made a trip to St. Joseph, Michigan with ox teams and returned with loads of flour for the settlers. This haul of approximately 250 miles round trip required two months.

The First Land Sales

A United States Land Office was opened in Milwaukee about 1839. Those who entered this region prior to that time and established claims to land, had done so without governmental authority. Frequent quarrels resulted from claim jumpers attempting to dispossess the earlier settlers. To meet this evil the first settlers organized what came to be known as the Milwaukee Union, to protect priority land rights of the members.

First Roads

The Congress of 1839 appropriated $10,000 to build a road from Racine to Green Bay, and a like amount for a road from Racine to Janesville. These roads were built under the supervision of Thomas J. Cram of the U. S. Topographical Engineers.

Nationality of First Settlers

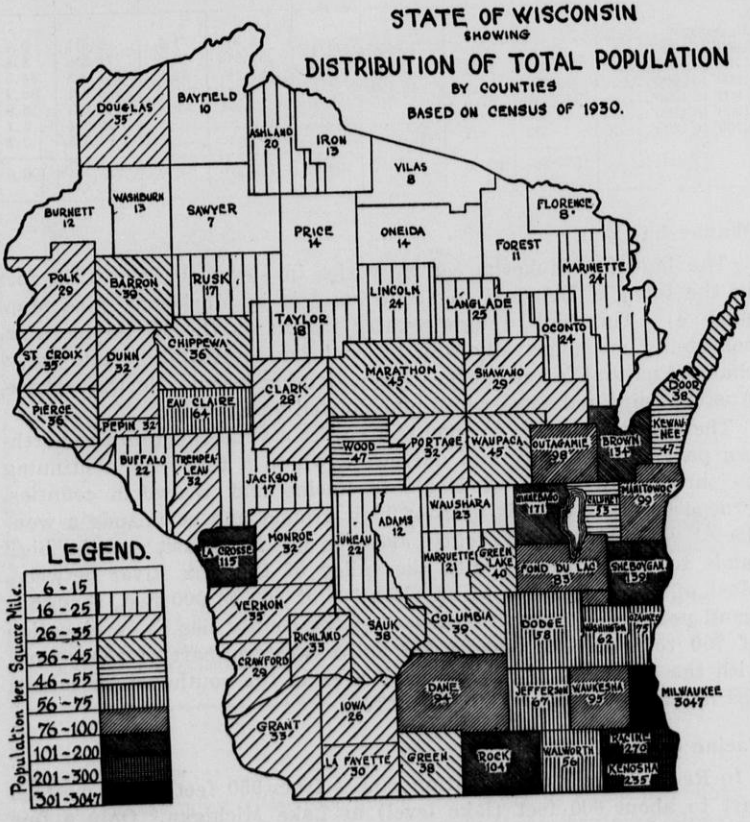
The settlers coming before 1840 were almost entirely from eastern states, with Yankee names prevailing. Following 1840, when land was offered for sale by the government, immigrants from England, Ireland, Wales, Germany and the Scandinavian countries began coming in large numbers. Social unrest and insecurity also brought some roving bands of religious and economic idealists. Among them was a communistic society of Fourierites organized in England under the leadership of Thomas Hunt. Like similar attempts elsewhere, their project was soon abandoned.

The cheap labor of all these immigrants made possible the wild speculative and exploiting schemes of the enterprising Yankees.

THE GEOGRAPHY OF WAUKESHA, RACINE AND KENOSHA COUNTIES

Location

The location of these counties in what has become known as the Lake Michigan waterfront made them among the earliest settled in Wisconsin. Opportunity for shipping by water aided in an early and highly diversified use of land. Next to Milwaukee county, Racine and Kenosha counties are today the most densely populated counties in the state. (See Map, Page 7) Waukesha county also has numerous industries as well as a highly developed agriculture and a relatively high population density. Waukesha county lies west of Milwaukee. Racine and Kenosha counties are south and have shore line on Lake Michigan.



Elevation

From the water front on Lake Michigan to the highest part on Government Hill (Elevation 1232 ft.) in Waukesha county the difference in elevation is about six hundred and thirty five feet. Seventy

per cent of the land in these three counties lies at an elevation of from 700 to 900 feet above sea level and less than three hundred feet above lake level. The highest portion is part of the ridge commonly called the "kettle moraine", which crosses Waukesha in a southwesterly direction. From northern Waukesha county there is a gradual slope eastward toward Lake Michigan and southward to the shoreline in Kenosha county where over 2500 acres of land is approximately at lake level. (For elevation maps see pages 9, 10, 11) The following table shows the acreage of land lying at different elevations.

ACREAGE OF LAND AT DIFFERENT ELEVATIONS IN THE THREE COUNTIES

Elevation	Waukesha	%	Racine	%	Kenosha	%	Total	%
Under 600'					2,617	1.5	2,617	0.4
600' to 700'			37,767	18.3	34,042	19.6	71,809	9.8
700' to 800'	39,452	11.1	124,300	60.2	91,247	52.6	254,998	34.5
800' to 900'	177,388	49.9	44,130	21.4	44,743	25.8	266,261	36.2
900' to 1000'	115,590	32.5	160	0.1	921	0.5	116,671	15.9
1000' to 1100'	22,914	6.4					22,914	3.1
1100' to 1200'	513	0.1					513	0.1
Total	355,857	100.0	206,357	100.0	173,570	100.0	735,784	100.0

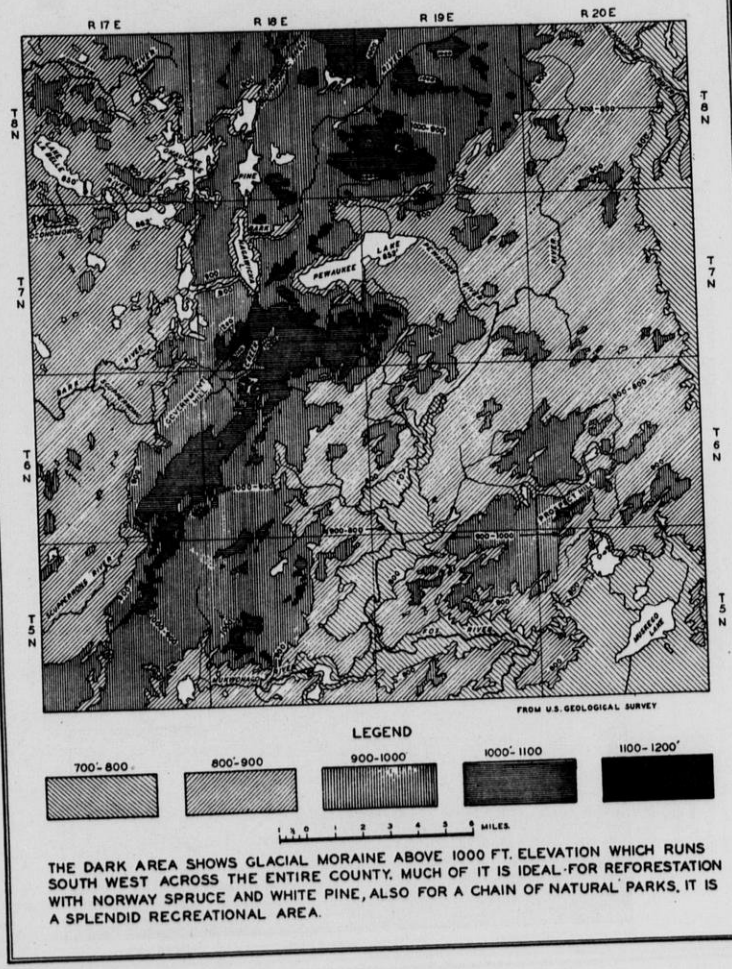
Waukesha County

The land in Waukesha county varies in elevation from 1233 feet in the town of Delafield to about 760 feet in Muskego. (See Map, page 9) This high, rough country known as the Kettle moraine, containing much gravelly soil, is ideal for reforestation, and for a chain of natural forest parks. The native hardwoods, Norway spruce, Austrian pine and some white pine do well on this land.

The elevation of 900 to 1000 feet covers a wide range in the northern part of the county and narrows down to a thin strip continuing on through the town of Eagle to Racine and Walworth counties. Prospect Hill is on this area of high ground and commands a wonderful view of the "Muskego Lakes" to the southeast, and the high lands to the northwest with the valley of the Fox River between. Most of this valley lies at an elevation of 800 to 900 feet, though a small portion in the southern part of the county lies at an elevation of 700 to 800 feet. Almost the entire western part of the county with the exception of a very small area in the southwestern corner, lies at an elevation of 800 to 900 feet.

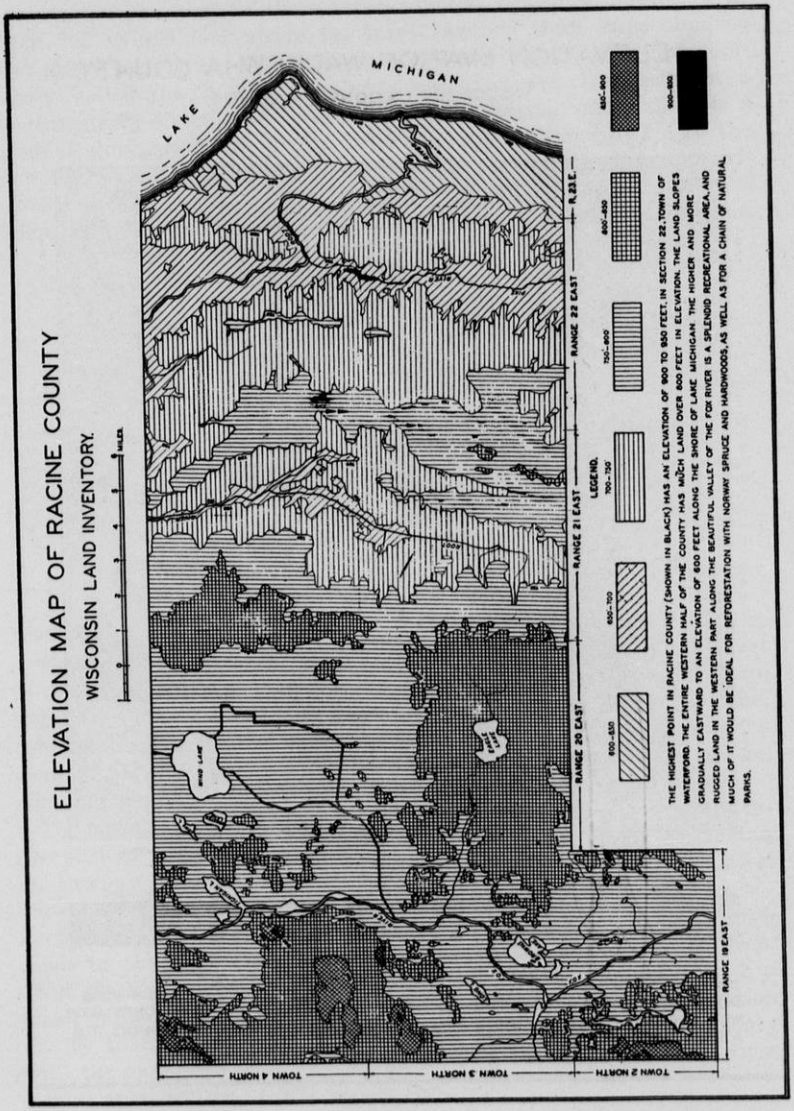
Racine County

In Racine county the elevation ranges from 950 feet in the western part to about 600 feet (lake level) at Lake Michigan. Only a few points in the extreme western section are over 900 feet in elevation. (See map, page 10) Possibly 40% of the land area of the western part of Racine county has an elevation of 800 feet. It is on this higher morainal land that reforestation should be encouraged.



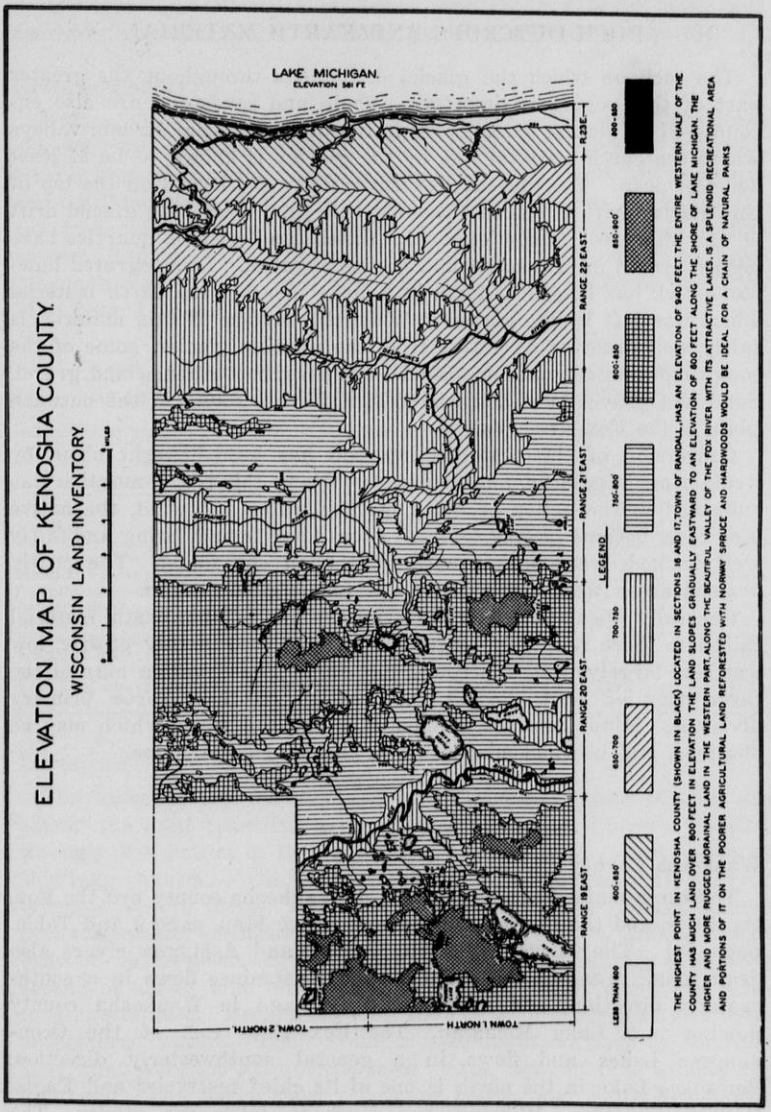
Kenosha County

The highest point (940 feet above sea level) in Kenosha county is on the morainal ridge near the western border. The area along the Lake Michigan shoreline in this county, as in Racine county, is low and flat. The higher land in the western lake region of the county offers the best opportunity for reforestation. (See Map, page 11)



TOPOGRAPHY

The relief of these counties is level to rolling except in the higher elevations where hills in many cases have steep slopes. Here tillage is impractical and should be discouraged. Much of the timber has been cut from these hills and exposure to wind and quick surface drainage has resulted in carrying away much of the surface soil, leaving an exposure of partially decomposed rock. This region is an



unusual formation, in that it is the result of two lobes of the glacier meeting and dropping their loads of earth material as they receded. (See Map, inside front cover) Numerous buried blocks of ice were left by the receding glaciers. These ice blocks finally melted and some of the depressions thus formed became lakes and swamps. This accounts for the numerous lakes, swamps and dry kettles of this region.

ROCK OUTCROPS AND EARTH MATERIAL

The rock on which the glacial drift rests throughout the greater part of this region is limestone. Shale and sandstone are also encountered at places; particularly in the old pre-glacial stream valleys where the earth material left by the glacier is known to be at least 300 feet deep. The present Fox River flows southward on the top of this glacial drift in one of these old valleys. Where the glacial drift is very thin, rock is now exposed. Extensive limestone quarries have been operated in Waukesha and Racine counties. Disintegrated limestone rock has helped to form in a large measure the earth material which was left by the glacier. While the surface of this material is fairly well assorted by water from the melting glacier, some of the rough moraine contains unassorted boulders, cobblestones and gravel. Sand and gravel in well assorted deposits are found in the outwash plain of the Fox River Valley.

Conversion of this material into soil has been brought about by weathering, vegetation and drainage. Where this rough moraine was subjected to the action of quick moving water and wind, the native land cover became largely forest. Areas level to undulating and fairly well drained, were prairie with some open oak forest. The poorly drained areas were covered by peat forming vegetation.

Generally speaking, therefore, the surface of this earth material falls into three relatively large classes, viz., land largely prairie, low wet land largely peat, and rough moraine. The elevation map of the three counties show clearly the location of these three primary divisions. Minor detail is delineated in the soil maps, which may be obtained, and use and adaptation in the land cover maps.

DRAINAGE

Waukesha County

The three main drainage systems of Waukesha county are the Fox, the Bark, and the Oconomowoc rivers. (See Map, page 9 and Table, page 13) The Menominee, Scuppernong and Ashippun rivers also drain small areas of the county. The Menominee flows in a southeasterly direction, and is the only drainage in Waukesha county flowing into Lake Michigan. The Fox rises east of the Oconomowoc Lakes and flows in a general southwesterly direction. Pewaukee Lake in the north is one of its chief reservoirs and Eagle, Howitt, Phantom, Millpond and Muskego lakes are others. The Oconomowoc Lakes in the northwestern part of the county drain southwesterly through the Oconomowoc river into the Rock River. Lake Nagawicka, the upper and lower Nahmabin and the Nashotah lakes drain into the Bark river, a tributary of the Rock River.

Racine County

The two main drainage systems for Racine county are the Fox and Root Rivers. The Root River flows southeasterly through the

county into Lake Michigan at Racine, and the Fox River flows in a southwesterly direction. (See Map, page 10 and Table, page 13)

Kenosha County

Most of Kenosha county is drained by the Fox and Desplaines rivers. Both of these rivers flow in a southerly direction. The Fox river drains most of the lake region in the western part of the county and the Desplaines river which rises in southern Racine county drains the more level region. The Pike, a small river, rising in southeastern Racine county, flows south parallel to the shore of Lake Michigan and empties into the lake just north of Kenosha. (See Map, page 11) (see Table, page 13)

LAND AREAS OF VARIOUS DRAINAGE BASINS IN WAUKESHA, RACINE AND KENOSHA COUNTIES

Drainage Basin	Acres in Waukesha Co.	Acres in Racine Co.	Acres in Kenosha Co.	Total
Fox River	217,421	97,900	60,900	376,221
Bark River	45,056	----------	----------	45,056
Oconomowoc River	43,800	----------	----------	43,800
Menominee River	20,550	----------	----------	20,550
Scuppernong River	19,430	----------	----------	19,430
Ashippun River	9,600	----------	----------	9,600
Root and Lake Michigan Drainage	----------	90,657	----------	90,657
Pike and Lake Michigan Drainage	----------	11,400	36,480	47,880
Desplaines River	----------	6,400	76,190	82,590
Total Land area of counties ex. of lakes	355,857	206,357	173,570	735,784

Lakes

The lakes of the Oconomowoc (or Waukesha) Lake District are among the most beautiful in the state. Samuel A. Storrow, passing through this district in 1817 gives us probably our first description of this lake country. "On the morning of the 27th (Sept. 27, 1817) I found a severe frost. At about ten o'clock, after having passed grounds inferior to those of yesterday, came to a small and handsome body of water, about eight miles in circumference, shortly after to a second of about three miles, after that to a third of about five miles in circumference. I remained some time to admire the beauty of these sequestered waters. Their stillness was disturbed only by the wild fowl, that were too little accustomed to the sight of man to heed my approach. The lands shortly became better, and more abundantly wooded and watered than those of yesterday, the white oaks being the largest I had ever seen."

Pewaukee Lake is the largest with an area of over three and one half square miles, while Garvin Lake has an area of only about 22 acres. Nagawicka Lake, the deepest, has a depth of 94.5 feet. All the lakes drain westward except Pewaukee. (For these and other lakes see Table, page 14)

SURVEY OF PRINCIPAL LAKES OF WAUKESHA, RACINE AND KENOSHA COUNTIES.

DRAINAGE BASIN	LAKE	COUNTY	TOWNSHIP	RANGE	ELEVATION (FT.)	LENGTH (MI.)	BREADTH (MI.)	SHORE LINE (MI.)	AREA (ACRES)	MAX. DEPTH (FT.)	MEAN SLOPE OF BOTTOM (%)	VOLUME (MILL. CU. YDS.)
ASHIPPUN	FOWLER	WAUKESHA	8	17E.	861	0.94	0.44	2.00	83.5	50.0	5.2	1.92
BARK RIVER	CROOKED	"	7	17E.	868	0.67	0.31	1.08	54.8	16.0	1.9	0.55
	GENESEE NORTH	"	7	17E.	866	0.51	0.42	1.5	101.9	36.4	3.4	1.23
	GENESEE SOUTH	"	7	17E.	865	0.40	0.30	1.2	62.7	47.6	6.1	1.38
	NAGAWICKA	"	7	18E.	890	2.75	1.12	7.0	917.6	94.5	4.2	53.65
	NASHOTAH UPPER	"	7	17E.	872	0.81	0.40	2.2	136.7	51.2	4.4	5.08
	NASHOTAH LOWER	"	7	17E.	871	0.79	0.25	1.9	100.3	46.2	5.3	3.26
	NEMAHBIN UPPER	"	7	17E.	876	1.05	0.56	2.8	271.1	62.0	3.5	13.03
	NEMAHBIN LOWER	"	7	17E.	870	0.93	0.60	2.5	265.5	35.2	1.8	3.49
	OTIS	"	7	17E.	866	0.43	0.37	1.1	40.0	28.3	5.1	1.02
FOX RIVER	BROWNS	RACINE	2&3	19E.		1.25	0.75		390.4	23.0		
	CAMP	KENOSHA	1	20E.		2.40	1.00		256.0	19.7		
	DENOON	WAUKESHA	5	20E.		0.81	0.44		185.6	62.3		
	EAGLE	"	5	17E.		0.87	0.56		211.2	4.9		
	EAGLE	RACINE	3	20E.		1.31	1.00		486.4	13.1		
	LONG	"	4	20E.		1.00	0.25		134.4	19.7		
	MINISTER	"	4	20E.		0.75	0.50		180.0	65.6		
	MUSKEGO BIG	WAUKESHA	5	20E.		3.75	2.00		2,739.2	26.2		
	MUSKEGO LITTLE	"	5	20E.		1.50	0.87		518.4	46.0		
	PHANTOM	"	5	18E.		0.68	0.37		108.8	27.9		
	PEWAUKEE	"	7	18&19E.	852	4.50	1.20	4.50	2,298.0	45.3	0.9	48.06
	POWERS	KENOSHA	1	18&19E.		1.12	.62		416.0	32.8		
	ROCKLAND	RACINE	2&3	19E.		0.50	0.25		52.2	26.2		
	SILVER	KENOSHA	1	20E.		1.25	0.87		582.4	42.6		
	TWIN	"	1	19E.					1,075.2			
	WIND	RACINE	4	20E.		2.00	1.50		1,408.0	49.2		
OCONOMOWOC	BEAVER	WAUKESHA	8	18E.	910	1.10	0.44	3.4	305.4	49.0	3.0	8.26
	GARVIN	"	8	18E.	873	0.31	0.17	0.87	21.6	36.1	4.8	0.59
	LA BELLE	"	8	17E.	854	2.70	1.12	7.8	14.2	46.6	1.5	19.85
	MOUSE	"	8	18E.	877	0.82	0.21	2.4	90.3	66.3	6.9	4.04
	NORTH EAST PART	"	8	18E.	897	1.35	0.47	3.3	329.0	78.0	6.2	22.29
	NORTH WEST PART	"	8	18E.	897	0.67	0.36	1.7	115.0	73.6	7.4	6.96
	OCONOMOWOC MAIN	"	7	17E.	862	1.75	0.85	4.7	631.3	62.6	3.2	31.84
	OCONOMOWOC N.E.	"	7	17E.	862	0.75	0.50	2.3	180.0	49.2	3.8	7.53
	OKAUCHEE	"	8	17&18E.	873	2.37	1.80	11.1	1,057.0	94.0	3.2	57.27
	PINE	"	8	18E.	903	2.30	1.05	6.8	755.7	90.0	4.7	48.48
	SILVER	"	7	16E.	864	0.97	0.56	2.9	231.9	44.0	3.0	5.88
	GOLDEN	"	7	16&17E.		1.37	0.50		256.0	42.6		
	KEESUS	"	8	18E.		0.87	0.81		236.8	41.0		
DES PLAINES	HOOKER	KENOSHA	1	20E.		0.75	0.37		64.0	23.0		
	PADDOCK	"	1	20E.		0.62	0.37		96.0	31.1		

LAND ADAPTATION

Basic factors which determine land adaptation within any region are *markets, climate* and *soil.* Density of population and the means by which this population earns its livelihood determines at least the local market for products of the land. These counties have relatively a dense population. (See Map, page 7 and following table)

County	Total Population	Average per Sq. Mile Where Cities Are Included	Total Rural Population	Av. per Square Mile for Rural Population
Waukesha	52,358	94.5	30,992	55.9
Racine	90,217	270.0	18,561	55.6
Kenosha	63,277	235.2	13,015	48.4
Average	205,852	177.9	62,568	54.2

This table shows that at least 75% of these people do not obtain their livelihood by farming. Farm produce also finds ready market in Milwaukee county where the average population per square mile is 3045 of which possibly 3000 also purchase all their food supplies. Much land in this region is in farm use which at a greater distance from industrial centers would not be so used. With improved transportation, land better adapted for certain types of production elsewhere is becoming a competitor for the consuming market of this industrial area. Therefore, greater rhyme and reason must enter into the selection of land for specific use here in the near future. Land adaptation for uses other than agriculture make this region ideal for a relatively dense population. Topography, lakes, streams and forests though depleted offer environment for recreation and also for further extension of urban use. There are adequate roads for such an extension of urban use; for these counties have 2469 miles of highway divided as follows:

Improved gravel	1,639 miles
Hard surfaced	474 "
Private and dirt improved	258 "
Improved dirt	39 "
Unimproved gravel	59 "
Total	2,469 "

There are also 640 miles of railroad, 1360 miles of power line and 2254 miles of telephones. (This includes telephone lines along railroad right-of-ways.)

LAND UTILIZATION

The present status of the use of land in these counties is shown in the Land Classification Tables (inserted opposite pages 16, 17, 18) and is set forth graphically in plates on pages 16, 17, 18. A very high percentage of cleared land and pasture obtains for every county. A comparison of the land utilization in the three counties follows:

	Waukesha		Racine		Kenosha		Total	
	Acreage	Per cent	Acreage	Per cent	Acreage	Per cent	Acreage	Per cent
Cleared crop land	226,843	61.6	149,796	71.1	110,349	62.1	486,988	64.4
All pasture	24,028	6.5	16,068	8.1	18,408	10.4	59,404	7.9
Marsh land	45,808	12.4	14,252	6.7	20,078	11.9	80,138	10.5
Woodlands	46,165	12.5	17,953	8.5	14,848	8.4	78,968	10.4
Water	12,817	3.5	4,459	2.5	3,652	2.1	20,968	2.8
Urban	13,012	3.5	7,408	3.5	9,880	5.6	30,306	4.0
	368,673	100.0	210,836	100.0	177,222	100.0	756,731	100.0

The above table shows a total area of 756,731 acres. Of this total area, 72% is cleared land and pasture. Forests including timbered swamps cover 10.4% and the marshy peat land 10.5% of the total. The Plates on pages 16 to 30 inclusive show this relationship which is just about the reverse of what obtains in the northern part of the state.

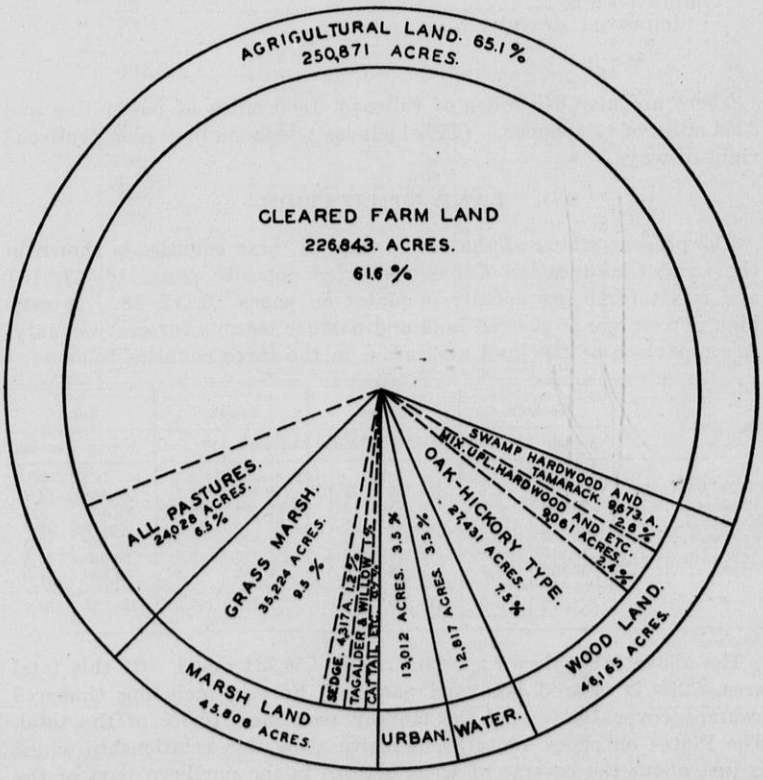
Considering the nature of the physiographic base, it is quite apparent that some land has been cleared and continues in farm use which should not have been cleared. This is particularly true of Waukesha county where there is so much land with rugged topography. Reforestation should therefore be extended on some of the agricultural land designated as permanent pasture, and on land formerly cropped, but which has reverted to permanent pasture, on account of stoniness and steep topography. This latter type of land has been designated on the land use maps by the symbol "CPP". Some of the marshy and weedy peat land designated as "C4" and "E4" also offers opportunity for an extension of wood lots. This increase in wood-

CLASSIFICATION OF TOTAL AREA

TOTAL AREA 368,673 A.

WAUKESHA COUNTY.

1934.



PLATE

TABLE III

WAUKESHA COUNTY COVER CLASS

	AGRICULTURAL ACRES									MARSH ACRES								WOODLANDS 4619
DESC. TOWNSHIP	RANGE	CLEARED	PASTURE	C.S.	STUMP PASTURE	PERMANENT PASTURE	C.P.P.	ORCHARDS	ABANDONED	OPEN	GRASS	SEDGE	TAG ALDER	CAT TAIL	LEATHER LEAF	WEEDY PEAT	WATER	URBAN
5 N	17 E	12312	129		149	1359		18		162	3421	248	325		47		329	406
5 N	18 E	12121	126		343	1480	10	22	10	25	3754	828	152	180	22		522	286
5 N	19 E	15307	169		298	650		79		22	3552	314	82	100	52		6	339
5 N	20 E	14485	33		351	746		10	70		1334		136	1285			2084	86
6 N	17 E	11178	21		187	1291		8		16	4930	780	396	25			215	5537
6 N	18 E	13605			82	1315	593	17	21	132	2168	1027	267	95			86	283
6 N	19 E	12725	253		301	1004	185	87	35	203	3432	190	351			10	15	2202
6 N	20 E	17481			348	387	35	225			953		380	31	25	66	22	415
7 N	17 E	12171	138	41	37	861	114	102			2371	409	438	6			2129	742
7 N	18 E	11159	317		263	1088	756	133	13	476	1676		54	70			1942	658
7 N	19 E	14165	356		255	600	119	68	28	290	2227	81	300	15		55	997	1654
7 N	20 E	15561			157	911		108	149		1415	409	106	7	221			1495
8 N	17 E	14438	8		33	903	249			6	1536	20	255	17			2233	1803
8 N	18 E	13263	465		72	539	232		6	11	838	11	112	7			2147	1008
8 N	19 E	18112			84	646	160				997							620
8 N	20 E	17828			397	614		30	93		622		470		107		90	960
TOT. BY DENSITY																		
TOT. BY TYPES		225,911	2,015	41	3,357	14,394	2453	907	425	1,343	35,224	4,317	3,824	1,838	474	131	12,817	13,012
% BY TYPES		61.5	.5		.9	3.6	.7	.2	.1	.4	9.6	1.2	1.0	.5	.1		3.5	

	OAK-HICKORY TYPE												MIXED UPLAND HARDWOODS												SWAM			
	0—6			6—12			12—18			18—24			0—6			6—12			12—18			18—24			0—6		6—	
TOWNSHIP	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	M	P	G	M
5 N			20		1741	1593		208	474			33														25		
5 N		147	150		472	1533	35	110	474		12	30		10				12							49			
5 N		8	10	44	192	194	179	355	133		158	24			16		84	13	9	51	20					15		
5 N				126	422	806	97	264	115						7		11	39			36							
6 N	37	113	282	439	572	553	70	569	154				19			12	49	49								74		
6 N		4	22	127	1087	1504	91	111	89	116	30	12					19	22						18		50		
6 N		35	10	18	274	226		106	47			3			20	20	85	197	40	87	85		18		30	80		2
6 N			31		61	235			82						41		40	149		213	824					53		
7 N	2		137	64	517	270	109	316	44	20	31	33			5	263	549	30	29	421	6						19	
7 N			102	40	2167	1463	95	232	72					11			9											
7 N	6		18	42	262	256	104	283	269								25	9									18	
7 N		6	37		187	146	44	41	103						42	8	311	129		183	54	40				13		
8 N					32	130	24	43	40						33		324	345	22	40	79			23		19		
8 N			26		903	359		92					110	166	173		580	303		47	19			5	4	31	55	2
8 N		65			225	575			10						7		326	276								18		
8 N						70	50							17	6	81	130	209	66	11	62			10	23	32		
	45	378	845	900	9,114	9,913	898	2,730	2,106	136	231	135	129	204	350	382	2542	1,782	166	1,053	1,185	40	18	56	106	410	92	10
											27,431													7,907				
											7.5													2.2				

AGRICULTURAL

CS — CULTIVATED STUMP LAND — AREA BEING CULTIVATED AND STUMPS BEING REMOVED.
STUMP PASTURE — CUTOVER LAND USED FOR PASTURE.
PERMANENT PASTURE — LAND NOT TILLABLE DUE TO TOPOGRAPHY STONINESS ETC.
C.P.P. — POOR LAND PREVIOUSLY CROPPED.
ABANDONED — NOT USED AT PRESENT
OPEN — LAND NOT USED AS PASTURE. MAY INCLUDE A FEW SCATTERED TREES.

MARSH

GRASS — MARSH GRASSES SUCH AS BLUE JOINT AND RED TOP
SEDGE — ALL COARSE AND ANGULAR "GRASSES."
TAG ALDER — LOWLAND BRUSH SUCH AS ALDER WILLOW AND RED DOGWOOD
CAT TAIL — COMMON VARIETY
LEATHER-LEAF — HEATHER GROWTH INCLUDING BLUEBERRY CRANBERRY AND LABRADOR TEA.
WEEDY PEAT — PEAT LAND CHANGED BY DRAINAGE AND FIRE NOW COVERED WI

WAUKESHA COUNTY COVER CLASSIFICATION AND INVENTORY BY TOWNSHIPS AND BY TYPES

WOODLANDS 46190 ACRES																																																										COMMU	
		MIXED UPLAND HARDWOODS												SWAMP HARDWOODS										TAMARACK						POPPLE WHITE BIRCH						RED CEDAR				CON.			W.P.		R.	TOTAL	HOUSES OCCUPIED	HOUSES UNOCCUPIED	SUMMER HOMES	SCHOOLS	CHURCHES	CEMETERIES	STORES	CREAMERIES	GAS STATION	GRIST MILL	PEA VINERY	HARD SURFACE	IMP. GRAVEL
-24		0-6			6-12			12-18			18-24			0-6		6-12			12-18			18-24		0-6			6-12			0-6			6-12			0-6		6-12		6-12		12-	0-6																
M	P	G	M	P	G	M	P	G	M	P	G	M	P	M	P	G	M	P	G	M	P	M	P	G	M	P	G	M	P	G	M	P	G	M	P	M	P	M	P	M	P	P	G	M															
	33														25			17							4			47	9	43		4									10					23133	165	10	96	3		2		1		1		12.9	45
12	30		10				12							49														72	5		55			10	40											23097	171	7	102	6								8.3	42
58	24			16		84	13	9	51	20					15		88	39		161	10	4	8			27	67	81			20			29											17	23036	253	8	1	6	5	5	1		2			12.8	47
				7		11	39			36							9	67		58	31		10				2		98						3											22821	283	3	467	6	3	3	7		2			12.8	52
		19			12	49	49								74			24						32		512	40	149		72		92					14	14								23043	161		4	4	3	2			2			3	44
30	12					19	22						18		50		8	31											3		10	20														23065	253	3		4	2	3			1			18.0	47
	3			20	20	85	197	40	87	85		18		30	80		250	45	35	70	60										15	5														22854	190	5		7		1						7.0	51
				41		40	149		213	824					53			62		360	155					80			235			10														22999	435	1		9	4	2	7		5			18.9	57
31	33			5	263	549	30	29	421	6						19	51	7		34	6		17	208		37	52	103	42	13	32	10		25	21	24	32	32	35							23205	303	10	661	4	5	1	1		2		1	14.0	49
			11			9											20												26		14			10			38									22904	530		293	4	2	1						16.7	50
						25	9									18		49		72	42	10	40						3	5																22833	333	10	307	4	1	2	2		4	1		34.9	37
				42	6	311	129		183	54	40				13		107	297		21	64	4	59		196	123		198	18																4	23012	494	16	1	13	5	2	13	1	18		1	19.7	58
				33		324	345	22	40	79			23		19			55	6		51				41	76	20	214	81			20		22	4					7		18			4	23274	264	18	83	3	5	2	3	3			3	13.7	53
		110	166	173		580	303		47	19			5	4	31	55	285	733		39	74	0	74		15	3		4								17	256						22	20		23134	434	8	293	5	4	7						10.8	61
				7		326	276								18		187	417			98				34	41		86	154																	23138	231	3		5	1	2						9.0	60
			17	6	81	130	209	66	11	62			10	23	32		38	214	27	66	90							48	653			11														23125	426	6		6	3	12	7	1	10		3	17.6	60
31	135	129	204	350	382	2,542	1,782	166	1,053	1,185	40	18	56	106	410	92	1,043	2,057	68	881	681	1[illegible]	208	240	290	899	181	1002	1,327	133	146	172		96	68	41	340	46	35	7	10	18	22	20	25														
	27,431												7,907										5,734						3,939						615				462			35		42	25	368,673	4,926	108	2308	89	43	47	41	6	46	2	8	227.2	818
	7.5												2.2										1.6						1.1						.2				.1							100													

MARSH

ARSH GRASSES SUCH AS BLUE JOINT AND RED TOP.

LL COARSE AND ANGULAR "GRASSES."

—LOWLAND BRUSH SUCH AS ALDER WILLOW AND RED DOGWOOD

- COMMON VARIETY

EAF—HEATHER GROWTH INCLUDING BLUEBERRY CRANBERRY AND LABRADOR TEA.

AT—PEAT LAND CHANGED BY DRAINAGE AND FIRE NOW COVERED WITH PRAIRIE GROWTH

WATER—INCLUDES LAKES, PONDS, AND LARGE STREAMS.

RBAN—ALL LAND INSIDE CORPORATE LIMITS OF CITIES T AND SOCIAL INSTITUTIONS.

NUMBERS SUCH AS 0—6 6—12 DENOTE DIAMETER OF TR

G—M—P DENOTES DENSITY OF FOREST

G—GOOD M—MEDIUM P—POOR

S

														COMMUNICATION FACILITIES MI.								DRAINAGE MI.							GAME COUNT											DESC.	
		TOTAL	HOUSES OCCUPIED	HOUSES UNOCCUPIED	SUMMER HOMES	SCHOOLS	CHURCHES	CEMETERIES	STORES	CREAMERIES	GAS STATION	GRIST MILL	PEA VINERY	HARD SURFACE	IMP. GRAVEL	UNIMP. GRAVEL	IMP. DIRT	UNIMP. DIRT	PRIVATE ROAD	RAILROADS	TELEPHONE L.	POWER LINES	SMALL STREAMS	LARGE STREAMS	DRAINAGE DITCH	DRAINAGE CANAL	SPRINGS	GRAVEL PITS	QUARRIES	NURSURIES	FUR FARM	MUSKRAT HS.	PARTRIDGE	PHEASANT	QUAIL	BLACK FOX	PRAIRIE CH.	GEESE	MINK	TOWNSHIP	RANGE
		23133	165	10	96	3		2		1		1		12.9	45.1	1.6	3.5		7.0	7.5	48.9	15.9	10.5	7.0	23.8		15	13					14	10						5 N	17 E
		23097	171	7	102	6								8.3	42.3	2.7	1.5		17.0	7.0	43.9	36.4	7.6	10.8	16.4		9	9			1	3	36	8						5 N	18 E
	17	23036	253	8	1	6	5	5	1		2			12.8	47.2		.7		8.4	9.7	63.8	50.3	11.6	15.0	12.4		1	5			1	25	12	14	9					5 N	19 E
		22821	283	3	467	6	3	3	7		2			12.8	52.9		.1	4	11.5	10.1	66.2	55.4	17.7		20.3	.8	9	17				1	2	1						5 N	20 E
		23043	161		4	4	3	2			2			.3	44.6	60	4.4		11.1	6.5	32.8	12.7	13.8	4.2	15.0	.2	6	10		1	1	4	62	6						6 N	17 E
		23065	253	3		4	2	3			1			18.0	47.6		.9		10.0	14.4	54.9	26.6	39.9	1.3	.8	.3	20	17	10		1	22	23	3						6 N	18 E
		22854	190	5		7		1						7.0	51.2				2.7	13.1	55.4	38.3	25.5	8.6	1.2		24	15		3		7	12	6						6 N	19 E
		22999	435	1		9	4	2	7		5			18.9	57.5	.4			6.9	6.0	60.5	107.4	31.5		2.4	7.8	2	8					38							6 N	20 E
		23205	303	10	661	4	5	1	1		2		1	14.0	49.4		10.7		12.4	7.9	56.7	46.3	9.8	4.4			2	6		1	2	2	54	36	6		1			7 N	17 E
		22904	530		293	4	2	1						16.7	50.1	.3			18.7	12.8	62.7	31.5	12.4	4.3						1	1								7 N	18 E
		22833	333	10	307	4	1	2	2		4	1		34.9	37.4		1.2		9.9	21.3	85.0	69.2	15.7	7.7	18.9	.8	15	5					21	1			1	1		7 N	19 E
	4	23012	494	16	1	13	5	2	13	1	18		1	19.7	58.4	1.0	.9		5.3	13.7	75.3	65.2	16.8	1.7	17.0	.2	5	3		1			52							7 N	20 E
	4	23274	264	18	83	3	5	2	3	3			3	13.7	53.1	.8	.8		6.6	10.5	44.3	35.1	9.7	11.8			4	9					14	14			4			8 N	17 E
		23134	434	8	293	5	4	7						10.6	61.6	3.4	2.4		34.9	9.7	77.1	46.5	8.2	10.7	.2		13	5			1					5				8 N	18 E
		23138	231	3		5	1	2						9.0	60.0				5.9	17.9	68.6	43.8	20.7	.6			1	7	1		1				4					8 N	19 E
		23125	426	6		6	3	12	7	1	10		3	17.6	60.1	1.0	.5	.4	6.8	15.7	74.8	63.0	19.4	8.4	11.4			27	3		1		3					1	8 N	20 E
0	25																																								
2	25	368,673	4,926	108	2308	89	43	47	41	6	46	2	8	227.2	818.5	17.2	27.6	.8	175.1	183.8	970.9	743.6	270.8	96.5	139.8	10.1	126	156	14	7	10	64	353	99	15	4	7	5	1		
		100																																							

WATER—INCLUDES LAKES, PONDS, AND LARGE STREAMS.
URBAN—ALL LAND INSIDE CORPORATE LIMITS OF CITIES TOWNS AND SOCIAL INSTITUTIONS.
NUMBERS SUCH AS 0—6 6—12 DENOTE DIAMETER OF TREES
G—M—P DENOTES DENSITY OF FOREST
G—GOOD M—MEDIUM P—POOR

CON.—CONIFERS SUCH AS PINE AND SPRUCE
W.P.—WHITE PINE.
P.L.—FOREST PLANTATION.

Classification Table.

entory 1934.

LANDS (ACRES)
52.8 ACRES

	A1 — 6-12			A3 — 6-12			C3 — 6-12			RC — 0-6		
P	G	M	P	G	M	P	G	M	P	G	M	P
	30.4	44.4				35						
	21.7	43	30	14.5	57.5							
6					91	35.9		17.3				
	32.5		29.5		9.5	18		246.7				
56		135			9.5	12.7		37.8				
37		54.5	119.5					12.3				
21								24				
51	19.5	4			7.5			43			9	
		20										
						6.5						
171	104.1	300.9	179	14.5	175	108.1		381.1			9	
.08	.05	.15	.09		.09	.05		.2				

GAME (NO)				HIGHWAYS (MI.)																
HUNG. PART.	PHEASANT	QUAIL	SQUIRREL	HARD SURFACED	IMPROVED GRAVEL	UNIMPROVED GRAVEL	LANE	POWER LINE	TELEPHONE LINE	RAILROAD	OCCUPIED HOUSE	UNOCCUPIED HOUSE	SUMMER HOME	SCHOOL	CHURCH	CREAMERY	STORE	FILLING STATION	TOTALS
0	Δ																		
				9.5	19.5		2.1	23.7	20.3	6	216		63	3	1		2	2	8610.7
				18.6	51.5		3.5	43.6	51.2	18.5	381	8	1	11	2		4	9	22634.8
62	3	18		13.5	58.3		13	31.6	67.1		330	6		8	3	1	6	7	22659.2
9	1	7		6.5	44.2		12.6	29.2	43.5	5.5	194	5	209	5	3		7	3	22777.1
55	3		4	14.5	40.5		17.7	39.9	35.7	4	203	6	378	8			3	1	22087.8
30	12		12	9.2	18.1	1	7	11.8	23.2	6	77		3	4	1				11265.5
	2			6	16.2		4.1	18	21.5	9	87	3		1	1				11509.8
				4.2	28.1	2.5	6.1	19.9	25.6	7	110	1	48	3				1	15370.6
19	17			13	48.3	2	8.9	27.2	40.7	6	196	5	141	7	2	2	6		23107
	15			22.5	45.8	2	4	38.8	54.8	6	273	5		11	2		2	6	23098.7
10	2			22.5	55.6		3.2	42.8	57	18	451			9	2		6	4	22996.8
				7.2	10.8	5	.3	11.2	11.9	6.7	141	2	2	3			1		4718
85	55	25	16	147.2	437	12.5	82.5	332.7	452.5	92.7	2659	41	845	73	17	3	37	33	210836
																			100%

B. F. HENRY
E. O. LARSEN
RACINE, WIS.
8-18-34

Racine County General Classification Table.

Wisconsin Land Inventory 1934.

WOODLANDS (ACRES)
17952.8 ACRES

NDS (ACRES) SEDGE C4	LEATHERLEAF D4	WEEDY PEATLAND E4	CRANBERRY F4	D1 — 0-6 G	D1 — 0-6 M	D1 — 0-6 P	D1 — 6-12 G	D1 — 6-12 M	D1 — 6-12 P	D1 — 12-18 G	D1 — 12-18 M	D1 — 12-18 P	D1 — 18+ G	D1 — 18+ M	D1 — 18+ P	A1 — 6-12 G	A1 — 6-12 M	A1 — 6-12 P	A3 — 6-12 G	A3 — 6-12 M	A3 — 6-12 P	C3 — 6-12 G	C3 — 6-12 M
				4			15.6	108.4	116.8		22	58.8				30.4	44.4				35		
83.3					6					167.5	607.5	431.8				21.7	43	30	14.5	57.5			
		28				7	14	406.1	448.5	1	191.5	72.5	77.1	138.9	6					91	35.9		17.3
56		1756.5	1	12				40	71	87.5	995.5	561.2				32.5		29.5		9.5	18		246.7
30.5				9.5	31.5		287.9	700.2	214.5	195.5	647.3	412.9	37		56		135			9.5	12.7		37.8
3	96.5			4		12.8	242.2	198.4	342.8	184.9	283.4	209.5	96	131.8	37		54.5	119.5					12.3
574.5			35				42	20	415.4	81	219.5	384			21								24
					66.5	72.5	152	606.5	739.5	134	282.3	441.5		75	51	19.5	4			7.5			43
539.4		6		3			210.5	210.5	294.5	81	608	578.5					20						
34							42.7	246.9	271.6	56.2	409.1	201.7											
							55	149.5	58.5	2	53.3	42.3											
				12	22.5	40.5	40		95.5			91									6.5		
1320.7	96.5	1790.5	36	44.5	126.5	132.8	1101.9	2686.5	3068.2	990.6	4317.6	3485.7	210.1	345.7	171	104.1	300.9	179	14.5	175	108.1		381.1
.63	.04	.85	.01	.02	.06	.06	.52	1.27	1.45	.47	2.05	1.66	.1	.16	.08	.05	.15	.09		.09	.05		.2

(INCHES)
18+

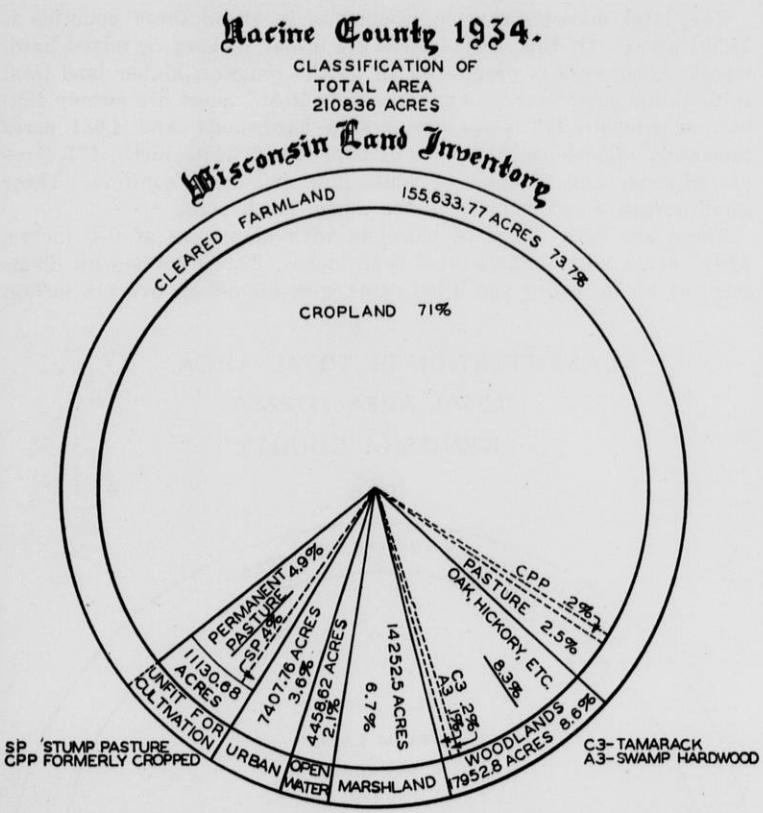
Racine C

DESC. TOWNSHIP AND RANGE	AGRICULTURAL (ACRES)													MARSHLANDS (ACRES)										
	CLEARED C	PASTURE P	STUMP PASTURE SP	PERMANENT PASTURE PP	FORMERLY CROPPED CPP	ORCHARD	FUR FARM	EROSION	ABANDONED A	URBAN U	BURIAL PLOT	GRAVEL PIT Ø	OPEN WATER L	TAG ALDER-WILLOW A4	CATTAIL B4	GRASS C4	SEDGE C4	LEATHERLEAF D4	WEEDY PEATLAND E4	CRANBERRY F4	DI — 0-6 G	DI — 0-6 M	DI — 0-6 P
CALEDONIA T4N - R23E	6927.2	167.1	19.2	198.9		6.4		7		632.3			110.2	32.4		74.6					4		
CALEDONIA T4N - R22E	19719.2	159	168.6	471.7		42				430.8	9.5		72.3			100.7	83.3					6	
RAYMOND T4N - R21E	19069.1	5328	80	933.9	29	24				42.5	12.4	5	54.5	12.5	39.1	289.6			28				7
NORWAY T4N - R20E	13569.5	290.9	72	1370.6						240.5	7		1363.5	217.2	45.5	1683.5	56		1756.5	1	12		
WATERFORD T4N - R19E	12910.8	422	152	949.5			20		9	475	5	3.5	1179	69	185	2890.2	30.5				9.5	31.5	
ROCHESTER T3N - R19E	6222.4	504.3	95.1	1095.4		9	7		9.5	130.2		7.5	117.9	69.3	24.8	944.5	3	96.5			4		12
BURLINGTON T3N - R19E	5497.5	177.5		1023.9	364.5					1480.5	37		679.5	43.5		389.5	574.5			35			
BURLINGTON T2N - R19E	7695	677.6	71.8	1228.2	61	36	8		6.5	176		29.5	286.2	96.7	37	2257.7						66.5	72
DOVER T3N - R20E	15397.7	1158.6	111	1546.5		4			23	862	11		526.5		21.5	893.8	539.4		6		3		
YORKVILLE T3N - R21E	18955.1	977.2	49	1116.5		28				322.5	2.5		46		6	333.7	34						
MT. PLEASANT T3N - R22E	20567.1	179.2		372.9		110			18	1115.5	26			7	7	233.5							
MT. PLEASANT T3N - R23E	30064	63.5		4						1245.1	48	16	23			4					12	22.5	40
TOT. BY TYPE	149537	5309.7	818.7	10312	454.5	259.4	35	7	66	7152.9	158.4	61.5	4458.6	547.6	365.9	10095.3	1320.7	96.5	1790.5	36	44.5	126.5	132
% BY TYPE	70.95	2.52	.39	4.89	.22	.12	.01		.03	3.39	.07	.03	2.11	.26	.17	4.78	.63	.04	.85	.01	.02	.06	.06

KEY - G - GOOD
M - MEDIUM
P - POOR

DI - OAK HICKORY TYPE
AI - UPLAND HARDWOOD
A3 - SWAMP HARDWOOD
C3 - TAMARACK
RC - RED CEDAR

DIAMETER CLASSES (INCHES)
0-6 6-12 12-18 18+



land would be helpful in reducing dust storms and erosion, as well as in raising the water table, reducing rapid runoff and excessive evaporation.

Of the present marsh or peat land, not now used for crop production, 50,000 acres would probably support a tree growth of Norway spruce, tamarack and black ash. Much of the balance of the marsh land would be eliminated by a raise of a few feet in lake levels. (See Plates on pages 28, 29, 30)

Of the woodlot area of 78,991 acres, about 68,000 acres are upland hardwoods, mainly oak-hickory, and the balance of nearly 11,000 acres are swamp hardwoods and tamarack.

STATUS OF THE WOODLANDS

Formerly these counties were well timbered with oak and other varieties of hardwoods. Samuel Storrow when he travelled through this region in 1817 mentions the white oak trees as the largest he had ever seen. He also mentions the oak openings, or natural clearings, looking as if made by the hand of man.

The total acreage now in woodlands in these three counties is 78,991 acres. Of this, 68,134 acres are in oak-hickory or mixed hardwoods. This area is practically all on the rougher, higher land least suitable for agriculture. Approximately 10,857 acres are swamp timber, of which 6,173 acres are swamp hardwoods, and 4,684 acres tamarack. There are 615 acres of popple and white birch, 471 acres of red cedar and 77 acres of white pine and other conifers. These small acreages are included in the mixed hardwoods.

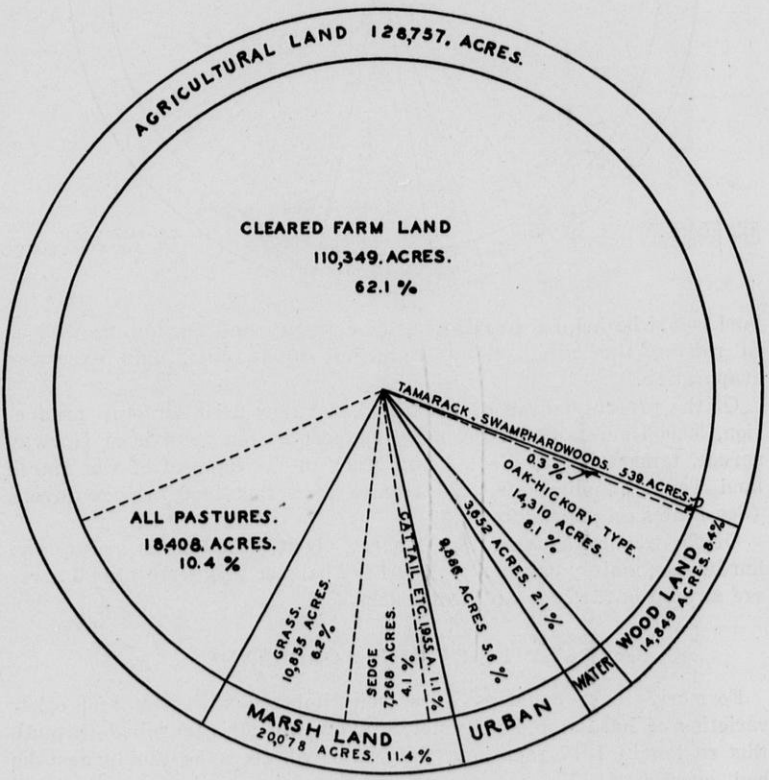
There are 5,389 acres of woodlots with diameters of 0–6 inches, 48,413 acres with diameters of 6–12 inches, 22,985 acres with diameters of 12–18 inches and 2,180 acres with diameters over 18 inches.

CLASSIFICATION OF TOTAL AREA.

TOTAL AREA 177,222 A.

KENOSHA COUNTY.

1934.



PLATE

KENOSHA COUNT

PHYSICAL INVENTORY OF KENOSHA COUNTY INCLUDING LAND COVER CLASSI

ACRES

DESC.		AGRICULTURAL																OAK-HICKORY D-1												SWAMP HARDWOOD A-3						TAMARACK C-3					
																		0-6			6-12			12-18			18 & OVER			0-6			6-12			0-6			6-12		
TOWNSHIP	RANGE	C CLEARED	P PASTURE	SP STUMP PASTURE	PP PERMANENT PAST.	CPP POOR LAND PREVIOUSLY CROPPED	Y ORCHARDS & VINEYARDS	A ABANDONED	O OPEN	U URBAN	AIR PORT	CAMPSITE	CEMETERY	COMMERCIAL GRAVEL PITS	GOLF COURSE	NURSERY	PARKS	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	
1N	20E	11,060	497	69	794	236	2	145	188	1,310			11	262	123		48	58	35		188	833	795	220	326	188			11			7	32							33
2N	22E																																								
2N	23E	20,933	446	9	430	246	94	208		2,696	120		44		225	80	321	29	6	10	236	140	189		42	80			6				89	5						
1N	19E	8,297	244	68	680	171	94			740			6	26	289					49	20	451	424		392	457		116			8									
1N	22E																																								
1N	23E	15,100	786	56	778	525	35	2,108		3,238	147		2		51						84	878	327	18	449	34			23											
2N	21E	17,029	1,137	255	301	456	20			29			3						31		36	400	380	48	202	267			30											
1N	19E																																								
2N	19E	8,011	159	30	893	291		3		230			8	12				3			81	629	386		174	323		22	76									168	179
1N	21E	14,872	1,163	376	1,507	82	37	60		104			1					12	5		221	762	243		80	158		6											
2N	20E	14,677	1,134	297	668	615	7					140							8	44	144	745	585	71	486	387		72	79							8			
TOTAL		109,979	5,566	1,160	6,051	2,622	289	2,524	188	8,347	267	140	75	300	688	80	369	102	85	103	1,010	4,838	3,329	357	2,151	1,894		216	225	8		7	121	5		8		168	212
PERCENT		62.06	3.14	.65	3.41	1.48	.16	1.42	.11	4.71	.15	.08	.04	.17	.39	.05	.21	048	.05	.06	.57	2.73	1.88	.20	1.21	1.07		.12	.13	.005		004	.07	003		005		.09	.12

0-6, 6-12, ETC. DIAMETER IN INCHES. ABBREVIATIONS: G-GOOD, M-MEDIUM, P-POOR.

KENOSHA COUNTY 1934

Y INCLUDING LAND COVER CLASSIFICATION IN ACRES-BY CIVIL TOWNSHIPS AND BY TYPES.

NUMBERS → MILES

	SWAMP HARDWOOD A-3									TAMARACK C-3						MARSH					WATER (LAKES)	TOTAL ACRES	HOUSES OCCUPIED	HOUSES UNOCCUPIED	SUMMER HOMES	SCHOOLS	CHURCHES	STORES	FILLING STATIONS	CREAMERIES	ARMORY	SANITARIUM	GREENHOUSES	HANGAR	GRAVEL PITS	EROSIONS	SPRINGS	FUR FARMS	GAME COUNT			HIGHWAYS					TELEPHONE & POWER LINES		RAILROADS
	18 & OVER			0-6			6-12			0-6			6-12			CAT TAIL	SEDGE	WEEDY PEAT	TAGALDER-WILLOW	GRASS																					GEESE	HUNG. PART.	PHESANT	HARD SURFACED	GRAVEL IMPROVED	GRAVEL UNIMPROVED	DIRT IMPROVED	DIRT UNIMPROVED	TELEPHONE	POWER	
	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	B4	C4	E4	A4	C4																															
			11				7	32						33	9	144	1,004		68	2,658	1,754	23,108	221	12	182	10	1	1	8						11	1	2	3		17	3	14.74	52.96	3.22	1.42		52.78	47.73	12.96
			6					89	5							9	74		7	153		26,927	496	4		8		3	9		1	1				6	1			29	3	22.27	55.21	8.18	3.50	.57	62.90	60.36	24.41
		116			8											22	167	125	87	902	1,520	15,355	141	2	376	4		2		1						3	2			11		8.48	40.45	1.65	.93		39.96	20.82	5.96
			23													344	1,393		80	1,217		27,673	470	5	2	13	1		14				5	1	1					13	1	29.21	58.27	2.30	.47	.25	51.98	57.73	26.22
			30													71	990	4	13	1,118	12	22,832	201	5		11	3		1						1	3			88	9	10.43	36.10	4.50	.50		42.08	14.35	
		22	76										168	179		202	972		190	2,167	171	15,380	156	2	10	7	3	2	3	1						7	2			11	1	8.29	30.73	1.20	3.52		36.49	22.04	4.15
		6														166	1,277	324	18	1,443	181	23,098	221	2		7	2	1	5						8	2			36	12	7.00	53.13	1.77			44.97	32.09	6.10
		72	79								8					45	1,391		35	1,197	14	22,849	171	5		8	1		1						5	3	1	1	15	57	7		56.75	6.15	.75		42.57	28.21	
		216	225		8			7	121	5		8		168	212	9	1,003	7,268	453	498	10,855	3,652	177,222	2,077	37	570	68	11	9	41	2	1	1	5	1	29	24	6	4	15	262	36	100.42	383.60	28.97	11.09	.82	373.73	283.33	363.13
		.12	.13		.005			.004	.07	.003		.005			.09	.12	.005	.57	4.10	.26	.28	6.13	2.06	100.																										

ATIONS: G-GOOD, M-MEDIUM, P-POOR.

WISCONSIN LAND

MILES

UNT	HIGHWAYS					TELEPHONE & POWER LINES		RAILROADS		DESC.		
PHESANT △	HARD SURFACED ▬	GRAVEL IMPROVED ▬	GRAVEL UNIMPROVED ▬	DIRT IMPROVED ═	DIRT UNIMPROVED ⁝⁝	TELEPHONE ⁝⁝	POWER ⊥⊥⊥	RAILROADS ╫	R.R. ABANDONED ╫	TOWNSHIP	RANGE	
3	14.74	52.96	3.22	1.42		52.78	47.73	12.96		1 N	20 E	SALEM
3	22.27	55.21	8.18	3.50	.57	62.90	60.36	24.41		2 N 2 N	22 E 23 E	SOMERS
	8.48	40.45	1.65	.93		39.96	20.82	5.96	4.12	1 N	19 E	RANDALL
1	29.21	58.27	2.30	.47	.25	51.98	57.73	26.22		1 N 1 N	22 E 23 E	PLEASANT PRAIRIE
9	10.43	36.10	4.50	.50		42.08	14.35			2 N	21 E	PARIS
1	8.29	30.73	1.20	3.52		36.49	22.04	4.15		1 N 2 N	19 E 19 E	WHEATLAND
12	7.00	53.13	1.77			44.97	32.09	6.10		1 N	21 E	BRISTOL
7		56.75	6.15	.75		42.57	28.21			2 N	20 E	BRIGHTON
36	100.42	383.60	28.97	11.09	.82	373.73	283.33	363.13	4.12	TOTAL		
ATI										PERCENT		

WISCONSIN LAND INVENTORY.

There is practically no reproduction. This is due to grazing, and many woodlots are rapidly becoming open pasture. (See Plates and Cuts on pages 19, 21–27 inclusive) Plates on pages 21, 22, 23 show the acreage of the woodlands density. The following table shows the approximate acreage, size, density and cords of the various kinds of woodlots in the three counties.

Note the dead trees in this heavily grazed woodlot.

Note the condition of this ungrazed woodlot.

	Waukesha County			Racine County				Kenosha County			
Acres	Size	Density	Cords	Acres	Size	Density	Cords	Acres	Size	Density	Cords
569	0–6	Good	None	44	0–6	Good	None	102	0–6	Good	None
1,185	0–6	Med.	None	136	0–6	Med.	None	101	0–6	Med.	None
3,016	0–6	Poor	None	133	0–6	Poor	None	103	0–6	Poor	None
1,555	6–12	Good	46,650	1,220	6–12	Good	36,600	1,185	6–12	Good	35,550
13,850	6–12	Med.	207,750	3,543	6–12	Med.	53,145	5,171	6–12	Med.	77,565
15,192	6–12	Poor	75,960	3,355	6–12	Poor	16,775	3,343	6–12	Poor	16,715
1,132	12–18	Good	45,280	991	12–18	Good	39,640	357	12–18	Good	14,280
4,664	12–18	Med.	93,280	4,318	12–18	Med.	86,360	2,151	12–18	Med.	43,020
3,990	12–18	Poor	31,920	3,486	12–18	Poor	27,888	1,894	12–18	Poor	15,152
176	18 up	Good	7,040	210	18 up	Good	8,400				
437	18 up	Med.	8,740	346	18 up	Med.	6,920	216	18 up	Med.	4,320
399	18 up	Poor	3,192	171	18 up	Poor	1,368	225	18 up	Poor	1,800
46,165			519,812	17,953			277,096	14,848			208,402

Av. per rural home.....105 Av. per rural home.....104 Av. per rural home.....100 c'ds
Av. per acre..... 1.4 Av. per acre..... 1.3 Av. per acre..... 1.25
Total fuel wood in the three counties 1,005,310 cords.

Note. Table based on the following:

No. of cords in good stand 6–12" 30 per acre
No. of cords in med. stand 6–12" 15 per acre
No. of cords in poor stand. 6–12" 5 per acre

No. of cords in good stand 12" and up 40 per acre
No. of cords in med. stand 12" and up 20 per acre
No. of cords in poor stand 12" and up 8 per acre

In connection with the cutting and depletion of the woodlands, it is interesting to note the percentage of recently cut over land as compared to the total acreage of woodland. The following table shows this relationship.

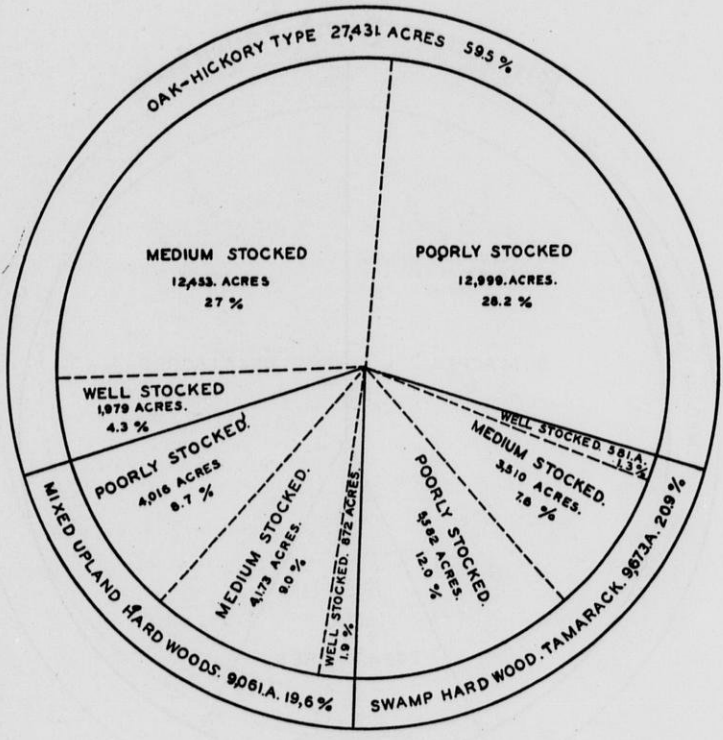
	Total Stumpland	Woodland	Total	%
Waukesha Co.	3398	46,190	49,588	6.8
Racine Co.	819	17,953	18,772	4.4
Kenosha Co.	1160	14,848	16,008	7.2
Total	5377	78,991	84,368	6.4

The present total stumpland cut very recently is 5,377 acres. This represents 6.4% of the total wooded area of the region. If this amount were cut every year the entire area of woodlands in this district would be gone in about fifteen years.

FARM WOODLOT MANAGEMENT

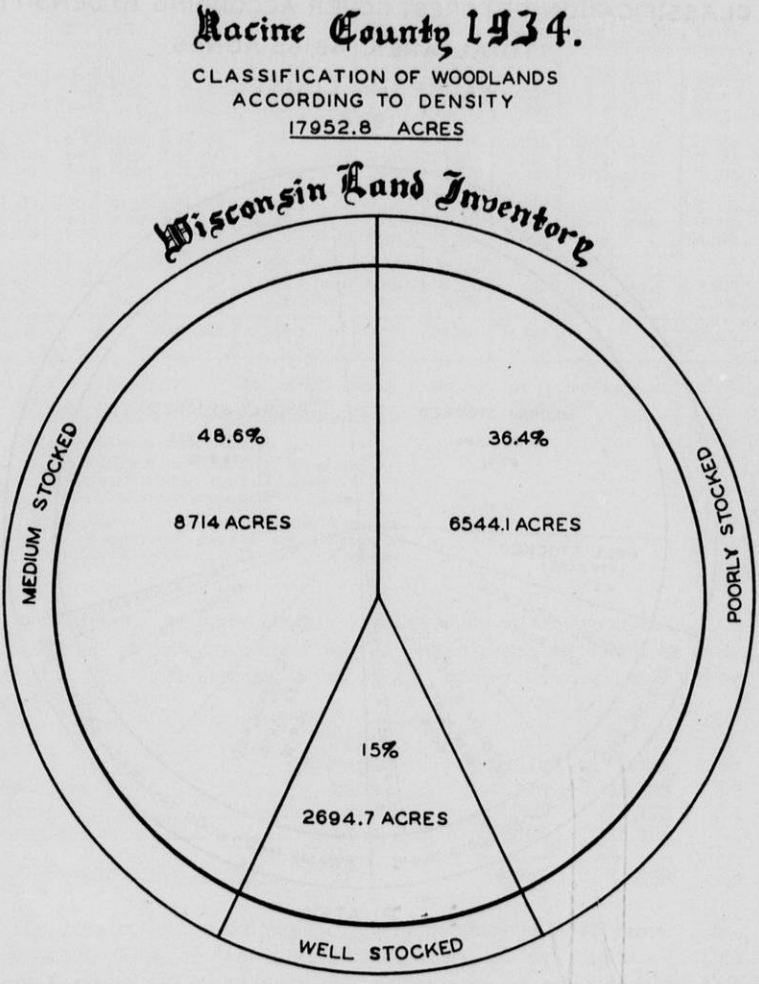
The present trend toward more intensive use of the best land on the farm leaves more steep, stony and wet land relatively idle. Such lands should be growing timber, because a farm is never operated at its greatest efficiency unless all its land is producing to capacity. Other reasons why such land should again be placed under forest cover are:

CLASSIFICATION OF FOREST COVER ACCORDING TO DENSITY.
TOTAL AREA 46,165 ACRES.
WAUKESHA COUNTY.
1934.



PLATE

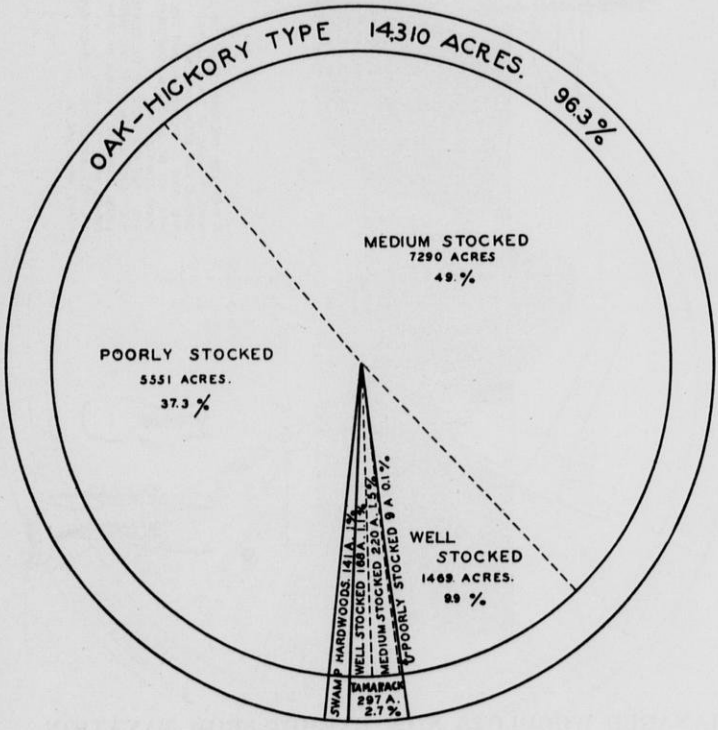
1. Conservation of soil moisture not only of the forested land, but extending out to adjacent open fields.
2. Erosion control by holding the ground from washing. (The forest floor prevents water from running off as fast as in the open; absorbing and checking the beating rain, and the roots hold the soil.)
3. The need of windbreaks to reduce evaporation and stop dust storms.
4. To provide fuel, lumber, fence posts, poles, ties, pulp wood, as well as maple sugar and other products.
5. Woodlots provide work for winter and late fall.



6. By utilization of the poorer lands of the farm the gross value of the farm is increased.
7. Woodlands provide a refuge for game and all forms of wild life, and add much to the beauty of the landscape.
8. More woodlands are needed for recreational use along the densely populated Lake Michigan water front. (See Cut page 7)

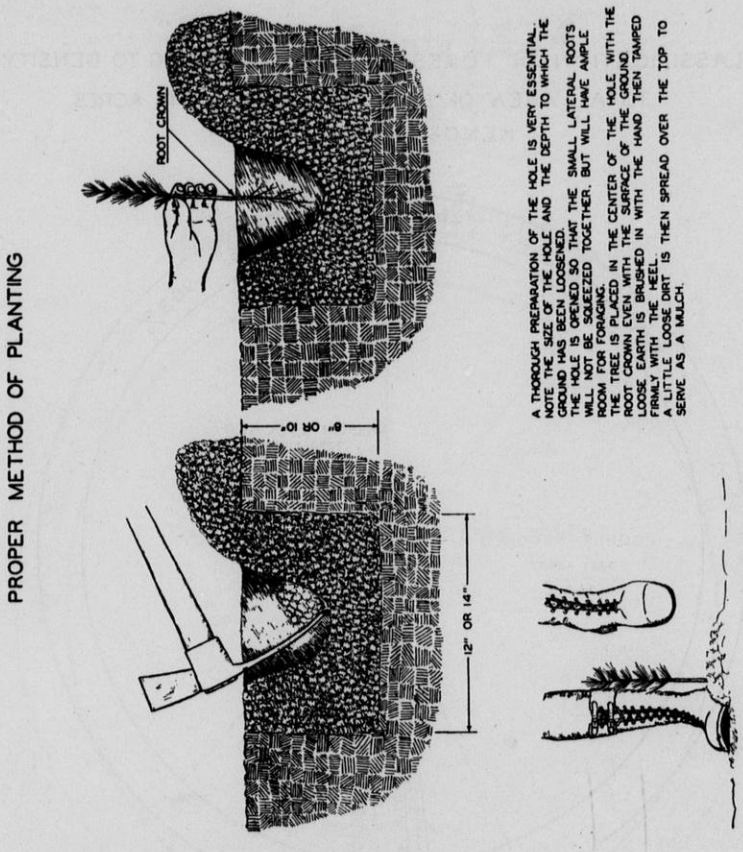
One of the first things necessary in the proper care of a woodlot is improvement cutting. This consists of cutting out the defective

CLASSIFICATION OF FOREST COVER ACCORDING TO DENSITY.
TOTAL AREA OF FOREST COVER 14,848. ACRES.
KENOSHA COUNTY.
1934.



PLATE

trees and those trees of inferior species that may be crowding the better ones. This can be done best when cutting fuel wood. In all thinnings, care should be taken that the remaining stand is not injured. This cutting opens the stand enough to give the remaining trees light and space, so they will grow more rapidly. In cutting out building material use should be made of mature or over mature trees. Clear cutting should be avoided especially on steep slopes where erosion is liable to occur. Large open spaces can be planted with young trees, or an open stand can be underplanted with small trees which are shade tolerant.



MANAGED WOODLOTS NOW EXEMPT FROM TAXATION

In order that a growth in acreage of farm woodlots might be encouraged, new laws have been recently enacted which exempt woodlots from *taxation* under certain restrictions. The new state law relating to woodlots exempts the following type of land from taxation.

(a) "Any woodlot or woodlots forming an integral, even though detached, part of any improved and regularly operated farm, and not exceeding one-fifth of the total area of such farm, if the same is enclosed with a legal fence sufficient to keep out horses, cattle, sheep, hogs or other grazing animals.

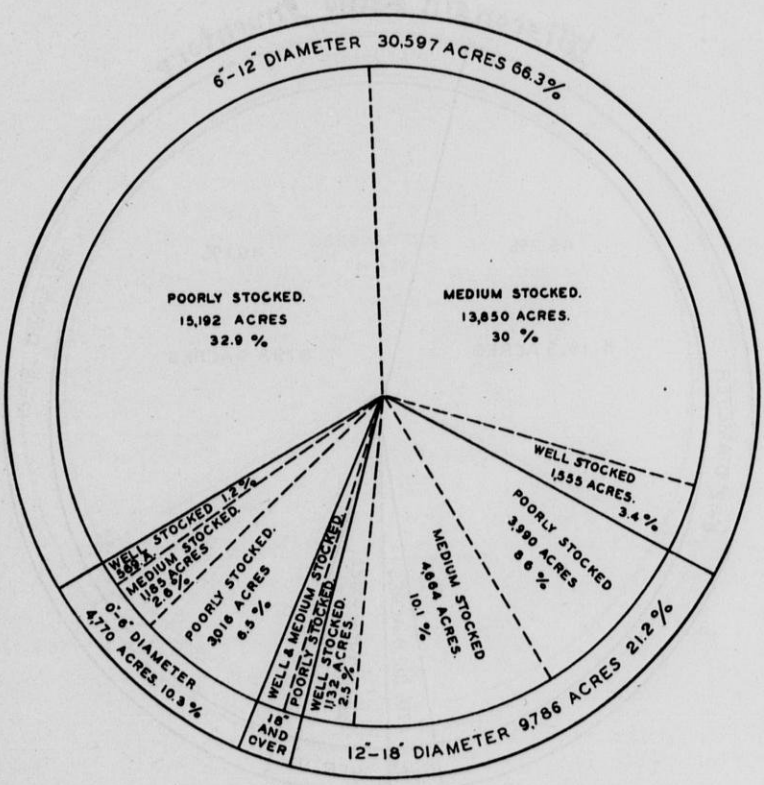
(b) "In addition to the land described in paragraph (a) any portion of a regularly operated farm, the slopes of which are at a gradient of more than thirty per cent, if the same is enclosed with a fence consisting of not less than three barbed wires and the owner refrains from cultivating or mowing such portion, grazing any type of live-

CLASSIFICATION OF FOREST COVER ACCORDING TO SIZE.

TOTAL AREA 46,165 ACRES.

WAUKESHA COUNTY.

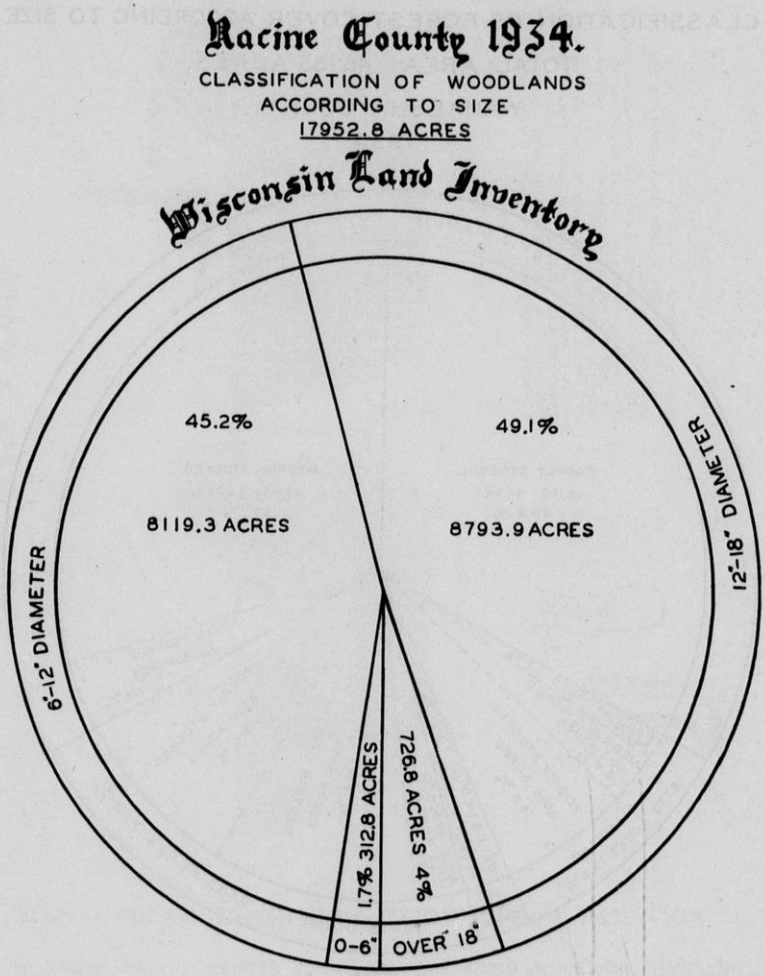
1934.



PLATE

stock thereon, and from burning over such land or takes reasonable precaution to prevent such burning; and if the owner makes a reasonable effort to reforest such portion or to revegetate the same with grass or shrubs such as will prevent erosion or excessive run-off."

In order to obtain such an exemption the owner must file with the town clerk a sketch of the property to be exempted, giving proper dimensions etc., and certifying that the land will not be grazed or burned over, and that he will endeavor to practice forestry upon the land or otherwise revegetate with grass or shrubs the sloping portions liable to erode.

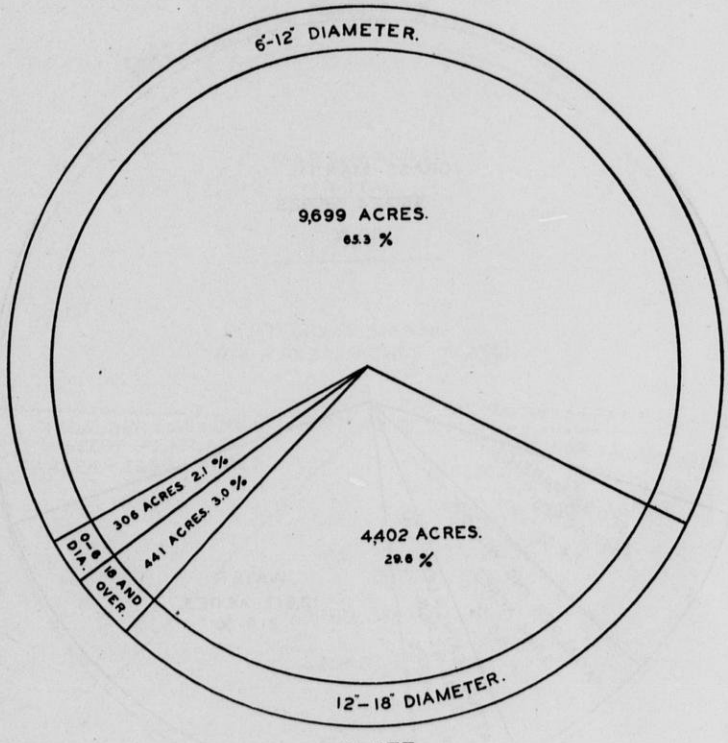


FOREST PLANTING AREAS

High Land

There are 35,300 acres of poorly stocked woodlots in the three counties upon which planting of additional trees would be advisable. About 5,530 acres have reverted from crop land to permanent pasture. (CPP) To this should be added 1343 acres of open land (unused land). This makes a total of 42,175 acres that is better adapted to forest use than to farm crops and pasture. The following table shows the acreage of the above types in the three counties:

CLASSIFICATION OF FOREST COVER ACCORDING TO SIZE.
TOTAL AREA OF FOREST COVER 14,848 ACRES.
KENOSHA COUNTY.
1934.

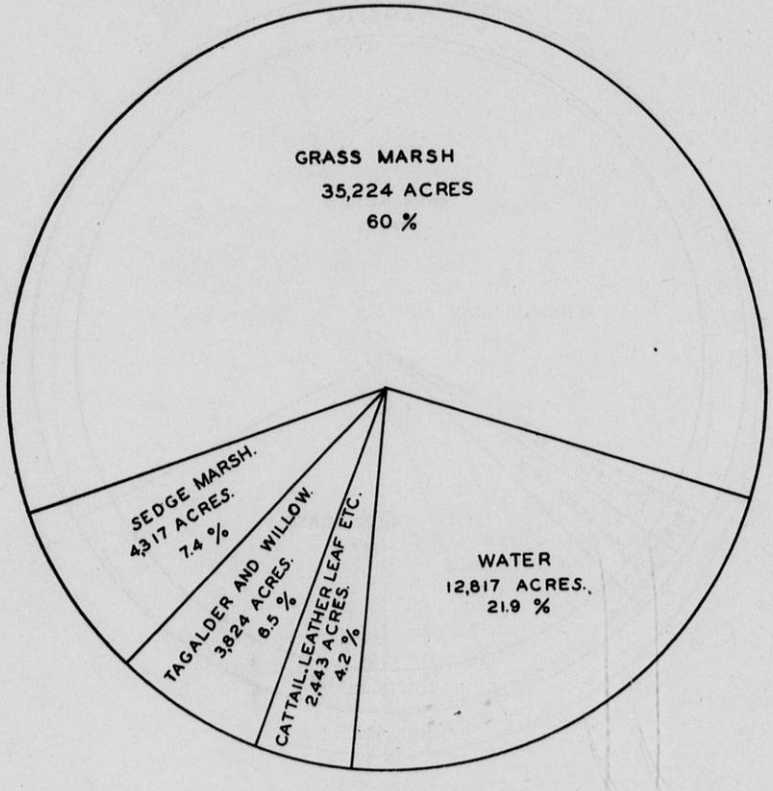


PLATE

PLANTING AREAS ON HIGH LAND

Type	Waukesha	Racine	Kenosha	Totals
CPP	2,453	455	2,622	5,530
Poorly stocked woodlands	22,597	7,145	5,560	35,302
Open land	1,343	----	----	1,343
	26,393	7,600	8,182	42,175

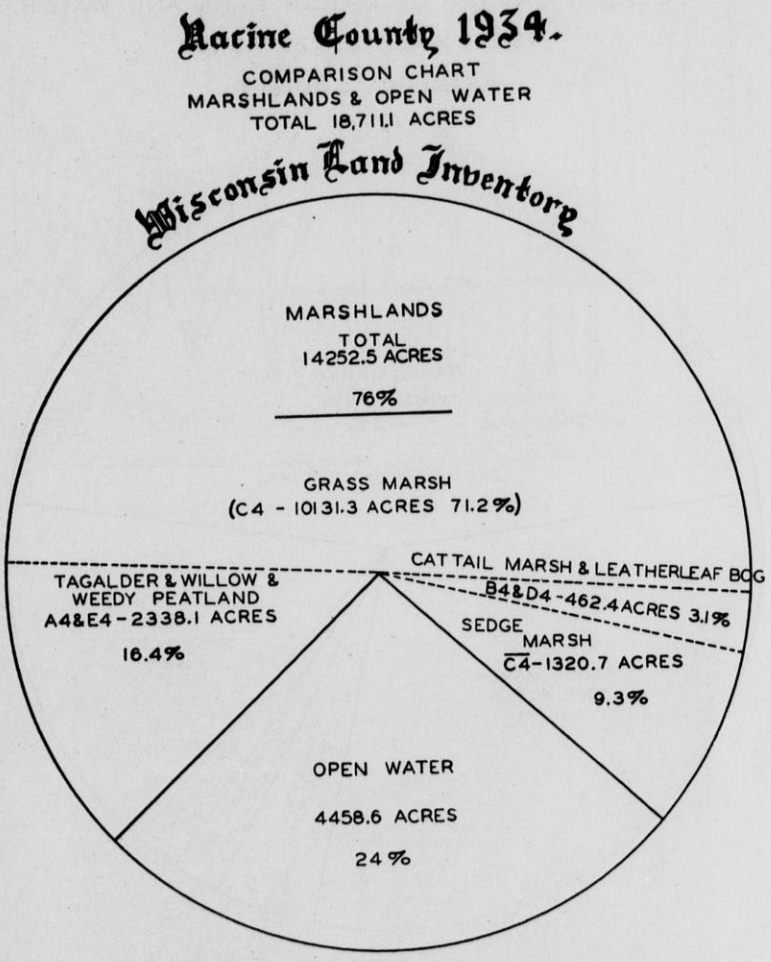
CLASSIFICATION OF MARSH LAND AND WATER.
TOTAL AREA 58,625 ACRES.
WAUKESHA COUNTY.
1934.



PLATE

Marsh Land

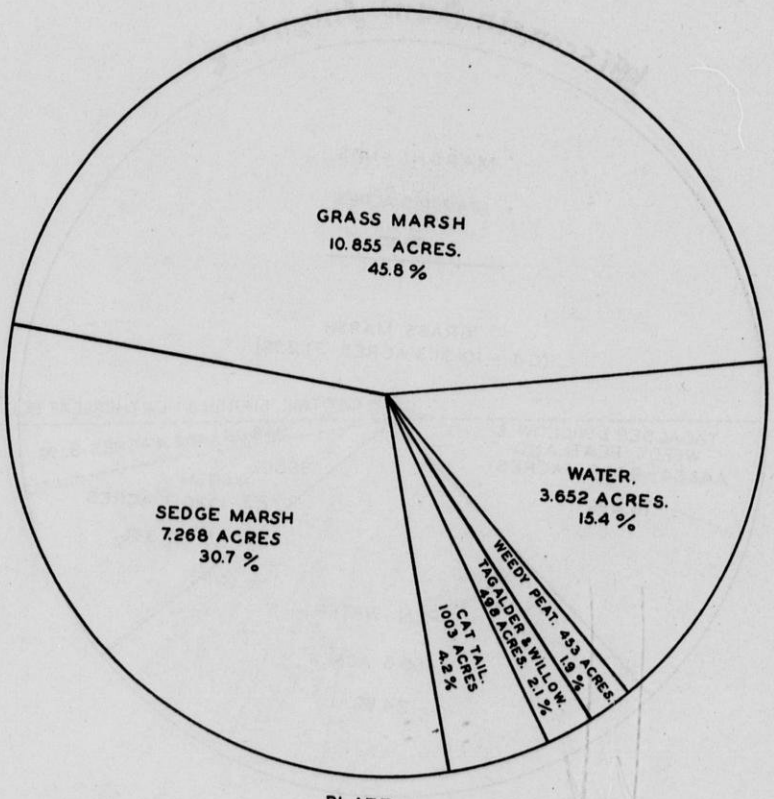
Beside the above high land, there is a total of 76,325 acres of marsh land that should in part be covered with forest growth. Of this 12,906 acres are sedge marsh, 56,174 acres are grass marsh, 2,375 acres are weedy peat land, and 4,870 acres are low brush land. Much of the grass marsh land is used for pasture and, therefore, should not be considered in a forest planting program.



PLANTING AREAS ON MARSH LAND

Type	Waukesha	Racine	Kenosha	Totals
Sedge	4,317	1,321	7,268	12,906
Grass	35,224	10,095	10,855	56,174
Weedy Peat	131	1,791	453	2,375
Brush	3,824	548	498	4,870
	43,496	13,755	19,074	76,325

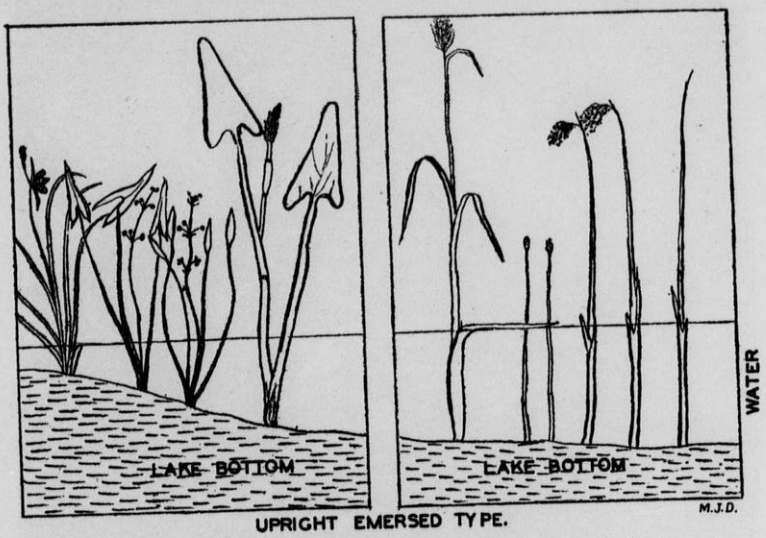
CLASSIFICATION OF MARSH LAND AND WATER.
TOTAL AREA 23.729 ACRES.
KENOSHA COUNTY.
1934.



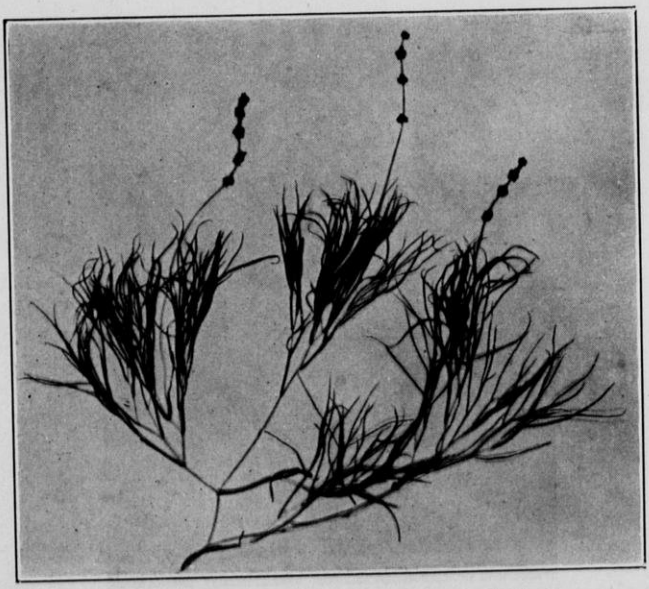
PLATE

The total area, including the high and low land on which forest planting is immediately possible, is 62,324 acres. Planting this area would not decrease the permanent upland nor grass marsh land pasture.

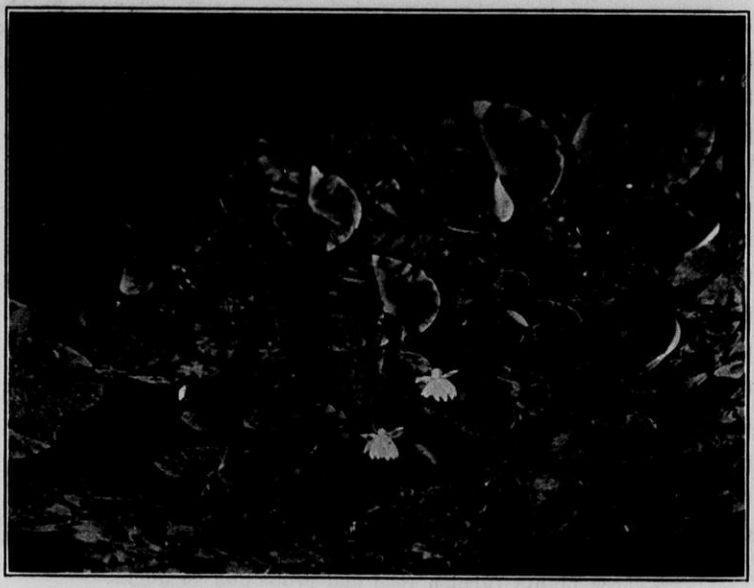
Waukesha county has 34,665 acres of the above amount of land in need of planting, Racine county has 11,260 acres and Kenosha county has 16,399 acres. (For the proper planting method see page 24)



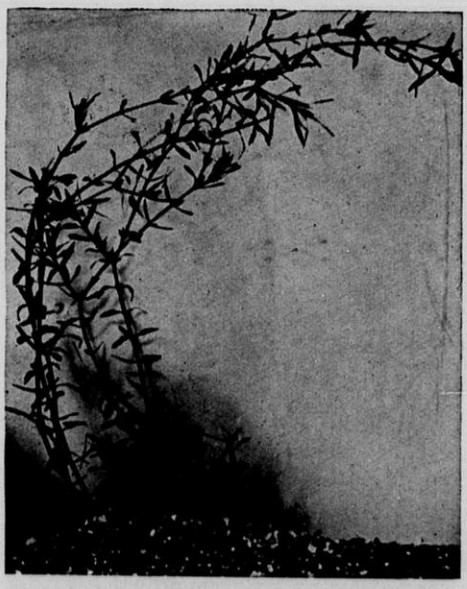
These plants furnish food and protection to ducks.



Sago pondweed also an important duck food.



Lily pads are common where game fish live.



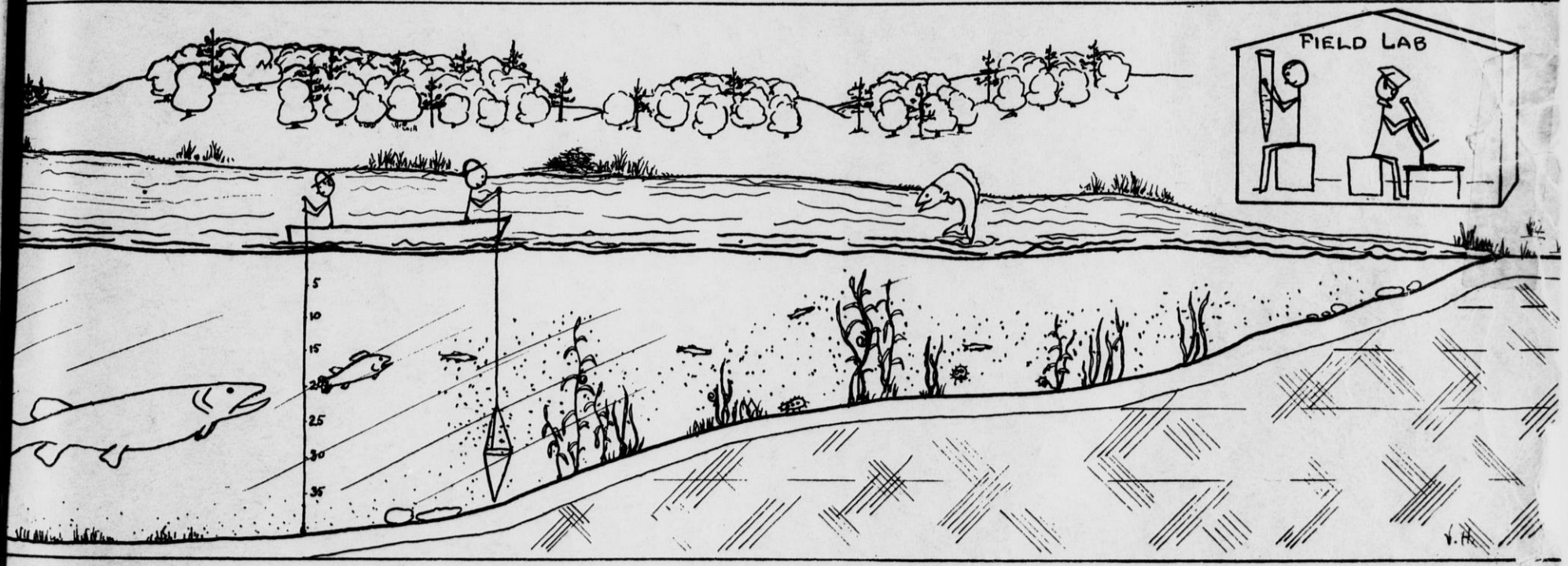
The common water weed *(Elodea)* Important to fish life.

STATE OF WISCONSIN

STATE PLANNING BOARD

Governor JULIUS P. HEIL, *Chairman* MARTIN W. TORKELSON, *Director of Regional Planning*

MADISON, WISCONSIN JANUARY, 1939



INVENTORY OF NORTHERN WISCONSIN LAKES

Bulletin No. 5

By

DIVISION OF LAND ECONOMIC INVENTORY

JOHN S. BORDNER, *Director* WM. W. MORRIS, *Forester*
EARL D. HILBURN, *Engineer* LEWIS POSEKANY, *Biologist*
RUSSELL SANFORD, *Botanist*
411 W. Wing, Capitol Building

INTRODUCTION

The Wisconsin Land Economic Inventory Division has compiled from its own inventory data, and the findings of those who engage in special and refined research the information in this bulletin. The Division accepts what President Roosevelt has so well said about the need of governmental agencies finding the best use for land on which the people depend. However, what is more important than finding this best land use, according to President Roosevelt, is to get people to carry out in a concerted manner a program of better land use. To do this they must understand their common problems. Lake use is only a distinct phase of general land use and this bulletin, it is hoped, may serve as a guide to better lake use. Wisdom is no one man's possession in a democracy. Therefore concerted action of a majority can only come through common understanding. A common understanding by those who depend on lakes for their daily living as well as vacationists and sportsmen will make it possible for Conservation officers to spend more and more time in lake improvement and less time in law enforcement (policing). It is hoped therefore that this bulletin may be helpful in making possible the ancient concept of better government, viz., that government governs best which is required to govern least.

Grateful acknowledgment is hereby made to the following agencies and people for data and assistance. The agencies are: the National Resources Board, the U. S. Biological Survey; the Federal Forest Service; the Botany and Zoology Departments of the University of Wisconsin; the Wisconsin Department of Conservation; the Wisconsin Geological and Natural History Survey, the Wisconsin Public Service Commission, and the Wisconsin Board of Health. The people are: John H. Steenis, Jr. Biologist, U. S. Biological Survey; Professors C. Juday, Norman Fassett, Chester A. Herrick, Lowell W. Noland, E. F. Bean and Mr. S. Brackett of the University of Wisconsin; Lewis Posekany, Biologist and Russell Sanford, Botanist, who did much of the field work; Earl D. Hilburn in charge of the Land Economic Inventory W.P.A. Project, and Otis Bersing and Sid Gordon who are in charge of lake improvement work for the Biology Division of the Wisconsin Department of Conservation. The Land Economic Inventory Division is particularly grateful to the Forest Rangers and Conservation officers as well as the resort owners, county officials and others for their splendid cooperation.

JOHN S. BORDNER, *Director.*

Entered as 2nd-class matter, January 28, 1915 at the post office at Madison, Wisconsin, under the act of June 6, 1901.

TABLE OF CONTENTS

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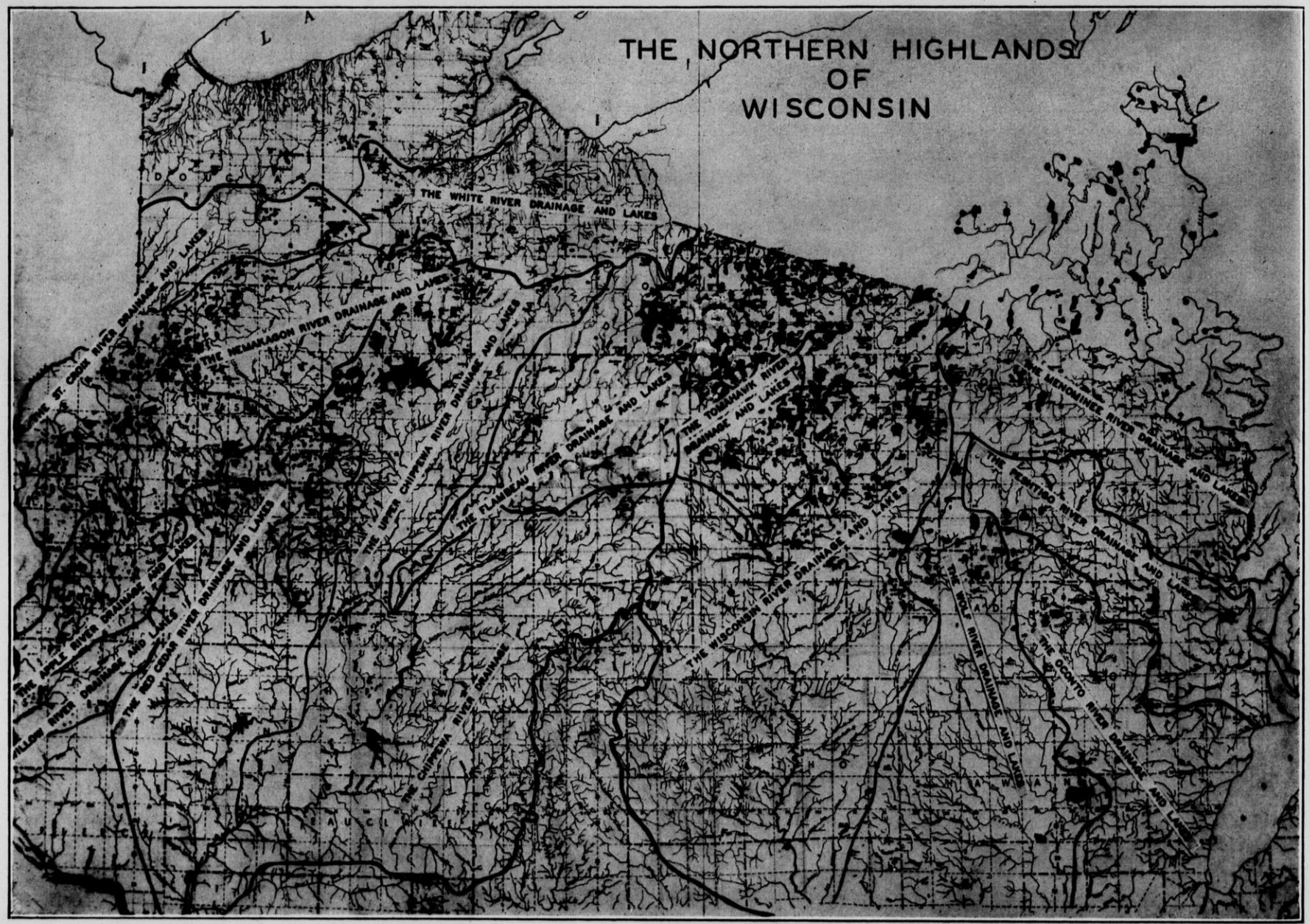
THE NORTHERN HIGHLANDS
OF
WISCONSIN
THE WHITE RIVER DRAINAGE AND LAKES
THE NEMAKAGON RIVER DRAINAGE AND LAKES
THE ST. CROIX RIVER DRAINAGE AND LAKES
THE UPPER CHIPPEWA RIVER DRAINAGE AND LAKES
THE FLAMBEAU RIVER DRAINAGE AND LAKES
THE TOMAHAWK RIVER DRAINAGE AND LAKES
THE MENOMINEE RIVER DRAINAGE AND LAKES
THE PESHTIGO RIVER DRAINAGE AND LAKES
THE APPLE RIVER DRAINAGE AND LAKES
THE RED CEDAR RIVER DRAINAGE AND LAKES
THE CHIPPEWA RIVER DRAINAGE
THE WISCONSIN RIVER DRAINAGE AND LAKES
THE WOLF RIVER DRAINAGE AND LAKES
THE OCONTO RIVER DRAINAGE AND LAKES

NORTHERN HIGHLAND LAKES. THE SOURCE OF WISCONSIN'S RIVERS

Without water there is no life. It is as important, therefore, to determine the amount, area, nature and behavior of the water of these northern regions as it is to map and measure the land forming the environs of these bodies of water, because they are the source of the primary river systems of Wisconsin. Gathering the water from thousands of lakes, these streams course southward to the Mississippi and Lake Michigan. The well assorted soil in these river valleys with a well regulated flow of water in the streams is Wisconsin's inexhaustible natural resource. A well regulated stream flow is assured by the great natural reservoirs in these highland counties providing they are protected by forests and properly managed. The entire state is, therefore, interested in maintaining fair water levels in these great natural reservoirs.

Much has been written about the influence of lakes and forests on climate. "Some is good" as the Irishman said, "and much is worse". However, all are agreed that the summer atmosphere within a forest and near water is cooler than on a dry prairie or desert waste. A lower temperature means less evaporation and therefore more water to feed the rivers flowing from this northern highland with its many lakes. The forests on these lake highlands have been greatly depleted. Much land is now idle, i.e., has no worthwhile forest growth. Forests on this idle land will mean a cooler summer atmosphere, and therefore, less evaporation. The utilization of this land area for the production of commercial forests will do much to maintain fair water levels in these vast lake reservoirs and assure a continued stream flow. This well regulated stream flow directly affects the economic life of the state. It is, therefore, the duty of the people of the state to participate in putting the land to work again growing forests on the shores of its lakes.

The glacial deposits of this highland region contain relatively small amounts of calcium and magnesium and, as a consequence, the waters of these lakes contain only small amounts of these substances in solution. On the basis of the hardness of the water, they range from very soft to hard. Even the lakes with the largest amounts of these substances possess much less than the average lake in southeastern Wisconsin. The waters of those lakes that do not have inlets or outlets are usually very soft, while those that do have inlets and outlets possess distinctly harder waters. Overproduction of "summer bloom" is, therefore, not as common as where the water is hard.

IMPORTANT FACTORS AFFECTING LAKES

Lake Physiography

One of the most important factors in lake physiography is the reaction of water to physical and chemical activity. As temperature decreases water becomes more dense—that is heavier, until it reaches its maximum at—not 32° F. (freezing)—but at 39° F., so that at 33° water is actually lighter than water at 40°, hence it tends to come to the top. For this reason, a deep lake does not freeze solid. Associated with specific gravity of water is its thermal resistance to mixing. As the sun warms the water at the surface, it warms the deeper water to a lesser degree. Coupled with the wind currents and animal activity, the water is slowly mixed. As the difference between surface water and depth water becomes more pronounced, the cooler water offers more and more resistance to mixing until finally the lake is divided into very definite layers of water. The size of these layers, of course, depends upon several physical conditions, i.e., the size of the lake, the volume of water, the depth of the lake, its shape, and position relative to prevailing winds, but for lakes having a maximum depth of over 30 feet the following is generally true: (1) from the surface to a depth of 10 to 15 feet there will be a gradual decrease in temperature; (2) following this the next 10 to 15 feet have a more pronounced drop in temperature, until in the region of thirty feet the temperature has dropped so far as to resist mixing; (3) from this point to the bottom (temperatures taken with an H & B minimum registering thermometer by the Land Inventory crews) the temperature remains constant.

Certain terms which have been assigned to these typical temperature layers will be used in further discussion because they convey the idea in the fewest number of words so that the reader is urged to associate epilimnion (upper water) with the upper layer of warm water until it drops at a more rapid rate—where the layer is designated as thermocline (temperature drop). The thermocline extends to that point in the lake where the temperature reaches the minimum. From this point on, the remaining volume of water (to the bottom) is the hypolimnion (under lake). It is this thermal stratification that influences lake life. In the epilimnion are found the algae, waterfleas, and minnows. Extending into the thermocline are the large aquatic plants, the ordinary game fish, the minnows, and the general plankton. The hypolimnion of most of the stratified northern Wisconsin lakes contains little or no life due to the following: as the organisms in the upper water die or give off waste products, this detritus or debris sinks slowly downward, decaying as it goes. As it decays it uses up the life giving oxygen gas dissolved in water. In the upper waters this depletion of oxygen is made up by dissolving more gas from the air or from oxygen produced by the plants and mixing with the non-oxygenated water; but in the lower waters there is no mechanism for replacement of used oxygen. So, the oxygen content of this lower water slowly goes down until it can no longer support economically valuable life. Then this large body of dead water becomes a retarding action to the lake. This water may still be very cold and have nutritive substances, but is not capable of producing as much life.

Drainage and Depth

No study was made of the oxygen content of the lakes, but rather of the conditions that govern the oxygen content necessary for aquatic life. The presence of inlets and outlets in lakes results in an exchange of water and aids in keeping the water supplied with oxygen. If this exchange of water is not adequate or if the lakes are landlocked, they must have sufficient depth to maintain enough oxygen for fish life. If the lake is too shallow, the oxygen will be consumed due to decay and the respiratory processes of aquatic life during the winter freeze over. A prolonged hot weather period in the summer may also cause a depletion of oxygen in shallow lakes due to excessive decay. Landlocked lakes having very soft water should be at least twelve feet deep in order that oxygen will not be used up during the winter freeze over. If such lakes "bloom" i.e., become green due to plankton they should be still deeper. This also applies to landlocked lakes of higher lime or bound carbon dioxide content. Because of the corresponding greater abundance of vegetative matter laid down to decay more oxygen is used up during the winter.

Appearance of Lake Water

Most of the lakes in Northern Wisconsin, particularly the landlocked lakes with sandy beaches have relatively clear water. This means that the sunlight can penetrate to greater depths which makes it possible for aquatic plants to grow in deeper water. Consequently the zone of aquatic plants and corresponding animal life is wider than it would have been if the water had been turbid. Clear lakes with very soft and soft water have a sparse growth of plant life,

and other forms of life are also relatively scarce, due to the lack of essential mineral nutrients necessary for plants. Stained water of lakes is due chiefly to organic matter held in suspension or solution. In such lakes plants are found only in shallow water since light does not penetrate to great depths. During the summer many lakes bloom or become green due to the abundance of microscopic plants known as phytoplankton, which absorb free carbon dioxide and to some extent the half bound carbon dioxide. (3) The absence of free carbon dioxide from water results in a much higher pH than would have existed if the phytoplankton were not present, but the half bound carbon dioxide or carbonate content is not already altered by the presence of this kind of algae. For example, on June 21 Sugar Lake (T. 33 N. R. 9 W., Sec. 15, 22) had a bound carbon dioxide content of 4.3 parts per million, but the pH was above 9.6. In the early spring the pH would be about 7 or below. Other plants use free carbon dioxide but do not have such a noticeable effect on the water.

(3) Free carbon dioxide is the carbon dioxide dissolved in the water that exists in a free state.

Half bound carbon dioxide is a carbon dioxide that is loosely combined with carbonates to form bicarbonates.

Water Levels of Lakes

A constant water level is *essential for* aquatic plants and animals. Lowered water levels due to the drouths of the last few years have damaged fishing conditions because desirable habitats that serve as shelter for fish, harbor for fish foods, and spawning grounds, such as former aquatic plant areas, snags, and like debris, as well as sandy and gravelly bottoms are all left exposed.

Brush and sapling refuges sunk in lakes where protection is lacking to young game fish and also minnows improves such lakes by increasing shelter and also becomes a harbor for fish food.

A constant dam level should be established for all flowages and lakes having dammed outlets. Without such control, planting aquatic vegetation is useless.

Lake Soils

The lake bottoms of deeper water areas with the exception of flowage lakes are composed of a greenish black organic matter. Professor E. A. Birge and C. Juday of the Wisconsin Geological and Natural History Survey have found that this mucky matter is composed chiefly of plankton remains with a variable amount of mineral soil.

The varied nature of the soils in shoal waters offers a corresponding diversified environment for water life. Gravelly areas that are somewhat sheltered from heavy wave action serve as a harbor for the nymphs of the caddis *(Trichoptera)* and fly *(Plecoptera)*. Pure sand has little to offer for sustaining life. However, if overlaid with a thin layer of organic matter, it usually furnishes desirable environment for aquatic plants and other life, particularly in the lakes with the higher lime content. Most lakes have large areas of mucky organic soils in the shoal water region. Some fishermen further divide these organic deposits by classifying them as muck and as loon bottom or silt. Muck is physically and chemically broken down matter which furnishes desirable soils for plant life in the medium to hard water lakes. Loon bottom or silt is of fine texture but only partially broken down and often has an abundance of food nutrients necessary for minute forms of animal life. Silt is a poor name for this kind of organic matter since it is usually used to denote a type of mineral soil of fine texture.

In hard water lakes considerable amounts of marl are laid down with the organic matter. However, it is doubtful that the marl content is sufficient to warrant removing this mixture for agricultural use, except in very old deposits of extinct or partially extinct lakes.

Hardness and Softness of Water

Conditions associated with the hardness and softness of lake water are of basic importance for fish. The analysis of lake water as to its hardness and softness is based on the bound carbon dioxide content rather than on the pH since the pH is more variable. (1) The bound carbon dioxide content of water was determined by Seyler's method (2).

(1) A pH 0-|-7 is neutral, below 7 is acid, and above 7 is alkaline.

(2) Seyler, C. A.
1894, Chemical News, Vol. 70.
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Professor C. Juday of the Wisconsin Geological and Natural History Survey furnished the following table from which the nature of the lake water was determined.

0- 5 parts per million of bound carbon dioxide yields a very soft water (V.S.)

5-10 parts per million of bound carbon dioxide yields a soft water (S)

10-20 parts per million of bound dioxide yields a medium water (M)

20-30 parts per million of bound carbon dioxide yields a medium hard water (M.H.)

Over 30 parts per million of bound carbon dioxide yields a hard water (H)

AQUATIC LIFE

Survey of Aquatic Plants

Various plant associations can be correlated with different fishing conditions. This fact is very important in determining the species of game fish desirable for stocking lakes. Table (page 6) illustrates the relative importance of the hardness and softness of lake water. The very soft water lakes are named first, and the plants are divided into groups similar to those used in Professor N. C. Fassett's paper, *"Plants of Some Northeastern Wisconsin Lakes."* (4) These plant divisions were further altered in part to promote a better understanding.

(4) Fassett, N. C.
1930, Plants of Some Northeastern Wisconsin Lakes, the Transaction of the Wisconsin Academy of Science, Arts and Letters, Vol. XXV.

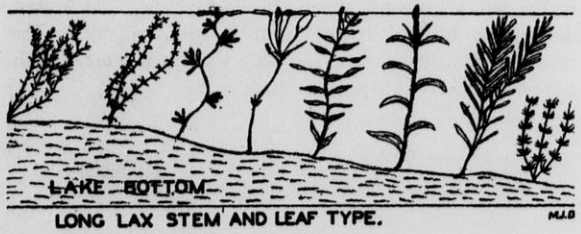
The Short Stiff Stem Leaf or Rosette Type

The Short Stiff Stem, Leaf, or Rosette Plants are small, inconspicuous and of little consequence for fish life. The tubers of stubby wapato *(Sagittaria graminea & S. cuneata)* are of some value as duck foods. The presence of these plants and a lack of the more conspicuous submerged flexuous vegetation, such as different pondweeds, indicate very soft water lakes. Such lakes do not have a desirable environment for wall-eyed pike, but are suitable for bass; however, minnow spawners and refuges for small fish should be placed in the shoal waters.

SHORT STIFF STEM, LEAF, OR ROSETTE TYPE

The Long Lax Stem and Leaf Type

The long lax stem and leaf plants are mostly submerged and have always been associated with game fish because they serve as the ultimate source of food for fish, since diverse kinds of animal life that live on these plants are used as food



LONG LAX STEM AND LEAF TYPE. M.J.D

directly and indirectly by game fish. Professor Juday summarized this inter-relation between plant and fish life by pointing out that "the complicated chain between plant and animal life may have a dozen links in it." This type of plant with a few exceptions is conspicuously lacking in very soft and soft water lakes, but is usually abundant and varied in lakes of higher lime content. The majority of these plants are also duck foods. The seeds, leaves, and in some cases, the winter buds, and tubers are desirable foods for water-fowl. Moreover, these submerged plants are important because they affect lake environment by utilizing the carbon dioxide and liberating oxygen which is so essential for aquatic animal life.

This process is known as Photosynthesis, meaning putting together, by the use of light energy, carbon and other elements and forming starches and fats. Without this process in the pondweeds and other green water plants, lakes would have no fish food, and the oxygen supply of the water would be much lower.

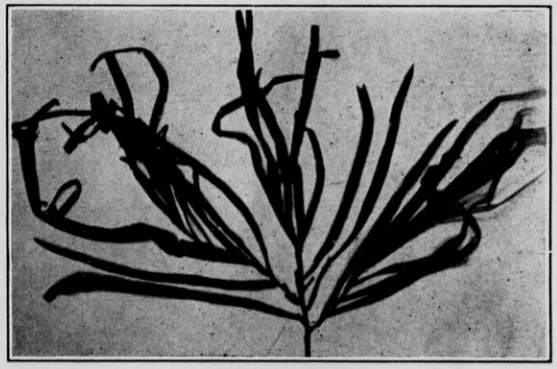
Broad Leaved Pondweeds

MUSKIE WEED
(Potamogeton praelongus) An example of the broad leafed pondweeds; note the boat-shaped leaf tip. Natural size.

Of these long lax flexuous plants, *the broad leaved pondweeds* are the most conspicuous. A typical plant of this group is the muskie weed *(Potamogeton praelongus)*. This weed is a lax stem plant with broad submerged leaves, that has a small flower or seed bearing spike protruding upright out of the water. The distinctive feature that separates the muskie weed from other broad leaved pondweeds is the boat-shaped leaf tip. Beds of this plant have been observed to be the favorite feeding grounds for the muskellunge. This does not mean that if muskie weeds are found, the muskellunge are in that water, but rather, that in "muskie waters" this giant fish is often among the weed beds of this plant.

Other broad leaved pondweeds are the bass weed *(Potamogeton Richardsonii)* with its crisp, curly, clasping leaves; the large leafed bass weed *(Potamogeton amplifolius)* with its large and very broad submerged leaves and also conspicuous floating leaves, and the floating brown leaf *(Potamogeton natans)* with its prominent floating leaves and usually lacking inconspicuous flexuous linear leaves. Of these plants the large leaved bass weed and the floating brown leaf are of particular value for water-fowl because the spike clusters of the bright orange colored seeds have been reported as desirable food for ducks, especially during the fall migratory flight.

Pondweeds with Submerged Lax Ribbon Leaves



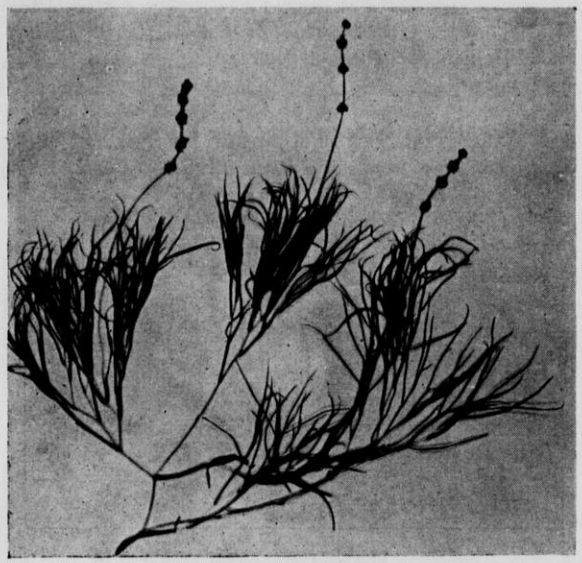
LEAFY PONDWEED
(Potamogeton epihydrus) An example of the ribbon leafed pondweeds. One-half natural size.

Other pond weeds are characterized by having submerged lax ribbon leaves, such as the leafy pondweed *(Potamogeton epihydrous)*. This plant is of particular interest because it can grow in very soft water. It has a flexuous stem, submerged ribbon leaves about one-eighth to three-eighths of an inch in width and of varied length, and also often has spatulate floating leaves. The feature that separates this plant from other ribbon leaved pondweeds is the smooth slippery nature of its delicate submerged leaves. The spiked clusters of the clam shaped rim edged seeds of this plant are desirable duck food.

Other ribbon leaved pondweeds are the flat stemmed pondweed *(Potamogeton zosterifolius)* adequately described by its name, and the water fern or Robbin's pondweed that has a round stem, and semi bristled fern-like arranged leaves. Dense beds of the water fern are a favorite haunt for northern pike.

The Narrow or Thread Leaved Pondweeds

The third and last division of the pondweeds is the narrow or thread leaved plants which are usually less conspicuous than the other groups. The most important of this group is the sago pondweed *(Potamogeton pectinatus)*.



SAGO PONDWEED
(Potamogeton pectinatus) An example of the thread or narrow leaved pondweeds. One-third natural size.

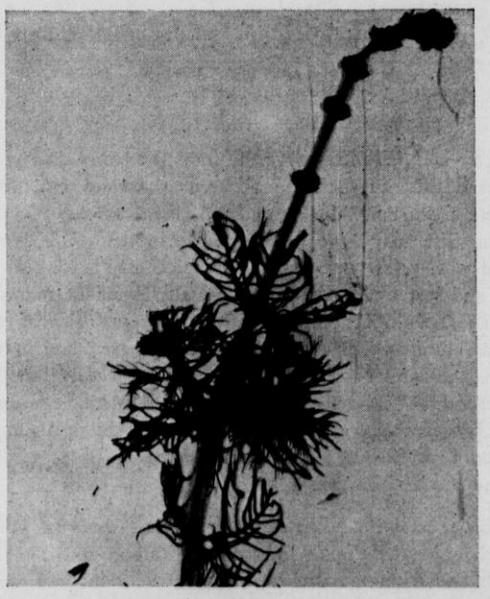
It is characterized by having a much forked stem with somewhat bristly linear leaves. The sago pondweed serves as a food and shelter plant for fish and is also one of the most important duck foods. It is fairly common in the hard water lakes, such as Island Lake.

The bushy pondweed *(Najas flexilis)* is often abundant in lakes of medium to hard water. This plant is distinguished by its slender branching stem and the abundance of linear somewhat tapered leaves, which give the plant a bushy appearance. The seeds are small, inconspicuous, and born solitary at the base of the leaf. Mr. N. Hotchkiss of the Biological Survey of the United States Department of Agriculture has observed beds of bushy pondweeds being torn up and probably eaten by mallards and teal.

For the sake of convenience the other narrow leaved pondweeds have been classed under *Potamogeton pusillus* type. These plants are similar in appearance and of importance for fish. The following species of plants were observed in Rusk county lakes and those of adjacent counties. *Potamogeton dimorphus, P. P. Friesii, P. foliosus, P. Oakesianus* (rare), and *P. pusillus*. Another long lax stemmed group of plants, that are not pondweeds, is the compound leaf group. The most prominent plants of this group are the bristly leaved coontail or hornwort *(Ceratophyllum demersum)* the common pinnated thread leaved water milfoils. *(Myriophyllum spicatum)*, the foul smelling muskgrass or stonewort *(Chara spp.)* which often carpets the lake bottom in part and is considered one of the most valuable plants for fish and ducks and lastly, the common bladderwort *(Utricularia vulgaris)* that has tiny sacs attached to the leaves which trap minute animals. The common bladderwort like the leafy pondweed is sometimes found in very soft water lakes growing in mucky shoal water areas. Other bladderworts found are the small bladderwort *(Utricularia minor)* a rare inconspicuous plant of little significance and the purple flowered bladderwort *(Utricularia purpurea)*. This purple flowered bladderwort is an extremely lax flexuous stemmed plant with prominent doubly compound filamentous leaves which furnish the much desired harbor and cover for fish and fish foods. This plant is very rare in Wisconsin, but was found growing in abundance in North Lake (T. 33 N. R. 9 W., Sec. 3, 10) and sparingly in Bass Lake (T. 33 N. R. 9 W., Sec. 16, 21).

COONTAIL
(Ceratophyllum dermersum) Another compound leaved plant.

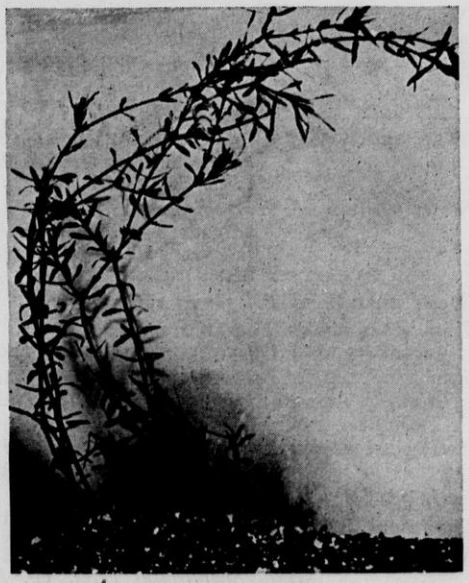
The coontail deserves special consideration because it is one of the most important duck foods. In the spring of the year the tender bristly leaved bud like shoots growing from the old stem are among the first available duck foods, and in the fall when most aquatic plants have died and broken down, this bristled leaved plant is still available. The mallard, black duck, coot and blue and green winged teals have been observed to eat this plant.



COMMON WATER MILFOIL
(Myriophyllum spicatum) An example of the compound leaved plants: note the compound pinnated thread leaves. Natural size.

The Water Smart Weed, Water Weed and Water Star Grass

Other long lax plants not included in the above groups are the following: water star grass *(Heteranthera dubia)* which is somewhat similar to the ribbon leaved pondweeds but does not bear spiked clusters of seeds; the water smartweed *(Polygonum natans)* and the water-weed *(Elodea canadensis)*. The water smartweed has much in common with the various smartweeds of our gardens. It has a pink spiked flower, and floating leaves that become a bright maroon in late summer and early fall. The water-weed is a submerged branch stemmed plant with small sharp pointed



WATER WEED
(Elodea canadensis) One-third natural size.

leaves usually borne in groups of three on the stem. Cultivated forms of water-weed or Elodea are present in most aquaria.

Pad and Ribbon Leaved Plants

The pad and ribbon leaf plants with the exception of wild celery are found in lakes of varied lime content. However, they are more tolerant to lakes of higher lime content.

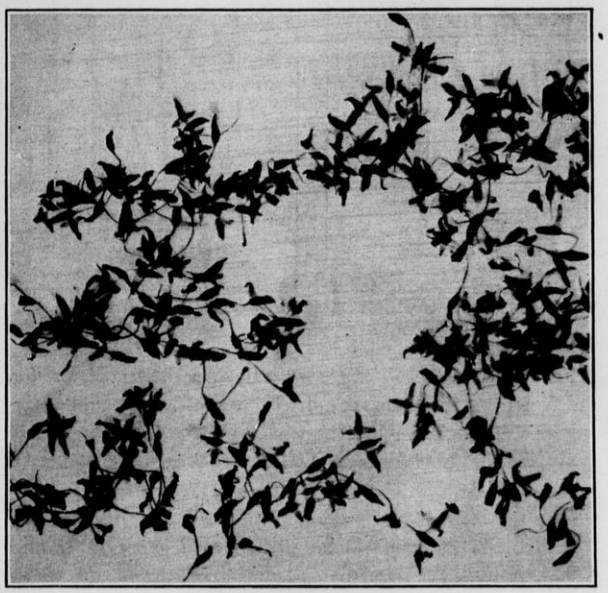
PAD AND RIBBON LEAF TYPE

The pad leaved plants represented by the white water lily *(Castalia tuberosa)* with its showy white flower, the yellow water lily *(Nymphozanthus variegatus)* with its less conspicuous yellow flower, and the water shield *(Brasenia Schreberi)* distinguished by its jelly coated stem and its smaller oblong shaped leaves with the stem attached at the center of the leaf furnish shade and cover for fish. Of these plants the yellow water lily is of particular importance as a duck food. Later in the season at the time of the fall migratory flight of water-fowl, the stem of the yellow water lily droops, submerging the urn shaped seed bearing fruit. The tough cover and structure surrounding the seeds partially breaks down and the seeds jell out. Of the many marsh and aquatic plants used by muskrats the white and yellow water lilies are much desired. It is a common sight, in many lakes, to find that the large underground stems or rhizomes of these plants have been uprooted by muskrats.

The ribbon leaved plants are represented by the ribbon weed, or floating leafed bur-reed *(Sparganium angustifolium & S. fluctuans)* and wild celery *(Vallisneria americana)*. Wild celery is a valuable fish and duck food. It is the favorite food for diving ducks, viz., the canvas backs and redheads.

Free Floating Plants

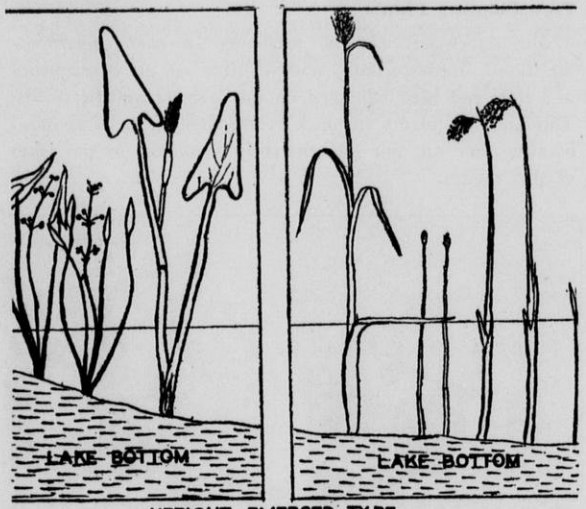
The duckweeds *(Lemna minor & Spirodela polyrhiza)* are small, inconspicuous, and of little or no consequence and have not been tabulated on the table of aquatic plants. Though these plants are duck foods, they are not important because they are not quantitatively abundant in the lakes of this region.



GREATER DUCKWEED
(Lemna trisulca) Grows in mats in hard shallow water. Whole plant eaten by ducks.

Upright Emersed Type

The upright emersed vegetation has prominent parts protruding out of the water. Several of these plants are sometimes found in marsh and shoreline habitats. This type is represented by reed and blade leaved plants such as bulrushes *(Scirpus spp.)* cat tail *(Typha latifolia)*, sedges, mostly *(Carex comosa)*, and wild rice *(Zizania aquatica)*. Prominent broad leaved plants are the following: pickerel weed *(Pontederia cordata)* identified by its large blunt heart-shaped leaves and conspicuous violet-blue spiked flower; wapato or duck potato *(Sagittaria latifolia)* usually having arrow heart-shaped leaves and *(S. heterophylla)* usually having spatulate shaped leaves. The tubers of this plant are an important duck food. The heath plants such as leather leaf *(Chamaedaphne calyculate)* and pale



UPRIGHT EMERSED TYPE.

laurel *(Kalmia polifolia)* are valuable shelter plants for fish where lakes are completely or partly surrounded by bogs. Though the upright emersed plants are not so important for fish life, they furnish necessary cover for ducks when of sizeable area. Muskrats use these plants, particularly the blade leaved plants, of which wild rice is the most desirable when available for shelter, food and for building their houses.

Wild Rice

Wild rice deserves special consideration. No other plant seems to have such a magnetic attraction for ducks. It furnishes excellent cover and shelter for water-fowl and its grains are a much sought for food. Even after the ducks and particularly the black birds have eaten considerable quantities of rice and the wind has whipped, thrashed and sown wild rice seed for the next year's crop, ducks continue to linger and to be attracted to rice beds rather than to other locations possessing equally desirable cover. This is probably due to the fact that the rice grains are still available on lake bottoms and that the beds of this blade leaved plant are associated with those long lax submerged food plants, such as the pondweeds with their edible spiked clusters of seeds, the bristled leaved coontail and other like plants that are usually found in abundance in the open water margins of wild rice beds.

It is unfortunate that efforts to propagate this plant have been only partially successful. Wild rice requires: (1) a constant water level particularly during the late spring and summer, (2) an exchange of water due to drainage, (3) a medium to hard water, (4) a shoal water bottom of a somewhat broken down peat or muck or a layer of thin peat or muck over sand, and (5) a depth of water not to exceed approximately three feet. Beds of wild rice have been killed out by a twelve inch fluctuation of water level during the growing season. Muskrats being particularly fond of wild rice often destroy the initial efforts of this plant to establish itself, and when rats become too plentiful, they will gradually destroy the rice beds. Since rice is able to replace itself readily in those areas of decomposed and semi-decomposed rice straw, it seems quite probable that the sinking of old straw, marsh hay or similar vegetation and allowing it to decay at least in part would furnish a very desirable condition for planting wild rice. Ripe grains of wild rice that have been kept moist can be successfully planted in the autumn. If rice is planted in the spring, seed should be obtained from a reliable aquatic nursery because of the difficulty involved in preserving its vitality.

OUTLINE OF AQUATIC TYPES

Short Stiff Stem, Leaf, or Rosette Type

Where scientific names other than from Gray's Manual are used, the latter are placed in parenthesis.

1. Waterwort ------ *Elatine Minima (Nutt.)* Fisch. & Mey. (E. *americana* of Gray's Man., ed. 7, in part)
2. Needle Rush ---- *Eleocharis acicularis* (L.) R. & S.
3. Pipewort -------- *Eriocaulon septangulare* With. (E. *articulatum* (Huds.) Morong)
4. ---------- *Gratiola aurea* Muhl. f. *pusilla* Fassett
5. Quill wort ------ *Isoetes* spp.
   Juncus pelocarpus Mey. F. *submersus* Fassett
6. ---------- *Juncus pelocarpus* Mey. f. *submersus* Fassett
7. ---------- *Littorella americana* Fern. (L. *uniflora* of Gray's Man., ed. 7)
8. Water lobelia --- *Lobelia Dortmanna* L.
9. ---------- *Myriophyllum tenellum* Bigel.
10. Creeping Buttercup *Ranunculus reptans* L.
11. ---------- *Sagittaria cuneata* Sheldon (S. *arifolia* Nutt.)
12. ---------- *Sagittaria graminea* Michx.

Long, Lax Stem and Leaf Type

13. Water marigold -- *Bidens Beckii* Torr.
14. Coon tail, Hornwort ----- *Ceratophyllum demersum* L.
15. Muskgrass, Stonewort ----- *Chara spp.*
16. Elodea, Water weed *Elodea canadensis* Michx.
17. Water star grass, Mud Plantain -- Heteranthera dubia (Jacq.) MacM.
18. Mosses -------- *Musci*
19. Small water milfoil *Myriophyllum alterniflorum* D C
20. Water milfoil, Fox tail ------ *Myriophyllum spicatum* L.
21. Water milfoil --- *Myriophyllum verticillatum* L.
22. Water milfoil ---- *Myriophyllum spp.*
23. Naiad, Najas, Bushy pond weed *Najas flexilis* (Willd.) Rostk. & Schmidt
24. ---------- *Nitella spp.*
25. Water smart weed *Polygonum natans* A. Eaton f. *genuinum* Stanford *(P. amphibium* L. of Gray's Man., ed. 7)
26. Water smart weed *Polygonum natans* A. Eaton f. Hartwrightii Lang. *(P. amphibium* L. var. *Hartwrightii* (Gray) Bissell)
27. Water smart weed *Polygonum* spp.
28. Pond weed, musky weed, Bass weed *Potamogeton amplifolius* Tuckerm
29. Pond weed ------ *Potamogeton capillaceus* Poir. (P. *pusillus* of Gray's Man., ed. 7 in part)
30. Leafy pond weed - *Potamogeton epihydrus* Raf. var. cayugensis (Wiegand) Benn.
31. Leafy pond weed - *Potamogeton epihydrus* Raf.
32. Pond weed ------ *Potamogeton foliosus* Raf.
33. Variable pond weed *Potamogeton gramineus* L. var. *graminifolius Fries.* (P. *heterophyllus* Schreb
34. Musky weed, Bass weed, Floating pond weed, Floating brown leaf ---------- *Potamogeton natans* L.
35. Pond weed ------ *Potamogeton obtusifolius* Mertens and Koch
36. Sago pond weed, Fennel leaved pond weed ---- *Potamogeton pectinatus* L.
37. Pond weed, White stem pond weed *Potamogeton praelongus* Wulf
38. Pond weed, Narrow weed -- *Potamogeton pusillus* L.

39. Pond weed, Narrow leaved pond weed _____ *Potamogeton pusillus* L. var *mucronatus* Filbes

40. Pond weed, Narrow leaved pond weed _____ *Potamogeton pusillus* L. var. *tenuissimus* Mertens & Koch

41. Pond weed, Musky weed, Bass weed *Potamogeton Richardsonii* (Benn.) Rydb.

42. Pond weed _____ *Potamogeton Robbinsii* Oakes

43. Pond weed _____ *Potamogeton dimorphus* Raf.

44. Pond weed, Eel grass pond weed *Potamogeton zosterifolius* Schumacher

45. Pond weed _____ *Potamogeton spp.*

46. Stiff water crowfoot _____ *Ranunculus longirostris* Godr. (R. *circinatus* of Gray's Man., ed. 7)

47. Aquatic sedge ___ *Scirpus subterminalis* Torr.

48. Bladderwort _____ *Utricularia gibba* L.

49. Smaller bladder wort _____ *Utricularia minor* L.

50. Purple bladder wort _____ *Utricularia purpurea* Walt.

51. Greater bladder wort _____ *Utricularia vulgaris* L.

Pad and Ribbon Leaf Type

52. Water shield ____ *Brasenia Schreberi* Gmel.

53. White water lily__ *Castalia tuberosa* (Paine) Greene

54. Small yellow pond lily _____ *Nymphozanthus microphyllus* (Pers.) Fern. *(Nymphaea microphylla* Pers.)

55. Medium sized yellow pond lily *Nymphozanthus rubrodiscus* (Morong) Fern. (Nymphaea *rubrodisca* (Morong) Greene)

56. Yellow pond lily, common yellow pond lily _____ *Nymphozanthus variegatus* (Engelm.) Fern. (*Nymphaea* advena Ait. var. *varietgata* (Engelm.) Fern.)

57. Bur-reed, Narrow ribbon leaf ____ *Sparganium angustifolium* Michx.

58. Bur-reed, Broad ribbon leaf ____ *Sparganium fluctuans* (Morong) Robinson

59. Wild celery, Eel grass, Tape grass *Vallisneria americana* Michx. (V. *spiralis of* Gray's Man., ed. 7)

60. Duck weed _____ *Lemna perpusilla* Torr

61. Duck weed, Duck meat _____ *Lemna trisulca* L.

62. Floating liverwort Riccia _____ *Riccia fluitans.* L.

63. Duck weed, Duck meat _____ *Spirodela polyrhiza* (L.) Schleid.

Upright Emersed Type

64. Sweet flag _____ *Acorus Calamus* L.

65. Water arum, Calla lily _____ *Calla palustris* L.

66. Sedge _____ *Carex comosa* Boott

67. Swamp loosestrife, water willow __ *Decodon verticillatus* (L.) Ell.

68. _____ *Dulichium arundinaceum* (L.) Britton

69. Big spiked rush __ *Eleocharis palustris* (L.) R. & S. var. *major* Sonder

70. Three stem rush __ *Eleocharis Robbinsii* Oakes

71. Pipes _____ Equisetum limosum L. (E. fluviatile L.)

72. Common reed, Reed rush, Giant reed _____ *Phragmites communis* Trin.

73. Pickerel weed ___ *Pontederia cordata* L.

74. Marsh five-finger _ *Potentilla palustris* (L.) Scop.

75. Arrow leaf, Wapato, Duck potato *Sagittaria latifolia* Willd.

76. _____ *Sagittaria heterophylla* Pursh

77. Bulrush _____ *Scirpus acutus* Muhl. (S. *occidentalis* (Wats.) Chase)

78. Bulrush, Three Stem Bulrush __ *Scirpus americanus* Pers.

79. Bulrush, River bulrush _____ *Scirpus fluviatilis* (Torr.) Gray

80. Bulrush _____ *Scirpus rubrotinctus* Fern.

81. Bulrush, Three stem rush _____ *Scirpus Torreyi* Olney

82. Bulrush, Soft stem bulrush _____ *Scirpus validus* Vahl.

83. Bur-reed _____ *Sparganium americanum* Nutt.

84. Bur-reed _____ *Sparganium chlorocarpum* Rydt. (S. *diversifolium* of Gray's Man., ed. 7)

85. Bur-reed _____ *Sparganium chlorocarpum* Rydt. var. *acaule* (Beeby) Fern. (S. *diversifolium* Graebn. var. *acaule* (Beeby) Fern. & Eames)

86. Bur-reed _____ *Sparganium eurycarpum* Engelm.

87. Bur-reed _____ *Sparganium* spp.

88. Cat-tail _____ *Typha latifolia* L.

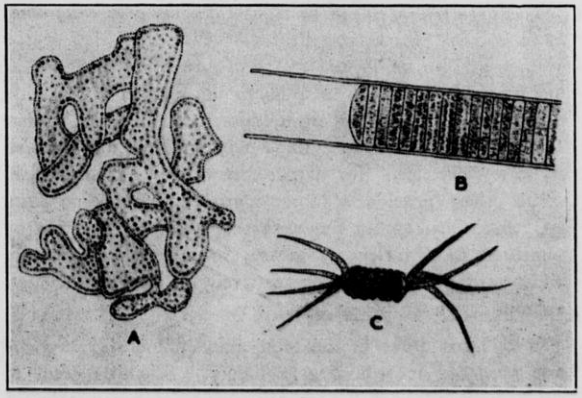
89. Wild rice, Indian rice _____ *Zizania aquatica* L. var. *angustifolia* Hitchc. (Z. *aquatica* of Gray's Man., ed. 7)

90. Wild rice, Indian rice _____ *Zizania aquatica* L. var. *interior* Fassett. (Z. *Palustris* of Gray's Man., ed. 7)

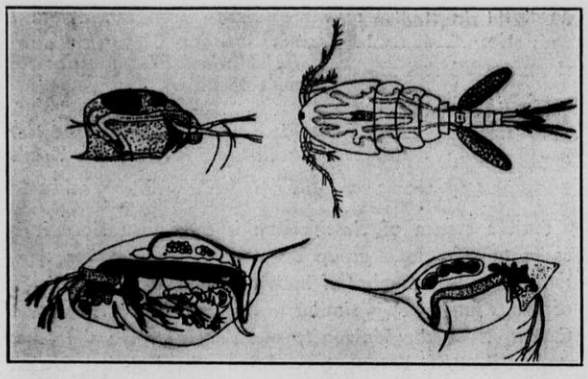
Such a system of classification is convenient since it is easier to refer to a group of plants belonging to a type, rather than to a number of individual plants. This division of plants into types is similar to that used by Prof. Norman C. Fassett of the University of Wisconsin. In the lakes studied by Prof. Fassett, a condition existed similar to that found in the lakes surveyed by the Land Economic Inventory Division. This classication of plants was made only for those plants in the lakes studied.

LAKE PLANKTON

The small animal and plant life that floats passively or swims in a very limited manner in the open water of our lakes and ponds is known as fresh water plankton. These forms as defined in the Natural History Survey of Wisconsin, Bulletin 61, include plants and animals ranging in size from bacteria to those as complex as the shell encased forms known as crustacea of which the crawfish is one of the larger examples. Others are: the larvae of insects that live around water and lay their eggs, so that the immature insect (larva) hatching from the egg lives



TYPICAL FORMS OF PLANT PLANKTON
(Phytoplankton) Common in "green" hard water.
A X 2000. B X 825. C X 180.

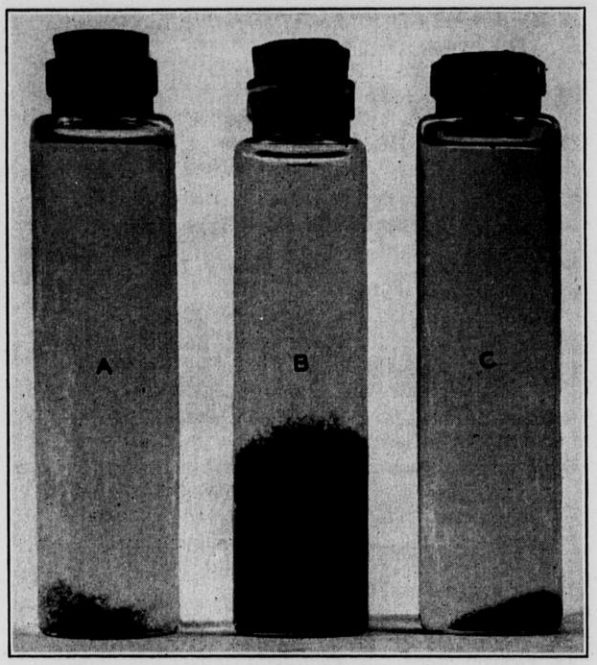


Some animal or zoo-plankton forms,—better known as water fleas. These forms are very important fish food. As shown here they are greatly enlarged. Many are invisible to the naked eye.

in the water. The young of the stone fly is an example of such a larva. A more common one is the larva of the mosquito, sometimes referred to as "rainbarrel wiggler". A common form of plankton is the "lake bloom" which appears in summer. This "lake bloom" may contain so much chlorophyll bearing plankton that it produces a green and often blue green scum on the water. Bacteria are also plants that with some other forms of water plants do not contain chlorophyll. All of these small floating plants are referred to by scientists as phyto-plankton. Phyto means plant when combined with another word, hence phyto-plankton is plant plankton to distinguish it from animal plankton.

The extensive work in measuring plankton as carried on by Dr. E. A. Birge and Professor Chancey Juday of the Wisconsin Natural History Survey shows that these plankton forms do not reach their maximum number at the same time. Some forms are most numerous even in winter. This is fortunate because these winter forms may furnish at least "dry hay" for larger organisms, including fish, while others provide a more nourishing pasture in summer time. Plankton in the water of lakes therefore can be compared to a variety of grasses in a permanent pasture which are at their best successively in spring, summer, autumn or winter.

Why lakes differ in the total number and size of game fish produced is still largely theory. Scientists seem to agree, however, that the quantity of plankton suitable for fish food and which produces the least amount of decomposable material to settle to the lower water to exhaust



Plankton removed from an equal volume of water. A. from non-productive soft water lake. B. from Hardwater lake. C. productive soft water lake.

the dissolved oxygen while decomposing and in doing so rendering the region uninhabitable to fish should make for maximum production. This implies, of course, a balance which is at least almost incontrollable. Water pollution through the introduction of nitrogen solubles possibly tends to produce an excess of plankton less suitable for fish food or its presence may be toxic in some manner so that the water may become unhealthy for fish that live in the upper water. This does not explain, however, why fish such as white fish and ciscoes, that live in deep, cool water, occasionally die in great numbers in late summer unless they are forced to the upper waters in order to obtain oxygen, and are there subjected to environmental conditions which they cannot survive. The oxygen in the deep water in such cases is used in the decay of plankton and other aquatic growth that settled to this deeper water. It is quite obvious, that from the practical point of view pollution of lake water by sewage should be guarded against by those who inhabit the shore line of lakes, and all dead fish should be removed and buried as soon as discovered. It is best to pick up dead fish, with a net, or if on the shoreline, with a shovel, because serious infections may result from handling them with bare hands. Sanitary environment for land animals, domestic or wild is now accepted as necessary to successful propagation, why not for aquatic animals?

The sportsman, conservationist, recreationist and commercial resort owner should have at least a layman's knowledge of plankton because it constitutes the basic fish food and because its quantity varies in different lakes as the quantity of pasture varies in different pasture fields. In some lakes certain forms of plankton become so numerous that they pollute the water as they decay, i.e. they become plankton weeds. This has happened in certain of the Madison chain of lakes. Actual measurements of the plankton yield in this chain of lakes as made by Birge and Juday shows the comparative yield about as follows: Monona twice, Waubesa almost three times, and Kegonsa nearly four times as much as Mendota at the times when plankton catches were made. Of course, this does not mean that the average for the year would necessarily give this ratio. It does correspond, however, to what is generally known, viz., that the lower lakes of the chain produce such a heavy crop of some forms of plankton as the summer season advances as to cause an offensive odor. Another reason why knowledge of plankton is important is because the diseases that attack fish and waterfowl are, when free swimming, a part of this water life.

The illustrious Swift, Dean of St. Patrick's, possibly two centuries ago, published in "On Poetry a Rhapsody" the following:

So, naturalists observe a flea
Hath smaller fleas that on him prey
And these have smaller still to bite 'em;
And so proceed ad infinitum.

The Englishman De Morgan, some seventy years back, did a better version in "A Budget of Paradoxes", as follows:

Great fleas have little fleas upon
their backs to bite 'em,
And little fleas have lesser fleas,
and so ad infinitum.

These verses very aptly illustrate through the last centuries when science was still young, that the interdependence of life, one form upon another, was recognized.

Modern science has added much to clarify this interdependency, so that man may now manage his environment intelligently, increasing that which is useful and valuable and reducing that which is more destructive and apparently useless. These destructive and apparently useless forms are commonly referred to as causes of disease and also as parasites. In lakes this destructive condition seems to be closely associated with the summer season when "lake bloom" is common. Some of the more common parasitic forms are mentioned under *Aquatic Parasites.*

Water pollution of any sort including the decay of dead fish in lakes increases the possibilities of plankton as it appears in the summer time in "lake bloom" in hard water lakes. This bloom, characteristic of hard water lakes and particularly shallow hard water lakes with drainage, is made up of a number of very minute whole plants, and is not, as is sometimes held to be, the remains of broken down larger plants. These minute plants are called algae, and fall into two classes, viz., the blue-green, and the green.

The blue-green algae manufacture food, which is stored largely in the form of fats. These, possibly due to their fatty content, float on or near the surface. Their nature is such that they can live both in hot and very cold water. When they become sufficiently abundant they may form scums, which decaying rapidly in hot weather give off offensive odors and in isolated cases, are known to have produced potent chemical poisons. The green algae grow in the upper warm water of lakes, and since this water only becomes warm with added summer heat, these forms never become a nuisance. In spite of their occasional offensive odor and unsightliness, algae play a very important part in lakes; for fish are dependent upon them for food, either eating them or living on other organisms that feed on them. Algae, therefore, along with other green aquatic plants, may be called the machine that converts the chemical nutrients in the water into available fish food.

On the other hand lakes with very soft water have a less amount of plankton. Some such lakes are sometimes referred to as wet deserts, i.e. with a very limited amount of plankton life. Some of these are now being fertilized for experimental purposes,[1] and it is found, as the pondweeds and other vegetation increases in abundance, the plankton also increases. While this experimental work has been very limited it does indicate that lakes may in time be handled like farms and made to produce the maximum and proper kind of crop which in its ultimate harvest condition is game fish.

[1] Weber Lake, Vilas Co. Birge and Juday.

AQUATIC PARASITES

The requests for information on fish and other aquatic parasites made by fishermen, Conservation Clubs and resort owners, caused the Division of Land Economic Inventory to include in its Lake Inventory in 1937, a reconnaissance study of aquatic parasitism. These parasites, which may be of economic importance, are classified briefly as follows:

1. Endo (internal) parasites. These are larval forms in (a) the skin, (b) the muscles, (c) the viscera of the fish, and (d) adult forms living in the intestines of fish.
2. Ecto (external) parasites.
   a. Crustacea
   b. Flatworms
   c. Protozoa
   d. Bacteria and fungi

The internal parasites are most often inquired about by fishermen. Of these the yellow grub of perch and bass and the one which causes the spotted skin on bluegills, bass, northern pike, wall eyed pike and perch are most common. Further classification and a life history of these parasites is necessary in order to understand how fish become infected.

The yellow grub, common in perch and bass in midsummer, has the following life cycle: the larva hatching from the egg in the water is a tiny microscopic form (Miracidium) that swims about very rapidly. If it succeeds in finding a live snail, it bores into the body of the snail and begins the second stage in its life cycle. As it feeds upon the snail's body it soon changes into a sporocyst (egg sac) containing from 8 to 15 second generation forms. These second generation forms mature and pass out of the sac structure. They only move a short distance, and each soon in a like manner produces many third generation forms. These third generation forms when mature are equipped for swimming and with special boring organs. When they emerge from the snail's body, they swim about until they come in contact with some fish to which they attach themselves and bore into the skin of the fish.

Since snails live in shallow water, fish are infected as they feed among the shoal water plants. After entering the fish, these small organisms called Cercaria begin to grow from microscopic size to the parasites seen by fishermen in the muscles of the fish. During their growth they become inclosed in a sac-like covering and, as mature

YELLOW GRUB
(Clinostimum marginatum) Under the skin of yellow perch.

grubs, remain quiet for some period of time. If the fish is heavily infected by these grubs, it dies or becomes so weakened that it floats. In either case, the fish may be picked up by some fish-eating bird, and the grub then emerges from the fish and fastens itself to the throat lining of the bird. Here it begins to lay many eggs, which again pass into the water with the bird's droppings. Once in the water they develop and hatch, and the life cycle starts anew. As the summer season advances and the water becomes warmer, the life cycle speeds up, a complete cycle covering

a month or less of time. Heavy infection is, therefore, more common in the late summer. It is during this time that fishermen frequently complain about fish infection. It is only when fish become heavily infected that they are actually killed.

Another internal fish parasite, which though only recognized by careful and experienced observers, is the tape worm of bass. Though its life cycle has not been definitely established, waters infested by it should be avoided in bass propagation. The following is the supposed, though not definitely proven, life cycle of this parasite. The adult tape worm living in the intestines of the mature bass lays thousands of eggs which pass into the water. These eggs hatch into free swimming, microscopic forms which enter the bodies of waterfleas. Since waterfleas form one of the principal foods for young bass, if infected fleas are eaten by young bass, these parasites again become active within the intestinal tract of the young bass and penetrate the intestinal wall and move through the body cavity to the ovary or egg laying organ of the young bass, where they grow from microscopic size to a tiny worm about 1/8 of an inch in length. If the infected young bass in turn is eaten by an adult bass, the small worm develops into a mature tape worm within the intestines of the mature bass. This mature tape worm again lays thousands of eggs and a new life cycle starts. The fact that this parasite is so closely associated with bass makes it important that bass nesting and rearing ponds should be kept as free as possible of infection, else the young bass when planted may infest other waters.

Still another parasite is the one that causes the tiny black specks (Strigeids) on the skin of fish which usually appear in the mid and late summer (almost no fish being without them) though unsightly cause no known damage. The same can be said for the few that live on the gills of fish. Those living in the viscera of fish are more numerous. Their number and spread is associated with fish eating birds. The actual harm of these parasites is unknown, possibly not great and since the viscera of fish are not used for food, the fisherman has little to worry about.

There is only one local fish tapeworm that infects man. None of these parasites have ever been found in Wisconsin fish, and if found could only infect man if the fish were eaten raw or only partly cooked.

No specimens of external crustacean parasites were found. Since these are more common in the spring, the fact that none were found from June 1st to September 15th does not mean that spring infection may not be present. Only very light infections of protazoan parasites were noted. No serious infection of bacterial and other fungal parasites was noted. A very limited number of specimens of trout from the Nemakagon basin were examined for the disease known as "bloody blotch", but no infection was found nor was any reported by fishermen.

Thus far, no dangerous parasitic infection of fish has been found in the counties where this very limited reconnaissance has been carried on. (Washburn, Burnett and Polk Counties)

Among other aquatic parasites, the organism causing "Swimmer's Itch" has a direct economic bearing, because one infection on a perfectly splendid and popular bathing beach may result in people shunning the beach afterward, though the water may have been infected for only a day or two.

The Lake Survey Crew has been checking evidence of "Swimmer's Itch" and the presence of extensive snail beds; particularly the snails which are known as carriers or hosts of the organism causing "Swimmer's Itch". Wading and other birds and animals frequenting lake shores and the shoal waters were also watched in order to aid if possible the State Board of Health in its cooperation with the Department of Zoology of the University of Wisconsin in the recently authorized study of "Swimmer's Itch".

LARVAL STAGE OF BASS TAPEWORM
On surface of ovary of young Bass.

ADULT BASS TAPEWORM
(Proteocephalus ambiopletis) From "accessory stomachs" of L. M. Bass.

BLACK SPOT
(Strigeids) In skin of young fish. X 0.75

"Swimmer's Itch" was definitely identified in 1928 by W. W. Cort, a biologist working at the Biological Station of the University of Michigan, when a severe infection of his hands followed immersion of his hands in water containing recently collected snails. He found that very small, chigger-like free swimming forms were being shed by the snails and that these penetrated to the sensitive layer of the skin beneath the outer epidermal layer where their presence caused inflammation, pain and a severe itching sensation. Since then Dr. Cort and others including Dr. Albert C. Edwards and Mr. Sterling Brackett of Wisconsin have added much to a better understanding of this skin infection.

"Swimmer's Itch" may appear as early as June 15th in the lakes of southern Wisconsin and possibly as late as August in the lakes of northern Wisconsin. Since soft water lakes have less aquatic vegetation, and fewer snails, the sandy shoal waters of these lakes are usually least apt to have "Swimmer's Itch". The State Board of Health is particularly interested in finding control measures whereby beaches near resorts, scout camps and other extensive recreational centers may be protected against these rash producing water "chiggers". Those desiring further knowledge of "Swimmer's Itch", its prevention, and treatment, should write to the State Board of Health, Madison, Wisconsin.

GAME AND OTHER FISH COMMON TO NORTHERN WISCONSIN LAKES

Larger Game Fish

Common Name	Scientific Name
Large mouth (L. M.) bass, L. M. black bass, L. M. green bass	*Micropterus salmoides* or *Huro floridana*
Small mouth (S. M.) bass, S. M. black bass, S. M. Oswego bass, yellow bass	*Micropteris dolomieu*
Wall-eyed (W. E.) pike, W. E. perch, pike, perch	*Stizostedion spp.*
Pickerel, northern (N.) pike	*Esox lucius* or *E. americanus*
Muskellunge, musky, tiger musky, northern musky	*Esox masquinongy*

Pan Fish

Common crappie or croppie, white crappie, white bass	*Pomoxis annularis*
Black crappie or croppie, spotted crappie, calico bass	*Pomoxis sparoides*
Rock bass, red-eye	*Ambloplites rupesatris*
Bluegill, blue sunfish	*Lepomis pallidus*
Sunfish, pumpkin seed	*Eupomotis spp.*
Perch, yellow perch, ringed perch	*Perca flavescens*
Bullhead	*Ameiurus spp.*

Rough Fish

Red horse	*Moxostoma aureolum*
Suckers (family)	*Catostomidae*
Gar	*Lepisosteus spp*

THREE FAMILIES OF GAME FISH

For practical purposes, the game fish in the lakes of northern Wisconsin may be classified according to body shape.

Pike

For example, the pike family includes the muskellunge, the northern pike or pickerel and mud or midget grass pike or pickerel. These fish have elongated bodies and heads, long and depressed snouts and very large mouths with sharp tiger-like teeth. They are carniverous and depend largely upon their ferociousness for survival. They can kill a fish of their own size and are known as fresh water sharks or killer fish.

Perch

This family includes the ring or yellow perch and the pike perch, better known as the wall-eyed pike. These fish have two distinct spiny rayed dorsal fins which have protective value. They frequent deeper water. Both the ring perch and pike perch or wall-eyed pike are carniverous and are known to be cannibalistic. Even the newly hatched fry soon begin to eat each other.

Both these families spawn in shallow, weedy shoals, generally in channel lakes where thousands of eggs remain entangled among the water weeds until they hatch. Muskellunge, northern pike and the wall-eyed pike or perch are at their best in large channel lakes where there is a continuous abundance of non-game fish (forage fish). Where food is limited, as in sandy soft water lakes, they destroy many bass and panfish.

Bass

Members of the bass or sunfish family are more numerous in northern Wisconsin lakes. To this family belong all bass, crappies and sunfish. These fish have laterally flattened bodies, most conspicuous in sunfish, largest of which is the bluegill. The largest of this family are the large and small-mouthed bass, both of which grow to considerable size, though a five pound bass is considered a very large bass. The large-mouthed bass is most common in lakes with heavily weeded, quiet shoals, while the small-mouthed bass prefers more open and clear channel water such as the rippling, weedy and gravelly shoals of the lakes in the the Flambeau drainage. Others in this family, and common to northern Wisconsin lakes, are the crappie, rock bass and sunfish. These smaller bass and sunfish are generally known as panfish. Largest of the sunfish is the bluegill, so-called from the dark colored flap on the dorsal edge of the gill cover. The black crappie (also known as croppie) seems to prefer environment similar to the large-mouthed bass and is common in northern Wisconsin lakes. Crappie grow to largest size in large and productive channel lakes such as Chetac and Red Cedar of the Red Cedar drainage. This family of fish requires lakes with sandy and gravelly shoals for spawning. They, unlike pike and perch, build nests in weedy, gravelly shoals. These nests are guarded and it is commonly thought that the parent fish create a water circulation in the nest by the constant movement of their paired fins. After the young hatch they continue to guard the newly hatched young for some time. It is obvious that lakes of limited food and protective environment should be left to members of this family, because such lakes have natural spawning grounds for bass, but their sandy and gravelly beaches have little of the proper spawning environment for members of the pike family and also the wall-eyed or pike perch. Such bodies of water are all the land-locked, sand-lined kettle lakes. Spawning and shelter refuges for minnows are more important in these lakes than spawning boxes for bass; for bass and sunfish will even build nests on semi-decomposed weeds and marl but since they are also carniverous they require an abundance of minnows, crawfish and large insect larvae, or they too consume their own kind.

Conditions associated with the carbonate content of lake water particularly with reference to depth and drainage, lake soils, and nature of aquatic plants are a deciding factor used for determining the nature of lake environment suitable for different fish associations.

Pan fish are able to adapt themselves to a variety of conditions providing that the water does not become deoxygenated. In lakes where the larger game fish population has been depleted, restocking will be hampered due

to the presence of carnivorous pan fish especially perch and crappies. Abundant aquatic plant cover and other forms of shelter tend to correct this evil.

Of the larger game fish, wall-eyed pike have been extensively planted in many lakes. The planting of wall-eyed pike in lakes of low lime content has not been successful. Where a few wall-eyed pike have developed in these lakes, they do not add to the game fish population but rather lower it because they destroy young bass. In some lakes, fishing has been ruined due to the presence of a few wall-eyed pike. These fish thrive in lakes of river systems and often develop and propagate in deeper lakes of higher lime content which have a varied and abundant aquatic plant growth. Even in these lakes where wall-eyed pike are successfully planted the bass population will suffer. For this reason it is advisable for fishermen and resort owners to choose either wall-eyed pike or bass.

DESIRABLE GAME FISH ASSOCIATIONS FOR DIFFERENT TYPES OF LAKES

	Very soft and soft water lakes	Medium to hard water lakes
Fish Associations	L. M. bass or N. pike S. M. bass	L. M. bass, W. E. pike, S. M. bass or N. pike, N. pike - Muskellunge, Muskellunge
Comments	N. pike are usually harmful to bass. S. M. bass require gravelly shoal water areas for spawning.	W. E. pike are harmful to bass but not to N. pike. W. E. pike thrive in lakes having inlets and outlets passable for fish. Muskellunge should not be planted in the smaller lakes.

BEAVER, MUSKRAT AND DUCKS

Other animals closely associated with lakes in northern Wisconsin are the beaver, muskrat and duck. These animals utilize plants as food and shelter. Many lakes too shallow for more than a very limited fish population have food and shelter for muskrats and ducks. Such lakes are most numerous in the sand plain of the northwestern part of the state. Here many of the relatively shallow kettle (land locked) lakes now have little open water. Sedges, rushes and like plants are common. Water lilies, particularly the yellow pond lily, are common, as are pondweeds and other duck foods. While water levels in these lakes have been raised by the heavy precipitation of 1938 it is doubtful whether many will remain permanently at the higher level. It is apparent, therefore, that these shallow lakes should be managed and conserved for the use of ducks and muskrats.

There are some shallow lakes with outlets that have their water levels controlled by beaver dams. Beaver are common in such lakes and their work tends to improve them.

Beaver. Beavers live mostly on the bark of trees and shrubs. They build their houses and dams of woody stems and branches, reenforced by other vegetation, organic matter, and sometimes stones. Plants used commonly by beavers are:

Common Name	Scientific Name
Willow	Salix spp.
White Birch	Betula papyrifera
Yellow Birch	Betula lutea
Bog Birch	Betula pumila var. glandulifera.
Tag Alder	Alnus incana Alnus crispa
Trembling aspen	Populus tremuloides
Big tooth aspen	Populus grandidentata

Muskrat. Muskrats are mostly herbivorous, but they sometimes eat mollusks and such fish as carp, though they rarely harm game fish. Aquatic and marsh vegetation is their chief food. It is a common sight to find rhizomes of white water lilies and yellow pond lilies that have been uprooted by muskrats. Muskrats build their houses of marsh and aquatic plants, reenforced by muck. Plants commonly used by muskrats are the following:

Common Name	Scientific Name
Sedges	Carex spp.
Bulrushes	Scirpus spp.
Spike rushes	Eleocharis spp.
Wild Rice	Zizania aquatica
Pickerel-weed	Pontederia cordata
Bur-reeds	Sparganium spp.
Pond weeds	Potamogeton spp.
Wapato	Sagittaria latifolia Sagittaria heterophylla
Wild Celery	Vallisneria americana
White water lilies	Castalia tuberosa
Yellow pond lilies	Nymphozanthus spp.
Cat-tail	Typha latifolia

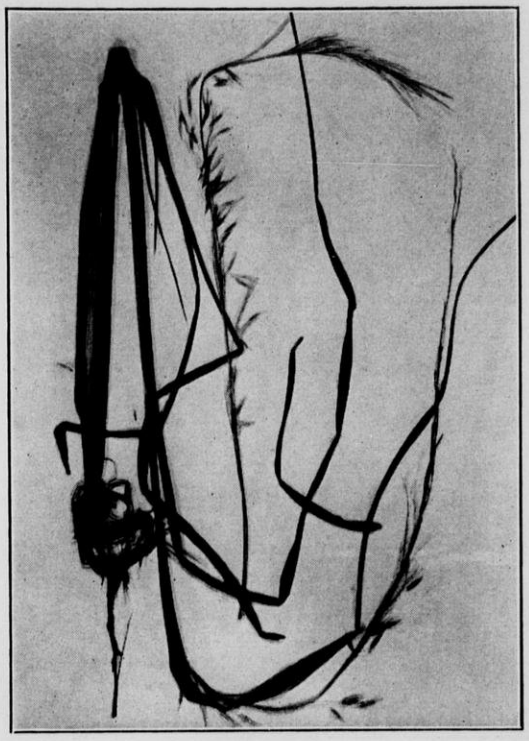
Ducks. The attractiveness of lakes for local and migratory ducks are dependent on two factors, shelter and food. Lakes with wooded shorelines, marshy regions, and abundant upright emersed aquatic plants, furnish excellent cover for ducks. Many shore line and aquatic plants are duck foods, of which wild rice is the most important. Attractive plant duck foods found in northern Wisconsin lakes are:

Common Name	Scientific Name
Wild Rice	Zizania aquatic
Wild Celery	Vallisneria americana
Wapato	Sagittaria latifolia Sagittaria heterophylla
Muskgrass	Chara spp.
Pond weeds	Potamogeton spp.
Smart weeds	Polygonum spp.
Some of the sedges	Carex spp.
Duck weeds	Spirodela polyrhiza Lemna trisulca
Bulrushes	Scirpus spp.
Coontail	Ceratophyllum demersum
Bur-reed	Sparganium spp.

Duck Food

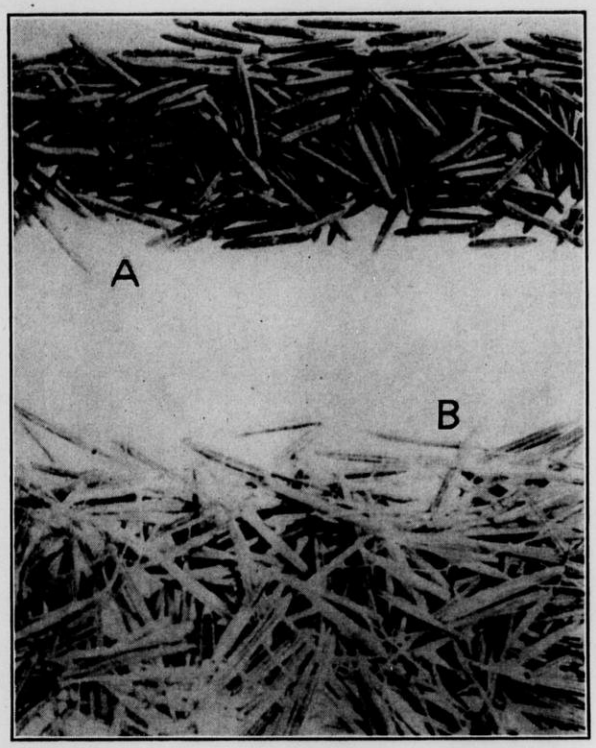
Ducks, like other fowl, feed on a large variety of foods. In order of importance these foods may be grouped as: (a) strictly aquatic, (b) shore line and (c) dry land. Tubers, rootstalks, runners, stems, leaves, flowers and fruits of plants in the water or on the shore line are eaten and the fruit of dry land plants such as acorns and the fruit of the ash, northern holly and the thornapple are sometimes eaten. Animal food such as insect larvae, adult insects, slugs, snails, clams and craw fish are also eaten. More important, however, than all these, are the aquatic and marsh plants given in the following tables:

FOOD AND COVER PLANTS FOUND GROWING IN SHALLOW LAKES WITH SANDY SHORELINES AND CONSIDERABLE OPEN WATER																	
	DUCKS EAT								VALUE AS FOOD			VALUE AS COVER					
COMMON NAME	WHOLE PLANT	SEEDS	WINTER BUDS	ROOTSTALKS	TUBERS	FOLIAGE	ABUNDANT IN QUIET WATERS	ABUNDANT IN SLIGHT CURRENTS	EXCELLENT	GOOD	FAIR	EXCELLENT	GOOD	FAIR	NONE		
AQUATIC PLANTS																	
WILD CELERY			X	X		X		X	X						X		
BUSHY PONDWEED		X				X	X			X					X		
COONTAIL		X				X	X			X					X		
WATER WEED						X	X			X					X		
WATER SHIELD		X					X	X			X				X		
YELLOW WATER LILY		X					X				X				X		
WHITE WATER LILY		X					X				X				X		
WHITE WATER CROW		X				X	X				X				X		
MUSK GRASS					X	X	X			X					X		
LESSER DUCKWEED	X						X			X					X		
GREATER DUCKWEED	X						X			X					X		
SAGO PONDWEED		X		X	X	X		X	X						X		
VARIOUS PONDWEEDS		X		X	X	X	X	X		X					X		
WATER MILFOIL						X	X				X				X		
MARSH PLANTS																	
WILD RICE		X				X	X	X	X				X				
DUCK POTATO					X		X			X				X			
BULRUSHES		X					X	X		X		X					
PICKEREL WEED		X					X				X			X			
BUR-REED		X					X	X			X		X				
SPIKE RUSH	X	X		X			X				X			X			
FOOD AND COVER PLANTS FOUND GROWING IN LAKES WITH SOFT MARSHY OR SWAMPY SHORES & LITTLE OPEN WATER																	
AQUATIC PLANTS																	
WATER WEED						X	X			X					X		
COONTAIL		X				X	X			X					X		
BUSHY PONDWEED	X	X					X	X		X					X		
WATER SHIELD		X					X	X			X				X		
YELLOW WATER LILY		X					X				X				X		
WHITE WATER LILY		X					X				X				X		
MARSH PLANTS																	
DUCK POTATO					X		X			X					X		
SEDGES		X					X	X			X		X				
PICKEREL WEED		X					X	X			X				X		
BULRUSHES		X					X	X		X		X					
WATER SMARTWEED		X					X			X					X		
BUR-REED		X					X	X			X		X				
REED GRASS							X	X				X					
CAT-TAIL							X	X				X					



WILD RICE

(Zizania agutica) Grows in fresh shallow water having a constant level. Seeds and foliage eaten by ducks.



A. WILD RICE SEED, with the hull removed, as prepared for table use.

B. WILD RICE SEED, with the hull on.

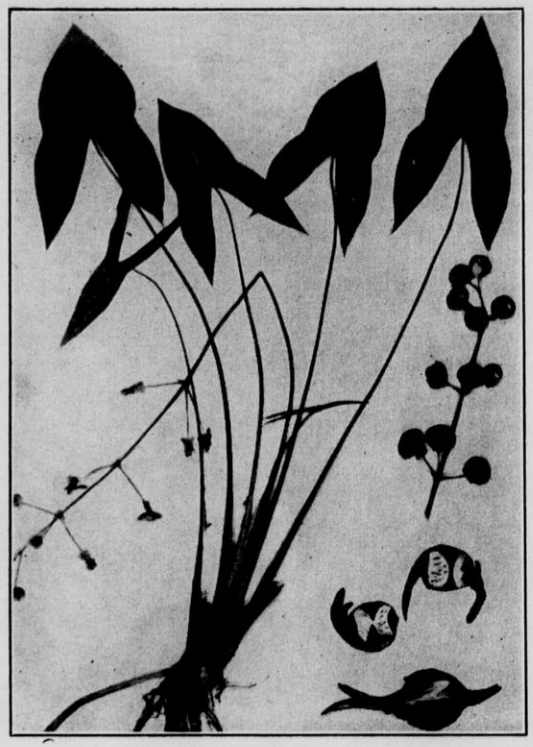
The Land Economic Inventory Basic to Lake Management

The lake inventory made by the Wisconsin Land Economic Inventory Division, due to limited funds, has of necessity, been little more than a reconnaissance study. It has been guided and supplemented with refined studies of certain lakes by the Wisconsin Natural History Survey and also by the lake data provided by the Wisconsin Conservation Department and the National Forest Service. All these data, as compiled in this report, are designed as a guide to an intelligent lake management program.

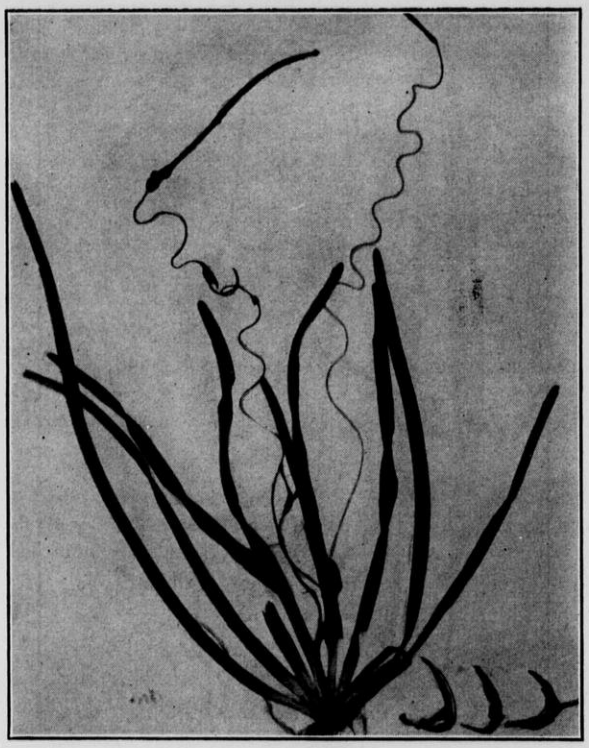
Adaptation

Lake use like land use depends upon adaptation. Prairie land is generally poor forest land, and much of the extensive forest areas are certainly submarginal farm land. Lakes may be classified in a similar manner, because they are also capable of producing a crop, which like grain or live stock on farm land, and forests on forest land, have value and can be sold or exchanged for value. The growing, harvesting and marketing of this crop furnishes work for people in lake regions. Again, lakes like land, vary in their natural productiveness and the kind of crop they may produce.

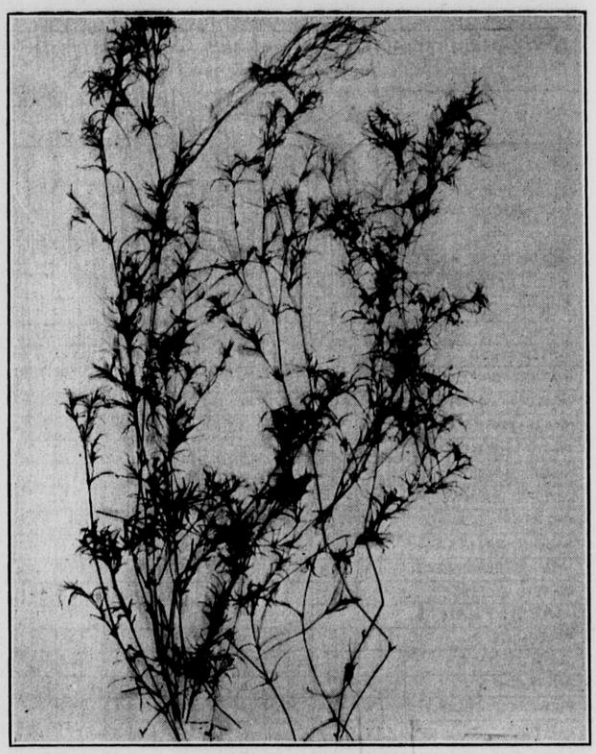
Mulligan Lake in Douglas County produces heavy yields of wild rice, when water levels are controlled. Such bodies of water as Ghost Lake in Sawyer County are a natural spawning and breeding ground for muskellunge. Crystal Lake in Vilas County, has water so non-productive, clear and soft (without mineral content) that its beaches may be used by recreationists without any danger of infection from swimmer's itch.



WAPATO
(Sagittaria latifolia) Grows on damp soil, or in very shallow water. Whole plant is eaten by ducks, but tubers are preferred.



WILD CELERY
(Valisneria spiralis) Grows in water to a depth of 4 ft. Buds and tubers eaten by ducks.



BUSHY POND WEED
(Naias flexilis) Grows in water to a depth of 10 ft. Whole plant eaten by ducks.

Management

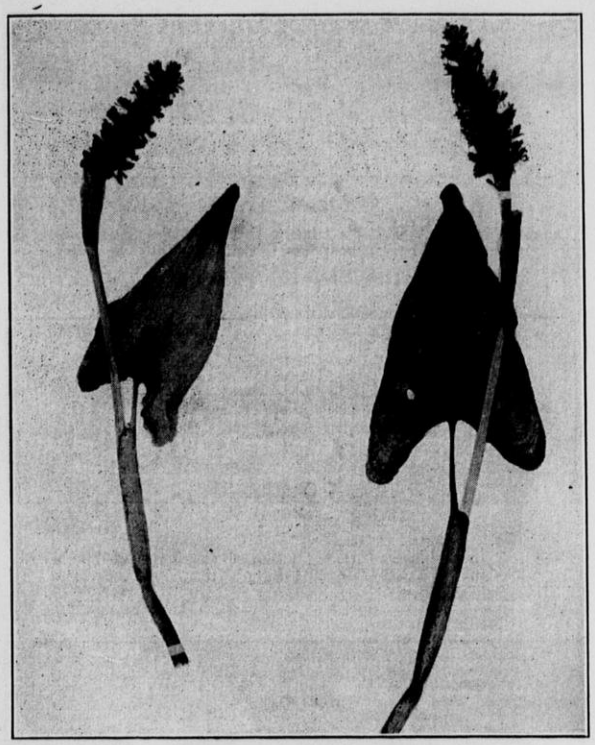
Management of these lakes should improve Mulligan Lake for the production of wild rice by establishing a permanent water level. Ghost Lake already has an established water level, which makes it possible for the "tiger muskie" of the Chippewa to spawn in its grassy shoals, where the newly hatched young thrive on the food of these shallow waters. It would certainly be poor management to lower the water level in this lake during the spawning, hatching and early life of the young "muskies". Establishing permanent and higher water levels in other spring fed lakes such as Ghost Lake might materially improve grassy shoals as breeding grounds for muskies, northern and wall-eyed pike. *Good Management* tends to improve lakes for specific uses. The Wisconsin Conservation Department has recently set up a Biology Division with trained personnel in charge to advise and guide those interested in lake improvement. Those desiring advice and aid in lake management should consult this trained personnel.

Guidance

Guidance and state aid are important, but the public must cooperate and particularly those whose livelihood depends upon lakes, viz., public resort owners, fishing guides, and, of course, summer home owners. Counties also have conservation committees, who assist and guide in lake management work. The people of Wisconsin's lake region with the guidance and help of the Biology Division of the State Conservation Department and the County Committees should become true conservators in replacing game fish, destroyed weed beds, shoreline forests, and replacing spawning grounds, protection and food for forage fish (minnows) in lakes about which loggers still living tell stories of fabulous and wanton catches of bass and other game fish during logging days. These old loggers also reported that while these lakes were still protected against strong wave action, their shoals were filled with beds of bullrushes and floating pad vegetation where now shoals are barren.

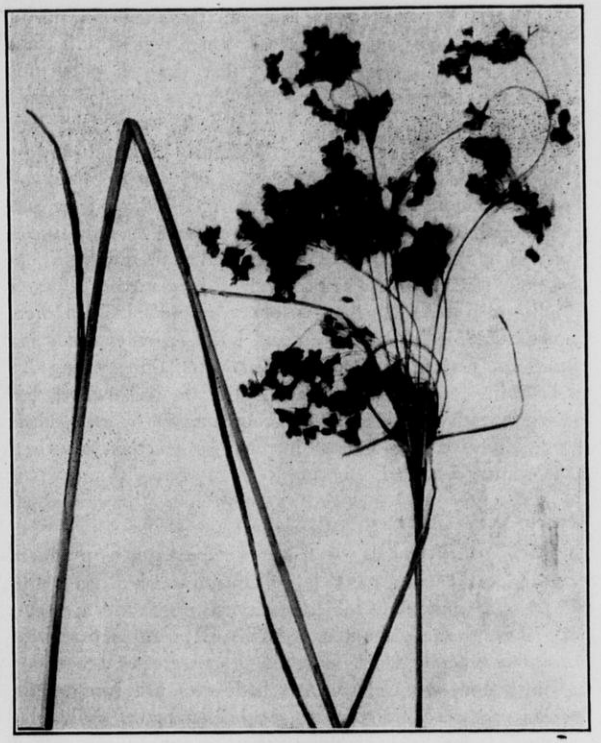
Classification

Those interested in lake management will note from this report that lakes are naturally grouped into various classifications such as (a) landlocked (lakes without outlets) and drainage lakes (lakes with outlets and frequently inlets); (b) lakes with very soft, soft, medium, and hard water; and (c) lakes in kettles (usually more or less round with little or no drainage), and those in preglacial water courses (usually long and relatively narrow). Further study reveals that landlocked lakes are in sand lined kettles and have very soft to medium water, and therefore, a less abundant and varied vegetation than lakes with drainage



COMMON PICKEREL WEED
(Pontedaria cordata) Emergent—grows in still shallow water. All parts of plant are eaten by ducks.

COMMON BUR-REED
Grows emergent in shallow water. Seeds eaten.



REED GRASS
(Scirpus cyperinus) Grows on moist soil. Suitable cover. Seldom eaten.

and medium to hard water. Though lakes may be classified, nevertheless, each lake should be managed according to present conditions, natural adaptation and the need of the people who use it.

Each Lake a Farm

Lakes, though alike in many ways, must each be managed separately by the people who have a special (particularly economic interest) in them. For example, excessive drought has exposed large portions of the shoals in some lakes. Though the heavy precipitation during the current season, 1938, has already raised the water levels in these disappearing lakes from 18 to 24 inches, nevertheless, weed beds had been destroyed and spawning grounds for fish, native to such lakes (the bass family) had been materially reduced, and protection and spawning places for the minnows on which members of the bass family feed had been changed. Man-made devices, such as so called brush carpets which have been used extensively by the Wisconsin Conservation Department, seem to be giving excellent results. A brush carpet is nothing more than brush wired together. Plans of this and other lake improvement devices can be furnished because hundreds have already been installed by State and Federal Agencies. None of these devices should be used without consulting at least the local conservation warden since placing them carelessly may do more harm than good. For example, if a "brush carpet" were placed where shoals are still right for "the bass family" to spawn such spawning grounds might be ruined. Again the changing water level may have already brought in new plants, such as cattails, that with the rising water afford essential protection, and consequently brush carpets and other devices may be unnecessary for protection. Of course, this is a mere illustration of how complicated lake farming becomes, as lake environment, climate and water levels change.

Farmers have at times unwittingly ruined land by over cropping, over grazing and improper tillage, so people who use lakes at times may have in like manner taken possession of a natural spawning ground for members of the bass family (particularly bass, blue gills, and crappies) by clearing the sandy and gravelly shoals of bullrushes and other protective vegetation for use as a bathing beach. Resort owners and summer home owners who use such water for bathing beaches can well afford to help improve spawning and feeding grounds elsewhere in the lake for their finned live stock which furnish them with both sport and food.

Fertilizing

Crystal Lake in Vilas County has been mentioned as an outstanding example of non-productive water. All such soft water lakes, however, are not equally barren of fish

life. Hundreds of them, due to falling water levels, have lost large areas of shoal water where fish food and shelter was once found, so that the fish population has decreased from the day when loggers reported former fabulous catches. Weber, a very soft water lake near Crystal is now used by the Wisconsin Natural History Survey for experimental purposes. It is being fertilized and is already more productive. Professor C. Juday, of the Survey, reported that small bass and perch were the only species of fish left in the lake. This means that the minnow population (forage fish) had entirely disappeared. Professor Juday also reported that waterweeds and plankton were scarce. Under fertilizer treatment, however, waterweeds and plankton growth are yielding a better crop. Restocking this lake with forage fish may again increase the number and size of perch and bass; these having survived by eating their own kind. If they do not increase in size then new bass stock must be added.

Lake Acre Yields

How many pounds of fish per acre can be produced under good management is yet unknown, but game fish yield is a worthwhile subject for conservators and managers of lakes to think about and to discuss with recreationists and the general public. Planning for a greater production is just underway. New fish hatcheries are being built. Their production is reaching the billion mark. What becomes of the hatch as these activities supplement natural reproduction?

Stunted Fish

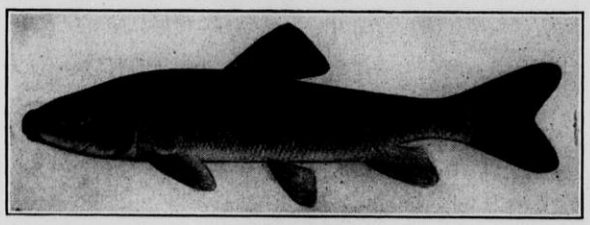
There are lakes where the legal size is not reached. Such fish are known as stunted fish. This is common among perch and bass. Half starved muskellunge have also been found in non-productive lakes. Some species of sunfish (shetland pony fish) remain small when mature. These are very plentiful in some lakes. They consume the food of better fish and if too numerous should be removed.

Fish Scales an Index to Growth and Age of Fish

The normal growth and age of fish can be determined by scale studies. The Natural History Survey is equipped to make these studies. Scales sent to Professor C. Juday or the Biology Division of the Conservation Department will show whether fish are growing normally. Stunted fish usually are found in very soft, and soft water landlocked lakes, which due to poor soil, softness of the water and lake changes are not productive. Fertilizing such lakes may increase the fish food and protection. In the meantime it may be determined whether the stunted fish will grow or whether they should be removed and replaced by fish that grow to larger size.

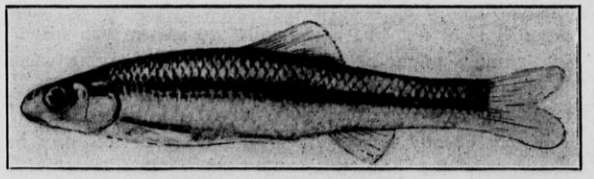
More Minnows

Lake managers should do all they can to aid the minnow population (forage fish) by supplying them shelter, food and places to spawn. Some lakes like Weber also require restocking. It will be interesting to watch the results of Professor C. Juday's and Dr. E. A. Birge's experimental work in this lake when again restocked with minnows. Of course game fish must eat in order to grow, but it is too bad that they must at times eat so many of their own kind in order to reach the legal size. More food will assure more fish of legal size.

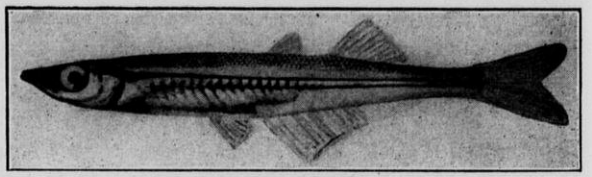


COMMON SUCKER
Also known as the fine scaled sucker. A splendid forage fish for muskellunge. Also good "muskie" bait.

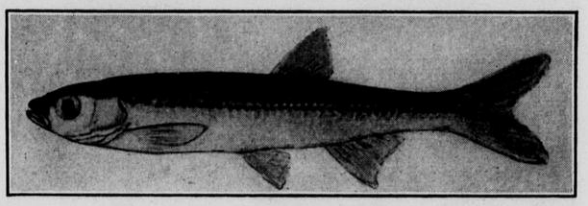
LOG PERCH
Largest of darter minnows. Length 4 to 6 inches. Found in streams and channel lakes.



BLUNT NOSED MINNOW
Length 2–3½ inches. One of the common mud eating minnows.

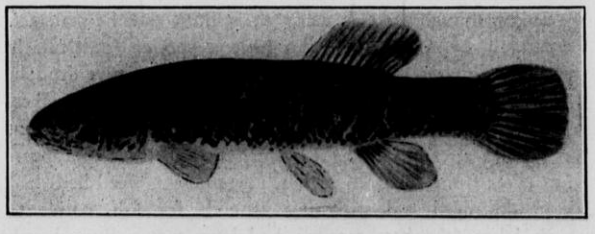


BROOK SILVERSIDE
Length 3 inches. A pike-like minnow that feeds almost exclusively on animal food, largely land insects that drop into the water.



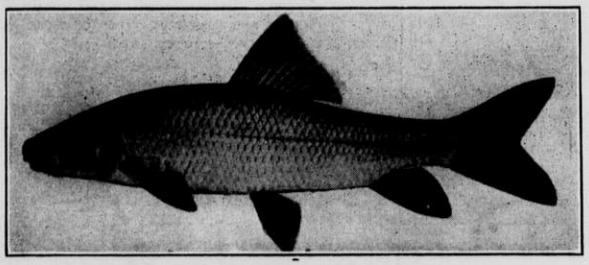
SHINER
Length 5 to 8 inches. One of the most common and best known minnows. Color—sides and belly silvery. Back—dark.

STONE ROLLER
Also known as Greased Chub. Length 6 inches. Color—brownish-olive. Good for bait. Very hardy.



MUD MINNOW or MUD FISH
Length 4 inches. Commonest of minnows, in muddy ponds and lakes. Very hardy. Sometimes mistaken for young dogfish.

JOHNNY DARTER
Length 2½ inches. Color—pale strawish olive with V-shaped markings. Common in fresh, relatively clear water.



SHORT-HEADED RED HORSE
Moderate size. Color—pale yellowish olive. Common. A forage fish for game fish.

Cannibalism

Game fish are carniverous and also cannibalistic, i.e. they eat their own kind, so little fish furnish food for larger fish. Reference has already been made to Weber Lake where only bass and perch remain.

Predators or Wolf Fish

The sportsman is not particularly interested in knowing whether a muskellunge is a member of the pike family or the bass family. His primary interest is catching fish that are fighters when hooked and good for food when landed. Every sportsman should, however, be keenly interested in protecting game fish from fish that destroy other game fish. Such fish are called predators or wolf fish.

The gar fish in its heavy armor-like skin and with its long sawlike jaws is probably the most destructive of all wolf fish. Many lakes are badly infested with gar fish. Every effort should be made by sportsmen to aid in gar fish removal. Like wolves which are hunted for bounties, gar fish too could be fished for bounty. Of course this method is very remote. Vacationists have been known, however, to fish for gar fish, much as hunters engage in crow eradication. One vacationist on Lake Okauchee in Waukesha county reports catches of 10 to 20 per day. Of course gar fish may be useful when not too numerous, because they destroy dwarfed and also diseased fish that frequent surface water, where gar fish spend most of their time. Catching dwarfed sunfish and perch is good sport for children. Why depend on gar fish? Other economically useless fish are the dog fish (fresh water shark). The dog fish offers plenty of sport to the angler who hooks one. Another method of reducing the number of dog fish is to remove with a small dip net the newly hatched young fish which swim in compact masses near the surface for some time after hatching.

Among the game fish, those of the pike family, (muskellunge, northern pike, and mud pickerel) frequently become killers. Muskellunge and northern pike (pickerel) have been known to become very destructive. The small mud pickerel is not large enough to destroy many game fish, but it is known to kill small fish. The number that kill wantonly are however possibly more mythical than real. In any event these large killers are the ones when finally hooked that measure and weigh far beyond the legal requirement. The sportsman who knows of the presence of such fish in certain waters can well afford to cast for days to finally land one of these "killer fish".

Carp do not eat other fish, but do ruin the weed beds and consume large quantities of food adapted to young game fish and also forage fish. They cannot be classed as predators but rather as usurpers of game fish environment, where like wild goats they consume the forage of more useful animals.

Other Predators

Turtles and some birds are known to feed upon fish. Only occasionally are turtles numerous enough to do much damage. Possibly, turtles should be more closely watched in shallow or dead lakes, which have become breeding grounds for ducks, because turtles are known to kill young ducks. In such lakes mud turtles become quite numerous. Since turtles can be easily trapped and have economic value when caught, their control should not be difficult.

The fish eating birds, other than *terns,* are not very numerous on inland lakes. Terns are more numerous around shallow productive lakes where they feed largely as scavengers, characteristic of their kind (the gull family). Within the last few years cormorants, scarcely known to people of Wisconsin, except in migratory flight, have been stopping in the lake region of northern Wisconsin. This black bird with long neck and short duck-like legs is so conspicuous that even the casual observer is sure to see it. When frightened it takes wing to some nearby tree. Observations indicate that it frequents small shallow streams, rather than lakes. These streams usually have a heavy population of minnows, and this may be the reason why the cormorant prefers them to lakes.

The general public as it becomes more and more conservation conscious, should report to the Biology Division of the State Department of Conservation, any evidence of apparent or real damage due to predators. These observations, when investigated may prove very helpful in maintaining a better balance of life in our lakes. A cautious approach and study of what constitutes a balance in nature is better than hasty action, because the latter frequently leads to an unbalanced condition. An example of such an unbalanced condition was the very large population of snow shoe rabbits in recent years in some northern Wisconsin counties, following the intensive trapping of brush wolves for bounty and pelt. As many as 100 of the snow shoe-like, bewhiskered hind legs (jumpers) of this rabbit (hare) have been observed by the writer in early spring in one place, the cache of one or a few brush wolves. Nine snow shoe rabbits recently killed were observed one November day, where a brush wolf was seen apparently preparing for winter. A similar correlation of life may obtain in lakes, so do not condemn any species of life too hastily, because on first observation it may appear unnecessarily destructive to other life.

Forests Important to Lakes

Removing the forests from lake shorelines has permitted excessive wave action to destroy the refuge and feeding grounds for game fish, young and old, and also of forage fish. It has wasted lakes still further by allowing drying winds to rapidly carry away surface evaporation. Lake management, therefore, implies that conservators of lakes must also be conservators of forests, and assist in protecting and replacing forests on open wind beaten shores.

Forests

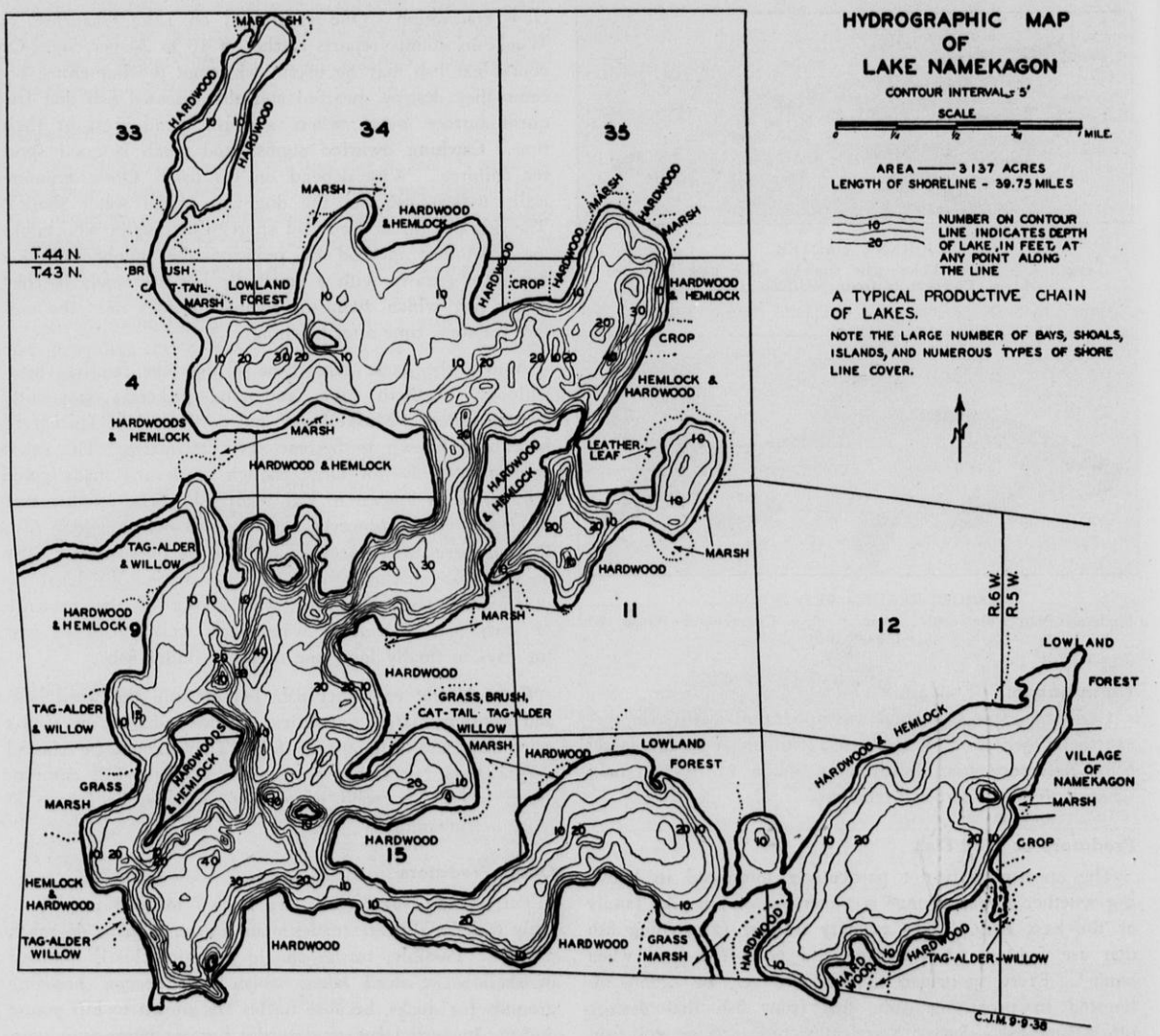
Forests must be managed and protected as the first step in lake management. This is particularly true in the so called "Barrens". Many lakes within this region, particularly in the northwestern Wisconsin highlands area, can only be saved through forest improvement and planting.

Non-productive Lakes

Lake soil like dry land soil improves with time as organic matter becomes an increasing part of its composition. The nature of the mineral earth is also important. Sand and gravel are very inert and have little plant food. They break down very slowly and so give off less fertility. Sand lined lake kettles are, therefore, generally less productive. This, however, is not true of the sand lined lake kettles of many of the shallow kettle lakes in Burnett and Washburn counties, because these are relics of an old lake bed in which the soil was very old clay. Where the sand lining is not very deep over this clay, its influence is evident for many of these lakes though now too shallow for fish have medium to hard water. These lakes have produced a prolific growth of vegetation and are rapidly becoming marshes. There is also some evidence of lake clay in other regions particularly near Lake Namakagon and even in Vilas, the highest county in the state.

Productive Lakes

Such lakes have older bottoms, where the soil is more productive. They also have greater areas of shoal water. These bottoms are usually not sandy. These lakes are often parts of preglacial water courses. Of course there are other factors which tend to make them more productive. They generally have some drainage, a varied depth and shore line, are usually long and narrow, and less subject to damage from wave action. Such lakes have medium to hard water and produce an abundant and varied vegetation and plankton. Fish protection and food is therefore plentiful. These lakes are like large luxuriant and varied pastures where farmers can graze cattle, hogs and sheep at the same time. Here members of the Pike family and members of the Bass family get along very well, and those who know where to fish can catch a mess of large crappies or bluegills for breakfast, and a northern pike or wall-eyed pike or possibly a "muskie" for dinner. Among these outstanding lake systems are the channel lakes of the leading rivers flowing from these northern highlands. Examples of such lakes are Lake Chetac and others on the Red Cedar drainage. Similar lakes are located in southwestern Rusk county and northern Chippewa county, and Nemakagon and adjacent lakes in Bayfield county. While some of these lakes are obviously not within well drained preglacial water courses they have lake soil of greater fertility than that found in kettle lakes which have a deep lining of sand. Such lakes with varied and abundant fish environment are the Eagle (Eagle River) and the Tomahawk (Minocqua)



chains in Vilas and Oneida counties. These lakes lying within the terminal and ground moraine of the Green Bay Glacier also have soil with a much higher lime content, and can be classed as relatively more productive than lakes not so influenced by limestone. Though lakes are less numerous in this region which was influenced by the Green Bay Glacier, many are channel lakes with varied and productive fish environment. The Waupaca chain is a good example of these lakes. Similar lakes are found in Polk county; also western Barron county, and possibly southern Burnett county. This group of lakes, the greater number of which form the headwaters of the Apple River have very hard water, and are referred to frequently as the limestone lakes of western Wisconsin where the last glacier scoured and broke down the limestone of this region. Others of these lakes drain into the Red Cedar. These

lakes are very productive. Bone, Balsam, Half Moon, and Round Lake are some of the larger lakes in the Apple River Chain.

Flowage Lakes

The management of flowage lakes depends upon how the water is used. A minimum water level is usually maintained. However, where the flowage reservoirs are extensive and relatively shallow and used as water storage for power production as are large areas of the flowages on the Chippewa, upper Flambeau, Manitowish and Turtle rivers, much of the basin is dry land for portions of the year. Such flowages are not as productive for aquatic life as they would be if water levels could be maintained, as they are in Lake Gordon, the flowage in the St. Croix river west of Gordon in Douglas county. This flowage is not a reservoir built for power production as are the ones in the Chippewa and other rivers here mentioned. Blaisdell Lake in Sawyer county is a flowage similar to Gordon Lake. The flowage north of Hayward on the Totogatic River is also built to maintain a permanent minimum level.

Flowages are not well understood by the general public —for example—an extensive area of water is generally considered ideal for waterfowl. However, if the water is not productive of waterfowl food it may have little value, except possibly as a resting place (tourist camp) for migrating waterfowl. This is true of the large flowages used for power production. Where water levels are maintained as in Lake Gordon and Blaisdell Lake, careful management will greatly improve their productiveness. Blaisdell Lake, partially a natural flowage, has an abundance of wild rice, the premier duck food and shelter. A careful study of such water plants as wild celery, wapato, or water-potato, the water smartweed, coontail, and similar pondweeds, and planting these in these flowages, where depth and conditions are similar to where they grow naturally, will result in the improvement of these flowages for waterfowl. The interdependency of all life must be kept in mind at all times by managers of land and water adaptable to waterfowl and other wild life use. Since the conservation of water by regulatory dams has caused a sudden change of water levels, thus flooding out certain vegetation, it is logical that vegetation adapted to the new environment must be substituted in order to make the area more productive for the use to which it is now best adapted.

NEAR CITY OR VILLAGE OF	DAM IS ON STREAM LISTED BELOW	REGULATORY	POWER	STORAGE	BODY OF WATER REGULATED OR CREATED
DOUGLAS COUNTY					
BENNETT	AMNICON RIVER	X			LYMAN LAKE
SUPERIOR	BLACK RIVER	X			PATTISON PARK L.
WASCOTT	TOTOGATIC RIVER	X			CRANBERRY LAKE
GORDON	EAU CLAIRE R.		X		FLOWAGE
" "	ST. CROIX RIVER	X			GORDON FLOWAGE L.
" "	EAU CLAIRE RIVER	X			LOWER EAU CLAIRE LAKE
BURNETT COUNTY					
GRANTSBURG	WOOD RIVER		X		FLOWAGE LAKE
" "	WOOD RIVER		X		FLOWAGE LAKE
DANBURY	LOON CREEK	X			MINERVA LAKE
" "	LOON CREEK	X			LOON LAKE
" "	YELLOW RIVER		X		YELLOW LAKES
WEBSTER	CLAM RIVER	X			CLAM LAKE
WASHBURN COUNTY					
BIRCHWOOD	RED CEDAR RIVER			X	BIRCH LAKE
SPOONER	TOTOGATIC RIVER	X			LAKE NANCY
" "	SLIM CREEK	X			SLIM LAKE
" "	YELLOW RIVER	X			SPOONER LAKE
" "	YELLOW RIVER	X			SPOONER FLOWAGE
TREGO	NAMEKAGON R.		X		NAMEKAGON FLWG.
SARONA	BRILL RIVER	X			LONG LAKE
POLK COUNTY					
MILLTOWN	BALSAM BROOK	X			HALF MOON LAKE
AMERY	APPLE RIVER		X		BLACK BROOK FLWG.
" "	APPLE RIVER		X		AMERY FLOWAGE
" "	HORSE CREEK	X			BIG LAKE
" "	BALSAM BROOK	X			WAPAGASET LAKE
" "	APPLE RIVER		X		BLACK BROOK FLWG.
ST. CROIX FALLS	ST. CROIX RIVER		X		ST. CROIX FALLS FLWG.
" " " "	ST. CROIX RIVER			X	NEVER'S RESERVIOR
BALSAM LAKE	BALSAM BROOK	X			BALSAM LAKE
CLAM FALLS	CLAM RIVER		X		CLAM FALLS FLWG.
LUCK	BUTTERNUT CREEK	X			BUTTERNUT LAKE
BARRON COUNTY					
RICE LAKE	HEMLOCK RIVER	X			BOLGER DAM FLWG.
" "	RED CEDAR RIVER			X	RED CEDAR LAKE
" "	RED CEDAR RIVER		X		RICE LAKE
CHETEK	CHETEK RIVER		X		CHETEK LAKE
BARRON	YELLOW RIVER		X		BARRON FLOWAGE
HAUGEN	BEAR CREEK			X	BEAR LAKE
PRAIRIE FARM	HAY RIVER	X			PRAIRIE FARM FLWG.
POSKIN	VERMILLION R.	X			POSKIN LAKE
CHIPPEWA COUNTY					
CHIPPEWA FALLS	DUNCAN CREEK	X			CHIPPEWA MILL POND
" " "	CHIPPEWA RIVER		X		LAKE WISSOTA
" " "	HALLIE CREEK	X			LAKE HALLIE
CORNELL	CHIPPEWA RIVER	X			CORNELL LAKE

C.J.M.

NEAR CITY OR VILLAGE OF	DAM ON STREAM LISTED BELOW	REGULATORY	POWER	STORAGE	BODY OF WATER REGULATED OR CREATED
EAU CLAIRE COUNTY					
AUGUSTA	EAU CLAIRE RIVER	X			LAKE EAU CLAIRE
" "	BRIDGE CREEK		X		MILL POND
" "	BRIDGE CREEK		X		FLOUR MILL POND
ALTOONA	EAU CLAIRE RIVER	X			ALTOONA L. FLOWAGE
FALL CREEK	FALL CREEK		X		MILL POND
EAU CLAIRE	CHIPPEWA RIVER		X		EAU CLAIRE DELLS FLWG.
BAYFIELD COUNTY					
BAYFIELD	PIKES CREEK	X			SALMO FISH HATCH.
DELTA	SPRING CREEK	X			SPRING LAKES
DRUMMOND	BR. OF WHITE R.	X			DRUMMOND POND
" "	BR. OF WHITE R.	X			LAKE OWEN
" "	EAU CLAIRE RIVER	X			UPPER EAU CLAIRE L.
" "	EAU CLAIRE RIVER	X			MIDDLE EAU CLAIRE L.
CABLE	NAMAKAGON RIVER	X			NAMAKAGON LAKE
IRON RIVER	IRON RIVER		X		UPSONS POND
" " "	IRON RIVER			X	IRON LAKE
" " "	PIKE RIVER	X			PIKE LAKE CHAIN
PORT WING	IRON RIVER		X		ORIENTA FLOWAGE.
SAWYER COUNTY					
RESERVE	COUDERAY RIVER	X			COURT D'ORIELLS
LORETTA	CHIPPEWA RIVER	X			BLAISDELL LAKE
HAYWARD	TOTOGATIC RIVER	X			TOTOGATIG FLWG.
" "	NAMAKAGON R.		X		HAYWARD LAKE
" "	CHIEF RIVER	X			ROUND L. DIVERSION
" "	SPIDER CREEK	X			SPIDER LAKE
" "	GHOST CREEK	X			GHOST LAKE
" "	TEAL RIVER	X			TEAL LAKE
WINTER	CHIPPEWA RIVER			X	LAKE CHIPPEWA
" "	MOOSE RIVER			X	MOOSE LAKE
" "	FISH TRAP CREEK	X			FISH TRAP LAKE
" "	FISH TRAP CREEK	X			BLACK LAKE
RADISSON	COUDERAY RIVER		X		GRIM FLOWAGE
" "	CHIPPEWA RIVER	X			RADISSON FLOWAGE
STONE LAKE	SAND CREEK	X			SAND LAKE
CLAM LAKE	CHIPPEWA RIVER	X			LOWER CLAM LAKE
" "	RED IKE CREEK	X			BASS REARING POND
RUSK COUNTY					
WEYERHAUSER	HEMLOCK CREEK	X			MURPHY DAM FLWG.
" "	POTATO CREEK	X			POTATO LAKE
HAWKINS	MAIN CREEK	X			HAWKINS POND
" "	SHAMROCK CREEK	X			SHAMROCK LAKE
BRUCE	SWIFT CREEK	X			ISLAND LAKE
" "	SWIFT CREEK	X			CHAIN LAKES
TONY	FLAMBEAU RIVER		X		BIG FALLS FLOWAGE
LADYSMITH	FLAMBEAU RIVER		X		THREE FLOWAGES
ASHLAND COUNTY					
CLAM LAKE	W. FORK CHIPPEWA	X			DAY FLOWAGE
" "	W. FORK CHIPPEWA	X			UPPER CLAM LAKE

C.J.M.

NEAR CITY OR VILLAGE OF	DAM IS ON STREAM LISTED BELOW	REGULATORY	POWER	STORAGE	BODY OF WATER REGULATED OR CREATED
ASHLAND COUNTY					
MELLEN	BAD RIVER	X			MELLEN FLOWAGE
" "	BRUNSWEILER CR.	X			FRENCH LAKE
" "	GALLILEE CREEK	X			LAKE GALLILEE
ASHLAND	WHITE RIVER		X		WHITE RIVER FLWG.
PRICE COUNTY					
BUTTERNUT	BUTTERNUT CREEK	X			BUTTERNUT LAKE
LUGERVILLE	S.FORK FLAMBEAU R.	X			LUGERVILLE FLWG
PARK FALLS	N. FORK FLAMBEAU R.		X		FOUR FLOWAGES
FIFIELD	S.FORK FLAMBEAU R.	X			ROUND & PIKE LAKES
PHILIPS	BIG ELK RIVER	X			JOB FLOWAGE
" "	BIG ELK RIVER	X			MUSSER FLOWAGE
PRENTICE	JUMP RIVER	X			PRENTICE FLOWAGE
IRON COUNTY					
MERCER	TURTLE RIVER	X			LAKE OF THE FALLS
" "	TURTLE RIVER	X			SHEA DAM FLOWAGE
" "	MONTREAL RIVER	X			PINE LAKE
MANITOWISH	CIRCLE LILLY CR.	X			CIRCLE LILLY LAKE
" "	FLAMBEAU RIVER			X	FLAMBEAU FLWG.
VILAS COUNTY					
LAND-O-LAKES	L. TAMARACK	X			TAMARACK FLOWAGE
" " "	WISCONSIN RIVER			X	LAKE VIEUX DESERT
" " "	PORTAGE CREEK	X			CHARLOTTE LAKE
CONOVER	TWIN RIVER			X	TWIN LAKES
" "	BUCKATABON CR.			X	BUCKATABON LAKE
" "	L. DEERSKIN CREEK			X	DEERSKIN LAKE
" "	PIONEER RIVER	X			PIONEER LAKE
PHELPS	DEERSKIN RIVER			X	LONG LAKE
SAYNER	LIT ST GERMAIN C.			X	LIT. ST. GERMAIN L.
" "	PLUM CREEK	X			PLUM LAKE
" "	BIG ST. GERMAIN R.			X	ST. GERMAIN LAKE
LAC-D-FLAMBEAU	BEAR RIVER	X			FLAMBEAU CHAIN
" " " "	SAND CREEK	X			WHITESAND LAKE
" " " "	LIT. TROUT CREEK	X			LITTLE TROUT LAKE
WINCHESTER	TURTLE RIVER	X			TURTLE LAKE
WINEGAR	LIT. HORSEHEAD CR.	X			HORSEHEAD LAKE
STAR LAKE	STAR CREEK	X			STAR LAKE
WOODRUFF	SQUAW CREEK	X			SQUAW LAKE
EAGLE RIVER	NINE MILE CREEK			X	UPPER NINE MILE C
" " " "	EAGLE RIVER		X		EAGLE RIVER CHAIN
MANITOWISH	MANITOWISH R.			X	REST LAKE CHAIN
BOULDER JUNCT	MANITOWISH R.	X			FISHTRAP LAKE
ONEIDA COUNTY					
TOMAHAWK L.	WISCONSIN R.			X	RAINBOW RESERVOIR
" " "	BIG ST GERMAIN CR.	X			PICKERAL LAKE
TOMAHAWK	TOMAHAWK RIVER			X	WILLOW RESERVIOR
" "	GILMORE CREEK	X			GILMORE LAKE
MINOCQUA	TOMAHAWK RIVER			X	MINOCQUA CHAIN
EAGLE RIVER	EAGLE RIVER			X	LONG LAKE CHAIN

C J M

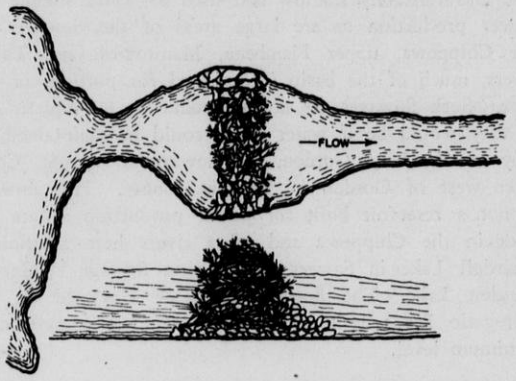
NEAR CITY OR VILLAGE OF	DAM IS ON STREAM LISTED BELOW	REGULATORY	POWER	STORAGE	BODY OF WATER REGULATED OR CREATED
ONEIDA COUNTY					
EAGLE RIVER	SEVEN MILE CR.			X	FLOWAGE
" "	SUGAR CAMP CR.			X	SUGAR CAMP RES.
" "	SQUIRREL CREEK			X	SQUIRREL LAKE
" "	NINE MILE CREEK			X	NINE MILE CR. FLWG.
" "	LITTLE RICE CR.	X			HANCOCK LAKE
" "	LITTLE RICE CR.	X			ONEIDA LAKE
RHINELANDER	PELICAN RIVER			X	N. PELICAN CHAIN
" "	WISCONSIN RIVER		X		HOT RAPIDS FLWG.
" "	WISCONSIN RIVER		X		RHINELANDER FLWG.
PELICAN L.	PELICAN RIVER			X	PELICAN LAKE
THREE LAKES	CANAL	X			THUNDER LAKE
" "	CANAL	X			RICE LAKE
" "	CANAL	X			RANGE LINE LAKE
LINCOLN COUNTY					
TOMAHAWK	SPIRIT RIVER			X	SPIRIT FLOWAGE
" "	WISCONSIN RIVER		X		TOMAHAWK FLWG
MERRILL	WISCONSIN RIVER		X		MERRILL FLOWAGE
BRADLEY	TOMAHAWK			X	LAKE NAKOMIS
LANGLADE COUNTY					
ANTIGO	SPRING BROOK	X			SKINNER DAM
" "	SPRING BROOK	X			SPRINGBROOK FLWG.
" "	SPRING BROOK	X			FAUST FLOWAGE
ELCHO	WOLF RIVER	X			POST LAKE
" "	ENTERPRISE CR.	X			ENTERPRISE LAKE
PHLOX	RED RIVER		X		PHLOX FLOWAGE
FOREST COUNTY					
CRANDON	WOLF RIVER	X			LITTLE RICE LAKE
" "	WOLF RIVER	X			PINE LAKE
" "	SWAMP CREEK	X			METONGA LAKE
OCONTO COUNTY					
MOUNTAIN	OCONTO RIVER	X			ANDERSON LAKE
" "	N. BR. OCONTO R.	X			CHUTE POND
OCONTO	OCONTO RIVER		X		APPLE DAM FLOWAGE
STILES	OCONTO RIVER		X		STILES POND
TOWNSEND	MC CAUSLIN BR.			X	RESERVOIR
SURING	MESSENGER CR.	X			KELLY LAKE CHAIN
MARINETTE COUNTY					
PESHTIGO	PESHTIGO RIVER		X		SIX FLOWAGES
MARINETTE	MENOMINEE RIVER		X		EIGHT FLOWAGES
WAUSAKEE	NOQUEBAY OUTLET	X			NOQUEBAY LAKE

TAKEN FROM THE RECORDS OF THE
WIS PUB SERVICE COMMISSION
WATER POWER SECTION
KENNETH C MAC LEISH
WATER POWER ENGINEER

C.J.M.

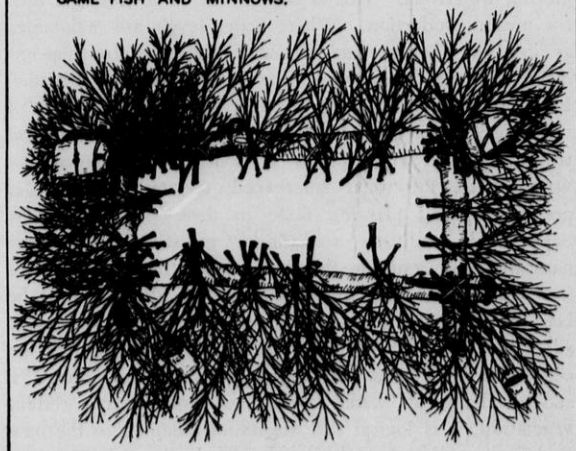
A PRACTICAL FILTER DAM

AREAS OF DANGEROUS WATER, PARTICULARLY SHALLOW AREAS OF FLOWAGES INTO WHICH THE WATER FLOWS SEASONALLY THROUGH NARROW CHANNELS, SHOULD BE PROTECTED BY FILTER DAMS. A BRUSH AND ROCK DAM IS USEFUL FOR THIS PURPOSE. THE SUB-MERGED BRUSH ALSO FURNISHES PROTECTIVE AND SPAWNING ENVIRONMENT FOR MINNOWS.



A HOLLOW SQUARE SHELTER

WHERE PROTECTIVE ENVIRONMENT IS INADEQUATE, A HOLLOW SQUARE SHELTER SERVES AS A REFUGE FOR GAME FISH AND MINNOWS.



C.J.M.

Numerous flowages, purely regulatory in nature have been created through the construction of dams by public works agencies, and many more are in the process of construction. Besides those already mentioned, the Wisconsin Public Service Commission reports the following in this Northern Highland lake region.

Spring Lakes

There are numerous spring fed lakes with depth and water temperature suitable for trout. Some of these lakes are landlocked and many have outlets. They vary in productiveness. But all are limited in fish environment to possibly the production of trout, and should be managed accordingly. Reforestation is important to the improvement of these small spring lakes. The growth of shrubs and other insect harboring vegetation should also be encouraged along their shore lines because trout are known to feed heavily on insect life. An outstanding group of such lakes lies east of Antigo in Langlade county. The lakes near Delta in Bayfield county are another example.

Deep Lakes

There are a number of lakes of sufficient depth and low temperature to support cisco, whitefish and lake trout. Of these cisco are the most common. None of these fish offer much sport to summer anglers. However, since cisco furnish food for wall-eyed pike and possibly other game fish their presence in these deep lakes is important and should be considered in the management of such lakes. While great depth is not always an index to environment for cisco, they are found in the deeper lakes, where plankton suitable to their needs, water temperature, oxygen content and protective environment is right.

Very Shallow or Dead Lakes

The management of the numerous very shallow or so-called dead lakes is distinct and different from that of all other lakes. The primary economic return from such lakes does not come from fish though some fish may still be present, but rather from the production of waterfowl and fur bearers. Many of these lakes are very fertile, and are producing luxuriant vegetation which is rapidly filling in all open water where its decay uses up the oxygen in the water. All vegetation and plankton suitable for ducks should be encouraged in such lakes. There are hundreds of these lakes in Burnett and Washburn counties, where ducks are common. The ever present tern indicates that minnows, frogs and crawfish are still present, else these scavengers of inland lakes would not be so numerous. The extensive group of shallow lakes with their marsh environment within this region can well be managed for waterfowl propagation and as a state wild life refuge. Similar isolated lakes throughout northern Wisconsin require like management though possibly not by a public agency.

LAKES ADAPTED TO DUCKS IN BURNETT AND WASHBURN COUNTIES

These lakes are generally referred to as shallow or dead lakes. Some are, however, shallow channel lakes that are also productive for fish. Clam Lake in Burnett county, with its permanent water level, is such a lake. All shallow lakes when landlocked are adapted primarily for ducks and are less than 12 feet in depth. Though the excessive precipitation of 1938 has added some depth to these lakes, it is doubtful whether the water level will rise sufficiently to again make them good fish lakes. These shallow lakes fall into two distinct classes: (a) those with relatively solid and sandy beaches and considerable open water and (b) those with soft, mucky and marshy shorelines and little or no open water. The latter lakes frequently dry up in part during the hot summer season. Their vegetation is therefore becoming more and more swamp-like and aquatic vegetation is disappearing. The former lakes have a larger amount and variety of aquatic vegetation that furnishes duck food while the swamp-like vegetation in the latter lakes furnishes a greater amount of shelter and protection to ducks against their natural enemies, adverse climate and also against duck hunters. Both types of lakes are useful and should be managed, as nearly as possible, to produce a maximum amount of duck food and shelter. Clam Lake and Fish Lake in Burnett county and Ellsworth Lake and Doc Lake in Washburn county are typical of those lakes having some open water, good feeding grounds and some shelter for ducks. Green Lake and Pine Lake in Burnett county and Randall Lake and Spring Lake in Washburn county are typical of the lakes in this region with swampy shore lines and little or no open water. Ducks feeding in the open water lakes soon learn to take refuge in the less accessible swamp-like lakes when the hunting season opens. (see table page 15.)

THE LAKES OF DOUGLAS COUNTY

Douglas county has approximately 100 lakes and ponds. Of these 80 cover twenty or more acres with a total area of more than 12,000 acres. Many of the smaller lakes are too shallow for fish. Like adjacent counties, Douglas has numerous sand lined kettles which are relics of the old glacial lake reported in 1929 by H. P. Aldrich and N. C. Fassett as Glacial Barrens Lake. Many of these shallow kettles are now dry. The deeper kettles protected by forested shorelines show less water recession. Widening beaches indicate that some still containing water have been reduced to less than one half their original area. The primary lakes of the southern portion of the county all drain into the St. Croix. St. Croix Lake, the source of the St. Croix river is obviously a partially filled portion of a pre-glacial water course. Whitefish Lake is not only the largest landlocked lake but also the deepest lake in the county. Its shorelines indicate that it may have been a part of a pre-glacial water course. Amnicon, Lyman, Minnisuing, Nebagamon and Black are all within the Lake Superior watershed. These lakes have an abundance of water from inlets and springs. All are productive lakes, but Black, is practically inaccessible on account of boggy shorelines, and like Amnicon and Lyman is shallow. Minnisuing and Nebagamon it appears may also have been a part of an ancient water course filled in by glacial action.

THE LAKES OF WASHBURN COUNTY

Washburn County has more than 275 distinct and separate bodies of water, ranging in size from Long Lake with an area of nearly 4000 acres, to small land locked lakes and ponds. Added water area has also been created by regulatory and power dams. The trend, however, is toward less water area for many lakes are approaching the danger line of shallowness. Only added forest protection will prevent excessive dessication from hot drying winds striking the surface of these bodies of water. Hundreds of small kettle swamps are mute evidence of this drying action, for these were at one time filled with water. Old shore lines are to be seen in many places. The lakes of Washburn County in glacial time were ice filled depressions. Some of these like Long Lake were within a preglacial valley. As the ice melted, water covered much of the entire area. In time new drainage channels developed. The Totogatic, Namekagon and Yellow rivers are such streams. The Red Cedar draining its system of lakes within an old drainage area is typical of drainage that followed a partially filled in preglacial water course. The divide separating the Red Cedar drainage from the others mentioned, is relatively rugged. This higher topography has an elevation of 1306 feet at Stone Lake at the upper end of the divide in Wash-

burn county and 1294 at Sarona near the southern boundary of the county. Birchwood to the southeast is already more than 50 feet lower. Going west from the divide, Shell Lake is more than fifty feet lower and Spooner more than 200 feet lower. From Sarona the divide swings to the west, and elevation increases to 1375 feet at Barronett. Numerous small kettle lakes within this rugged divide are spring fed. Long, Balsam and Birch Lakes are relatively narrow, long channel lakes well protected from severe wave action. These lakes have hard water. This means that their water is fertile and that an abundance of fish food is produced. All have good drainage.

The drainage to the west toward the St. Croix meanders through new water courses. Numerous lakes within this area, now landlocked, still have visible outlets. Others have intermittent drainage and many are landlocked within relatively deep kettles. Many in shallow kettles have dried up and others are too shallow to support fish life. The numerous kettles in this drainage being sand lined, have fine sandy beaches. These kettles are frequently referred to as relics of Glacial Lake Grantsburg, (Barrens) which during the ice age period, covered much of the region west into Burnett county and north into Douglas and Bayfield counties. These numerous kettle lakes generally have soft and very soft water. Where not heavily fished, protected against severe wave action and of sufficient depth, they afford relatively good fishing. Pan fish and bass do well in these lakes. Bathing beaches are numerous. With the very splendid work which is being done in forest protection and improvement, a better environment of Washburn county lakes is assured and their economic value will be increased. Added shade and protection will also improve the trout water of the county.

THE LAKES OF BURNETT COUNTY

The lake system of Burnett county is largely within the old lake bed of an ancient lake (Glacial Lake—Grantsburg). While the topography in this county was not greatly modified by the last glacial movement in Wisconsin, the glacier did in its advance deposit other earth material and in its recession left a sand mantle variable in depth over this old lake clay. Where this mantle is not too deep the present lakes have relatively hard water and are very productive. Many were shallow and some of these have become marshes and others without drainage are now too shallow for fish. Fish Lake southwest of Grantsburg is a good example. The channel lakes in Burnett county, though shallow, particularly with controlled water levels are exceedingly productive. Clam Lake is a good example.

THE LAKES OF POLK AND BARRON COUNTIES

The lakes of these counties, particularly those of Polk county, are often referred to because of their very hard water as limestone lakes of western Wisconsin. The last glacial movement had less influence on these counties, because of the very hard and rugged hills north and east. However, another glacier from the west, possibly of an earlier period, did scour the limestone to the west which may account for these limestone lakes and numerous marl beds. These lakes are very productive. Many of them are long and relatively narrow; parts of the Apple river and Red Cedar river drainages. Bone Lake and Red Cedar Lake are typical of the lakes of these drainage systems.

THE LAKES OF RUSK COUNTY

The total area of Rusk county lakes is less than 11,000 acres. The largest is Island Lake, and the deepest is Sand Lake. Others of depths over 70 feet are Chain and Clear. All these larger deep lakes lie in the southwestern part of the county within the terminal moraine left by the last glacier. Others of the larger lakes lie within the plain back of the moraine. Island, Amacoy and Rice are the larger lakes of this group. All of these lakes drain into the Chippewa River. The shoal water of most of these lakes is relatively varied and fertile, producing food and protection for fish. The land locked lakes are less productive. Dams within the Flambeau River have created a series of flowages, the largest of which is the Big Falls Flowage. Flambeau flowages in Rusk county are confined to relatively narrow deep channels, which insure adequate depth and drainage.

THE LAKES OF SAWYER COUNTY

There are about 260 lakes and ponds in Sawyer County. The total area of these lakes is approximately 61,500 acres. This includes practically all water areas of 20 acres or more. The total mileage of shoreline of these lakes is approximately 535, including the shorelines of the flowages in several rivers.

The lakes of Sawyer County owe their origin to glacial activity, which completely altered the old topography and drainage. The new topography contains many depressed areas that are partially drained or not drained at all. These constitute the swamps and lakes.

In recent time the very extensive flowage in the Chippewa River has further enlarged the water area of the county by thousands of acres. Where there were once possibly a dozen small lakes, the flowage now extends beyond their shorelines to cover approximately 15,000 acres. This vast expanse of water, though seasonally fluctuating in volume, has very large areas of depth adequate for fish life. Debris and vegetation, even in the shallow water, give harbor and protection to minnows and other fish food. Sawyer county lakes are known largely by regions. The primary regions are, Connor's Lake in the southeastern part of the county; the Court Oreilles in the central part; the Spider, Teal, Lost Lake and Ghost in the northern; and the Lake Chetac region in the southwestern part of the county. The preglacial water courses are almost completely buried in Sawyer county. Such lakes as Chetac, Whitefish and Spider show evidence of being part of an original water course. There is also some reason to believe that the Connor's Lake group is within an old water course. The old water course lakes are generally more productive.

THE LAKES OF BAYFIELD COUNTY

Bayfield county from its Central Highlands drains north and east through the Iron and numerous smaller rivers (trout water) into Lake Superior; northeast through the White River to Chequamegan Bay and southwest through the Chippewa, Namekagon and Eau Claire rivers to the Mississippi. The four primary lake systems are the White, Eau Claire, Namekagon and Chippewa. The Eau Claire lakes and numerous so-called sand bar lakes of the western part of the county are the deeper sand lined depressions of an ancient lake which was partially filled in by glacial action. There are many of these relic lakes in the sand plain of Bayfield county and counties of the southwest.

The Namekagon, White and Chippewa lake systems are all new lakes within the moraine left by the last glacier. This moraine extends from the vicinity of the Iron River south and east toward Clam Lake.

The Eau Claire and sand bar lakes have extensive sand beaches and ideal bathing facilities. The lakes in the moraine have shorelines, varying from sandy and gravelly beaches to precipitous banks and low wet bogs. These lakes have abundant and varied plant life, both pond weeds

and plants of which the sedges, pickerel weeds, and water lilies are examples. There are approximately 300 lakes in Bayfield county with a six hundred mile shore line.

The lake inventory of this report covers the larger and accessible lakes. Those not included are small kettle lakes and ponds, ranging from five to forty or more acres in area, and generally inaccessible, though frequently not without fish. Many are becoming too shallow as timber is removed and excessive evaporation follows. These smaller lakes where depth is adequate, like other landlocked lakes have clear, soft water; a relatively sparse growth of aquatic vegetation and limited fish food. Perch, sunfish and bass are adapted to such lakes and are usually present.

THE LAKES OF ASHLAND COUNTY

The iron bearing Penokee range extends across Ashland county to some distance west of Mellen. Mellen is located at the primary water gap in the range through which the Bad River flows northward to Lake Superior. With its tributaries the Bad River drains the area directly west, south and southwest of the Penokee range. Mineral, English, Meder, Leland, Gallilee, Eureka, Twins and Carolina have outlets into the Bad River. A scarcely perceptible divide south of this Bad River drainage becomes the headwater of the east fork of the Chippewa and a small portion also drains into the Flambeau. The primary lakes and outlets in this drainage are Augustine, Upper Clam, Long, Bear, and Butternut.

While Ashland county has fewer lakes than adjoining counties, these lakes have suffered least from excessive evaporation during dry years. This is probably due to the extensive areas of swamp south of the Penokee Range. Approximately one third of this total area is timbered swamp and marsh and the lakes and ponds cover less than 2 per cent of the area. There is no place in these northern highlands where drainage meanders as much as do the head waters of the Bad and Chippewa rivers, before the Bad River finally turns north through the Penokee Gap and the Chippewa southward toward the Mississippi. The shoals of the lakes in this region are varied and water weeds, rushes and reeds are plentiful, furnishing ample protection for fish, and the more useful plankton.

THE LAKES OF IRON COUNTY

Iron county like Ashland county is crossed by the iron-bearing Penokee range. There are only a few small lakes north of this range, but numerous and large lakes lie south and east. Most of these drain into the Turtle, Manitowish and Flambeau rivers. The waters of these rivers join west and south of Mercer where their combined water becomes the extensive flowage lake of southern Iron county. Only Island, Pine and some smaller nearby lakes drain north through the Montreal river to Lake Superior. Extensive areas of swamp make up much of the land area of this lake region. Most of these are timbered. Even the area now within the Turtle, Manitowish and Flambeau flowages was largely timbered. More than 25 sections of land are within this extensive flowage an area where there were very few lakes before the flowage was created.

The more important and productive natural lakes border the flowage to the east and north. These are all depressions within the ground moraine left by the recession of the last glacier.

THE LAKES OF LANGLADE COUNTY

The lakes of Langlade county can be divided into those having soft to medium water and those having medium to very hard water. The last group lie in the eastern part of the county i.e., the part of the county containing broken down limestone left by the glacier which swept in from the east, and the first group lie within the path of the glacier which swept from the north and contained little or no limestone. Langlade county has very many small lakes in the irregular depressions within the terminal moraine. Most of these are landlocked, but with sufficient depth for fish. The eastern area also has numerous spring-fed lakes of high carbonate content that have good trout environment. Such lakes are numerous east of Antigo.

THE LAKES OF ONEIDA COUNTY

Oneida, like Vilas county, has a very large area in lakes and ponds. These lakes are largely part of the Eagle and Tomahawk chains. Pelican and other lakes, east and south of Rhinelander, and some smaller groups of lakes near the Wisconsin river, drain directly into the Wisconsin. Since the Eagle and Tomahawk drainages are part of the larger Wisconsin river drainage, practically all lakes in Oneida county drain into the Mississippi; for the few in the western part of the county that drain into the Flambeau, also reach the Mississippi. Only a small portion of the southeastern part of the county drains into the Wolf river and this region has very few lakes. The lakes of Oneida county are similar in origin, soil and adaptation to the lakes of Vilas county. Very few hydrographic maps have been completed of lakes in this region but reconnaissance studies show a varied shoal bottom and vegetation in these extensive channel lakes.

THE LAKES OF VILAS COUNTY

Vilas county has 750 lakes and ponds of 10 or more acres. These lakes cover 14 per cent of the total area of the county, and are the highest lakes in the state. The average altitude of the county is approximately 1700 feet above sea level, which places these lakes about 1100 feet above the elevation of Milwaukee, 850 feet above Madison, and 1,000 feet above Prairie du Chien, at the mouth of the Wisconsin river. The lakes of Vilas county are largely kettle holes left in the ground moraine by the last glacial movement into Wisconsin. Their shores consist of the usual glacial material, silt, sand, gravel and boulders in various proportions. There is also some evidence of red clay.

Many of these kettles are now extinct lakes and 15,000 acres of the county, once water, are now leather leaf and sphagnum bogs. An additional 75,000 acres of the county is open marsh and forest swamp. Lac Vieux Desert is Vilas county's largest lake. From its expanse of more than 4,000 acres flows the Wisconsin, the primary river of the state. Trout Lake is the largest kettle, with a maximum depth of 115 feet. Most of the lakes do not exceed 40 feet. The majority of the lakes have excellent shores for summer homes as well as good beaches for bathing.

Most of the lakes of Vilas county are stained more or less by vegetable material that is extracted from leaves and from plant debris in marshes and bogs. The brown color varies in degree from only a trace up to that resembling weak tea. In most cases the brown color is relatively slight. The more deeply stained waters are found in lakes with marshy or boggy shores and in those which receive a large amount of drainage water from marshes. The water of a few of the lakes does not possess any brown color whatever, such as the water of Crystal Lake west of Sayner. These crystal, clear lakes are deeply lined sand kettles and have very soft water.

DOUGLAS COUNTY	T 43 N. R. 10 W.	T 43 N. R. 11 W.					TOWN 43 NORTH RANGE 12 WEST					
NAME OF LAKE	SNAKE	ALEXANDER	CLYDE	MULLIGAN	RED	SAUNTRY'S POCKET	BASS	BOND	LEADER	TWO MILE	SPIDER	WHITEFISH
LAKE IN SECTIONS	19	12	26	13	28-29-30	1	10, 15	21, 28 29	21, 22, 27	12, 13	5, 6, 7, 8	3, 4, 10, 11 9, 16, 20, 21
NEAREST TRADING POINT AND P.O.	WASCOTT	GORDON	WASCOTT	GORDON	WASCOTT	GORDON	GORDON	WASCOTT	WASCOTT	GORDON	GORDON	GORDON
AREA IN ACRES	77	48	37	77	294	106	110	162	212	112	63	918
MAXIMUM DEPTH IN FT.	38	12	11	8	39	8	23	64	56	29	17	100
GAME FISH IN LAKE NOW	L.M. BASS N PIKE SUNFISH BLUEGILLS	ROCK BASS BLUEGILLS SUNFISH	W E. PIKE L. M. BASS BLUEGILLS PERCH	N. PIKE BULLHEAD	W E PIKE N. PIKE ROCK BASS BLUEGILLS CRAPPIES L.M. BASS	N. PIKE BULLHEADS	N. PIKE L.M BASS BLUEGILLS GRAPPIES	N PIKE L M BASS BLUEGILLS PERCH	L M BASS N PIKE BLUEGILLS PERCH	PERCH	L M. BASS BLUEGILLS	N. PIKE L. M BASS BLUEGILLS ROCK BASS WHITEFISH CISCOES LAKE TROUT CRAPPIES
FISH SUITABLE FOR PLANTING	L M. BASS				W E PIKE N PIKE ROCK BASS BLUEGILLS		N. PIKE L. M BASS BLUEGILLS	N PIKE L M BASS BLUEGILLS	L.M. BASS	L.M BASS BLUEGILLS	L M. BASS N. PIKE	L.M BASS N. PIKE
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	SEASONAL OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR MEDIUM	CLEAR VERY SOFT	CLEAR VERY SOFT	BROWN MEDIUM HARD	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR VERY SOFT	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR VERY SOFT	CLEAR MEDIUM HARD	CLEAR SOFT
AQUATIC VEGETATION	ABUNDANT AND VARIED	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	FAIRLY ABUNDANT	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE	ABUNDANT AND VARIED	SCARCE
LAND COVER SURROUNDING LAKE	BURN - POPPLE	JACKPINE	JACKPINE BOG	BLACK SPRUCE SWAMP	HARDWOOD AND JACKPINE	JACKPINE	OAK AND POPPLE BRUSH	SCRUB OAK AND JACKPINE	JACKPINE	POPPLE	NORWAY PINE AND POPPLE	SCRUB OAK AND MAPLE

DOUGLAS COUNTY	TOWN 43 NORTH RANGE 13 WEST					T 44 N. R. 10 W.	T 44 N. R. 11 W.			T 44 N. R 12 W.	T 45 N. R. 10 W.	T 45 N. R. 12 W.
NAME OF LAKE	CRANBERRY	CRYSTAL	PERSON	RAILROAD (PRIVATE)	ROUND	LOWER EAU CLAIRE	SIMMS	LOWER OX	UPPER OX	ST CROIX FLOWAGE OR GORDON LAKE	LOON	ST CROIX
LAKE IN SECTIONS	24, 25	23,24,25,26	21, 22,	27	12	24, 25 - BALANCE IN BAYFIELD CO.	30 - ALSO 25 IN T 44 N R 11 W	8	14	27,28,31,32,33,34,35	13	24, 25, 36 ALSO 18,19 T 45 N R 11 W
NEAREST TRADING POINT AND P.O.	WASCOTT	WASCOTT	WASCOTT	WASCOTT	GORDON	GORDON	GORDON	SOLON SPRINGS	GORDON	GORDON	SOLON SPRINGS	SOLON SPRINGS
AREA IN ACRES	286	320	171	64	30	897	282	62	66	2887 OF WHICH 308 IS IN ISLANDS	65	957
MAXIMUM DEPTH IN FT.	17	19	8	14	69	39	41	12	20	ADEQUATE FOR FISH	16	24
GAME FISH IN LAKE NOW	N PIKE L M. BASS CRAPPIES BLUEGILLS BULLHEAD	N. PIKE L M BASS BLUEGILLS PERCH	L M BASS N PIKE ROCK BASS BLUEGILLS PERCH	L M BASS BLUEGILLS SUNFISH	L M BASS S. M. BASS PERCH	N PIKE L M BASS ROCK BASS BLUEGILLS PERCH W E PIKE	PERCH BULLHEADS	W E. PIKE N PIKE L. M. BASS BLUEGILLS SUNFISH PERCH BULLHEAD	N. PIKE W E PIKE L M BASS ROCK BASS BLUEGILLS PERCH BULLHEAD	ALL GAME FISH COMMON TO ST CROIX RIVER	L. M. BASS W. E. PIKE BLUEGILLS	W. E PIKE N. PIKE L. M BASS S. M BASS CRAPPIES PERCH CATFISH
FISH SUITABLE FOR PLANTING	L M BASS	L M BASS	BULLHEAD	(L M BASS)	L M BASS	WE PIKE	L M BASS BLUEGILLS	W E. PIKE N. PIKE SUNFISH BULLHEAD	L.M. BASS S.M BASS W E PIKE (REMOVAL)	S.M. BASS MUSKELLUNGE ROCK BASS W E. PIKE	L M BASS S.M. BASS BLUEGILLS	N. PIKE W E PIKE L. M BASS S M BASS
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET
WATER IS	BROWN MEDIUM HARD	CLEAR SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR MEDIUM HARD	CLEAR VERY SOFT	CLEAR MEDIUM HARD	BROWN MEDIUM HARD	CLEAR MEDIUM	CLEAR MEDIUM HARD	CLEAR MEDIUM
AQUATIC VEGETATION	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE	ABUNDANT	SCARCE	ABUNDANT AND VARIED	SCARCE	ABUNDANT AND VARIED	ABUNDANT AND VARIED	WILD RICE	ABUNDANT AND VARIED	ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	SCRUB OAK AND JACKPINE	POPPLE BRUSH	POPPLE BRUSH	WHITE PINE	SCRUB OAK AND JACKPINE	JACKPINE IMPROVED LAND	JACKPINE	CEDAR AND SPRUCE SWAMP	SCRUB OAK AND JACKPINE	SCRUB OAK - PINE AND SWAMP	SCRUB OAK-MARSH - JACKPINE	PINE, CITY, AND HARDWOOD FOREST

WASHBURN COUNTY	T.41N. - R.12&13W	TOWN 41 NORTH - RANGE 12 WEST.		T. 41&42N.-R13W.	TOWN 41 NORTH - RANGE 13 WEST.				TOWN 42 NORTH - RANGE 12 WEST.			
NAME OF LAKE	CHICOG	MAC (STANCE)	SILVER	TWIN LAKE	MACCLAIN	MATHEWS	PEAR	LOWER McKENZIE	GILMORE	POKEGAMA	HORSESHOE	BASS
LAKE IN SECTION	6, 7 BAL. IN T.41N.-R.13W.	29	35,36, 25, 26	2 BAL. IN T.42N.-R13W.	11,12	14,23	9,16	31,32 & T.40N-R.13W.	8.9,17, 20	21,22,28, 32, 33	30, 31 & T.42 N. R13W.	32, 31
NEAREST TRADING POINT AND P O	MINONG	LAMPSON	LAMPSON	MINONG	MINONG	LAMPSON	MINONG	LAMPSON	MINONG	MINONG	MINONG	MINONG
AREA IN ACRES	123	112	165	205	162*	27	58	187	395	400	120	200
MAXIMUM DEPTH IN FT	26	13	15	24	24	25	30	20	33	25	15	27
GAME FISH IN LAKE NOW	L.M.BASS N.PIKE BLUEGILLS PERCH	L.M.BASS W.E.PIKE BLUEGILLS CRAPPIES	L.M.BASS BLUEGILLS CRAPPIES W.E.PIKE	L.M.BASS BLUEGILLS	L.M.BASS W.E.PIKE N.PIKE CRAPPIES BLUEGILLS PERCH	L.M.BASS N.PIKE CRAPPIES BLUEGILLS PERCH ROCKBASS	L.M.BASS W.E.PIKE CRAPPIES	L.M.BASS N.PIKE BLUEGILLS CRAPPIES ROCKBASS PERCH	L.M.BASS S.M.BASS W.E.PIKE BLUEGILLS CRAPPIES N.PIKE	L.M.BASS W.E.PIKE N.PIKE CRAPPIES ROCKBASS PERCH	L.M.BASS BLUEGILLS CRAPPIES	L.M.BASS W.E.PIKE N.PIKE BLUEGILLS PERCH
FISH SUITABLE FOR PLANTING	N.PIKE L.M.BASS BLUEGILLS	BULLHEADS	L.M.BASS BLUEGILLS	L.M.BASS BLUEGILLS	L.M.BASS BLUEGILLS	L.M.BASS S.M.BASS BLUEGILLS	BLUEGILLS L.M.BASS	S.M.BASS L.M.BASS N.PIKE BLUEGILLS ROCKBASS	L.M.BASS S.M.BASS BLUEGILLS W.E.PIKE ROCKBASS	W.E.PIKE N.PIKE BLUEGILLS ROCKBASS	L.M.BASS BLUEGILLS ROCKBASS	L.M.BASS S.M.BASS N PIKE BLUEGILLS
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET
WATER IS	MEDIUM HARD CLEAR	SOFT CLEAR	SOFT CLEAR	SOFT CLEAR	MEDIUM CLEAR	HARD CLEAR	VERY SOFT CLEAR	HARD CLEAR	MEDIUM CLEAR	VERY HARD CLEAR	SOFT CLEAR	MEDIUM CLEAR
AQUATIC VEGETATION	ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE
LAND COVER SURROUNDING LAKE	SCRUB OAK POPPLE	SPRUCE SWAMP JACK PINE	POPPLE OAK	JACK PINE	SWAMP JACK PINE	YOUNG JACK PINE FOREST	JACK PINE FOREST	JACK PINE FOREST	PINE FOREST	PINE HARDWOOD	JACK PINE	JACK PINE

DOUGLAS COUNTY	T.46N R.11W.	T. 46N. R 13W.		T 46N. R.14 W.	T 47 N. R. 11 W.	
NAME OF LAKE	MINNISUING	DOWLING	LYMAN	AMNICON	NEBAGAMON	STEELE
LAKE IN SECTIONS	9,10 15 16 21	7, 18	15 16 21 22	12, 13	35 36 ALSO 1,2,12 T46N.R11W	28 32 33
NEAREST TRADING POINT AND P.O.	NEBAGAMON	BENNETT	BENNETT	BENNETT	NEBAGAMON	NEBAGAMON
AREA IN ACRES	564	121	466	312	950	190
MAXIMUM DEPTH IN FT.	39	12	11	21	54	10
GAME FISH IN LAKE NOW	L. M. BASS N. PIKE W. E. PIKE CRAPPIES BLUEGILLS	MUSKELLUNGE L. M BASS PANFISH	MUSKELLUNGE L M BASS BLUEGILLS PERCH	W E PIKE N. PIKE L. M. BASS MUSKELLUNGE PANFISH	W. E PIKE N. PIKE L. M. BASS ROCK BASS BLUEGILLS PERCH SUNFISH	N. PIKE PERCH
FISH SUITABLE FOR PLANTING	L.M. BASS W.E. PIKE	L. M. BASS	L M BASS	W.E PIKE	W. E. PIKE	
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET
WATER IS	BROWN MEDIUM HARD	BROWN MEDIUM HARD	BROWN MEDIUM	BROWN MEDIUM	BROWN MEDIUM HARD	CLEAR MEDIUM
AQUATIC VEGETATION	ABUNDANT AND VARIED	SCARCE	ABUNDANT AND NOT VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	HARDWOODS	YOUNG HARDWOODS COTTAGES	YOUNG BALSAM AND HARDWOODS	HARDWOODS AND SWAMP	YOUNG HARDWOODS COTTAGES	CLEARED LAND AND SWAMP

BURNETT COUNTY	TOWN 37 NORTH RANGE 18 WEST			
NAME OF LAKE	PINE	TRADE	ROUND	HOLMES
LAKE IN SECTION	22 - 23	20-21-28-29	27-28-34	30-31
NEAREST TRADING POINT AND POST OFFICE	GRANTSBURG	GRANTSBURG	LUCK	GRANTSBURG
AREA IN ACRES	60	315	155	50
MAXIMUM DEPTH IN FEET	40	30	28	21
GAME FISH IN LAKE NOW	SUNFISH BASS N.PIKE BULLHEADS	W.E. PIKE N.PIKE L.M. BASS S.M. BASS CRAPPIES PERCH ROCK BASS SUNFISH	L.M. BASS S.M. BASS BLUEGILLS CRAPPIES N. PIKE W.E. PIKE BULLHEADS	L. M. BASS PICKEREL SUNFISH CRAPPIES BULLHEADS PERCH
FISH SUITABLE FOR STOCKING	SUNFISH HASS N. PIKE BULLHEADS	L.M.BASS S.M.BASS N. PIKE SUNFISH	L. M. BASS S. M. BASS BLUEGILLS	PICKEREL SUNFISH
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET
WATER IS	CLEAR SOFT	CLEAR VERY HARD	CLEAR HARD	CLEAR HARD
AQUATIC VEGETATION	SCARCE	ABUNDANT	ABUNDANT	ABUNDANT
LAND COVER	CROP LAND - HARDWOODS	HARDWOODS	HARDWOODS.	SPRUCE

WASHBURN COUNTY	TOWN 37 NORTH - RANGE 10 WEST							TOWN 37 NORTH - RANGE 11 WEST		TOWN 37 NORTH - RANGE 12 WEST		
NAME OF LAKE	HEMLOCK	BIG SPIDER (CROOKED)	NICK	BASS LAKE	PAVLAS *	BIRCH	BALSAM	LONG	FENTON	BIG RIPLEY	LITTLE RIPLEY	LITTLE KEKEGAMA
LAKE IN SECTION	1,2	2,3,10,11	3,4	5,6,7,8	6,7	24,25, BAL IN SAWYER CO.	26,27,34,35	SEVERAL SECTIONS	20,21,28	4,9,10	5,8,9	15,22
NEAREST TRADING POINT AND P. O.	BIRCHWOOD	BIRCHWOOD	BIRCHWOOD	BIRCHWOOD	SARONA	BIRCHWOOD	BIRCHWOOD	SARONA	SARONA	SHELL LAKE	SHELL LAKE	SARONA
AREA IN ACRES	44	191	27	219	42	270 IN WASHBURN COUNTY	275	3917	183	63	44	72
MAXIMUM DEPTH IN FT.	34	62	77	54	37	37	51	72	48	11	SHALLOW	22
GAME FISH IN LAKE NOW	BASS W. PIKE CRAPPIES BLUEGILLS	W.E.PIKE N.PIKE L.M.BASS BLUEGILLS CRAPPIES (MUSKELLUNGE)	L.M.BASS W.E.PIKE BLUEGILLS	L.M.BASS N.PIKE BLUEGILLS PERCH	NO INFORMATION AVAILABLE	L.M.BASS S.M.BASS W.E.PIKE N.PIKE WHITEFISH ROCKBASS BLUEGILLS CRAPPIES	L.M.BASS S.M.BASS W.E.PIKE N. PIKE WHITEFISH ROCKBASS BLUEGILLS CRAPPIES	L.M.BASS S.M.BASS W.E.PIKE BLUEGILLS N.PIKE CRAPPIES PERCH	L.M.BASS W.E.PIKE BLUEGILLS PERCH	L.M.BASS W.E.PIKE PERCH	NO DATA TAKEN	NO INFORMATION AVAILABLE
FISH SUITABLE FOR PLANTING	BASS BLUEGILLS	L.M.BASS S.M.BASS BLUEGILLS	L.M.BASS BLUEGILLS	L.M.BASS BLUEGILLS	L.M.BASS S.M.BASS BLUEGILLS	CRAPPIES W.E.PIKE N.PIKE BLUEGILLS ROCKBASS	CRAPPIES W.E.PIKE N. PIKE BLUEGILLS ROCKBASS	L.M.BASS S.M.BASS N.PIKE BLUEGILLS	L.M.BASS S.M.BASS BLUEGILLS	L.M.BASS BLUEGILLS	W.E.PIKE BLUEGILLS ROCKBASS	L.M.BASS BLUEGILLS
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET.	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	VERY SOFT CLEAR	MEDIUM CLEAR	VERY SOFT CLEAR	SOFT CLEAR	SOFT CLEAR	VERY HARD CLEAR	VERY HARD CLEAR	VERY HARD CLEAR	SOFT CLEAR	SOFT CLEAR	STAINED GREEN	VERY SOFT CLEAR
AQUATIC VEGETATION	SCARCE	ABUNDANT	SCARCE	FAIR	ABUNDANT	VERY ABUNDANT	VERY ABUNDANT	VARIED	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD	HARDWOOD	HARDWOOD	HARDWOOD	HARDWOOD CLEARED LAND	HARDWOOD CLEARED LAND	HARDWOOD	HARDWOOD PINE FOREST	HARDWOOD PINE FOREST	HARDWOOD	POPPLE	POPPLE BRUSH CLEARED LAND
					* IN T.37N. R.11W.							

WASHBURN COUNTY	T 37 N - R 12 W.	T 37 N. - R. 13 W	TOWN 38 NORTH - RANGE 10 WEST		TOWN 38 NORTH RANGE 11 WEST			TOWN 38 NORTH - RANGE 12 WEST				T.39 N. - R.10 W.
NAME OF LAKE	KEKEGAMA	PINE	SLIM	SLIM CREEK	BAKER	SEYMOUR	RIPLEY LAKES	DEVILS	TOZER *	RANDELL	SHELL	STONE
LAKE IN SECTION	23,26,35	22	1,2,11,12	3,10	3,10	9,10,15	19,30	29,32,33,34	1, 2	5,6	SEVERAL SECTIONS	23,24,25,26
NEAREST TRADING POINT AND P O.	SARONA	SHELL LAKE	STONE LAKE	STONE LAKE	SPOONER	SPOONER	SHELL LAKE	SHELL LAKE	SPOONER	SPOONER	SHELL LAKE	STONE LAKE
AREA IN ACRES	98	35	327	54	43	95	44	166	8	44	2409	497
MAXIMUM DEPTH IN FT.	25	15	SHALLOW	SHALLOW	17	11	22	78	49	12	36	43
GAME FISH IN LAKE NOW	L.M.BASS BLUEGILLS CRAPPIES PERCH N.PIKE	N. PIKE PERCH CRAPPIES SUNFISH	NO INFORMATION TAKEN	NO INFORMATION TAKEN	L.M.BASS N.PIKE PERCH	L.M.BASS W.E.PIKE BLUEGILLS PERCH	PERCH BLUEGILLS L.M.BASS S.M.BASS W.E.PIKE	L.M.BASS S.M.BASS W.E.PIKE BLUEGILLS PERCH	NO INFORMATION AVAILABLE	N.PIKE BASS BLUEGILLS	L.M.BASS CRAPPIES S.M.BASS PERCH W.E.PIKE ROCKBASS BLUEGILLS	L.M.BASS W.E.PIKE PERCH LAKE TROUT
FISH SUITABLE FOR PLANTING	L.M.BASS S.M.BASS BLUEGILLS (N. PIKE)	BLUEGILLS BULLHEADS	NO INFORMATION TAKEN	NO INFORMATION TAKEN	PRIVATE	BULLHEADS	L.M.BASS S.M.BASS BLUEGILLS	W.E.PIKE BLUEGILLS ROCKBASS	S.M.BASS BLUEGILLS	N.PIKE BASS	BLUEGILLS ROCKBASS W.E.PIKE	L.M.BASS S.M.BASS BLUEGILLS
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	HARD STAINED GREEN	HARD	NO INFORMATION TAKEN	NO INFORMATION TAKEN	SOFT CLEAR	SOFT CLEAR	SOFT CLEAR	HARD CLEAR	VERY HARD CLEAR	HARD		SOFT CLEAR
AQUATIC VEGETATION	ABUNDANT AND VARIED	*ABUNDANT	NO INFORMATION TAKEN	NO INFORMATION TAKEN	ABUNDANT	DUCK FOOD	SCARCE	SCARCE	SCARCE	VERY ABUNDANT	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD	HARDWOOD	HARDWOOD CLEARED LAND	HARDWOOD SWAMPS	HARDWOOD	HARDWOOD SWAMPS	HARDWOOD	PINE FOREST OPEN MARSH	POPPLE CLEARED LAND	SWAMP PASTURE	HARDWOOD CLEARED	HARDWOOD PINE
									* IN T.38N.-R.13W.			

WASHBURN COUNTY	TOWN 39 NORTH - RANGE 11 WEST		TOWN 39 NORTH - RANGE 12 & 13 WEST		TOWN 39 NORTH - RANGE 13 WEST		TOWN 40 NORTH - RANGE 10 WEST		T. 40 N. - R.11 W.	TOWN 40 NORTH - RANGE 12 WEST		T. 40 N. - R.13 W.
NAME OF LAKE	DILLEY	POTATO	CABLE	SPOONER	ROCKY RIDGE	CYCLONE	BEAN	BASS	SPRING	NEMAKAGON FLOWAGE	WHALEN (WHALELAND)	ISLAND
LAKE IN SECTION	18	36	13,18	22,23,25,26,27 35,36	5,8	28,35	14,15,22	17,20	25,26,36	17,20,27,28,29 34,35	23,24	11,14
NEAREST TRADING POINT AND P. O.	TREGO	SPOONER	SPOONER	SPOONER	SPOONER	SPOONER	STINETTE	SPRING BROOK	EARL	TREGO	TREGO	TREGO
AREA IN ACRES	43	249	157	1212	69	50	129	197	179	387	123	231
MAXIMUM DEPTH IN FT.	10	20	11	15	5	18	38	33	24	38	20	51
GAME FISH IN LAKE NOW	L.M.BASS W.E.PIKE BLUEGILLS CRAPPIES	L.M.BASS W.E.PIKE N. PIKE	SUNFISH	L.M.BASS W.E.PIKE BLUEGILLS CRAPPIES	L.M.BLACK BASS N. PIKE PERCH BLUEGILLS	L.M.BASS N. PIKE W.E.PIKE BLUEGILLS PERCH S.M.BASS	L.M.BASS W.E.PIKE N. PIKE BLUEGILLS CRAPPIES PERCH	L.M.BASS S.M.BASS W.E.PIKE BLUEGILLS CRAPPIES	L.M.BASS N. PIKE BLUEGILLS BULLHEADS	L.M.BASS S.M.BASS W.E.PIKE N.PIKE TROUT (MUSKELLUNGE) BLUEGILLS CRAPPIES ROCKBASS	L.M.BASS W.E.PIKE N. PIKE BLUEGILLS CRAPPIES PERCH	L.M.BASS W.E.PIKE N. PIKE BLUEGILLS CRAPPIES S.M.BASS
FISH SUITABLE FOR PLANTING	W.E.PIKE N.PIKE	W.E.PIKE SUNFISH N.PIKE	SUNFISH BULLHEADS SHOULD HAVE DUCK FOOD PLANTINGS	W. E. PIKE	L.M.BASS N. PIKE BLUEGILLS	L.M.BASS (S.M.BASS) BLUEGILLS	W. E. PIKE BLUEGILLS	L.M. BASS BLUEGILLS	L.M.BASS BLUEGILLS	ALL ABOVE BUT MUSKELLUNGE TROUT	W. E. PIKE N.PIKE	L.M.BASS S.M.BASS BLUEGILLS
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED
WATER IS	HARD CLEAR	VERY HARD MARL BOTTOM IN AREAS	MEDIUM HARD VERY CLEAR	VERY HARD CLEAR	VERY HARD CLEAR	MEDIUM CLEAR	HARD CLEAR	MEDIUM CLEAR	MEDIUM HARD CLEAR	HARD CLEAR	HARD CLEAR	HARD CLEAR
AQUATIC VEGETATION	ABUNDANT	ABUNDANT	SCARCE	VERY ABUNDANT AND VARIED	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE	ABUNDANT AND VARIED	ABUNDANT	ABUNDANT	ABUNDANT
LAKE COVER SURROUNDING LAKE	MARSH CLEARED LAND	HARDWOOD	HARDWOOD POPPLE SPRUCE	JACK PINE HARDWOOD OPEN MARSH	CLEARED LAND HARDWOOD POPPLE	TAMARACK POPPLE	POPPLE TAMARACK CLEARED LAND	NORWAY AND JACK PINE	JACK PINE CLEARED LAND	FOREST VARIED	HARDWOOD JACK PINE	JACK PINE OPEN MARSH

WASHBURN COUNTY	TOWN 40 NORTH - RANGE 13 WEST											T 41 N. - R.11 W.
NAME OF LAKE	DEER	SKUNK	DUNN	BIG CASEY	BIG MACKENZIE	BASS	LITTLE BASS	LINCOLN	SUNFISH	LOON	LITTLE CASEY	GULL
LAKE IN SECTION	8,17	12,13	14,23	15,16,21,22	30,31 BAL. IN BURNETT CO.	29,32	31,32	36,25-BAL.IN T.40 R.12	22,23	22,27	24,25	28,29,32,33 & T.40N. R.11W.
NEAREST TRADING POINT AND P.O.	SPOONER	TREGO	TREGO	SPOONER	SPOONER	SPOONER	SPOONER	TREGO	TREGO	TREGO	TREGO	LAMPSON
AREA IN ACRES	197	96	260	399	258 BAL. IN BURNETT CO.	106	142	109	66	67	39	390
MAXIMUM DEPTH IN FT	21	26	48	20	47	35	45	26	25	61	21	20
GAME FISH IN LAKE NOW	L.M.BASS BLUEGILLS	L.M.BASS N. PIKE BLUEGILLS	L.M.BASS W.E. PIKE N. PIKE BLUEGILLS CRAPPIES S.M BASS	L.M.BASS S.M. BASS W.E. PIKE N PIKE	L.M.BASS S.M. BASS W.E. PIKE N. PIKE BLUEGILLS CRAPPIES PERCH	L.M.BASS S.M.BASS W.E. PIKE BLUEGILLS CRAPPIES PERCH	L.M.BASS S.M.BASS N. PIKE BLUEGILLS CRAPPIES PERCH	L.M.BASS S.M.BASS N. PIKE BLUEGILLS CRAPPIES PERCH	L.M.BASS N.PIKE BLUEGILLS	NO INFORMATION AVAILABLE	L.M.BASS N. PIKE BLUEGILLS CRAPPIES	L.M.BASS S.M.BASS W.E. PIKE N.PIKE BLUEGILLS CRAPPIES
FISH SUITABLE FOR PLANTING	L.M.BASS S.M.BASS BLUEGILLS	BULLHEADS (W.E.PIKE) L.M.BASS BLUEGILLS	L.M.BASS BLUEGILLS (W.E.PIKE)	L.M.BASS BLUEGILLS N. PIKE	L.M.BASS S.M.BASS W.E. PIKE ROCK BASS	L.M.BASS S.M.BASS BLUEGILLS	L.M.BASS S.M.BASS BLUEGILLS	L.M.BASS BLUEGILLS	L.M.BASS BLUEGILLS S.M.BASS	L.M.BASS BLUEGILLS ROCK BASS	L.M.BASS BLUEGILLS ROCK BASS	W.E.PIKE L.M.BASS S.M.BASS N.PIKE BLUEGILLS
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET
WATER IS	SOFT CLEAR	SOFT CLEAR	MEDIUM CLEAR	MEDIUM CLEAR	MEDIUM CLEAR	MEDIUM CLEAR	MEDIUM HARD CLEAR	MEDIUM BROWN	SOFT CLEAR	SOFT CLEAR	MEDIUM CLEAR	MEDIUM HARD CLEAR
AQUATIC VEGETATION	ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT NOT VARIED
LAND COVER SURROUNDING LAKE	OPEN MARSH JACK PINE	JACK PINE	TAMARACK SWAMP HARDWOOD	TAMARACK SWAMP HARDWOOD	POPPLE JACK PINE	HARDWOOD BRUSH	JACK PINE POPPLE	JACK PINE GRASS MARSH	SCRUB OAK JACK PINE	SCRUB OAK	SCRUB OAK	HARDWOOD SPRUCE SWAMP

BURNETT COUNTY	TOWN 37 NORTH RANGE 18 WEST			TOWN 38 NORTH RANGE 18 WEST				TOWN 38 NORTH RANGE 17 WEST		TOWN 38 NORTH RANGE 16 WEST		
NAME OF LAKE	SPIRIT	RICE	BASS	LITTLE WOOD	WOOD	INDIAN	SILVER	MUDHEN	DUNHAM	CLAM	CROOKED	LARSON
LAKE IN SECTION	1-2-11-12	10-11	17-18	25-36	26-27-34-35	27	36	15-16-17-21	21-22-27-28	2-3-10-11-14-15	4-5-8	8
NEAREST TRADING POINT AND POSTOFFICE	FREDERICK	GRANTSBURG	GRANTSBURG	FALUN	GRANTSBURG	FALUN	FALUN	SIREN	SIREN	SIREN	SIREN	SIREN
AREA IN ACRES	485	112	47	212	515	15	45	500	255	902	142	25
MAXIMUM DEPTH IN FEET	21	SHALLOW	55	24	35	16	54	64	59	10	9	12
GAME FISH IN LAKE NOW	L.M. BASS S.M. BASS N. PIKE BLUEGILLS CRAPPIES ROCK BASS PERCH SUNFISH	NO INFORMATION AVAILABLE	PICKEREL (N. PIKE) L.M. BASS SUNFISH BULLHEADS	SUNFISH CRAPPIES PICKEREL (N. PIKE) L.M. BASS BULLHEADS BLUEGILLS	CRAPPIES SUNFISH PICKEREL (N. PIKE) BULLHEADS L.M. BASS	PICKEREL (N. PIKE) CRAPPIES L.M. BASS BULLHEADS	PICKEREL (N. PIKE) L.M. BASS SUNFISH PERCH CRAPPIES BULLHEADS	L.M. BASS N. PIKE PERCH SUNFISH S.M. BASS CRAPPIES	L.M. BASS N. PIKE CRAPPIES PERCH WHITEFISH BULLHEADS CISCOES S.M. BASS	N. PIKE W.E. PIKE L.M. BASS S.M. BASS STURGEON SUNFISH CRAPPIES BLUEGILLS ROCK BASS	NONE - FROZE OUT	L.M. BASS PERCH SUNFISH
FISH SUITABLE FOR STOCKING	S.M. BASS	NONE	PICKEREL L.M. BASS SUNFISH	L.M. BASS BLUEGILLS	S.M. BASS L.M. BASS	N. PIKE	L.M. BASS BLUEGILLS	L.M. BASS S.M. BASS	S.M. BASS BLUEGILLS	N. PIKE L.M. BASS S.M. BASS SUNFISH ROCK BASS	NONE	L.M. BASS
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	INTERMITTANT	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR VERY HARD	NOT TAKEN	CLEAR MEDIUM	CLEAR HARD	CLEAR VERY HARD	CLEAR HARD	CLEAR HARD	CLEAR VERY HARD	CLEAR HARD	GREEN STAIN VERY HARD	CLEAR VERY SOFT	CLEAR SOFT
AQUATIC VEGETATION	RELATIVELY SCARCE	ABUNDANT	SCARCE	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	VERY ABUNDANT	MODERATELY ABUNDANT	SUPER-ABUNDANT	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD	HARDWOOD	CROP LAND - HARDWOOD	HARDWOOD - PINE	HARDWOOD - PINE	MEADOW	HARDWOOD - PINE	CLEARED LAND - HARDWOODS	PINE - HARDWOOD	SWAMP - HARDWOOD	HARDWOOD	HARDWOOD

BURNETT COUNTY	TOWN 38 NORTH RANGE 16 WEST			TOWN 38 NORTH RANGE 15 WEST						TOWN 38 NORTH RANGE 14 WEST		TOWN 38 NORTH RANGE 16 WEST
NAME OF LAKE	LONG	CLEAR	SAND	SILVER	GOTFREY	WARNER	CRANBERRY	POKEGAMA (TWO LAKES)	SPENCER	PALQUETTES	BASHAW	BASS
LAKE IN SECTION	16-17-21-28	17-19-20	22	15-21-22	33-34	4-9	5-8	10-14-15	26-35-36	2-3	18-19	13-14-23-24
NEAREST TRADING POINT AND POSTOFFICE	SIREN	SIREN	SIREN	SIREN	SIREN	WEBSTER	WEBSTER	HERTEL	CLAM FALLS	SHELL LAKE	SHELL LAKE	WEBSTER
AREA IN ACRES	310	90	72	47		202	100	198	167	97	190	170
MAXIMUM DEPTH IN FEET	20	38	42	54	28	66	21	56	20	21	15	22
GAME FISH IN LAKE NOW	N. PIKE PICKEREL (N. PIKE) L.M. BASS BULLHEADS SUNFISH CRAPPIES PERCH	S.M. BASS CRAPPIES SUNFISH BLUEGILLS N. PIKE PERCH	L.M. BASS PICKEREL (N. PIKE) CRAPPIES BLUEGILLS PERCH	L.M. BASS SUNFISH	PICKEREL (N. PIKE) SUNFISH L.M. BASS CRAPPIES	L.M. BASS S.M. BASS SUNFISH CRAPPIES BLUEGILLS N. PIKE PERCH	N. PIKE W.E. PIKE L.M. BASS BLUEGILLS PERCH	L.M. BASS N. PIKE SUNFISH PERCH BULLHEADS	N. PIKE SUNFISH L.M. BASS CRAPPIES PERCH W.E. PIKE	N. PIKE L.M. BASS SUNFISH PERCH W.E. PIKE	L.M. BASS	S.M. BASS N. PIKE SUNFISH BLUEGILLS BULLHEADS
FISH SUITABLE FOR STOCKING	N. PIKE	L.M. BASS S.M. BASS	L.M. BASS	L.M. BASS S.M. BASS	L.M. BASS	L.M. BASS	L.M. BASS	L.M. BASS (W.E. PIKE)	L.M. BASS S.M. BASS	N. PIKE	L.M. BASS	S.M. BASS ROCK BASS
LAKE HAS OUTLET OR IS LANDLOCKED	CHANNEL LAKE	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	SEASONAL OUTLET	LANDLOCKED	OUTLET	LANDLOCKED
WATER IS	CLEAR VERY HARD	CLEAR VERY SOFT	CLEAR HARD	CLEAR VERY SOFT	CLEAR SOFT	CLEAR SOFT	CLEAR VERY SOFT	CLEAR VERY HARD	CLEAR VERY HARD	CLEAR MEDIUM	CLEAR HARD	CLEAR MEDIUM
AQUATIC VEGETATION	VERY ABUNDANT	ABUNDANT	FAIRLY ABUNDANT	SCARCE	SCARCE	ABUNDANT	SCARCE	VERY ABUNDANT	MODERATELY ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	MODERATELY ABUNDANT
LAND COVER SURROUNDING LAKE	SWAMP	HARDWOOD	HARDWOOD	HARDWOOD	HARDWOOD	PINE - HARDWOOD	HARDWOOD	HARDWOOD	PINE	HARDWOOD	HARDWOOD	SCRUB OAK - JACK PINE

BURNETT COUNTY	TOWN 39 NORTH RANGE 16 WEST		TOWN 39 NORTH RANGE 15 WEST							TOWN 39 NORTH RANGE 14 WEST	TOWN 40 NORTH RANGE 17 WEST	
NAME OF LAKE	UPPER CLAM	PIKE	MALLARD	LILLY (SNIDER)	AUSTIN	BIG SAND	VIOLA	HORSESHOE	OWL	BENOIT	BLUFF	LITTLE YELLOW
LAKE IN SECTION	26-27-34-35	25-36	1-2 & T.40 R15	6	6-7	27-28-32-33-34	31-32 T.38 R.15	18	31 & T.38 R.15	3-4-9-10	8 & 9	23-25 & 26
NEAREST TRADING POINT AND POSTOFFICE	SIREN	SIREN	WEBSTER	WEBSTER	WEBSTER	HERTEL	WEBSTER	WEBSTER	WEBSTER	GASLYN	DANBURY	WEBSTER
AREA IN ACRES	387	87	72	30	77	1390	274	12	172	274	30	320
MAXIMUM DEPTH IN FEET	8	17	30	45	61	33	34	33	22	45	25	NOT SOUNDED
GAME FISH IN LAKE NOW	N. PIKE L.M. BASS S.M. BASS W.E. PIKE SUNFISH BLUEGILLS CRAPPIES ROCK BASS PERCH	SUNFISH N. PIKE L.M. BASS (S.M. BASS) PERCH BULLHEADS	L.M. BASS N. PIKE SUNFISH PERCH (W.E. PIKE) (CISCOES)	SUNFISH L.M. BASS CRAPPIES N. PIKE PERCH BULLHEADS	N. PIKE SUNFISH L.M. BASS CRAPPIES S.M. BASS (W.E. PIKE) PERCH BULLHEADS	N. PIKE L.M. BASS CRAPPIES SUNFISH ROCK BASS PERCH BULLHEADS W.E. PIKE S.M. BASS	L.M. BASS N. PIKE SUNFISH CRAPPIES PERCH (W.E. PIKE)	N. PIKE CALICOE BASS PERCH BULLHEADS	NO INFORMATION AVAILABLE	L.M. BASS SUNFISH BLUEGILLS N. PIKE W.E. PIKE CRAPPIES BULLHEADS S.M. BASS	SUNFISH N. PIKE L.M. BASS PERCH BULLHEADS	BLUEGILLS W.E. PIKE N. PIKE L.M. BASS S.M. BASS PERCH CRAPPIES
FISH SUITABLE FOR STOCKING	NONE	L.M. BASS N. PIKE	BALANCED	NONE	L.M. BASS S.M. BASS	S.M. BASS L.M. BASS ROCK BASS	L.M. BASS	L.M. BASS	NONE	L.M. BASS	L.M. BASS	W.E. PIKE L.M. BASS S.M. BASS ROCK BASS
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET DAMMED
WATER IS	CLEAR VERY HARD	CLEAR VERY SOFT	CLEAR MEDIUM HARD	CLEAR SOFT	CLEAR HARD	CLEAR HARD	CLEAR SOFT	CLEAR SOFT	CLEAR SOFT	CLEAR HARD	CLEAR MEDIUM	CLEAR VERY HARD
AQUATIC VEGETATION	VERY ABUNDANT	MODERATELY ABUNDANT	RELATIVELY SCARCE	MODERATELY ABUNDANT	ABUNDANT	VERY ABUNDANT	ABUNDANT	SCARCE	VERY ABUNDANT	ABUNDANT	VERY ABUNDANT	ABUNDANT
LAND COVER SURROUNDING LAKE	SCRUB OAK - JACK PINE	HARDWOOD	WHITE PINE - JACK PINE	JACK PINE - GRASS	JACK PINE	OAK - JACK PINE	JACK PINE	POPPLE	MEADOW - SWAMP	MARSH - CROP LAND	JACK PINE HARDWOODS	SCRUB OAK JACK PINE

BURNETT COUNTY	TOWN 40 NORTH RANGE 16 WEST							TOWN 40 NORTH RANGE 15 WEST				
NAME OF LAKE	LOWER LOON	MINNIE	CROOKED	YELLOW	JOHNSON	DEVILS	CONNERS	LOON	HAM	CULBERTSON	BONER	NORTH SAND
LAKE IN SECTION	2-3-10 & 11	11	12-13 ALSO IN T.40N R.15 W.	19-20-27-28-29-30-31	14-23-24	27-33 & 34 ALSO IN T.39N R.16W.	35 & 36		7-18	10	23-24	25-26-35-36 23-24
NEAREST TRADING POINT AND POSTOFFICE	DANBURY	DANBURY	DANBURY	WEBSTER	WEBSTER	WEBSTER	WEBSTER	WEBSTER	DANBURY	DANBURY	WEBSTER	WEBSTER
AREA IN ACRES	175	50	195	2300	277	930	87	100	275	17	56	852
MAXIMUM DEPTH IN FEET	54	45	REPORTED SHALLOW	34	7	20	14	24	24	20	11	73
GAME FISH IN LAKE NOW	SUNFISH L.M. BASS N. PIKE W.E. PIKE CRAPPIES PERCH BULLHEADS CATFISH	PERCH SUNFISH L.M. BASS	SUNFISH L.M. BASS (W.E. PIKE) PERCH	W.E. PIKE L.M. BASS CRAPPIES SUNFISH S.M. BASS PERCH ROCK BASS WHITE FISH N. PIKE	N. PIKE PERCH L.M. BASS SUNFISH	CRAPPIES N. PIKE SUNFISH L.M. BASS W.E. PIKE PERCH	L.M. BASS N. PIKE SUNFISH	L.M. BASS N. PIKE SUNFISH CRAPPIES	N. PIKE L.M. BASS SUN FISH CRAPPIES BLUE GILLS	L.M. BASS N. PIKE SUNFISH	L.M. BASS PERCH BLUE GILLS	L.M. BASS N. PIKE PERCH BLUE GILLS CRAPPIES W.E. PIKE BULLHEADS CISCOES
FISH SUITABLE FOR STOCKING	L.M. BASS S.M. BASS W.E. PIKE	L.M. BASS	NONE	L.M. BASS WE. PIKE ROCK BASS S.M. BASS	NONE	L.M. BASS	L.M. BASS BULLHEADS	L.M. BASS	L.M. BASS (N. PIKE)	L.M. BASS	NONE	L.M. BASS S.M. BASS ROCK BASS N. PIKE
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR MEDIUM HARD	CLEAR MEDIUM	CLEAR SOFT	CLEAR VERY HARD	CLEAR SOFT	CLEAR MEDIUM HARD	CLEAR VERY SOFT	CLEAR HARD	CLEAR SOFT	CLEAR SOFT	CLEAR SOFT	CLEAR HARD
AQUATIC VEGETATION	ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	VERY ABUNDANT	ABUNDANT	VERY ABUNDANT	MODERATELY ABUNDANT	VERY ABUNDANT	VERY ABUNDANT	ABUNDANT	SCARCE	MODERATELY ABUNDANT
LAND COVER SURROUNDING LAKE	JACK PINE	JACK PINE	JACK PINE	HARDWOODS IMPROVED LAND	JACK PINE HARDWOODS	IMPROVED LAND	JACK PINE	JACK PINE - POPPLE	JACK PINE	HARDWOOD - POPPLE	JACK PINE - SPRUCE	JACK PINE - HARDWOOD

BURNETT COUNTY	TOWN 40 NORTH RANGE 14 WEST									TOWN 41 NORTH RANGE 16 WEST		TOWN 41 NORTH RANGE 15 WEST
NAME OF LAKE	FISH	BIRCH ISLAND	ROONEY	BASS	MIDDLE MC KENZIE	OAK	DURAND	BIG MC KENZIE	GASLYN	ROUND	MINERVA FLOWAGE	ROUND
LAKE IN SECTION	4-5-8-9	7-18-19 &T40N-R13W	10-11-15	11-12-13	13-24 &T40-R13W.	19-20	22	24-25-26-36 BAL IN WASHBURN CO.	32-33 &T39 R14	33-5T.40N. R.16W.	35-36 &TOWN 40 NO. RANGE 16 WEST	22
NEAREST TRADING POINT AND POSTOFFICE	DANBURY	WEBSTER	SPOONER	WEBSTER	SPOONER	WEBSTER	WEBSTER	SPOONER	WEBSTER	DANBURY	DANBURY	DANBURY
AREA IN ACRES	400	465	282	40	550	150	45	967	165	50	285	15
MAXIMUM DEPTH IN FEET	28	10	25	45	40	20	SHALLOW	47	9	19	36	44
GAME FISH IN LAKE NOW	L.M. BASS N. PIKE BLUE GILLS S.M. BASS W.E. PIKE PERCH BULLHEADS	N. PIKE (L.M. BASS)	N. PIKE L.M. BASS SUNFISH BULLHEADS W.E. PIKE	BLUE GILLS PERCH BASS FINGERLINGS	N. PIKE L.M. BASS CRAPPIES ROCK BASS BLUE GILLS S.M. BASS MUSKIES BULLHEADS	L.M. BASS BLUE GILLS SUNFISH PERCH BULLHEADS	NO INFORMATION AVAILABLE	L.M. BASS S.M. BASS W.E. PIKE N. PIKE CRAPPIES BULLHEADS BLUEGILLS	N. PIKE SUNFISH L.M. BASS	PERCH S.M. BASS (W.E. PIKE) SUCKERS	L.M. BASS N. PIKE W.E. PIKE S.M. BASS SUNFISH PERCH CRAPPIES BULLHEADS CATFISH	L.M. BASS SUNFISH PERCH
FISH SUITABLE FOR STOCKING	NONE	N. PIKE BULLHEADS	L.M. BASS	L.M. BASS	L.M. BASS S.M. BASS ROCK BASS	L.M. BASS	NONE	S.M. BASS L.M. BASS ROCK BASS (W.E. PIKE)	N. PIKE BULLHEADS	L.M. BASS	L.M. BASS W.E. PIKE ROCK BASS	L.M. BASS
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED
WATER IS	CLEAR MEDIUM HARD	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR VERY SOFT	CLEAR HARD	CLEAR SOFT	CLEAR VERY SOFT	CLEAR MEDIUM HARD	CLEAR NOT TAKEN	CLEAR SOFT	CLEAR HARD	CLEAR MEDIUM HARD
AQUATIC VEGETATION	VERY ABUNDANT	VERY ABUNDANT	VERY ABUNDANT	SCARCE	ABUNDANT	MODERATELY ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	VERY ABUNDANT	VERY ABUNDANT	MODERATELY ABUNDANT	MODERATELY ABUNDANT
LAND COVER SURROUNDING LAKE	JACK PINE-POPPLE	JACK PINE	POPPLE-JACK PINE	JACK PINE HARDWOOD	POPPLE & HARDWOOD	JACK PINE HARDWOOD	HARDWOOD- JACK PINE	HARDWOOD- JACK PINE	HARDWOOD- JACK PINE	JACK PINE	JACK PINE-SPRUCE LEATHER LEAF	JACK PINE TAMARACK

BURNETT COUNTY	TOWN 41 NORTH RANGE 15 WEST									TOWN 41 NORTH RANGE 14 WEST		
NAME OF LAKE	BURLINGAME	BASS	JOHNSON	TWENTY SIX	STONE	BRIGGS	STAPLES	FENTON (GABRIE)	UPPER LOON	BASS	NO NAME	DEER
LAKE IN SECTION	19 & 30	18 & T41N R.16W.	24	26-27	28-29	28-29	8-17	14	17-18-19	3	4	7
NEAREST TRADING POINT AND POSTOFFICE	DANBURY	DANBURY	DANBURY	DANBURY	DANBURY	DANBURY	DANBURY	DANBURY	DANBURY	DANBURY	DANBURY	DANBURY
AREA IN ACRES	62	72	12	245	35	82	52	20	187	15	18	127
MAXIMUM DEPTH IN FEET	16	12	7	45	SHALLOW	SHALLOW	43	SHALLOW	25	31	11	21
GAME FISH IN LAKE NOW	N. PIKE CRAPPIES SUNFISH L.M. BASS ROCK BASS BULLHEADS	L.M. BASS SUNFISH BLUE GILLS	BLUEGILLS	L.M. BASS N. PIKE ROCK BASS SUNFISH S.M. BASS CRAPPIES PERCH W.E. PIKE SUCKERS	NO INFORMATION AVAILABLE	NO INFORMATION AVAILABLE	L.M. BASS SUNFISH PERCH (N. PIKE)	NO INFORMATION AVAILABLE	L.M. BASS S.M. BASS BLUE GILLS CRAPPIE ROCK BASS PERCH SUCKERS BULLHEADS	L.M. BASS BLUE GILLS PERCH	BLUEGILLS	L.M. BASS CRAPPIES PERCH SUNFISH
FISH SUITABLE FOR STOCKING	L.M. BASS	L.M. BASS	BLUEGILLS BULLHEADS	S.M. BASS			L.M. BASS S.M. BASS		L.M. BASS	L.M. BASS S.M. BASS ROCK BASS		L.M. BASS
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR HARD	CLEAR SOFT	CLEAR SOFT	CLEAR HARD	CLEAR MEDIUM	CLEAR VERY HARD	CLEAR MEDIUM HARD	CLEAR SOFT	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR SOFT	CLEAR MEDIUM
AQUATIC VEGETATION	ABUNDANT	RELATIVELY SCARCE	VERY ABUNDANT	MODERATELY ABUNDANT	MODERATELY ABUNDANT	VERY ABUNDANT	MODERATELY ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	RELATIVELY ABUNDANT	RELATIVELY ABUNDANT	MODERATELY ABUNDANT
LAND COVER SURROUNDING LAKE	JACK PINE & POPPLE	JACK PINE	JACK PINE	JACK PINE	JACK PINE	JACK PINE TAG-ALDERS	OAK - JACK PINE	JACK PINE	JACK PINE - BIRCH- OAK	HARDWOOD JACK PINE	JACK PINE HARDWOODS	JACK PINE

BURNETT COUNTY	TOWN 41 NORTH RANGE 14 WEST									TOWN 42 NORTH RANGE 13 WEST	TOWN 42 NORTH RANGE 14 WEST	
NAME OF LAKE	WEBB	PRINCE	BIG BEAR	LONG	DES MOINES (SUCKER)	LITTLE BEAR	MINATURE	LILLY	NICABOYNE	LITTLE MC CRAW	BIG MC CRAW	NO MANS
LAKE IN SECTION	8-9-16-17 20 & 21	14-23	19 & 20	28-32 & 33 5-6 T.40 N. R.14W	28-29-32-33	31	22	34	36	13 - 24	6 - TOWN 42 NORTH RANGE 15 WEST	13 - & WASHBURN CO.
NEAREST TRADING POINT AND POSTOFFICE	DANBURY	DANBURY	DANBURY	SPOONER	DANBURY	DANBURY	WEBB LAKE	DANBURY	DANBURY	DANBURY	MARKSVILLE, MINN	MINONG
AREA IN ACRES	872	36	255	262	240	192	50	158	287	50	190	32
MAXIMUM DEPTH IN FEET	30	9	20	37	45	44	70	REPORTED SHALLOW	30	12	24	12
GAME FISH IN LAKE NOW	N. PIKE L.M. BASS S.M. BASS CRAPPIES PERCH W.E. PIKE BLUEGILLS BULLHEADS CATFISH	PERCH BLUEGILLS	L.M. BASS N. PIKE CRAPPIES BLUEGILLS SUNFISH BULLHEADS	N. PIKE L.M. BASS SUNFISH PERCH BULLHEADS SUCKERS	N. PIKE L.M. BASS BLUEGILLS CRAPPIES W.E. PIKE PERCH	L.M. BASS SUNFISH PERCH	L.M. BASS SUNFISH BULLHEADS ROCKBASS	N. PIKE BLUE GILLS	L.M. BASS N. PIKE SUNFISH CRAPPIES W.E. PIKE BULLHEADS	SMALL L.M. BASS BLUE GILLS	N. PIKE L.M. BASS SUNFISH CRAPPIES PERCH BULLHEADS	BLUE GILLS
FISH SUITABLE FOR STOCKING	L.M. BASS	NONE	L.M. BASS N. PIKE BLUEGILLS	L.M. BASS	L.M. BASS (W.E. PIKE)	L.M. BASS ROCK BASS N. PIKE S.M. BASS	L.M. BASS	NONE	L.M. BASS ROCK BASS	NONE	L.M. BASS	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED
WATER IS	CLEAR HARD	CLEAR SOFT	CLEAR MEDIUM HARD	CLEAR HARD	CLEAR HARD	CLEAR MEDIUM HARD	CLEAR SOFT	CLEAR SOFT	CLEAR HARD	CLEAR VERY SOFT	CLEAR MEDIUM	CLEAR SOFT
AQUATIC VEGETATION	VERY ABUNDANT	SCARCE	VERY ABUNDANT	VERY ABUNDANT	MODERATELY ABUNDANT	VERY ABUNDANT	SCARCE	NOT TAKEN	ABUNDANT	RELATIVELY ABUNDANT	ABUNDANT	SCARCE
LAND COVER SURROUNDING LAKE	JACK PINE	JACK PINE	MIXED PINE HARDWOOD	JACK PINE & POPPLE	JACK PINE & POPPLE	JACK PINE & POPPLE	JACK PINE	JACK PINE - POPPLE HARDWOODS	PINE - JACK PINE HARDWOODS	POPPLE & SCRUB OAK	JACK PINE - HARD WOODS	JACK PINE

POLK COUNTY	T.34N R.15W.			T.34N R16W	T.34N R.17W		TOWN 34 NORTH RANGE 17 WEST		TOWN 35 NORTH RANGE 15 WEST			
NAME OF LAKE	BIG HORSESHOE	LITTLE ROUND	SILVER	WHITE ASH	LONG LAKE	LOVELESS	BALSAM LAKE	GOOSE LAKE	PIPE	NORTH PIPE	CHAIN	MARTEL
LAKE IN SECTION	1,12 13 14	4, 9,	14, 15,	2, 11,	5,6,7,8,	8 17	1,2,3,10 PART IN 35-17	13	10,15,22	10	25	2
NEAREST TRADING POINT & P O	TURTLE LAKE	TURTLE LAKE	TURTLE LAKE	BALSAM LAKE	CENTURIA	CENTURIA	BALSAM LAKE	BALSAM LAKE	CUMBERLAND	CUMBERLAND	COMSTOCK	CUMBERLAND
AREA IN ACRES	732	56	36	340	417	81	937	163	207	57	40	45
MAXIMUM DEPTH IN FT	49	15	42	11	VERY SHALLOW	21	40	10	64	38	18	21
GAME FISH IN LAKE NOW	CRAPPIE N. PIKE S.M. BASS L.M. BASS PERCH SUNFISH W.E. PIKE	PERCH CRAPPIES N. PIKE L.M. BASS SUNFISH ROCKBASS	L.M. BASS S.M. BASS SUNFISH ROCKBASS	CRAPPIE N. PIKE L.M. BASS PERCH S.M. BASS	FISH FREEZE OUT	CRAPPIE SUNFISH L.M. BASS PERCH	L.M. BASS W.E. PIKE CRAPPIES SUNFISH PERCH N. PIKE	L.M. BASS	W.E. PIKE L.M. BASS N. PIKE SUNFISH	W.E. PIKE L.M. BASS N. PIKE SUNFISH	W.E. PIKE N. PIKE CRAPPIES PERCH SUNFISH	L.M. BASS BLUEGILLS
FISH SUITABLE FOR PLANTING	L.M. BASS S.M. BASS N. PIKE ROCK BASS	L.M. BASS SUNFISH ROCKBASS	S.M. BASS ROCKBASS L.M. BASS SUNFISH	S.M. BASS L.M. BASS N. PIKE CRAPPIE		L.M. BASS SUNFISH	S.M. BASS L.M. BASS (W.E. PIKE) N. PIKE	NONE	L.M. BASS S.M. BASS N. PIKE (W.E. PIKE)	L.M. BASS S.M. BASS N. PIKE ROCK BASS	N. PIKE SUNFISH	SUNFISH L.M. BASS ROCK BASS
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET DAMMED	OUTLET DAMMED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED
WATER IS	CLEAR SOFT	STAINED BROWN SOFT	CLEAR VERY SOFT	STAINED BROWN HARD		STAINED GREEN MEDIUM	CLEAR HARD	CLEAR SOFT	CLEAR SOFT	CLEAR	STAINED BROWN SOFT	STAINED BROWN VERY SOFT
AQUATIC VEGETATION	MODERATELY ABUNDANT	MODERATELY ABUNDANT	SCARCE	MODERATELY ABUNDANT		ABUNDANT	VERY ABUNDANT	MODERATELY ABUNDANT	MODERATELY ABUNDANT	MODERATELY ABUNDANT	MODERATELY ABUNDANT	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD PINE	HARDWOOD SWAMP	HARDWOOD	HARDWOOD	CROP LAND STUMP PASTURE	HARDWOOD PASTURE	HARDWOOD	HARDWOOD	HARDWOOD POPPLE	HARDWOOD W. PINE	HARDWOOD	HARDWOOD

POLK COUNTY	T.35 N. R. 16 W.					TOWN 35 NORTH RANGE 17 WEST	TOWN 35 NORTH RANGE 17 WEST			TOWN 35 NORTH RANGE 18 WEST	TOWN 37 NORTH RANGE 16 WEST	
NAME OF LAKE	BLAKES	CLARA	VINCENT	BONE	ROUND	NW¼ OF SW¼	RICE	HALF MOON	PINE	BIG TWIN	CLAM RIVER FLWG.	SUMMERS
LAKE IN SECTION	22, 27, 28	24, 25	4, 5, 9	5,6,7,8,17,18,20	11,12,13,14,24	33	20, 21, 28, 29	23,24,25,28,36	1, 11, 12	18	13, 24	27, 28, 33, 34
NEAREST TRADING POINT & P.O.	LUCK	LUCK	LUCK	LUCK	LUCK	MILLTOWN	MILLTOWN	MILLTOWN	MILLTOWN	CUSHING	CLAM FALLS	FREDERICK
AREA IN ACRES	369	69	22	1724	988	14	135	56	78	15	140	118
MAXIMUM DEPTH IN FT.	14	71	14	39	19			60		41	24	13
GAME FISH IN LAKE NOW	CRAPPIES SUNFISH L.M. BASS S.M. BASS PERCH N. PIKE	L.M. BASS SUNFISH (W.E. PIKE)	NONE NOTED	L.M BASS CRAPPIES W.E. PIKE SUNFISH PERCH	CRAPPIES BLUEGILL L.M. BASS N. PIKE W.E. PIKE S.M. BASS	L.M. BASS SUNFISH CRAPPIES		SUNFISH CRAPPIES W.E. PIKE L.M. BASS PERCH ROCK BASS N. PIKE	SUNFISH CRAPPIES BASS	L.M. BASS SUNFISH	N. PIKE L.M. BASS SUNFISH BROOK TROUT	SUNFISH CRAPPIES N. PIKE PERCH
FISH SUITABLE FOR PLANTING	CRAPPIES L.M. BASS N PIKE SUNFISH	L.M. BASS S.M. BASS	BULLHEADS SUNFISH	L.M. BASS SUNFISH	CRAPPIES N. PIKE SUNFISH L.M. BASS			N. PIKE W.E. PIKE L.M. BASS S.M. BASS ROCK BASS		L.M. BASS S.M. BASS SUNFISH ROCK BASS	N. PIKE L.M. BASS SUNFISH	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET DAMMED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET DAMMED	LANDLOCKED	LANDLOCKED	OUTLET DAMMED	OUTLET
WATER IS	STAINED GREEN HARD	CLEAR SOFT	CLEAR SOFT	GREEN HARD	CLEAR MEDIUM	VERY SOFT	CLEAR HARD	CLEAR HARD	SOFT	CLEAR SOFT	VERY HARD	CLEAR MEDIUM
AQUATIC VEGETATION	ABUNDANT	MODERATELY	ABUNDANT	VERY ABUNDANT	ABUNDANT	MODERATELY ABUNDANT	ABUNDANT	MOD. ABUNDANT	ABUNDANT	SCARCE	ABUNDANT	MOD. ABUNDANT
LAND COVER SURROUNDING LAKE	HARDWOODS	HARDWOODS	HARDWOODS	HARDWOOD	HARWOODS	HARDWOODS	HARDWOODS	UPLAND FOREST	HARDWOODS	HARDWOODS	ROCKY	

POLK COUNTY	TOWN 35 NORTH RANGE 19 WEST	TOWN 36 NORTH RANGE 15 WEST			TOWN 36 NORTH RANGE 16 WEST		TOWN 36 NORTH RANGE 16 WEST					
NAME OF LAKE	DEEP	GREENQUIST	LARIGAN	LITTLE LARIGAN	MC KENZIE	WARD	PINE	SPRING	LAMOUNT	PICKEREL	DAHL	JOHANSEN
LAKE IN SECTION	14	26, 35	10, 11, 14, 15	11	11,12,13,14	14	24	25	25 PART IN 36-15	25, 36	27, 28, 34	28, 29
NEAREST TRADING POINT AND P.O.	CUSHING	LORAINE	CUMBERLAND	CUMBERLAND	FREDERICK	FREDERICK	FREDERICK	LUCK	LUCK	LUCK	LUCK	LUCK
AREA IN ACRES		65	165	18	39	52	123	11	118	17	60	41
MAXIMUM DEPTH IN FT.	75	32	15	24	20	39	43	PRIVATE 49	31	44	FREEZE OUT	10
GAME FISH IN LAKE NOW	SUNFISH L.M. BASS	L.M. BASS S.M. BASS N. PIKE SUNFISH CRAPPIES	N. PIKE L.M. BASS CRAPPIES SUNFISH	L.M. BASS	W.E. PIKE L.M. BASS N. PIKE PERCH SUNFISH	W.E. PIKE N. PIKE SUNFISH ROCK BASS	N. PIKE L.M. BASS BLUEGILLS PERCH	L.M. BASS SUNFISH PERCH	L.M. BASS S.M. BASS N. PIKE SUNFISH CRAPPIES PERCH CALICO BASS	L.M. BASS N. PIKE SUNFISH	L.M. BASS SUNFISH	L.M. BASS SUNFISH PERCH
FISH SUITABLE FOR PLANTING	N. PIKE L.M. BASS SUNFISH	L.M. BASS S.M. BASS SUNFISH ROCK BASS	NONE	L.M. BASS SUNFISH ROCK BASS	L.M. BASS N. PIKE SUNFISH	W.E. PIKE N. PIKE ROCK BASS S.M. BASS	S.M. BASS L.M. BASS N. PIKE SUNFISH	NONE	L.M. BASS S.M. BASS N. PIKE SUNFISH	L.M. BASS N. PIKE SUNFISH	NONE	NONE
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR VERY HARD	CLEAR SOFT	CLEAR SOFT	STAINED BROWN SOFT	CLEAR HARD	CLEAR SOFT	MEDIUM HARD	CLEAR VERY SOFT	CLEAR SOFT	CLEAR VERY SOFT	SOFT	CLEAR VERY SOFT
AQUATIC VEGETATION	SCARCE	SCARCE	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE	SCARCE	MODERATELY ABUNDANT	MODERATELY ABUNDANT	SCARCE	ABUNDANT	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD	CLEARED LAND	HARDWOOD	MIXED HARDWOOD	HARDWOOD	HARDWOOD	HARDWOODS	HARDWOODS POPPLE	HARDWOODS	HARDWOODS	HARDWOODS CROPLAND	HARDWOODS CROPLAND

RUSK COUNTY	T.33 N. - R.9 W.	TOWN 34 NORTH - RANGE 7 WEST		TOWN 34 NORTH - RANGE 8 WEST		T. 34 N. - R.9 W.	TOWN 34 NORTH - RANGE 9 WEST				TOWN 35 NORTH - RANGE 7 WEST	
NAME OF LAKE	TWO BEAR	LOWER BASS	SAXTEN	AMACOY	STYLES	BASS	NORTH	EAST PICKEREL	CENTRAL PICKEREL	WEST PICKEREL	UPPER BASS	STAR (SUNFISH)
LAKE IN SECTION	4	20,21,28,29	28,33	25,26,35,36	7,18	16	3,10	15,16	16	16	12,13	25
NEAREST TRADING POINT AND P.O.	ISLAND LAKE	BRUCE	BRUCE	BRUCE	WEYERHAUSER	WEYERHAUSER	WEYERHAUSER	WEYERHAUSER	WEYERHAUSER	WEYERHAUSER	LADYSMITH	LADYSMITH
AREA IN ACRES	31	25	5	316	12	92	18	8	12	7	45	31
MAXIMUM DEPTH IN FT.	48	17	20	20	35	26	20	12	15	23	19	47
GAME FISH IN LAKE NOW	L.M.BASS N.PIKE BLUEGILLS	MUSKELLUNGE L.M.BASS W.E. PIKE BLUEGILLS PERCH BULLHEADS	L.M.BASS BLUEGILLS PERCH BULLHEADS	MUSKELLUNGE L.M.BASS N. PIKE CRAPPIES SUNFISH PERCH BULLHEADS	W.E. PIKE BULLHEADS	L.M. BASS W.E. PIKE CRAPPIES BLUEGILLS PERCH BULLHEADS	L.M. BASS N. PIKE BLUEGILLS PERCH BULLHEADS	L.M. BASS N.PIKE CRAPPIES BLUEGILLS PERCH BULLHEADS	N. PIKE BLUEGILLS PERCH BULLHEADS	N. PIKE BLUEGILLS PERCH BULLHEADS	L.M. BASS BLUEGILLS BULLHEADS	L.M. BASS BLUEGILLS
FISH SUITABLE FOR PLANTING	L.M.BASS	L.M.BASS	L.M.BASS	MUSKELLUNGE W.E.PIKE N. PIKE	L.M.BASS	L.M. BASS S.M. BASS	L.M. BASS	STOCKING NOT RECOMMENDED	L.M. BASS	L.M. BASS	L.M.BASS	L.M.BASS
LAKE HAS OUTLET OR IS LANDLOCKED	PERIODIC OUTLET	PERIODIC OUTLET	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	PERIODIC OUTLET	LANDLOCKED
WATER IS	VERY SOFT GREEN	MEDIUM BROWN	VERY SOFT BROWN	MEDIUM HARD GREEN	VERY SOFT BROWN	VERY SOFT CLEAR	VERY SOFT BROWN	VERY SOFT BROWN	VERY SOFT BROWN	VERY SOFT BROWN	MEDIUM CLEAR	SOFT CLEAR
AQUATIC VEGETATION	SCARCE AND NOT VARIED	FAIRLY ABUNDANT AND VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	FAIRLY ABUNDANT AND NOT VARIED	SCARCE NOT VARIED	SCARCE NOT VARIED	SCARCE NOT VARIED	FAIRLY ABUNDANT AND VARIED	ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	HARDWOOD POPPLE RECENT BURN	MARSHY	CLEARED	HARDWOOD CLEARED	TAMARACK	BLACK SPRUCE POPPLE	POPPLE WHITE BIRCH RECENT BURN	POPPLE WHITE PINE	POPPLE WHITE BIRCH	POPPLE WHITE BIRCH	POPPLE WHITE BIRCH	TAMARACK CLEARED

RUSK COUNTY	T.36 N. - R.5 W.	T. 36 N. - R.8 W.	T.36 N. - R.9 W.
NAME OF LAKE	BIG FALLS (FLOWAGE)	BUCK'S (STAR)	BUCK'S (HEMLOCK)
LAKE IN SECTION	25,26,35	19,30	23,26,27
NEAREST TRADING POINT AND P.O.	TONY	BIRCHWOOD	BIRCHWOOD
AREA IN ACRES	110	25	89
MAXIMUM DEPTH IN FT.	53	35	15
GAME FISH IN LAKE NOW	MUSKELLUNGE L.M.BASS S.M.BASS W.E.PIKE ROCKBASS BLUEGILLS	L.M.BASS CRAPPIES BLUEGILLS BULLHEADS	N.PIKE PERCH
FISH SUITABLE FOR PLANTING	MUSKELLUNGE W.E.PIKE	L.M.BASS S.M.BASS	L.M.BASS N.PIKE
LAKE HAS OUTLET OR IS LANDLOCKED	INLET, OUTLET AND DAMMED	PERIODIC	OUTLET DAMMED
WATER IS	MEDIUM BROWN	VERY SOFT BROWN	MEDIUM BROWN
AQUATIC VEGETATION	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	FAIRLY ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	HARDWOOD POPPLE	HARDWOOD MARSH	HARDWOOD WHITE BIRCH POPPLE

POLK COUNTY	TOWN 36 NORTH RANGE 17 WEST		TOWN 36 NORTH RANGE 18 WEST		TOWN 36 NORTH RANGE 19 WEST	
NAME OF LAKE	BIG BUTTERNUT	LIT. BUTTERNUT	TABOR LAKE	TWIN LAKES	WOLF	NEIMAN
LAKE IN SECTION	26, 27, 28, 33, 34	29, 32	19, 20	19	12, 13	24
NEAREST TRADING POINT & P.O.	LUCK	LUCK	CUSHING	CUSHING	CUSHING	CUSHING
AREA IN ACRES	387	183	35	40	93	24
MAXIMUM DEPTH IN FT.	20	20	16	26	24	12
GAME FISH IN LAKE NOW	SUNFISH W.E. PIKE L.M. BASS S.M. BASS CRAPPIES PERCH N. PIKE	N. PIKE W.E. PIKE L.M. BASS SUNFISH CRAPPIES BLUEGILLS	BLUEGILLS	L.M. BASS N. PIKE	CRAPPIES N. PIKE L.M. BASS SUNFISH PERCH	BULLHEADS
FISH SUITABLE FOR PLANTING	L.M. BASS SUNFISH N. PIKE	L.M. BASS SUNFISH N. PIKE	SUNFISH BULLHEADS	L.M. BASS N. PIKE	CRAPPIES N. PIKE L.M. BASS SUNFISH	BULLHEADS
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED
WATER IS	STAINED GREEN HARD	STAINED GREEN HARD	STAINED BROWN HARD	STAINED BROWN MEDIUM HARD	CLEAR HARD	CLEAR SOFT
AQUATIC VEGETATION	MODERATELY ABUNDANT	ABUNDANT	MODERATELY ABUNDANT	SCARCE	MODERATELY ABUNDANT	ABUNDANT
LAND COVER SURROUNDING LAKE	HARDWOODS PINE	HARDWOODS	HARDWOODS CLEARED	PASTURE	HARDWOODS TAMARAC	TAMARAC BOG

RUSK COUNTY	TOWN 33 NORTH-RANGE 7 WEST			TOWN 33 NORTH-RANGE 8 WEST		T 33N.-R 8&9W	TOWN 33 NORTH - RANGE 8 WEST				T 33N.-R8&9W	T 33N-R8W
NAME OF LAKE	BOOT	PULASKI	ROUND	BOG	CADDOT	CLEAR	GOOSE	ISLAND	McCANN	MUD	POTATO	RICE
LAKE IN SECTION	16,17,20	17,18,19	7,8,17,18	3	32	31,36	27, 34	20,21,28,29,30	30, 31	26, 27	23, 24, 25, 26 19	23, 26
NEAREST TRADING POINT AND PO	BRUCE	BRUCE	BRUCE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE
AREA IN ACRES	94	110	98	41	29	170	21	520	127	70	489	175
MAXIMUM DEPTH IN FT	35	39	8	8	28	70	51	50	37	12	25	38
GAME FISH IN LAKE NOW	L M BASS BLUE GILLS PERCH BULLHEADS	L M BASS BLUE GILLS PERCH BULLHEADS	L M BASS BLUE GILLS PERCH	MUSKELLUNGE L.M. BASS W.E. PIKE BLUE GILLS PERCH BULLHEADS	L M BASS BLUE GILLS PERCH BULLHEADS	MUSKELLUNGE L.M.BASS S.M BASS ROCK BASS BLUE GILLS SUNFISH	MUSKELLUNGE L.M.BASS W.E.PIKE CRAPPIES CISCOES	MUSKELLUNGE PERCH L.M.BASS S.M.BASS ROCK BASS BLUEGILLS	MUSKELLUNGE L.M.BASS S.M.BASS ROCK BASS SUNFISH BLUEGILLS	MUSKELLUNGE L.M.BASS W.E. PIKE CRAPPIES ROCKBASS BLUEGILLS SUNFISH BULLHEADS	MUSKELLUNGE L.M. BASS CISCOES S.M. BASS W.E PIKE CRAPPIES ROCKBASS BLUEGILLS BULLHEADS	MUSKELLUNGE L.M.BASS W.E PIKE CRAPPIES ROCKBASS BLUEGILLS SUNFISH BULLHEADS
FISH SUITABLE FOR PLANTING	L M BASS	L M BASS	STOCKING NOT RECOMMENDED	STOCKING NOT RECOMMENDED	L M BASS	MUSKELLUNGE L.M.BASS S.M.BASS W.E. PIKE	L M BASS S.M BASS	MUSKELLUNGE L.M. BASS S M BASS	MUSKELLUNGE L.M. BASS S.M.BASS W.E PIKE	MUSKELLUNGE W.E PIKE	MUSKELLUNGE L.M BASS S M BASS W.E PIKE	MUSKELLUNGE L M BASS S.M BASS W.E PIKE
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	PERIODIC OUTLET	LANDLOCKED	INLET AND OUTLET	PERIODIC OUTLET	OUTLET	INLET AND OUTLET	INLET AND OUTLET	INLET AND OUTLET	INLET AND OUTLET
WATER IS	VERY SOFT CLEAR	SOFT CLEAR	VERY SOFT CLEAR	MEDIUM HARD GREEN	VERY SOFT CLEAR	HARD CLEAR	MEDIUM HARD AND CLEAR	HARD AND CLEAR	HARD AND CLEAR	HARD AND CLOUDY	HARD AND CLEAR	HARD AND CLOUDY
AQUATIC VEGETATION	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	SCARCE BUT VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED
LAND COVER	LEATHER LEAF BOG BLACK SPRUCE POPPLE	SCRUB OAK POPPLE	BLACK SPRUCE POPPLE	WHITE PINE POPPLE	LEATHER LEAF CLEARED	POPPLE CLEARED	CLEARED	HARDWOOD POPPLE	HARDWOOD POPPLE CAT TAIL MARSH	MARSH SCRUB OAK RED MAPLE	HARDWOOD POPPLE	SCRUB OAK MAPLE POPPLE

RUSK COUNTY	T32&33N-R8W	T 33N-R8N	T 33N-R9N	T.32&33N-R9W	TOWN 33 NORTH - RANGE 9 WEST.		T32&33N-R9W.	TOWN 33 NORTH - RANGE 9 WEST				
NAME OF LAKE	SAND	STORE	ATWOOD	CHAIN	FISH	FOURTH	PINE	RUSK (BALL, BUCK)	HORSESHOE	SECOND	SUGAR	THIRD
LAKE IN SECTION	33, 34 4	28	27	35,36 12	28, 29 32 33	26	2, 3, 34, 35	15	5	26	15,22	26
NEAREST TRADING POINT AND P O	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE	ISLAND LAKE
AREA IN ACRES	189	6	7	310	147	4	465	10	22	20	39	4
MAXIMUM DEPTH IN FT	99	34	22	71	28	58	96	61	35	23	16	27
GAME FISH IN LAKE NOW	MUSKELLUNGE L M BASS S.M BASS BLUEGILLS SUNFISH CISCOES	L.M BASS BLUEGILLS BULLHEADS	BULLHEADS	MUSKELLUNGE L M BASS S.M BASS ROCKBASS BLUEGILL SUNFISH	L.M BASS N PIKE BLUEGILLS PERCH BULLHEADS	MUSKELLUNGE L.M. BASS S.M. BASS BLUEGILLS PERCH	L. M. BASS N. PIKE BLUEGILLS PERCH	W.E. PIKE N. PIKE ROCKBASS BLUEGILLS BULLHEADS	L. M. BASS N. PIKE CRAPPIES BLUEGILLS BULLHEADS	MUSKELLUNGE L. M. BASS BLUEGILLS PERCH	L. M. BASS PERCH BULLHEADS	MUSKELLUNGE L. M. BASS ROCKBASS BLUEGILLS PERCH
FISH SUITABLE FOR PLANTING	MUSKELLUNGE L.M BASS S M BASS	L M BASS	L M BASS	MUSKELLUNGE L.M BASS S M.BASS W.E. PIKE	L M BASS S M BASS	NONE	L. M. BASS S. M. BASS	L.M. BASS	L. M. BASS	L. M. BASS	L. M. BASS	
LAKE HAS OUTLET OR IS LANDLOCKED	PERIODIC INLET AND OUTLET	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	LANDLOCKED	PERIODIC INLET AND OUTLET	INLET AND OUTLET	PERIODIC OUTLET	INLET AND OUTLET
WATER IS	HARD CLEAR	VERY SOFT BROWN	VERY SOFT CLEAR	HARD CLEAR	VERY SOFT CLEAR	MEDIUM BROWN	VERY SOFT CLEAR	SOFT CLEAR	SOFT CLEAR	MEDIUM BROWN	VERY SOFT GREEN	MEDIUM BROWN
AQUATIC VEGETATION	ABUNDANT AND VARIED	SCARCE NOT VARIED	SCARCE NOT VARIED	ABUNDANT AND VARIED	SCARCE NOT VARIED	FAIRLY ABUNDANT AND VARIED	SCARCE NOT VARIED	SCARCE AND NOT VARIED	SCARCE NOT VARIED	ABUNDANT AND VARIED	SCARCE AND NOT VARIED	FAIRLY ABUNDANT AND VARIED
LAND COVER SURROUNDING	HARDWOOD MARSH	POPPLE	POPPLE	HARDWOOD CLEARED	HARDWOOD POPPLE SCRUB OAK	PINE MARSHY	HARDWOOD WHITE PINE POPPLE	CLEARED	HARDWOOD	HARDWOOD WHITE PINE	HARDWOOD AND CLEARED	HARDWOOD WHITE PINE

SAWYER COUNTY	T. 37 N - R. 6 W.	T. 37 N. - R. 7 W.	T. 37N. - R. 8 W.	T. 37&38 N. - R. 9 W.	T. 37 N. - R. 9 W.	T. 38 N - R. 3 W.	T. 38&39 N. - R. 3 W.	T. 38 N - R. 3 W.	T. 38&39 N. - R. 3 W.	T. 38 N. - R. 8 W.	TOWN 38 NORTH - RANGE 9 WEST	
NAME OF LAKE	WHITE BIRCH	WINDFALL	DEER	CHETAC	KNUTESON	CONNOR'S	MASON	PICKEREL	EVERGREEN	WEIGOR (BEVERLY)	LITTLE SISSABAGAMA	SISSABAGAMA
LAKE IN SECTION	29, 30, 31	23, 26	21, 28	3, 4, 5, 8, 9, 16, 17, 18, 19, 20, 27, 28, 33, 34	10, 11	22, 27, 28	2, 35, 36	11, 14, 15, 22, 23	1, 36	36	17, 18, 19, 20	5, 6, 7, 8, 17
NEAREST TRADING POINT AND P. O.	EXELAND	EXELAND	EXELAND	EDGEWATER	EDGEWATER	LUGGERVILLE	LUGGERVILLE	LUGGERVILLE	LUGGERVILLE	LEMINGTON	EDGEWATER	STONE LAKE
AREA IN ACRES	107	96	118	2249	50	409	180	315	157	45	302	830
MAXIMUM DEPTH IN FT.	12		10	25	18	74	40	47	20	28	63	49
GAME FISH IN LAKE NOW	SUNFISH PERCH BULLHEADS	L. M. BASS CRAPPIES PERCH	BULLHEADS PERCH BROOK TROUT	N. PIKE W. E. PIKE L. M. BASS S. M. BASS CRAPPIES BLUEGILLS PERCH	N. PIKE W. E. PIKE L. M. BASS PAN FISH	W. E. PIKE MUSKELLUNGE L. M. BASS S. M. BASS BLUEGILLS ROCK BASS PERCH	W. E. PIKE L. M. BASS MUSKELLUNGE SUNFISH PERCH	W. E. PIKE L. M. BASS S. M. BASS MUSKELLUNGE ROCK BASS BLUEGILLS	W. E. PIKE L. M. BASS MUSKELLUNGE SUNFISH PERCH	L. M. BASS MUSKELLUNGE ROCK BASS PERCH	L. M. BASS S. M. BASS MUSKELLUNGE ROCK BASS PERCH.	L. M. BASS S. M. BASS MUSKELLUNGE CRAPPIES BLUEGILLS
FISH SUITABLE FOR PLANTING		L. M. BASS		(W. E. PIKE) MUSKELLUNGE S. M. BASS L. M. BASS	L. M. BASS N. PIKE	S. M. BASS W. E. PIKE MUSKELLUNGE L. M. BASS	W. E. PIKE. L. M. BASS MUSKELLUNGE	W. E. PIKE MUSKELLUNGE S. M. BASS L. M. BASS	W. E. PIKE L. M. BASS MUSKELLUNGE	L. M. BASS	SAME AS ABOVE EXCEPT PERCH	S. M. BASS L. M. BASS MUSKELLUNGE S. M. BASS
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	SPRING INLETS AND OUTLET	INLET, OUTLET AND DAMMED	INLET AND OUTLET	INLET AND OUTLET	INLET AND WATER PASSAGE TO LAKE EVERGREEN	INLET AND OUTLET	WATER PASSAGE TO LAKE MASON OUTLET	INLET AND OUTLET	LANDLOCKED	OUTLET
WATER IS	MEDIUM BROWN	VERY SOFT CLEAR	MEDIUM HARD, BROWN	HARD GREEN	MEDIUM BROWN	MEDIUM HARD CLEAR	MEDIUM CLEAR	MEDIUM HARD CLEAR	MEDIUM CLEAR	MEDIUM BROWN	SOFT CLEAR	MEDIUM GREEN
AQUATIC VEGETATION	ABUNDANT AND VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	FAIRLY ABUNDANT AND VARIED	ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	POPPLE WITH WHITE BIRCH	CLEARED LAND PASTURE	HARDWOOD	HARDWOOD AND POPPLE	PINE AND HARDWOOD	HARDWOOD AND HEMLOCK	HARDWOOD, HEMLOCK AND BALSAM	HARDWOOD, HEMLOCK AND POPPLE	HARDWOOD, HEMLOCK AND BALSAM	HARDWOOD AND POPPLE	HARDWOOD AND POPPLE	HARDWOOD, POPPLE AND WHITE PINE

SAWYER COUNTY	T. 38 N. - R. 9 W.	T. 39 N - R. 3 W.	T. 39 N. - R. 5 W.	T. 39&40 N. - R. 5 W.	T. 39 N. - R. 5 W.	T. 39&40 N. - R. 5 W.	T. 39, 40 & 41 N R. 6, 7 & 8 W.	T. 39 N. - R. 7 W.	T. 39 N. - R. 8 W.	T. 39 &40 N. - R. 8&9 W.	TOWN 39 NORTH - RANGE 8 WEST	
NAME OF LAKE	SUMMIT	PELICAN	BARBER	SIREN (PERCH)	ISLAND	BLACK DAN	CHIPPEWA	BLUEBERRY	A-SHE-GAN	COURT OREILLES	DEVILS	LITTLE COURT OREILLES
LAKE IN SECTION	14	25	2, 3, 10	2, 35	2	1, 36	LAKE LIES IN 28 SECTIONS	4, 8, 9	23, 24	LAKE LIES IN 30 SECTIONS	23, 26, 27, 35	5, 6, 7, 8
NEAREST TRADING POINT AND P. O.	EDGEWATER	DRAPER	WINTER	WINTER	WINTER	WINTER	WINTER	COUDERAY	COUDERAY	RESERVE	COUDERAY	RESERVE
AREA IN ACRES	54	20	254	108	72	123	17228	322	74	4827	214	189
MAXIMUM DEPTH IN FT	19		23	18	33			27	40	83	8	35
GAME FISH IN LAKE NOW	L. M. BASS BLUEGILLS PERCH	L. M. BASS	W. E. PIKE L. M. BASS MUSKELLUNGE PERCH	L. M. BASS PERCH	L. M. BASS ROCK BASS SUNFISH BLUEGILLS PERCH	W. E. PIKE L. M. BASS MUSKELLUNGE CRAPPIES CISCOES	W. E. PIKE MUSKELLUNGE L. M. BASS S. M. BASS PERCH BULLHEADS	W. E. PIKE L. M. BASS BLUEGILLS PERCH	L. M. BASS CRAPPIES BLUEGILLS PERCH	W. E. PIKE MUSKELLUNGE L. M. BASS S. M. BASS BLUEGILLS PERCH	PERCH BULLHEADS	W. E. PIKE L. M. BASS S. M. BASS MUSKELLUNGE ROCK BASS BLUEGILLS SUNFISH PERCH
FISH SUITABLE FOR PLANTING	L. M. BASS	BULLHEADS	MUSKELLUNGE L. M. BASS	L. M. BASS	L. M. BASS	L. M. BASS MUSKELLUNGE	W. E. PIKE MUSKELLUNGE L. M. BASS ROCK BASS	L. M. BASS	L. M. BASS	W. E. PIKE L. M. BASS MUSKELLUNGE	BULLHEADS	W. E. PIKE L. M. BASS MUSKELLUNGE
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	FLOWAGE	OUTLET PERIODIC	LANDLOCKED	INLET AND OUTLET	OUTLET	INLET AND OUTLET
WATER IS	VERY SOFT CLEAR	VERY SOFT CLEAR	MEDIUM HARD GREEN	VERY SOFT CLEAR	MEDIUM HARD BROWN	MEDIUM HARD CLEAR	MEDIUM BROWN	MEDIUM CLEAR	VERY SOFT CLEAR	MEDIUM HARD CLEAR	MEDIUM HARD GREEN	MEDIUM HARD CLEAR
AQUATIC VEGETATION	ABUNDANT AND NOT VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE	SCARCE	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	ABUNDANT AND NOT VARIED	ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	SCRUB OAK AND POPPLE	HEMLOCK, POPPLE AND HARDWOOD	HARDWOOD AND POPPLE	POPPLE AND HARDWOOD	CLEARED LAND POPPLE	POPPLE AND WHITE BIRCH	HARDWOOD POPPLE AND PINE	POPPLE	HARDWOOD POPPLE PINE	HARDWOOD POPPLE AND PINE	HARDWOOD AND POPPLE	SCRUB OAK AND POPPLE

SAWYER COUNTY	T 39 N - R 8 W	TOWN 39 NORTH - RANGE 9 WEST					T. 40 N. - R. 4 W.	T. 40 N. - R. 5 W.	T. 40 & 41 N. - R. 7 W.	T. 40 & 41 N. - R. 7 & 8 W.	T. 40 N. - R. 8 & 9 W.	T. 40 & 41 N. - R. 8 W.
NAME OF LAKE	PIKE	HAM	UPPER HOLLY	LITTLE SAND	SAND	WHITE FISH	BLAISDELL	FISHTRAP	REED	SQUAW	GRINDSTONE	LITTLE ROUND
LAKE IN SECTION	12, 13	26, 27	22	19, 20	16, 17, 20, 21, 22	11, 12, 13, 14, 15, 22, 23	10, 15, 16, 17, 19, 20	11, 14	4, 32	1, 36, 6, 31	17, 18, 19, 20, 29, 30, 13 23, 24, 25, 26	2, 35, 36
NEAREST TRADING POINT AND P. O.	COUDERAY	STONE LAKE	STONE LAKE	STONE LAKE	STONE LAKE	STONE LAKE	LORETTA	LORETTA	HAYWARD	HAYWARD	HAYWARD	HAYWARD
AREA IN ACRES	35	126	34	75	984	856	530	174	93	127	3304	146
MAXIMUM DEPTH IN FT		28	17	14	48	103	9	10	18	30	61	28
GAME FISH IN LAKE NOW	W. E PIKE L. M. BASS ROCK BASS SUNFISH PERCH	L. M. BASS PERCH	L. M. BASS MUSKELLUNGE BLUEGILLS PERCH	L. M. BASS PAN FISH FEW W. E. PIKE	W. E. PIKE L. M. BASS S. M. BASS MUSKELLUNGE CRAPPIES SUNFISH BLUEGILLS PERCH BULLHEADS	W. E, PIKE L. M. BASS S. M. BASS MUSKELLUNGE BLUEGILLS PERCH, WHITE FISH LAKE TROUT CISCOES	W. E. PIKE L. M. BASS MUSKELLUNGE CATFISH BLUEGILLS PERCH BULLHEADS	FEW W. E. PIKE L. M. BASS MUSKELLUNGE CRAPPIES PERCH	L. M. BASS ROCK BASS SUNFISH PERCH	L. M. BASS ROCK BASS PERCH BULLHEADS	W. E. PIKE L. M. BASS S. M. BASS MUSKELLUNGE ROCK BASS BLUEGILLS PERCH	L. M. BASS S. M. BASS CRAPPIES BLUEGILLS BULLHEADS
FISH SUITABLE FOR PLANTING	PRIVATE	L. M. BASS	L. M. BASS	L. M. BASS	MUSKELLUNGE L M BASS S M BASS	MUSKELLUNGE W E PIKE L M BASS LAKE TROUT	W. E. PIKE CATFISH	L. M. BASS CRAPPIES MUSKELLUNGE	L. M. BASS	L. M. BASS	W. E. PIKE MUSKELLUNGE L. M. BASS S. M. BASS ROCK BASS	L. M BASS
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	INLET AND OUTLET	INLET AND OUTLET	INLET- OUTLET AND DAMMED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED
WATER IS	MEDIUM HARD CLEAR	VERY SOFT CLEAR	VERY SOFT BROWN	VERY SOFT CLEAR	MEDIUM GREEN	MEDIUM HARD CLEAR	MEDIUM HARD BROWN	MEDIUM BROWN	VERY SOFT CLEAR	SOFT MILKY	MEDIUM HARD CLEAR	MEDIUM CLEAR
AQUATIC VEGETATION	ABUNDANT AND VARIED	FAIRLY ABUNDANT AND NOT VARIED	ABUNDANT AND FAIRLY VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	FAIRLY ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	HARDWOOD AND POPPLE BALSAM	HARDWOOD AND POPPLE TAMARACK	HARDWOOD, PINE AND POPPLE	POPPLE, SCRUB OAK AND PINE TAGALDER	HARDWOOD, PINE AND POPPLE IMPROVED LAND	HARDWOOD, POPPLE AND SCRUB OAK	POPPLE HEMLOCK AND HARDWOOD BLACK ASH	POPPLE AND MARSH	POPPLE HARDWOOD AND SCRUB OAK	POPPLE - PINE AND SCRUB OAK SWAMP	POPPLE - PINE AND HARDWOOD IMPROVED LAND	HARDWOOD

SAWYER COUNTY	T 40 N. - R 8 & 9 W	TOWN 40 NORTH - RANGE 9 WEST						T. 41 N. - R. 5 & 6 W	TOWN 41 NORTH - RANGE 7 WEST			
NAME OF LAKE	SPRING	WINDIGO (BASS)	DURPHEE	GURNO *	JOHNSON	MINNEMAN (DAMMED)	SCHOOLHOUSE	MOOSE	PLACID	GALLAHAN	CLEAR	CURRIER
LAKE IN SECTION	6, 7 1, 12	21, 22, 26, 27, 28	34, 35	28, 33	25, 36	33, 34	34 35	9, 16, 17, 18, 19, 20, 29, 30, 13, 14, 24, 25	18, 19, 20	33, 34	20	11, 14
NEAREST TRADING POINT AND P O	HAYWARD	HAYWARD	HAYWARD	HAYWARD	HAYWARD	HAYWARD	HAYWARD	CLAM LAKE	HAYWARD	HAYWARD	HAYWARD	HAYWARD
AREA IN ACRES	182	485	187	56	54	32	51	1643	94	123	66	18
MAXIMUM DEPTH IN FT	21	57	16				12	17		11		
GAME FISH IN LAKE NOW	W E PIKE N. PIKE L M BASS CRAPPIES BLUEGILLS PERCH	N PIKE S M BASS L M BASS CRAPPIES BLUEGILLS SUNFISH PERCH	L M BASS PERCH	W. E. PIKE L M. BASS PAN FISH MUSKELLUNGE	L.M. BASS PAN FISH	L.M BASS BLUEGILLS	L.M. BASS PERCH BULLHEADS	W. E. PIKE L.M. BASS S.M. BASS MUSKELLUNGE PAN FISH	L.M. BASS PAN FISH	L M BASS MUSKELLUNGE ROCK BASS PERCH BULLHEADS	L.M BASS PAN FISH	L.M BASS PAN FISH
FISH SUITABLE FOR PLANTING	N PIKE L.M BASS	N PIKE L M BASS	L.M BASS		L.M. BASS	L.M BASS		MUSKELLUNGE L. M BASS W.E. PIKE		L.M. BASS		
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	HARD GREEN	VERY SOFT CLEAR	VERY SOFT CLEAR	MEDIUM BROWN	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	MEDIUM BROWN	VERY SOFT CLEAR	MEDIUM HARD BROWN	VERY SOFT CLEAR	VERY SOFT CLEAR
AQUATIC VEGETATION	ABUNDANT AND VARIED	ABUNDANT AND NOT VARIED	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	SCARCE AND NOT VARIED	SCARCE AND VARIED	SCARCE AND NOT. VARIED	SCARCE	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	SCARCE AND NOT VARIED	SCARCE AND NOT VARIED
LAND COVER SURROUNDING LAKE	POPPLE AND PINE	POPPLE AND HARDWOOD PINE	HARDWOOD AND POPPLE PINE	PINE & HARDWOOD SCRUB OAK	HARDWOOD, POPPLE AND PINE	HARDWOOD & CLEARED	PINE, POPPLE AND HARDWOOD	POPPLE AND HARDWOOD	HARDWOOD	HARDWOOD AND POPPLE	POPPLE AND WHITE BIRCH	HARDWOOD & CLEARED LAND
				* IN T 40 N - R 8 W								

SAWYER COUNTY	TOWN 41 NORTH - RANGE 7 WEST		T 41 N - R 7&8 W	TOWN 41 NORTH - RANGE 7 WEST		T 41 N - R 9 W		TOWN 42 NORTH - RANGE 5 WEST		T 42 N - R 5&6 W	TOWN 42 NORTH - RANGE 5 WEST	
NAME OF LAKE	LOVEJOY	LOWER TWIN	ROUND	STAR	UPPER TWIN	HAYWARD	SMITH	BOOS	CHRISTY	GHOST	GOODMAN	LOWER CLAM
LAKE IN SECTION	30	8, 9, 17	18, 19, 30, 13, 14, 22, 23, 24, 25, 26, 27, 35, 36	4, 5 T 42 N. R. 6 W	5, 6	22, 23, 26, 27	3, 4, 5, 9, 10	28	10, 15	19, 30, 31, 24, 25, 36	32	1, 11, 12
NEAREST TRADING POINT AND P O	HAYWARD	HAYWARD	HAYWARD	HAYWARD	HAYWARD	HAYWARD	HAYWARD	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE
AREA IN ACRES	75	221	3276	96	235	197	287	58	102	368	58	208
MAXIMUM DEPTH IN FT.			63		27	18	35	21	12	8		28
GAME FISH IN LAKE NOW	L.M. BASS BLUEGILLS PERCH	W.E PIKE L.M. BASS S.M. BASS MUSKELLUNGE CRAPPIES BLUEGILLS PERCH	L.M. BASS S.M. BASS BLUEGILLS SUNFISH PERCH CISCOES	L.M. BASS PAN FISH	W.E PIKE L.M. BASS S.M BASS MUSKELLUNGE CRAPPIES BLUEGILLS PERCH	N. PIKE W.E PIKE L.M BASS CRAPPIES BLUEGILLS BULLHEADS	N PIKE L M BASS S M BASS CRAPPIES BLUEGILLS PERCH BULLHEADS	W. E. PIKE ROCK BASS MUSKELLUNGE L M BASS PERCH BULLHEADS	PERCH ROCK BASS BULLHEADS	L.M. BASS MUSKELLUNGE BLUEGILLS SUNFISH PERCH BULLHEADS	L.M. BASS PAN FISH	W.E. PIKE L.M BASS MUSKELLUNGE ROCK BASS PERCH
FISH SUITABLE FOR PLANTING		WE. PIKE (S.M. BASS)	L.M. BASS S M BASS BLUEGILLS	(L M. BASS)	W.E. PIKE (S.M. BASS)	W E PIKE L M. BASS (CRAPPIES) N. PIKE	S.M BASS N. PIKE	SAME AS ABOVE		L M BASS MUSKELLUNGE		W.E. PIKE L.M. BASS MUSKELLUNGE ROCK BASS
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	INLET AND OUTLET	OUTLET	INLET AND OUTLET	INLET AND OUTLET	OUTLET	LANDLOCKED	INLET AND OUTLET AND DAMMED	LANDLOCKED	INLET AND OUTLET
WATER IS	SOFT CLEAR	MEDIUM HARD BROWN	MEDIUM CLEAR	MEDIUM HARD BROWN	MEDIUM HARD CLEAR	MEDIUM HARD BROWN	MEDIUM HARD BROWN	MEDIUM BROWN	VERY SOFT BROWN	MEDIUM BROWN	VERY SOFT CLEAR	MEDIUM BROWN
AQUATIC VEGETATION	SCARCE AND NOT VARIED	ABUNDANT AND VARIED	SCARCE AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE	ABUNDANT AND VARIED	FAIRLY ABUNDANT	SCARCE NOT VARIED	ABUNDANT AND VARIED	SCARCE NOT VARIED	SCARCE
LAND COVER SURROUNDING LAKE	POPPLE AND NORWAY PINE	HARDWOOD POPPLE SWAMP	HARDWOOD, WHITE PINE POPPLE	HARDWOOD & SWAMP FOREST	POPPLE, BALSAM AND SCRUB OAK	IN THE CITY OF HAYWARD	CLEARED LAND HARDWOOD POPPLE PINE SWAMP	POPPLE HARDWOOD	POPPLE HARDWOOD WHITE PINE SWAMP	HARDWOOD HEMLOCK MARSH	HARDWOOD POPPLE	HARDWOOD POPPLE

SAWYER COUNTY	T 42 N - R 5 W.	TOWN 42 NORTH - RANGE 6 WEST			TOWN 42 NORTH - RANGE 7 WEST			T 42 N - R 8 W.
NAME OF LAKE	RED IKE	LOST LAND	OLE	TEAL	HELANE	NORTH	SPIDER	PAC-WA-WONG
LAKE IN SECTION	2, 11	17, 19, 20, 21, 28, 29, 30, 32	30, 31	26, 27, 28, 33, 34	15, 16	14, 15	14, 15 22, 23, 24, 26, 27 33, 34	2, 3
TRADING POINT AND P.O	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	HAYWARD	HAYWARD	HAYWARD	HAYWARD
AREA IN ACRES	69	1070	75	892	62	70	1512	136
MAXIMUM DEPTH IN FT.	11	18	27	28		30	65	8
GAME FISH IN LAKE NOW	L.M BASS MUSKELLUNGE PERCH	W.E. PIKE L.M. BASS S.M. BASS MUSKELLUNGE BLUEGILLS PERCH BULLHEADS	L.M. BASS PAN FISH	W.E. PIKE L.M. BASS S.M BASS MUSKELLUNGE BLUEGILLS PERCH BULLHEADS	L.M. BASS PAN FISH	W.E. PIKE L.M. BASS PAN FISH	W E PIKE L M BASS MUSKELLUNGE PAN FISH	N PIKE W E PIKE L M BASS S M BASS SUNFISH BULLHEADS
FISH SUITABLE FOR PLANTING		W. E. PIKE L.M BASS S.M. BASS MUSKELLUNGE	L.M. BASS	L M BASS W E PIKE S.M. BASS MUSKELLUNGE		L M BASS W E. PIKE MUSKELLUNGE	W E PIKE MUSKELLUNGE L.M. BASS	N. PIKE W.E. PIKE S M BASS
LAKE HAS OUTLET OR IS LANDLOCKED	INLET AND OUTLET	INLET AND OUTLET	OUTLET	INLET AND OUTLET	LANDLOCKED	INLET AND OUTLET	INLET AND OUTLET	INLET AND OUTLET
WATER IS	MEDIUM BROWN	HARD GREEN	MEDIUM HARD BROWN	HARD GREEN	VERY SOFT CLEAR	MEDIUM HARD BROWN	MEDIUM HARD CLEAR	MEDIUM HARD BROWN
AQUATIC VEGETATION	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE NOT VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	HARDWOOD POPPLE BALSAM	HARDWOOD POPPLE SWAMP	HARWOOD POPPLE BALSAM PINE	HARDWOOD SWAMP BALSAM	POPPLE HARDWOOD	HEMLOCK HARDWOOD TAMARACK	HARDWOOD AND POPPLE	HARDWOOD, POPPLE AND WHITE PINE

BAYFIELD COUNTY	T 49 N - R. 7 W.	TOWN 50 NORTH - RANGE 6 WEST	
NAME OF LAKE	LENEWEE	PERCH	SISKOWIT
LAKE IN SECTION	21	22	21, 20
NEAREST TRADING POINT AND P O	IRON RIVER	CORNUCOPIA	CORNUCOPIA
AREA IN ACRES	24	48	336
MAXIMUM DEPTH IN FT.	23	17	18
GAME FISH IN LAKE NOW	L.M. BASS SUNFISH PERCH	L.M. BASS PERCH	L.M. BASS PERCH
FISH SUITABLE FOR PLANTING	L.M. BASS	L.M. BASS SUNFISH	L.M. BASS SUNFISH
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	SEASONAL OUTLET
WATER IS	CLEAR VERY SOFT	CLEAR VERY SOFT	BROWN STAIN VERY SOFT
AQUATIC VEGETATION	SCARCE	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	POPPLE	HARDWOOD	SPRUCE & HARDWOOD

BAYFIELD COUNTY	TOWN 43 NORTH - RANGE 5 WEST										TOWN 43 NORTH - RANGE 6 WEST	
NAME OF LAKE	BASS	BLACK DUCK	BUFFALO	CHIPPEWA	DELLS	ETHEL'S	GHOST	MUSKIE (WHITE BASS)	NUMBER FIVE	SPRING	HIDDEN	MCCLOUD
LAKE IN SECTIONS	6, 7	13	35	15, 16, 22	22, 27, 28	34 (N E)	20 29	25	33 34	34	29 30	36 ALSO SEC 31 T43N-R5
NEAREST TRADING POINT AND P O	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	CLAM LAKE	CABLE	CLAM LAKE
AREA IN ACRES	80	30	192	264	135	40	150	112	64	32	40	160
MAXIMUM DEPTH IN FT	10	15	18	11	40	27	22	30	11	19	15	11
GAME FISH IN LAKE NOW	L M. BASS SUNFISH PERCH	L M. BASS SUNFISH PERCH	L M BASS SUNFISH PERCH	L M BASS S M BASS SUNFISH PERCH BULLHEADS	L M BASS SUNFISH PERCH	L M BASS PERCH	L M BASS MUSKELLUNGE	L M. BASS MUSKELLUNGE SUNFISH PERCH	BASS PERCH	BASS PERCH	L M BASS	BASS PERCH
FISH SUITABLE FOR PLANTING	L M. BASS SUNFISH	L M. BASS SUNFISH	L M BASS SUNFISH	L M BASS S M BASS SUNFISH	L M BASS SUNFISH	L M BASS SUNFISH	L M BASS MUSKELLUNGE	L M. BASS S M BASS SUNFISH		L M BASS SUNFISH	L M BASS SUNFISH	
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	SEASONAL OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR SOFT	BROWN SOFT	CLEAR VERY SOFT	BROWN MEDIUM	CLEAR SOFT	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR VERY SOFT	CLEAR SOFT	CLEAR VERY SOFT	CLEAR SOFT
AQUATIC VEGETATION	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	FAIRLY ABUNDANT	ABUNDANT AND VARIED	ABUNDANT	SCARCE	SCARCE	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	POPPLE	POPPLE AND TAMARACK	SPRUCE SWAMP AND HARDWOOD	SWAMP AND HARDWOOD FOREST	HARDWOOD	HARDWOOD	PINE AND HARDWOOD	POPPLE	POPPLE AND HARDWOOD	HARDWOOD AND POPPLE	HARDWOOD AND PINE	POPPLE

BAYFIELD COUNTY	TOWN 43 NORTH - RANGE 6 WEST			TOWN 43 NORTH RANGE 7 WEST						TOWN 43 NORTH - RANGE 8 WEST		
NAME OF LAKE	NAMEKAGON	ROCKY	TWINS	HANSON	MURPHY'S POCKET	PETTY	PRICE	ROSA	WILLIAMS	CABLE	HENRY	OLE
LAKE IN SECTIONS	SPREAD ACROSS TOWNSHIP	29	17, 20	9, 16	15, 16	8, 17	8	6	16	1, 12	1	27, 28
NEAREST TRADING POINT AND P O	CABLE	CABLE	CABLE	CABLE	CABLE	CABLE	CABLE	CABLE	CABLE	CABLE	CABLE	CABLE
AREA IN ACRES	3256	12	80	30	40	80	88	42	30	250	32	56
MAXIMUM DEPTH IN FT	46	30	15	31	13	21	16	33	16	42	28	34
GAME FISH IN LAKE NOW	L M BASS S M BASS MUSKELLUNGE SUNFISH N PIKE W E PIKE CRAPPIES	L M BASS SUNFISH PERCH	N PIKE SUNFISH CRAPPIES BULLHEAD	L M BASS SUNFISH	L M. BASS N PIKE SUNFISH PERCH	L M BASS PERCH	L M BASS W E PIKE CRAPPIES SUNFISH	S M BASS CRAPPIES SUNFISH	L M BASS S M BASS	L M. BASS S M BASS W E PIKE N PIKE CRAPPIES SUNFISH PERCH	BASS SUNFISH	N PIKE SUNFISH CRAPPIES
FISH SUITABLE FOR PLANTING	W E PIKE MUSKELLUNGE	L M. BASS SUNFISH	L M. BASS	L M BASS		L M BASS SUNFISH	L M BASS SUNFISH	L M BASS SUNFISH	L M. BASS SUNFISH	W E PIKE CRAPPIES	L M. BASS S M. BASS	N PIKE CRAPPIES
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	BROWN MEDIUM HARD	CLEAR VERY SOFT	BROWN SOFT	CLEAR VERY SOFT	BROWN SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	VERY SOFT	CLEAR MEDIUM HARD	BROWN MEDIUM	CLEAR VERY SOFT
AQUATIC VEGETATION	ABUNDANT	SCARCE	ABUNDANT	SCARCE	ABUNDANT	VERY SCARCE	SCARCE	MODERATELY ABUNDANT	SCARCE	ABUNDANT	ABUNDANT	SCARCE
LAND COVER SURROUNDING	PINE AND HARDWOOD	HARDWOOD AND PINE	PINE AND HARDWOOD	POPPLE	PINE	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND POPPLE AND CEDAR SWAMP	SPRUCE SWAMP	PINE AND POPPLE

BAYFIELD COUNTY	TOWN 43 NORTH - RANGE 8 WEST		TOWN 44 NORTH - RANGE 5 WEST			T. 44 N. R. 6 W.						
NAME OF LAKE	SARAH	TOTAGETIC	ATKINS	COFFEE	TAYLOR	BASS	CLUB	CRANBERRY	CRYSTAL	DIAMOND	JACKSON	NOTHING
LAKE IN SECTIONS	15, 22	29, 30, 31, 32	19, 20	13, 24	30	24	13	34	32	29, 32	33, 34	21, 22
NEAREST TRADING POINT AND P O.	CABLE	CABLE	GRANDVIEW	GRANDVIEW	GRANDVIEW	GRANDVIEW	GRANDVIEW	GRANDVIEW	CABLE	CABLE	CABLE	GRANDVIEW
AREA IN ACRES	35	560	206	120	124	80	48	80	72	315	176	40
MAXIMUM DEPTH IN FT.	34	6	61	16	15	33	21	19	43	78	13	14
GAME FISH IN LAKE NOW	L. M. BASS S. M. BASS SUNFISH PERCH	N. PIKE PERCH BULLHEADS	L. M. BASS S. M. BASS N. PIKE SUNFISH ROCK BASS PERCH	L. M. BASS PERCH	N. PIKE SUNFISH BULLHEAD	N. PIKE SUNFISH PERCH BULLHEAD	N. PIKE CRAPPIES PERCH SUNFISH	L. M. BASS N. PIKE W. E. PIKE CRAPPIES SUNFISH	L. M. BASS S. M. BASS SUNFISH ROCK BASS PERCH	L. M. BASS S. M. BASS BULLHEAD N. PIKE SUNFISH PERCH	L. M. BASS S. M. BASS MUSKELLUNGE N. PIKE W. E. PIKE SUNFISH CRAPPIES	BASS BULLHEAD
FISH SUITABLE FOR PLANTING	L. M. BASS S. M. BASS	BULLHEADS	L. M. BASS SUNFISH	L. M. BASS S. M. BASS SUNFISH	L. M. BASS CRAPPIES	L. M. BASS CRAPPIES	L. M. BASS	L.M.BASS	L. M. BASS SUNFISH	L. M. BASS S. M. BASS SUNFISH CRAPPIES	W. E. PIKE MUSKELLUNGE	
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED
WATER IS	CLEAR VERY SOFT	BROWN MEDIUM HARD	CLEAR SOFT	GREEN MEDIUM HARD	BROWN SOFT	CLEAR MEDIUM HARD	CLEAR VERY SOFT	GREEN MEDIUM HARD	CLEAR VERY SOFT	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR VERY SOFT
AQUATIC VEGETATION	MODERATELY ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE	ABUNDANT	SCARCE	ABUNDANT AND VARIED	SCARCE	ABUNDANT	ABUNDANT AND VARIED	SCARCE
LAND COVER SURROUNDING LAKE	PINE AND HARDWOOD	HARDWOOD AND SWAMP	HARDWOOD	HARDWOOD	POPPLE AND HARDWOOD	POPPLE AND SPRUCE SWAMP	HARDWOOD	HARDWOOD	POPPLE AND HARDWOOD	POPPLE AND HARDWOOD	PINE AND POPPLE	POPPLE

BAYFIELD COUNTY	TOWN 44 NORTH - RANGE 6 WEST			TOWN 44 NORTH - RANGE 7 WEST						TOWN 44 NORTH - RANGE 8 WEST		
NAME OF LAKE	PORCUPINE	TRAPPER	WEST LAKE	BASS	EAST	MILL POND	MUD	NORTH EAST	OWEN	BIG BROOK	HAMMEL	NORTH BOW
LAKE IN SECTIONS	17, 18, 19, 20	26, 27	31	13	34, 35	5	26, 35	23, 26	EXTENDS ACROSS TOWNSHIP	28, 33	25	25, 36
NEAREST TRADING POINT AND P O.	GRANDVIEW	GRANDVIEW	CABLE	DRUMMOND	CABLE	DRUMMOND	CABLE	CABLE	DRUMMOND	DRUMMOND	CABLE	CABLE
AREA IN ACRES	159	80	48	48	168	80		32	1396	25	125	68
MAXIMUM DEPTH IN FT	25	31	15	26	19	VERY SHALLOW	7	39	87	16	45	39
GAME FISH IN LAKE NOW	L. M. BASS S. M. BASS N. PIKE SUNFISH PERCH BULLHEAD	BASS N PIKE SUNFISH ROCK BASS PERCH	BASS SUNFISH PERCH	BASS SUNFISH PERCH BULLHEAD	BASS PERCH			BASS SUNFISH PERCH BULLHEAD	L. M. BASS S.M. BASS N. PIKE W. E. PIKE CRAPPIES SUNFISH	BASS N. PIKE PERCH	BASS SUNFISH	L. M. BASS N. PIKE SUNFISH
FISH SUITABLE FOR PLANTING	L. M. BASS S. M. BASS SUNFISH	L. M. BASS S. M. BASS SUNFISH	L. M. BASS SUNFISH	L. M. BASS	L. M. BASS	SHOULD HAVE REGULATORY DAM AND A PLANTING OF DUCK FOOD	GOOD FOR DUCKS COONTAIL SHOULD BE PLANTED	S. M. BASS	S. M. BASS W. E. PIKE CRAPPIES	BASS	L. M. BASS SUNFISH	L. M. BASS SUNFISH
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	BROWN MEDIUM	BROWN MEDIUM	CLEAR SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	BROWN MEDIUM HARD	BROWN MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	BROWN MEDIUM HARD	CLEAR VERY SOFT	CLEAR VERY SOFT
AQUATIC VEGETATION	ABUNDANT AND VARIED	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT AND VARIED	FAIRLY ABUNDANT	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD	HARDWOOD AND CLEARED LAND	POPPLE	HARDWOOD AND PINE	PINE AND HARDWOOD AND CLEARED LAND	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	CEDAR AND TAMARACK SWAMP	HARDWOOD	HARDWOOD

BAYFIELD COUNTY	T. 44 N. R. 8 W.	TOWN 44 NORTH – RANGE 9 WEST									TOWN 45 NORTH – RANGE 5 WEST	
NAME OF LAKE	WILAPIRO	BONY	EAU CLAIRE LOWER	EAU CLAIRE MIDDLE	EAU CLAIRE UPPER	MUD	PICKEREL	ROBINSON	SMITH	SWEET	INDIAN	MARENGO
LAKE IN SECTIONS	36	4, 5, 8, 9	19, 30	8, 17, 20	2, 3, 9, 10, 11	3, 4, 9	4, 5	3, 4	2	1 2	23	34
NEAREST TRADING POINT AND P.O.	CABLE	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	GRANDVIEW	GRANDVIEW
AREA IN ACRES	64	220	528	853	1080	148	96	48	80	136	40	35
MAXIMUM DEPTH IN FT.	23	34	39	65	81	6	38	35	9	39	31	25
GAME FISH IN LAKE NOW	L. M. BASS W. E. PIKE CRAPPIES SUNFISH PERCH	L. M. BASS SUNFISH ROCK BASS PERCH	L. M. BASS N. PIKE W. E. PIKE SUNFISH ROCK BASS PERCH	L. M. BASS S. M. BASS N. PIKE W. E. PIKE SUNFISH ROCK BASS PERCH	N. PIKE SUNFISH ROCK BASS PERCH L. M. BASS S. M. BASS	L. M. BASS N. PIKE SUNFISH ROCK BASS PERCH	L. M. BASS S. M. BASS N. PIKE CRAPPIES SUNFISH	L. M. BASS N. PIKE SUNFISH ROCK BASS PERCH CRAPPIES	L. M. BASS S. M. BASS N. PIKE W. E. PIKE CRAPPIES SUNFISH PERCH	PERCH SUNFISH CRAPPIES N. PIKE W. E. PIKE L. M. BASS S. M. BASS	L. M. BASS CRAPPIES	L. M. BASS N. PIKE W. E. PIKE SUNFISH PERCH
FISH SUITABLE FOR PLANTING	L. M. BASS SUNFISH BULLHEAD	L. M. BASS S. M. BASS SUNFISH	CRAPPIES	W.E. PIKE CRAPPIE	L. M. BASS S. M. BASS		L. M. BASS SUNFISH	L. M. BASS S. M. BASS CRAPPIES		L.M. BASS S.M. BASS	L. M. BASS	L. M. BASS CRAPPIES
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET SPRING FED	LANDLOCKED	OUTLET	INLET AND OUTLET SPRING LAKE	OUTLET SPRING LAKE	LANDLOCKED	OUTLET
WATER IS	CLEAR VERY SOFT	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR MEDIUM	CLEAR SOFT	CLEAR HARD	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR SOFT	MEDIUM HARD
AQUATIC VEGETATION	SCARCE	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE	SCARCE	ABUNDANT	ABUNDANT	ABUNDANT	MODERATELY ABUNDANT	ABUNDANT
LAND COVER SURROUNDING LAKE	PINE AND HARDWOOD	POPPLE AND HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND POPPLE	SCRUB OAK AND PINE	SCRUB OAK AND JACK PINE	POPPLE	SCRUB OAK AND JACK PINE	POPPLE	POPPLE AND SWAMP

BAYFIELD COUNTY	TOWN 45 NORTH – RANGE 7 WEST									T. 45 N. R. 8 W.	TOWN 45 NORTH – RANGE 9 WEST	
NAME OF LAKE	ARMSTRONG	BASS NO. 1	BASS NO. 2	BASS NO. 3	BASS NO. 4	FLYNN	MILLPOND	PERCH	STAR	PIGEON	ELLISON	ISLAND
LAKE IN SECTIONS	19, 20	21	20, 21	15, 16	15	30	29, 32	5, 8	9, 10, 11, 15	26, 27, 34, 35	19, 30	7, 8, 17, 18
NEAREST TRADING POINT AN P O	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	DRUMMOND	IRON RIVER
AREA IN ACRES	69	88	50	43	64	74	80	72	320	150	95	111
MAXIMUM DEPTH IN FT.	38	58	48	49	24	19	17	36	27	19	17	47
GAME FISH IN LAKE NOW	L. M. BASS PERCH	L. M. BASS SUNFISH PERCH	L. M. BASS SUNFISH PERCH	L. M. BASS N. PIKE CRAPPIES SUNFISH PERCH	L. M. BASS N. PIKE CRAPPIES PERCH BULLHEAD	BASS SUNFISH PERCH	BASS N. PIKE	BASS SUNFISH PERCH	L. M. BASS S. M. BASS N. PIKE CRAPPIES SUNFISH PERCH	PERCH ROCK BASS CRAPPIES W. E. PIKE L. M. BASS S. M. BASS	L. M. BASS W. E. PIKE SUNFISH PERCH	L. M. BASS ROCK BASS PERCH
FISH SUITABLE FOR PLANTING	SUNFISH	L. M. BASS	L. M. BASS	S. M. BASS	S. M. BASS		CRAPPIES SUNFISH	L. M. BASS	L. M. BASS S. M. BASS	S. M. BASS	L. M. BASS	L. M. BASS SUNFISH
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	INLET	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	GREEN HARD	BROWN HARD	CLEAR VERY SOFT	GREEN MEDIUM HARD	CLEAR SOFT	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR SOFT
AQUATIC VEGETATION	SCARCE	SCARCE	SCARCE	ABUNDANT AND VARIED	ABUNDANT	SCARCE	ABUNDANT AND NOT VARIED	SCARCE	ABUNDANT AND VARIED	SCARCE	ABUNDANT AND VARIED	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD	HARDWOOD	HARDWOOD	POPPLE	POPPLE	PINE AND HARDWOOD	POPPLE	HARDWOOD	HARDWOOD AND POPPLE	PINE AND HARDWOOD	JACK PINE	PINE

BAYFIELD COUNTY	TOWN 45 NORTH - RANGE 9 WEST			TOWN 46 NORTH - RANGE 7 WEST								
NAME OF LAKE	KELLY	PIKE	TOMAHAWK	BASS	BULLHEAD	CAMP 1	DEEP	DELTA	DOLLAR	EVERETT	KERN	LONG
LAKE IN SECTION	23, 26	20	19, 20	28, 29	8	4,5	4	7, 18	8	18	27, 34	29
NEAREST TRADING POINT AND P.O.	DRUMMOND	DRUMMOND	DRUMMOND	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA
AREA IN ACRES	56	136	160	80	6	64	30	272	6	32	136	80
MAXIMUM DEPTH IN FT.	14	34	20	18	46	35	56	38	NOT SOUNDED	50	14	32
GAME FISH IN IN LAKE NOW	L.M. BASS PERCH	BASS PERCH	BASS SUNFISH PERCH	L M BASS W E PIKE CRAPPIES PERCH	BULLHEAD	L M BASS SUNFISH PERCH	L. M BASS	BASS N. PIKE W E PIKE SUNFISH PERCH	BASS SUNFISH	L. M BASS N. PIKE W E PIKE SUNFISH PERCH	BASS PERCH	BASS W E PIKE SUNFISH PERCH
FISH SUITABLE FOR PLANTING	NONE	L M. BASS S. M. BASS	L M. BASS S. M. BASS	KEEP PIKE OUT		L M BASS	SUNFISH	CRAPPIES		L M BASS S M BASS		S M BASS L M BASS SUNFISH
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR VERY SOFT	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR VERY SOFT	VERY SOFT	BROWN VERY SOFT	VERY SOFT	CLEAR MEDIUM HARD	BROWN MEDIUM	CLEAR MEDIUM	CLEAR VERY SOFT	CLEAR MEDIUM
AQUATIC VEGETATION	SCARCE	ABUNDANT	ABUNDANT	SCARCE	SCARCE	SCARCE	SCARCE	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE	ABUNDANT
LAND COVER SURROUNDING LAKE	YOUNG PINE AND POPPLE	SCRUB OAK AND PINE	SCRUB OAK AND PINE	SPRUCE SWAMP AND POPPLE	PINE AND HARDWOOD	POPPLE	HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND POPPLE	POPPLE	HEMLOCK AND HARDWOOD

BAYFIELD COUNTY	TOWN 46 NORTH - RANGE 7 WEST		TOWN 46 NORTH - RANGE 8 WEST									T 47 N - R 7 W
NAME OF LAKE	PANTHEON	SPRING (PRIVATE)	BASSWOOD	BELL	CANTHOOK (HAPPLE)	HILDUR	INCH	MURRY	SPIRIT	SWEDE	TROUT (STEEL HEAD)	DEER LODGE
LAKE IN SECTION	6	19, 20	13	13	10, 15	2	3	3	12, 13	12	9	32
NEAREST TRADING POINT AND P O	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	DELTA	IRON RIVER
AREA IN ACRES	54	214	80	32	50	96	48	200	40	48	30	40
MAXIMUM DEPTH IN FT	38	10	5	37	24	66	41	43	28	20	18	19
GAME FISH IN LAKE NOW	BASS N. PIKE SUNFISH PERCH	TROUT	L. M. BASS N. PIKE SUNFISH PERCH	L M BASS N. PIKE SUNFISH PERCH	BASS PERCH	L M BASS N. PIKE W E. PIKE CRAPPIES MUSKELLUNGE PERCH SUNFISH	L. M. BASS SUNFISH	BULLHEAD PERCH MUSKELLUNGE SUNFISH CRAPPIES N. PIKE W E. PIKE L. M. BASS S. M. BASS	BASS N. PIKE CRAPPIES PERCH	BASS SUNFISH ROCK BASS PERCH	BASS PERCH	L M BASS PERCH
FISH SUITABLE FOR PLANTING	L. M. BASS SUNFISH		L. M. BASS SUNFISH	L M BASS SUNFISH	L. M BASS	W E PIKE CRAPPIES	L. M. BASS SUNFISH	W. E. PIKE CRAPPIES MUSKELLUNGE	CRAPPIES	L. M. BASS SUNFISH	L M BASS	L M BASS
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	INLET AND OUTLET SPRING FED	INLET AND OUTLET SPRING FED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	INLET AND OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR VERY SOFT	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR VERY SOFT	CLEAR SOFT	CLEAR MEDIUM HARD	CLEAR SOFT	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT
AQUATIC VEGETATION	SCARCE	ABUNDANT	ABUNDANT	SCARCE	SCARCE	ABUNDANT	SCARCE	ABUNDANT	SCARCE	SCARCE	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	PINE AND POPPLE	PINE AND HARDWOOD	HARDWOOD	HARDWOOD	HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	HARDWOOD	HARDWOOD	HARDWOOD	HARDWOOD

BAYFIELD COUNTY	TOWN 47 NORTH - RANGE 7 WEST			TOWN 47 NORTH - RANGE 8 WEST								
NAME OF LAKE	SNAG	SPIDER	TWIN LAKES	ANGUS	BASS	BISMARCK	BUSKEY	CROOKED & DUCK	FIVE ISLAND	LONG	MILLICENT	MOON
LAKE IN SECTION	19	15, 22	17, 20	17	33	18, 30	21, 28	25, 26, 35, 36	34, 35	3, 2	21, 22, 27, 28	17, 18
NEAREST TRADING POINT AND P O	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER
AREA IN ACRES	30	26	24	25	51	101	195	175	64	242	204	31
MAXIMUM DEPTH IN FT	19	12	19	17	7	11	32	NOT SOUNDED	26	21	53	19
GAME FISH IN LAKE NOW	L M BASS PERCH	L M BASS N PIKE W E PIKE PERCH	PERCH	L M BASS		L M BASS N PIKE PERCH	L M BASS S M BASS MUSKELLUNGE N PIKE W E PIKE SUNFISH PERCH		S M BASS SUNFISH PERCH	L M BASS N PIKE W E PIKE SUNFISH PERCH	L M BASS S M BASS MUSKELLUNGE N PIKE W E PIKE SUNFISH PERCH	L M BASS PERCH
FISH SUITABLE FOR PLANTING	L M BASS SUNFISH	L M BASS	L M BASS SUNFISH	L M BASS SUNFISH			ANY GAME FISH SUITABLE FOR WHITE RIVER LAKES		L M BASS	L M BASS S M BASS	ANY GAME FISH SUITABLE FOR WHITE RIVER LAKES	L M BASS S M BASS SUNFISH
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED
WATER IS	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR SOFT	CLEAR VERY SOFT	CLEAR SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR MEDIUM
AQUATIC VEGETATION	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	ABUNDANT	SCARCE	SCARCE	ABUNDANT	ABUNDANT	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD	HARDWOOD	OAK AND JACK PINE	OAK AND JACK PINE	PINE AND HARDWOOD	SPRUCE SWAMP	PINE AND HARDWOOD	PINE AND HARDWOOD	PINE AND HARDWOOD	OAK AND PINE	PINE AND HARDWOOD	PINE AND POPPLE

BAYFIELD COUNTY	TOWN 47 NORTH - RANGE 8 WEST				TOWN 47 NORTH - RANGE 9 WEST					T 48 N - R 9 W.	T 48 N - R 7 W	T 49 N - R 6 W
NAME OF LAKE	RUTH	SPIDER OR MULLENHOFF	TWIN BEAR	WIEHE OR EAGLE	CRYSTAL	DEEP	IRON	PEST HOUSE	SUN OR HOSTRASSER'S	LONG	BLADDER	TWIN LAKE
LAKE IN SECTION	31	18, 19, 20	33 34	27, 33, 34	9	14	23, 24, 25	26, 27	14, 23	1	31	36
NEAREST TRADING POINT AND P O	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	IRON RIVER	WASHBURN	IRON RIVER	WASHBURN
AREA IN ACRES	73	141	200	286	100	112	240	59	15	40	80	70
MAXIMUM DEPTH IN FT.	26	19	56	56	23	26	10	20	13	19	17	24
GAME FISH IN LAKE NOW	L M BASS W E PIKE (DOMINATE) SUNFISH	S M BASS N PIKE SUNFISH	L M BASS S M BASS MUSKELLUNGE N PIKE W E PIKE SUNFISH PERCH	L M BASS S M BASS MUSKELLUNGE N PIKE W E PIKE SUNFISH PERCH	N PIKE W E PIKE PERCH	L M BASS N PIKE SUNFISH PERCH	L M BASS N PIKE SUNFISH PERCH	L M BASS PERCH	N PIKE CRAPPIES SUNFISH PERCH	L M BASS SUNFISH PERCH	L M BASS SUNFISH PERCH	L M BASS PERCH
FISH SUITABLE FOR PLANTING	L M BASS	S M BASS	ANY GAME FISH SUITABLE FOR WHITE RIVER LAKES	ANY GAME FISH SUITABLE FOR WHITE RIVER LAKES	L M BASS SUNFISH	L M BASS	L M BASS	L M BASS SUNFISH	L M BASS	L M BASS	L M BASS	L M BASS S M BASS SUNFISH
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR VERY SOFT	CLEAR SOFT	CLEAR MEDIUM HARD	CLEAR MEDIUM HARD	CLEAR SOFT	CLEAR VERY SOFT	BROWN STAIN SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR SOFT	CLEAR VERY SOFT	CLEAR MEDIUM
AQUATIC VEGETATION	SCARCE	SCARCE	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE	ABUNDANT	SCARCE	SCARCE	SCARCE	SCARCE	ABUNDANT
LAND COVER SURROUNDING LAKE	PINE, HARDWOOD AND CLEARED LAND	POPPLE, JACK PINE AND CLEARED LAND	PINE AND HARDWOOD	PINE AND HARDWOOD	OAK AND POPPLE	OAK AND POPPLE	POPPLE	PINE AND HARDWOOD	POPPLE	OAK AND JACK PINE	PINE	PINE AND HARDWOOD

ASHLAND COUNTY	T. 41 N. R. 1 E.	T. 41 N. R. 1 W.	T. 41 N. R. 3 & 4 W.	T. 43 N. R. 1 W.	T. 43 N. R. 2 W.		T. 42 & 43 N. R. 2 W.	T. 43 N. R. 2 & 3 W.	T. 42 & 43 N. R. 4 W.		T. 43 N. R. 4 W.	T. 44 N. R. 2 W.
NAME OF LAKE	HOFFMAN	BUTTERNUT	BEAR	AUGUSTINE	SUMMITT	GORDON	TORREY	MUD	LITTLE CLAM	UPPER CLAM	TWIN LAKES	GALLILEE
LAKE IN SECTIONS	26, 35	32, 33	31, 36	23, 26	22, 23	28, 33, 34	4, 33	18, 19-13, 24	5, 32	6, 31, 32	21, 22	14, 15, 22, 23
NEAREST TRADING POINT AND P O.	BUTTERNUT	BUTTERNUT	BUTTERNUT	GLIDDEN	GLIDDEN	GLIDDEN	GLIDDEN	GLIDDEN	CLAM LAKE	CLAM LAKE	CLAM LAKE	MELLEN
AREA IN ACRES	100	194 IN ASHLAND CO.	175	157	95	157	25	125	170	195	90	217
MAXIMUM DEPTH IN FT.	23	22	FLOWAGE LAKE NOT SOUNDED	SHALLOW	SHALLOW	32	36	10	8	17	13	22
GAME FISH IN LAKE NOW	L. M. BASS S. M. BASS PERCH	L. M. BASS S M. BASS MUSKELLUNGE W. E. PIKE BLUE GILLS ROCK BASS PERCH	L. M BASS S. M. BASS MUSKELLUNGE W. E. PIKE BLUE GILLS ROCK BASS PERCH	L. M. BASS PERCH SUNFISH	PERCH SUNFISH	L. M. BASS S. M. BASS MUSKELLUNGE W. E. PIKE CRAPPIES BLUE GILLS ROCK BASS PERCH	L. M. BASS S M. BASS PERCH SUNFISH	L. M. BASS S. M. BASS BLUE GILLS PERCH	L. M. BASS S. M. BASS BULLHEADS BLUE GILLS CRAPPIES PERCH	L. M BASS S M. BASS MUSKELLUNGE BLUE GILLS ROCK BASS CRAPPIES	L M BASS BLUE GILLS MUSKELLUNGE PERCH ROCK BASS	L M BASS S M BASS W E PIKE CRAPPIES BLUEGILLS ROCK BASS PERCH
FISH SUITABLE FOR PLANTING	L M BASS S. M. BASS SUNFISH	MUSKELLUNGE L M BASS S M BASS	ALL FISH COMMON TO CHIPPEWA RIVER	S. M BASS	L. M. BASS (CRAPPIES) BLUE GILLS	L M BASS S. M. BASS MUSKELLUNGE W. E. PIKE	L. M. BASS S. M. BASS (CRAPPIES) BLUE GILLS	L. M. BASS S. M. BASS BLUE GILLS ROCK BASS	S. M. BASS (CRAPPIES) L M BASS	L M BASS MUSKELLUNGE CRAPPIES W E PIKE	L M BASS BLUEGILLS	L M BASS N PIKE
LAKE HAS AN OUTLET OR IS LANDLOCKED	SEASONAL OUTLET	OUTLET	OUTLET	OUTLET	SEASONAL OUTLET	OUTLET WITH REGULATORY DAM	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET
WATER IS	CLEAR MEDIUM	SLIGHTLY GREEN MEDIUM	BROWN MEDIUM HARD	CLEAR MEDIUM	CLEAR SOFT SPRING FED	CLEAR MEDIUM	CLEAR SOFT	SLIGHTLY BROWN SOFT	CLEAR VERY SOFT	BROWN MEDIUM	VERY SOFT	CLEAR MEDIUM
AQUATIC VEGETATION	MODERATELY ABUNDANT	MODERATELY ABUNDANT	ABUNDANT AND VARIED	MODERATELY ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	SCARCE	SCARCE	MODERATELY ABUNDANT	SCARCE	ABUNDANT
LAND COVER SURROUNDING LAKE	SWAMP FOREST	HARDWOOD AND CLEARED LAND	HARDWOOD	HARDWOOD	HARDWOOD CLEARED LAND AND SWAMP	HARDWOOD CLEARED LAND AND SWAMP	HARDWOOD AND SWAMP	SWAMP FOREST	HARDWOOD AND PINE	HARDWOOD AND PINE	HARDWOOD AND CONIFERS	HARDWOOD

ASHLAND COUNTY	TOWN 44 NORTH RANGE 2 WEST					T.44N.- R.3 W.	T.44 N.- R.4 W.					
NAME OF LAKE	LELAND	EUREKA	TWIN LAKES	MEDER	CAROLINA	ENGLISH	MINERAL					
LAKE IN SECTION	29, 32	14	13, 23, 24	20	24, 25	4, 5, 7, 8, 9	11, 12, 13, 14					
NEAREST TRADING POINT & P O	MELLEN	MELLEN	MELLEN	MELLEN	MELLEN	MELLEN	MELLEN					
AREA IN ACRES	125	82	90	200	160	238	256					
MAXIMUM DEPTH IN FT.	15	NOT SOUNDED	10	12	12	40	15					
GAME FISH IN LAKE NOW	L M BASS S M. BASS SUNFISH W. E. PIKE PERCH & CRAPPIES ROCK BASS	L M BASS MUSKELLUNGE SUNFISH BLUEGILLS	L M BASS S M BASS SUNFISH PERCH	L M BASS W E PIKE BLUEGILLS PERCH	YELLOW PERCH	L M. BASS W. E. PIKE MUKELLUNGE ROCK BASS BLUEGILLS SUNFISH CRAPPIES	L M. BASS ROCK BASS BLUEGILLS SUCKERS					
FISH SUITABLE FOR PLANTING	L M. BASS S M. BASS (CRAPPIES) BLUEGILLS	L M BASS MUSKELLUNGE BLUEGILLS	L M BASS S M. BASS BLUEGILLS	L & S M BASS CRAPPIES BLUEGILLS	L & S M BASS (CRAPPIES)	L. M. BASS W E. PIKE MUSKELLUNGE	L M BASS					
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET - BUT DAMMED BY BEAVER	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET					
WATER IS	CLEAR-MEDIUM	CLEAR-SOFT	SLIGHTLY BROWN MEDIUM	BROWN-MEDIUM	CLEAR-MEDIUM							
AQUATIC VEGETATION	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT & VARIED	ABUNDANT & VARIED					
LAND COVER SURROUNDING LAKE	HARDWOOD	HARDWOOD	HARDWOOD AND CONIFERS	HARDWOOD	HARDWOOD AND HEMLOCK	HARDWOODS	HARDWOODS					

IRON CO.	T. 41 N. - R. 2 E.	TOWN 41 NORTH - RANGE 3 EAST.										
NAME OF LAKE	LITTLE ISLAND	FAUN	THREE SISTER LAKE	SHOE - BOOT	TEKE	STONE	ESS	FRENCH	MYSTERY	CHARMLEY	SPRINGSTEAD	BIG MUSKIE
LAKE IN SECTION	13	5,6	7	8,16,17	15	16,21	16,17	17,18	19	20	20, 21, 28	22
NEAREST TRADING POINT AND POSTOFFICE	PARK FALLS	PARK FALLS	PARK FALLS	PARK FALLS	MANITOWISH	PARK FALLS	PARK FALLS	PARK FALLS	PARK FALLS	PARK FALLS	PARK FALLS	PARK FALLS
AREA IN ACRES	55	44	45	170	45	75	50	130	15	70	210	85
MAXIMUM DEPTH IN FEET	18	33	31	32	12	28	22	25	19	22	30	25
GAME FISH IN LAKE NOW	BASS BLUEGILLS PERCH	BASS PERCH	L.M. BASS PERCH	CRAPPIES PERCH L.M. BASS BULL HEADS	L.M. BASS PERCH	MUSKELLUNGE L.M. BASS S.M. BASS CRAPPIES BLUEGILLS ROCKBASS PERCH	L.M. BASS PERCH BLUE GILLS	BASS MUSKELLUNGE BLUEGILLS PERCH	NO REPORT	L.M. BASS PERCH BLUE GILLS	L.M. BASS S.M. BASS W.E. PIKE BLUEGILLS	MUSKELLUNGE L.M. BASS S.M. BASS CRAPPIES BLUEGILLS ROCKBASS PERCH W.E. PIKE
FISH SUITABLE FOR STOCKING	L.M. BASS	L.M. BASS	L.M. BASS	L.M. BASS S.M. BASS BLUEGILLS	L.M. BASS	MUSKELLUNGE L.M. BASS S.M. BASS	L.M. BASS	L.M. BASS MUSKELLUNGE		L.M. BASS	L M BASS	MUSKELLUNGE L.M. BASS S.M. BASS
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET
WATER IS	SOFT CLEAR	SOFT CLEAR	SOFT CLEAR	MEDIUM SLIGHTLY STAINED	SOFT CLEAR	MEDIUM CLEAR	SOFT CLEAR	SOFT CLEAR	MEDIUM CLEAR	SOFT CLEAR	MEDIUM HARD CLEAR	MEDIUM SLIGHTLY COLORED
AQUATIC VEGETATION	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	ABUNDANT	SCARCE	VERY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	ABUNDANT	FAIRLY ABUNDANT	ABUNDANT VARIED	VARIED NOT ABUNDANT
LAND COVER SURROUNDING LAKE	FOREST SWAMP	POPPLE FOREST	SWAMP POPPLE FOREST	BALSAM POPPLE SPRUCE FOREST	POPPLE FOREST	HARDWOOD HEMLOCK FOREST	SWAMP HARDWOOD FOREST	POPPLE FOREST	SWAMP FOREST	HARDWOOD PINE	HARDWOOD SWAMP FOREST	PINE HARDWOOD SWAMP FOREST

IRON CO	TOWN 41 NORTH - RANGE 3 EAST								TOWN 41 NORTH - RANGE 4 EAST			
NAME OF LAKE	FERRY	BEAR SKULL	LITTLE MUSKIE	Mc DERMOTT	SWAMP	PINE	FLAMBEAU FLOWAGE	SARDINE	FLAMBEAU	RANDALL	CAPTAIN HENRY	
LAKE IN SECTION	23	26, 25	29	30	32	35, 36, 31 AND PRICE COUNTY	COVERS MANY SECTIONS	1, 12 AND 7 IN T41-R4E.	13, 24	17, 20	20, 29	23, 24
NEAREST TRADING POINT AND POSTOFFICE	PARK FALLS	PARK FALLS	PARK FALLS	PARK FALLS	PARK FALLS	PARK FALLS	MERCER AND MANITOWISH	MANITOWISH	LAC DU FLAMBEAU	MANITOWISH	MANITOWISH	LAC DU FLAMBEAU
AREA IN ACRES	95	85	50	80	45	440 IN IRON CO.		40	85	115	35	40
MAXIMUM DEPTH IN FEET	20	24	18	18	19	34	NOT SOUNDED	18	12	22	20	18
GAME FISH IN LAKE NOW	L.M. BASS PERCH BLUE GILLS	MUSKELLUNGE W.E. PIKE L.M. BASS N. PIKE ROCKBASS BLUEGILLS CRAPPIES PERCH	MUSKELLUNGE W.E. PIKE L.M. BASS S.M. BASS PERCH	L.M. BASS PERCH BLUEGILLS	L.M. BASS PERCH	MUSKELLUNGE W.E. PIKE L.M. BASS S.M. BASS CRAPPIES BLUEGILLS PERCH	FISH COMMON TO RIVERS SYSTEM	L.M. BASS PERCH BLUEGILLS	L.M. BASS PERCH	L.M. BASS PERCH S.M. BASS MUSKELLUNGE N. PIKE W.E. PIKE	L.M. BASS S.M. BASS BLUEGILLS PERCH	BASS PERCH
FISH SUITABLE FOR STOCKING	L.M. BASS	ANY GAME FISH COMMON TO LAKE	MUSKELLUNGE S.M. BASS	L.M. BASS	L.M. BASS BLUEGILLS CRAPPIES	MUSKELLUNGE L.M. BASS S.M. BASS		L.M. BASS		MUSKELLUNGE S.M. BASS	L.M. BASS S.M. BASS	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET
WATER IS	MEDIUM CLEAR	MEDIUM CLEAR	MEDIUM CLEAR	MEDIUM CLEAR	MEDIUM CLEAR	MEDIUM HARD SLIGHLY STAINED	MEDIUM HARD	MEDIUM STAINED	CLEAR SOFT	MEDIUM HARD CLEAR	CLEAR SOFT	MEDIUM CLEAR
AQUATIC VEGETATION	ABUNDANT	ABUNDANT IN PARTS	ABUNDANT	FAIRLY ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	SCARCE	FAIRLY ABUNDANT
LAND COVER SURROUNDING LAKE	CLEARED LAND POPPLE FOREST	PINE, HARDWOOD, SWAMP FOREST	SWAMP HARDWOOD FOREST	CLEARED LAND HEMLOCK FOREST	SWAMP FOREST	SWAMP AND HARDWOOD FOREST	SWAMP HARDWOOD FOREST	SWAMP FOREST	HARDWOOD AND PINE FOREST	HARDWOOD FOREST	HARDWOOD FOREST	SWAMP FOREST

IRON CO	TOWN 42N RANGE 2 E			TOWN 42N RANGE 3E			TOWN 42N. RANGE 4 E		TOWN 43N. RANGE 2E			T 43N.-R 3 E.
NAME OF LAKE	BLACK OR BIRGE	FOX	SAND	SOUTH PIKE	GRANT	WILSON	SANDY BEACH	BASS OR MUD	MOOSE	MOON	LITTLE MOOSE	BEAUMONT
LAKE IN SECTION	1	2,11	24	2,3	13.14.23.24	15.16.21.22	22.23	23,14	2.3.10	10	11	9.16
NEAREST TRADING POINT AND POSTOFFICE	MERCER	MERCER	MERCER	MERCER	MANITOWISH	MANITOWISH	MANITOWISH	MANITOWISH	MERCER	MERCER	MERCER	MERCER
AREA IN ACRES	120	40	45	135	95	155	130	40	300	35	40	40
MAXIMUM DEPTH IN FEET	18	16	20	28	12	22	20	6	12	12	12	22
GAME FISH IN LAKE NOW	MUSKELLUNGE L M BASS N. PIKE PERCH	L.M BASS S. M. BASS PERCH	MUSKELLUNGE L M BASS BLUEGILLS PERCH	MUSKELLUNGE W.E. PIKE L.M BASS	MUSKELLUNGE W E PIKE L. M. BASS S M. BASS PERCH	L M BASS S.M BASS BLUEGILLS ROCK BASS	MUSKELLUNGE L M BASS BLUEGILLS PERCH S.M. BASS	L.M BASS MUSKELLUNGE BULLHEADS	MUSKELLUNGE N PIKE W.E PIKE BLUEGILLS ROCK BASS	MUSKELLUNGE	MUSKELLUNGE W.E. PIKE BASS ROCK BASS PERCH	L. M. BASS PERCH
FISH SUITABLE FOR STOCKING	MUSKELLUNGE CRAPPIES	S M. BASS CRAPPIES	L.M. BASS	MUSKELLUNGE L M BASS	MUSKELLUNGE S.M BASS	L M BASS	L M BASS	L M. BASS	MUSKELLUNGE	S.M. BASS	S.M BASS	L M. BASS CRAPPIES
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	POSSIBLY SEASONAL	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED
WATER IS	CLEAR SOFT	CLEAR SOFT	CLEAR SOFT	FAIRLY CLEAR MEDIUM	CLEAR MEDIUM	SLIGHTLY COLORED SOFT	CLEAR MEDIUM	BROWN MEDIUM	BROWN MEDIUM	STAINED SOFT	CLEAR SOFT	FAIRLY CLEAR SOFT
AQUATIC VEGETATION	FAIRLY ABUNDANT	ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	SCARCE	ABUNDANT	ABUNDANT WILD RICE BED	ABUNDANT NOT VARIED	ABUNDANT	SCARCE	FAIRLY ABUNDANT
LAND COVER SURROUNDING LAKE	SWAMP AND HARDWOOD FOREST	SWAMP FOREST	HARDWOOD FOREST	SWAMP AND HARDWOOD FOREST	SWAMP AND HARDWOOD FOREST	POPPLE FOREST	SWAMP AND HARDWOOD FOREST	SWAMP FOREST	SWAMP AND HARDWOOD	SWAMP AND HARDWOOD	SWAMP AND HARDWOOD	SWAMP FOREST

IRON CO	TOWN 43N.-RANGE 3E											
NAME OF LAKE	CRAMER - WEST -	CRAMER - EAST -	BEAR.	RICE	TANK	BLUEGILL	ECHO	PIKE	CRYSTAL	LAKE OF THE FALLS	TAHOE	MERCER
LAKE IN SECTION	11	11	14, 23	23, 24, 25, 26	25,36 & T43N-R4E.	25,26	24, 25	27, 28	27, 33, 34	29 30 31 32	35.	35,36
NEAREST TRADING POINT AND POSTOFFICE	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER -	MERCER	MERCER	MERCER	MERCER	MERCER
AREA IN ACRES	27	52	35	57	165	22	40	20	125	375	83	300
MAXIMUM DEPTH IN FEET	23	29	16	20.	43	19	22	76	43	22	28	34
GAME FISH IN LAKE NOW	L.M. BASS PERCH	L.M. BASS PERCH	N. PIKE PERCH	MUSKELLUNGE W.E PIKE L.M. & S.M. BASS CRAPPIES BLUEGILLS PERCH	MUSKELLUNGE W.E PIKE L.M. & S.M. BASS CRAPPIES BLUEGILLS PERCH	L.M. BASS CRAPPIES PERCH	ALL GAME FISH COMMON TO TURTLE CHAIN	ALL GAME FISH COMMON TO TURTLE CHAIN	L.M. BASS BLUEGILLS PERCH	ALL GAME FISH COMMON TO TURTLE CHAIN	L M BASS S.M BASS	MUSKELLUNGE W.E PIKE L.M. & S.M. BASS CRAPPIES BLUEGILLS PERCH
FISH SUITABLE FOR STOCKING	L.M. BASS CRAPPIES	L M. BASS CRAPPIES	S M. BASS CRAPPIES			L.M. BASS CRAPPIES			L.M BASS	ALL GAME FISH IN TURTLE CHAIN		FISH COMMON TO FLAMBEAU FLOWAGE
LAKE HAS OUTLET OR IS LANDLOCKED	SEASONAL OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET
WATER IS	FAIRLY CLEAR SOFT	FAIRLY CLEAR SOFT	SLIGHT BROWN SOFT	FAIRLY CLEAR MEDIUM HARD	FAIRLY CLEAR MEDIUM	FAIRLY CLEAR MEDIUM	FAIRLY CLEAR MEDIUM HARD	FAIRLY CLEAR MEDIUM HARD	CLEAR VERY SOFT	FAIRLY CLEAR MEDIUM HARD	FAIRLY CLEAR SOFT	FAIRLY CLEAR MEDIUM HARD
AQUATIC VEGETATION	FAIRLY ABUNDANT	FAIRLY ABUNDANT	VERY ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT AND VARIED	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	ABUNDANT
LAND COVER SURROUNDING LAKE	HARDWOOD AND SWAMP FOREST	SWAMP AND HARDWOOD FOREST	POPPLE AND SWAMP FOREST	SWAMP AND HARWOOD FOREST	CLEARED LAND AND HARDWOOD FOREST	SWAMP FOREST	PINE AND SWAMP FOREST	POPPLE FOREST	HARDWOOD FOREST	HARDWOOD FOREST	HARDWOOD AND SWAMP FOREST	HARDWOOD FOREST

IRON CO.	TOWN 43N.- RANGE 4E.					TOWN 43N.- RANGE 4E.						
NAME OF LAKE	TWO LAKES	DU PAGE		BEAUTY		TWIN LAKES	FISHER	MUD	LITTLE OXBOW	BIG OXBOW	SPIDER	SUGAR
LAKE IN SECTION	27	28	34	35	32.33	1.2	2.3 AND IN T44N R4E	2.11	7	7.18	7.6.17.18	10
NEAREST TRADING POINT AND POSTOFFICE	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER
AREA IN ACRES	N. 25 S. 30	40	35	320	60	40	456	25	40	100	250	25
MAXIMUM DEPTH IN FEET	N. 22 S. 18	37	12	22	29	16	40	12	6	6	47	18
GAME FISH IN LAKE NOW		L.M. BASS PERCH	L.M. BASS PERCH	L.M. BASS R. BASS PERCH	L.M. BASS PERCH	L.M. BASS BLUEGILLS MUSKELLUNGE	ALL FISH COMMON TO TURTLE RIVER WATERS	ALL FISH COMMON TURTLE RIVER WATERS	ALL FISH COMMON TO TURTLE RIVER WATERS	ALL FISH COMMON TO TURTLE RIVER WATERS	ALL FISH COMMON TURTLE RIVER WATERS	L.M.& ROCK BASS
FISH SUITABLE FOR STOCKING		L.M & S.M. BASS		L.M. BASS - CRAPPIES			MUSKELLUNGE S.M. BASS CRAPPIES	STOCKING NOT NECESSARY			S.M. BASS CRAPPIES	L.M. BASS
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED
WATER IS	CLEAR MEDIUM HARD	SLIGHTLY BROWN SOFT	CLEAR SOFT	FAIRLY CLEAR MEDIUM	CLEAR SOFT	FAIRLY SOFT	FAIRLY CLEAR MEDIUM	FAIRLY CLEAR MEDIUM	FAIRLY CLEAR MEDIUM HARD	FAIRLY CLEAR MEDIUM HARD	BROWN MEDIUM HARD	FAIRLY CLEAR SOFT
AQUATIC VEGETATION	FAIRLY ABUNDANT	ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	FAIRLY ABUNDANT
LAND COVER SURROUNDING LAKE	HARDWOOD	"	"	"	"	"	"	"	"	"	"	"

IRON CO.	TOWN 43 N.- RANGE 4 E.								TOWN 44 N.- RANGE 1 E.			
NAME OF LAKE	CEDAR	BASS	LITTLE MARTHA	PAYMENT	ECHO *	MARGARET	MARTHA		O'BRIEN	FIFTEEN	SACK OR MUD	PLEASANT
LAKE IN SECTION	13.14	14.23	17.20	20.21	24.25	16.21	29.30.31.32	33.34	8.17	15	23.24	27.34
NEAREST TRADING POINT AND POSTOFFICE	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER		UPSON	UPSON	MERCER	MERCER
AREA IN ACRES	225	200	80	160	320	30	380	40	80	80	80	100
MAXIMUM DEPTH IN FEET	20	27	37	25	22	22	55	29			18	33
GAME FISH IN LAKE NOW	MUSKELLUNGE W.E. PIKE L.M.& S.M. BASS ROCK BASS BLUEGILLS	L.M. BASS PERCH	L.M.& S.M. BASS W.E. PIKE CRAPPIES MUSKELLUNGE PERCH	L.M. BASS BLUEGILLS PERCH	L M BASS S.M. BASS MUSKELLUNGE W.E. PIKE	L.M. BASS BLUEGILLS PERCH	MUSKELLUNGE L.M. & S.M. BASS W.E. PIKE SUNFISH PERCH	L.M. BASS BLUEGILLS PERCH	L.M. BASS BLUEGILLS PERCH	L.M. BASS BLUEGILL'S PERCH	L.M. BASS PERCH	L.M. BASS CRAPPIES BLUEGILLS
FISH SUITABLE FOR STOCKING	S.M. BASS MUSKELLUNGE		FISH COMMON TO LAKE	L.M. BASS CRAPPIES	FISH COMMON TO TURTLE FLOWAGE	L.M.& S.M. BASS CRAPPIES	PROBABLY DOESN'T NEED STOCKING	L.M.& S.M. BASS CRAPPIES	L.M. BASS BLUEGILLS	L.M. BASS BLUEGILLS	L.M. BASS CRAPPIES	L.M.& S.M. BASS CRAPPIES
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED
WATER IS	FAIRLY CLEAR MEDIUM	CLEAR MEDIUM	FAIRLY CLEAR HARD	CLEAR MEDIUM HARD	FAIRLY CLEAR MEDIUM HARD	CLEAR MEDIUM	SLIGHTLY BROWN HARD (MEDIUM)	FAIRLY CLEAR SOFT	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR MEDIUM
AQUATIC VEGETATION	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT	ABUNDANT
LAND COVER SURROUNDING LAKE	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD	PINE HARDWOOD
					* IN T43N. R.3W.							

IRON CO.	TOWN 44 NORTH-RANGE 2 EAST		TOWN 44 NORTH-RANGE 3 EAST		TOWN 44 NORTH- RANGE 4 EAST							
NAME OF LAKE	RUBY	ISLAND	PINE	LITTLE PINE	LAKE NINE	HEWETT	LAKE 15	OAK	PARDEE	OWL		LONG
LAKE IN SECTION	19, 20	19, 30 AND PARTLY IN 44N R 1E	20, 28, 29, 32, 33	28, 33	9	10, 15	15	16, 21	13, 24 AND VILAS CO	15, 22, 23	16, 19	19, 18, 26, 29, 30, 31, 32
NEAREST TRADING POINT AND POSTOFFICE	MONTREAL	MONTREAL	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER
AREA IN ACRES	40	400	500	30	25	120	35	80	300	150	25	640
MAXIMUM DEPTH IN FEET	20	24	30	18	18	38	12	34	43	46	14	28
GAME FISH IN LAKE NOW	L. M. BASS PERCH	MUSKELLUNGE W. E. PIKE L. M. BASS CRAPPIES	L. M. BASS CRAPPIES PERCH BLUEGILLS	L M BASS CRAPPIES PERCH BLUEGILLS	L. M. BASS PERCH BLUEGILLS	L M. BASS S. M. BASS MUSKELLUNGE W. E PIKE ROCK BASS BLUEGILLS PERCH	L M BASS PERCH BLUEGILLS	L M BASS S M BASS MUSKELLUNGE W E PIKE BLUEGILLS ROCK BASS PERCH	MUSKELLUNGE L M BASS S M BASS PERCH	L. M. BASS MUSKELLUNGE W E PIKE ROCK BASS BLUEGILLS PERCH S M BASS	L M BASS PERCH	MUSKELLUNGE W E PIKE L M BASS CRAPPIES PERCH BLUEGILLS
FISH SUITABLE FOR STOCKING	L. M. BASS CRAPPIES	MUSKELLUNGE L. M. BASS CRAPPIES	MUSKELLUNGE CRAPPIES	MUSKELLUNGE CRAPPIES	L M BASS BLUEGILLS	S M BASS MUSKELLUNGE CRAPPIES	L M. BASS BLUEGILLS	L M BASS S M BASS		S M BASS MUSKELLUNGE CRAPPIES	L M BASS	MUSKELLUNGE W E PIKE CRAPPIES
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET
WATER IS	FAIRLY CLEAR MEDIUM	FAIRLY CLEAR SOFT	FAIRLY CLEAR MEDIUM HARD	CLEAR MEDIUM	CLEAR MEDIUM	CLEAR SOFT	FAIRLY CLEAR MEDIUM	CLEAR SOFT	CLEAR SOFT	VERY SOFT	FAIRLY CLEAR SOFT	FAIRLY CLEAR MEDIUM
AQUATIC VEGETATION	ABUNDANT	ABUNDANT	ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	SCARCE	FAIRLY ABUNDANT	FAIRLY ABUNDANT	VERY ABUNDANT	SCARCE	FAIRLY ABUNDANT
LAND COVER SURROUNDING LAKE	HARDWOODS AND CONIFERS	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃

IRON CO	TOWN 44N. - RANGE 4 E								TOWN 45N-RANGE 1 W		T 46 N - R 3E	
NAME OF LAKE	VIRGIN	LITTLE OWL LAKE	LAKE 25	HAWK	PORK & BEAN	LITTLE FISHER	FISHER	TWO LAKES	UPSON	WEBER	LAVINA	
LAKE IN SECTION	21, 22	22	25 AND VILAS CO	28, 33	32 33	34	SEE T 43 N - R 4 E	14	12	5.6	25. 36	
NEAREST TRADING POINT AND POSTOFFICE	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	MERCER	UPSON	UPSON	HURLEY	
AREA IN ACRES	300	40	75	30	35	120		35	35	80		
MAXIMUM DEPTH IN FEET	32	20	12	18	20	10		18-22	18		16	
GAME FISH IN LAKE NOW	L.M & S.M BASS MUSKELLUNGE W.E. PIKE ROCK BASS PERCH BLUEGILLS	L.M BASS PERCH MUSKELLUNGE BLUEGILLS	PAN FISH	L.M BASS PERCH BLUEGILLS	BASS BLUEGILLS CRAPPIES PERCH	MUSKELLUNGE W E PIKE L.M. & ROCK BASS PERCH BLUEGILLS		L M & S M BASS BLUEGILLS PERCH	L M BASS PERCH BLUEGILLS	L M BASS BLUEGILLS PERCH	CRAPPIES PERCH	
FISH SUITABLE FOR STOCKING	MUSKELLUNGE L.M. & S.M. BASS W.E. PIKE	L M BASS BLUEGILLS		L.M BASS	L M BASS	MUSKELLUNGE W.E PIKE		BASS BLUEGILLS	L M BASS BLUEGILLS	L M BASS BLUEGILLS	L M BASS	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET		LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	
WATER IS	CLEAR SOFT	CLEAR MEDIUM	CLEAR SOFT	FAIRLY CLEAR MEDIUM	FAIRLY CLEAR MEDIUM	FAIRLY CLEAR MEDIUM HARD		CLEAR SOFT	CLEAR SOFT	CLEAR SOFT		
AQUATIC VEGETATION	FAIRLY ABUNDANT	FAIRLY ABUNDANT	SCARCE	ABUNDANT	ABUNDANT	ABUNDANT		FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	FAIRLY ABUNDANT	
LAND COVER SURROUNDING LAKE	HARDWOODS AND CONIFERS	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	

LANGLADE COUNTY	T. 30 N. R. 11 E	TOWN 30 NORTH - RANGE 12 EAST					TOWN 31 NORTH-RANGE 12 EAST					T. 31 N.-R. 13 E.
NAME OF LAKE	BEAR	DEMLOW	HILLGER	MEYER	MOOSE	PHLOX POND	JOYCE	GOTO	KENNEDY'S	MUELLER	SCMUHL'S	CLUBHOUSE
LAKE IN SECTION	20, 21	3	28	29	15, 16, 21, 22	26	13	22, 23	31	15, 22	29	21
NEAREST TRADING POINT AND P. O.	ANTIGO	PHLOX	PHLOX	PHLOX	PHLOX	PHLOX	POLAR	POLAR	POLAR	POLAR	POLAR	ELTON
AREA IN ACRES	21	20	21	21	134	27	10	74	18	90	18	11
MAXIMUM DEPTH IN FT	SHALLOW	SHALLOW	SHALLOW	15	21	20	SHALLOW	72	DEEP	37	SHALLOW	14
GAME FISH IN LAKE NOW	BULLHEADS	BROOK TROUT RAINBOW TROUT	SUNFISH PERCH BULLHEADS	L. M. BASS SUNFISH PERCH BULLHEADS	BROOK TROUT RAINBOW TROUT BROWN TROUT PERCH BULLHEADS	RAINBOW TROUT BROOK TROUT PERCH BULLHEADS	S. M. BASS SUNFISH	BROOK TROUT RAINBOW TROUT SUNFISH PERCH	BROOK TROUT RAINBOW TROUT PERCH	W. E. PIKE L. M. BASS S. M. BASS CRAPPIES CALICO BASS BLUEGILLS PERCH CATFISH BULLHEADS	BULLHEADS	BROOK TROUT BROWN TROUT PERCH
FISH SUITABLE FOR PLANTING		BROOK TROUT		L. M. BASS	L. M. BASS BROOK TROUT RAINBOW TROUT	L. M. BASS	NONE	L. M. BASS RAINBOW TROUT		W. E. PIKE AND N. PIKE OR BASS AND N PIKE		BROOK TROUT
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	INLET AND OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET
WATER IS	VERY SOFT BROWN	HARD CLEAR	HARD CLEAR	SOFT GREEN	HARD MILKY	HARD CLEAR	SOFT BROWN	HARD MILKY	HARD MILKY	HARD GREEN	VERY SOFT CLEAR	HARD CLEAR
AQUATIC VEGETATION	SCARCE	ABUNDANT AND FAIRLY VARIED	FAIRLY ABUNDANT	SCARCE	FAIRLY ABUNDANT AND VARIED	SCARCE	SCARCE	ABUNDANT AND VARIED	SCARCE	ABUNDANT AND VARIED	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	LEATHER LEAF BOG AND CLEARED LAND	WHITE CEDAR HARDWOOD	CLEARED LAND	CLEARED LAND	HARDWOOD AND POPPLE	CLEARED LAND	CLEARED LAND AND SWAMP	HARDWOOD	HARDWOOD	HARDWOOD AND CLEARED LAND	HARDWOOD AND SWAMP LAND	OPEN LAND

LANGLADE COUNTY	TOWN 31 NORTH - RANGE 13 EAST					T. 31 N - R 14 E.	T 31 N - R 15 E	TOWN 32 NORTH - RANGE 11 EAST				
NAME OF LAKE	DEADMANS	ELTON	FLORENCE	MC GEE	PUNCH OUT	WHITE LAKE	BOULDER	ANDERSON	BORTH	KIMBALL	NEVA	PERCH
LAKE IN SECTION	32	8, 9	32, 33	28	29	16, 17, 20, 21	20, 29	3, 10	6	6	10	6
NEAREST TRADING POINT AND P. O	ELTON	ELTON	ELTON	ELTON	ELTON	WHITE LAKE	MARKTON	KEMPSTER	KEMPSTER	KEMPSTER	KEMPSTER	KEMPSTER
AREA IN ACRES	22	14	53	14	2	126	59 IN LANGLADE CO	24	26	18	58	4
MAXIMUM DEPTH IN FT	16	SHALLOW	30	28		41	7	8	14	17	23	13
GAME FISH IN LAKE NOW	SUNFISH BULLHEADS	BROOK TROUT BROWN TROUT	BROOK TROUT RAINBOW TROUT L. M. BASS SUNFISH PERCH	BROOK TROUT RAINBOW TROUT L. M BASS SUNFISH PERCH	BROOK TROUT RAINBOW TROUT	L. M BASS N PIKE PERCH	L. M. BASS PERCH	L. M BASS PERCH	N. PIKE BLUEGILLS PERCH	L M BASS BLUEGILLS PERCH FEW W. E. PIKE	L M BASS N. PIKE BLUEGILLS PERCH BULLHEADS	L M BASS PERCH
FISH SUITABLE FOR PLANTING	L. M. BASS	BROOK TROUT	L. M. BASS RAINBOW TROUT	L M BASS BROOK TROUT RAINBOW TROUT	BROOK TROUT RAINBOW TROUT	L. M. BASS N. PIKE	NONE	NONE	N. PIKE	L. M. BASS	L. M. BASS N. PIKE	NONE
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	INLET AND OUTLET	INLET AND OUTLET	OUTLET	OUTLET	INLET AND OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	PERIODIC DRAINAGE
WATER IS	HARD CLEAR	HARD CLEAR	HARD CLEAR	HARD MILKY	HARD CLEAR	HARD CLEAR	CLEAR HARD	CLEAR VERY SOFT	CLEAR VERY SOFT	CLEAR SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT
AQUATIC VEGETATION	ABUNDANT AND VARIED	FAIRLY ABUNDANT	ABUNDANT AND VARIED	FAIRLY ABUNDANT AND VARIED	SCARCE	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE	FAIRLY ABUNDANT AND VARIED	SCARCE	FAIRLY ABUNDANT AND NOT VARIED	SCARCE
LAND COVER SURROUNDING LAKE	OPEN LAND, RECENT BURN AND WHITE CEDAR	HARDWOOD AND SWAMP LAND	OPEN LAND	POPPLE AND PIN CHERRY	SWAMP LAND	HARDWOOD AND HEMLOCK	SCRUB OAK AND PIN CHERRY	POPPLE AND PIN CHERRY	HARDWOOD AND SWAMP	POPPLE	POPPLE AND PIN CHERRY	POPPLE

LANGLADE COUNTY	T. 32 N. - R.12 E	T. 32 N. - R.14 E	T.32 & 33 N. - R.14 E.	T. 32 N. - R.14 E.	TOWN 33 NORTH - RANGE 10 EAST					T. 33 & 34 N - R. 10 E.	TOWN 33 NORTH - RANGE 10 EAST	
NAME OF LAKE	LAWRENCE	BEAR	MARY	SAWYER	BIRCH	BLACK OAK	BULLHEAD	CROOKED	DEEP WOODS	DUCK	DYNAMITE	GREATER BASS
LAKE IN SECTION	10, 15	22, 23, 26, 27	1, 36	16, 17, 20, 21	10	35	8	26	14	4, 33	5	1, 11, 12
NEAREST TRADING POINT AND P.O.	BRYANT	HOLLISTER	HOLLISTER	HOLLISTER	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE
AREA IN ACRES	38	195	153 IN LANGLADE CO.	189	13	77	27	13	56	134	90	241
MAXIMUM DEPTH IN FT.	39	18	10	24	8	29	SHALLOW	12	24	15	28	21
GAME FISH IN LAKE NOW	L.M. BASS N. PIKE SUNFISH PERCH BULLHEADS	L.M. BASS	L.M. BASS BLUEGILLS PERCH BULLHEADS BROOK TROUT RAINBOW TROUT	W.E. PIKE N. PIKE L.M. BASS S.M. BASS CRAPPIES BLUEGILLS SUNFISH PERCH	PERCH	L.M. BASS N. PIKE BLUEGILLS PERCH	BLUEGILLS PERCH BULLHEADS	L.M. BASS BLUEGILLS PERCH	L.M. BASS BLUEGILLS PERCH	L.M. BASS N. PIKE BLUEGILLS PERCH BULLHEADS	PERCH	L.M. BASS N. PIKE ROCK BASS BLUEGILLS SUNFISH PERCH
FISH SUITABLE FOR PLANTING	L.M. BASS N. PIKE	L.M. BASS	L.M. BASS	W.E. PIKE OR BASS AND N. PIKE		L.M. BASS N. PIKE			L.M. BASS	L.M. BASS N. PIKE	L.M. BASS N. PIKE	L.M. BASS N. PIKE
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	INLET AND PERIODIC OUTLET	INLET AND OUTLET	LANDLOCKED	INLET AND OUTLET	PERIODIC DRAINAGE	OUTLET	INLET AND OUTLET
WATER IS	CLEAR VERY SOFT	CLEAR HARD	CLEAR HARD	CLEAR HARD	CLEAR VERY SOFT	BROWN SOFT	BROWN VERY SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	BROWN VERY SOFT	BROWN MEDIUM	CLEAR VERY SOFT
AQUATIC VEGETATION	SCARCE	ABUNDANT AND VARIED	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	FAIRLY ABUNDANT	FAIRLY ABUNDANT AND NOT VARIED
LAND COVER SURROUNDING LAKE	HARDWOOD AND POPPLE	POPPLE AND PIN CHERRY	HARDWOOD AND HEMLOCK	POPPLE AND PIN CHERRY	HARDWOOD AND PIN CHERRY	HARDWOOD AND POPPLE	SWAMP	POPPLE	HARDWOOD AND POPPLE	POPPLE AND PIN CHERRY	POPPLE AND HARDWOOD	POPPLE, HARDWOOD AND PIN CHERRY IMPROVED LAND

LANGLADE COUNTY	TOWN 33 NORTH - RANGE 10 EAST											
NAME OF LAKE	GREEN BASS	HORSESHOE	KETTLE	LADY	LITTLE SADDLEBAG	LONG	LOWER BASS	LOWER CLEAR	MC DONALD	PARTRIDGE	PERCH	SADDLEBAG
LAKE IN SECTION	22	17	11, 14	1	16, 21	35	25, 36	25, 26	22	17	22	17
NEAREST TRADING POINT AND P.O.	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE
AREA IN ACRES	4	18	13	10	10	67	84	77		38		33
MAXIMUM DEPTH IN FT	19	24	SHALLOW	17	32	17	19	20		33		21
GAME FISH IN LAKE NOW	L M BASS BLUEGILLS PERCH	L.M. BASS BLUEGILLS PERCH	BLUEGILLS PERCH	L.M. BASS ROCK BASS SUNFISH	L.M. BASS PERCH	N. PIKE L.M. BASS CALICO BASS (W. E. PIKE) CATFISH	L.M. BASS N. PIKE BLUEGILLS PERCH	L.M. BASS BLUEGILLS PERCH	L.M. BASS BLUEGILLS PERCH	L.M. BASS N. PIKE BLUEGILLS PERCH	L.M. BASS BLUEGILLS PERCH	L.M. BASS BLUEGILLS PERCH BULLHEADS
FISH SUITABLE FOR PLANTING	L M BASS	L.M. BASS	NONE	L M BASS	L M BASS	L.M. BASS	L.M. BASS N PIKE	L.M. BASS N. PIKE		L.M BASS		L.M. BASS
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	CLEAR MEDIUM	BROWN VERY SOFT	CLEAR VERY SOFT	CLEAR VERY SOFT	BROWN VERY SOFT	CLEAR VERY SOFT	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT BROWN	VERY SOFT BROWN	VERY SOFT CLEAR	VERY SOFT BROWN
AQUATIC VEGETATION	ABUNDANT AND NOT VARIED	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	POPPLE	HARDWOOD	HARDWOOD AND HEMLOCK	POPPLE	TAMARACK AND HEMLOCK	HARDWOOD AND POPPLE	HARDWOOD AND POPPLE	POPPLE	POPPLE OPEN LAND	HARDWOOD AND SWAMP	POPPLE AND HARDWOOD	HARDWOOD AND SWAMP

LANGLADE COUNTY	TOWN 33 NORTH - RANGE 10 EAST					T. 33 & 34 N - R 10E	TOWN 33 NORTH - RANGE 10 EAST					
NAME OF LAKE	SHANTY BOTTOM	SNAG	SQUAW	SUMMIT	TANK	TAYLOR	TOWN LINE	TYPNER	UPPER CLEAR	WATER POWER	NO NAME	INDIAN
LAKE IN SECTION	22	22. 23	23, 26	2	22	5, 32	6	26	3, 10	11	36	23
NEAREST TRADING POINT AND P O	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE	SUMMIT LAKE
AREA IN ACRES		15	13	256		12	14	5	72	22	8	18
MAXIMUM DEPTH IN FT	17	19	16	28	21	12	29	17	23	16	6	17
GAME FISH IN LAKE NOW	L. M BASS BLUEGILLS PERCH	L M BASS BLUEGILLS PERCH	L M BASS BLUEGILLS PERCH	L. M. BASS N. PIKE BLUEGILLS PERCH BULLHEADS	L. M. BASS BLUEGILLS PERCH	L.M BASS PERCH	L. M. BASS N PIKE BLUEGILLS PERCH	L M BASS BLUEGILLS PERCH	L M BASS BLUEGILLS PERCH	L M BASS N. PIKE CRAPPIES BLUEGILLS SUNFISH PERCH	BLUEGILLS PERCH	L. M. BASS BLUEGILLS PERCH
FISH SUITABLE FOR PLANTING	L M BASS	L M BASS	L M BASS	L. M. BASS OR N PIKE	L M BASS	NONE	N PIKE		L M BASS	L M. BASS N. PIKE	NONE	L M BASS
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT BROWN	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	SOFT CLEAR
AQUATIC VEGETATION	SCARCE	SCARCE	SCARCE	FAIRLY ABUNDANT AND NOT VARIED	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	POPPLE	HARDWOOD AND POPPLE	POPPLE	HARDWOOD AND POPPLE IMPROVED LAND	POPPLE	HARDWOOD	HARDWOOD AND PIN CHERRY	POPPLE	SPRUCE, POPPLE AND HARDWOOD	HARDWOOD AND HEMLOCK	HARDWOOD AND HEMLOCK	HARDWOOD AND POPPLE

LANGLADE COUNTY	TOWN 33 NORTH - RANGE 11 EAST						T 33 & 34 N R 12 & 13 E.	TOWN 33 NORTH - RANGE 12 EAST			
NAME OF LAKE	HIGH	JACK	NOBOKEN	PENCE	SUNFISH	UPPER HIGH (HOUR GLASS)	UPPER LOW	UPPER VENTOR	CRYSTAL	SPRING	TWIN	TWIN
LAKE IN SECTIONS	22, 28	22, 23	20	25, 36	31	31	31	25	1, 6, 36	2, 11	11, 14	11
NEAREST TRADING POINT AND P O	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON
AREA IN ACRES	35	93	24	26	14	32	7	19	45 IN LANGLADE CO	70	16	48
MAXIMUM DEPTH IN FT	8	32	32	38	14	24	9	12	38	16	11	18
GAME FISH IN LAKE NOW	L. M. BASS N. PIKE PERCH	L. M. BASS PERCH BULLHEADS	BLUEGILLS PERCH BULLHEADS	CRAPPIES BLUEGILLS SUNFISH PERCH BULLHEADS	L. M BASS BLUEGILLS PERCH	L. M. BASS CRAPPIES BLUEGILLS PERCH	PERCH BULLHEADS	PERCH BULLHEADS	L. M BASS S. M BASS PERCH	W. E. PIKE N. PIKE L. M. BASS BLUEGILLS PERCH SUNFISH BULLHEADS	BULLHEADS PERCH	PERCH
FISH SUITABLE FOR PLANTING	NONE	L. M. BASS	N. PIKE	L. M. BASS		L. M. BASS			L. M BASS (S. M. BASS)	W E. PIKE N. PIKE		L. M. BASS (?)
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT BROWN	VERY SOFT BROWN	VERY SOFT CLEAR	HARD CLEAR	MEDIUM HARD CLEAR	MEDIUM GREEN
AQUATIC VEGETATION	FAIRLY ABUNDANT AND NOT VARIED	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE	ABUNDANT AND VARIED	ABUNDANT AND VARIED	SCARCE
LAND COVER SURROUNDING LAKE	POPPLE AND PIN CHERRY	POPPLE AND HARDWOOD	HARDWOOD, POPPLE AND SWAMP	HARDWOOD, POPPLE AND PIN CHERRY	PIN CHERRY AND POPPLE	POPPLE, HARDWOOD AND PIN CHERRY	POPPLE AND HARDWOOD	SPRUCE SWAMP	POPPLE AND HARDWOOD	POPPLE AND HARDWOOD	POPPLE AND HARDWOOD	HARDWOOD

LANGLADE COUNTY	T. 33 N. R. 12 E.	TOWN 33 NORTH — RANGE 13 EAST						TOWN 33 NORTH - RANGE 14 EAST		TOWN 34 NORTH RANGE 9 EAST		
NAME OF LAKE	VENTOR	CRANDALL	MUD	SPRUCE	TURTLE	TWIN	TWIN	ADA	PERCH	LITTLE BASS	OTTER	PERCH
LAKE IN SECTIONS	30	5	8	5,6	28	7	7,8	3,4	3	7	7	7
NEAREST TRADING POINT AND P.O.	PEARSON	LILY	LILY	LILY	LILY	LILY	LILY	CARTER	CARTER	PARRISH	PARRISH	PARRISH
AREA IN ACRES	6	1	9	8	34	66	14	104	30	16	14	27
MAXIMUM DEPTH IN FT.	13	SHALLOW	16	15	4	25	18	47	18	12	SHALLOW	8
GAME FISH IN LAKE NOW	L. M. BASS PERCH BULLHEADS	BROOK TROUT	PERCH BULLHEADS	PERCH BULLHEADS	L. M. BASS W. E. PIKE N. PIKE CRAPPIES SUNFISH PERCH	L. M. BASS BLUEGILLS PERCH BULLHEADS	PERCH BULLHEADS	L.M. BASS PERCH	BLUEGILLS PERCH	L.M. BASS BLUEGILLS PERCH	PERCH	BLUEGILLS PERCH BULLHEADS
FISH SUITABLE FOR PLANTING	NONE	BROOK TROUT			W. E. PIKE N. PIKE	L. M. BASS		L.M. BASS	L.M. BASS	L.M. BASS N. PIKE		
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	VERY SOFT BROWN	VERY SOFT CLEAR	SOFT CLEAR	VERY SOFT CLEAR	HARD CLEAR	HARD CLEAR	SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT BROWN	VERY SOFT CLEAR
AQUATIC VEGETATION	SCARCE	FAIRLY ABUNDANT	FAIRLY ABUNDANT AND NOT VARIED	SCARCE	ABUNDANT AND VARIED	ABUNDANT AND VARIED	FAIRLY ABUNDANT AND NOT VARIED	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD AND RECENT BURN	CEDAR AND SPRUCE	POPPLE AND SPRUCE	POPPLE AND WHITE BIRCH	POPPLE, HARDWOOD AND SWAMP	HARDWOOD, CLEARED LAND AND STUMP PASTURE	WHITE BIRCH HEMLOCK AND HARDWOOD	HARDWOOD	HARDWOOD	POPPLE	SWAMP	SPRUCE

LANGLADE COUNTY	T.34N.-R.9E.	TOWN 34 NORTH RANGE 10 EAST										
NAME OF LAKE	TWO ISLAND	AIR HOLE	BASS	BOG	CAMP	DOYLE	ENTERPRISE	FIRST	HILLSON	JORDON	PERCH	ROUND
LAKE IN SECTION	7	33, 28	8	7	7	34	3,4,9,10	1	1	2	8	6
NEAREST TRADING POINT AND P.O.	PARRISH	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO
AREA IN ACRES	24	69	82	19	50	7	541	11	8	8	10	4
MAXIMUM DEPTH IN FT.	15	7	29		35	15	25	16	24	SHALLOW	18	
GAME FISH IN LAKE NOW	L.M. BASS BLUEGILLS PERCH	PERCH N PIKE	L.M. BASS PERCH	L.M. BASS PERCH	L.M. BASS PERCH	BULLHEADS	N PIKE W.E PIKE L.M. BASS MUSKELLUNGE ROCK BASS WHITE BASS SUNFISH PERCH	L.M. BASS BLUEGILLS PERCH	PERCH	PERCH	L.M. BASS PERCH	PERCH
FISH SUITABLE FOR PLANTING	L.M. BASS		L.M. BASS		L.M. BASS		L.M. BASS OR W.E PIKE AND N. PIKE MUSKELLUNGE	L.M BASS	L.M BASS		L.M BASS	
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	PERIODIC OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	VERY SOFT CLEAR	VERY SOFT CLEAR	SOFT CLEAR	SOFT BROWN	VERY SOFT CLEAR	VERY SOFT BROWN	MEDIUM BROWN	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT BROWN	VERY SOFT GREEN
AQUATIC VEGETATION	SCARCE	SCARCE	FAIRLY ABUNDANT AND VARIED	SCARCE	SCARCE	SCARCE	FAIRLY ABUNDANT AND VARIED	SCARCE	SCARCE	SCARCE	SCARCE	SCARCE
LAND COVER SURROUNDING LAKE	HARDWOOD, POPPLE	BLACK SPRUCE	POPPLE, HARDWOOD AND SPRUCE	HARDWOOD, PINE AND HEMLOCK	HARDWOOD, PINE AND HEMLOCK	HARDWOOD AND HEMLOCK	POPPLE, HARDWOOD AND HEMLOCK	POPPLE, HARDWOOD AND PIN CHERRY	POPPLE, HARDWOOD AND PIN CHERRY	POPPLE HARDWOOD AND PIN CHERRY	POPPLE AND BLACK SPRUCE	POPPLE AND PINE

LANGLADE COUNTY	T 34N.-R.10E	TOWN 34 NORTH - RANGE 11 NORTH					TOWN 34 NORTH - RANGE 12 EAST					
NAME OF LAKE	ELCHO	AHINHAN (BASS)	CLEAR	LOON	MUD	POST	AGNES	BERENDSEN	DEADMANS	HOLLISTER	PICKEREL	ROLLING STONE
LAKE IN SECTION	12	24	23	34,35	26	2,3,10,11,13,14,22,23	23	23	35	25	24,25	11,12,13,14
NEAREST TRADING POINT AND P.O.	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO	ELCHO	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON	PEARSON
AREA IN ACRES	78	46	46	53		298 IN LANGLADE CO.	12	42	27	39	165 IN LANGLADE CO.	645
MAXIMUM DEPTH IN FT	28	21	30	18	SHALLOW	12	14	SHALLOW	8	35	12	10
GAME FISH IN LAKE NOW	PERCH	S.M. BASS PERCH BULLHEADS	S.M. BASS PERCH	L.M. BASS PERCH	N. PIKE	W.E. PIKE N. PIKE L.M. BASS WHITE BASS ROCK BASS CRAPPIES BLUEGILLS PERCH, BULLHEADS	SUNFISH PERCH BULLHEADS	SUNFISH BULLHEADS	BULLHEADS	L.M. BASS BLUEGILLS PERCH	W.E. PIKE N. PIKE L.M. BASS BLUEGILLS SUNFISH PERCH BULLHEAD	W.E. PIKE N. PIKE L.M. BASS BLUEGILLS SUNFISH PERCH
FISH SUITABLE FOR PLANTING	N. PIKE	L.M. BASS S.M. BASS	L.M. BASS S.M. BASS	L.M. BASS		W.E. PIKE N. PIKE	N. PIKE	NONE	NONE	L.M. BASS	W.E. PIKE	W.E. PIKE N. PIKE
LAKE HAS AN OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	INLET AND OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	INLET AND OUTLET	INLET AND OUTLET
WATER IS	MEDIUM HARD GREEN	VERY SOFT CLEAR	VERY SOFT CLEAR	SOFT CLEAR	MEDIUM HARD BROWN	MEDIUM HARD BROWN	MEDIUM CLEAR	MEDIUM CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	HARD CLEAR	MEDIUM HARD CLEAR
AQUATIC VEGETATION	SCARCE	SCARCE	SCARCE	SCARCE	ABUNDANT	ABUNDANT AND VARIED	SCARCE	FAIRLY ABUNDANT	SCARCE	SCARCE	ABUNDANT AND VARIED	ABUNDANT AND VARIED
LAND COVER SURROUNDING LAKE	HEMLOCK, HARDWOOD AND CLEARED	POPPLE AND PINE	POPPLE AND PINE	HARDWOOD	GRASS MARSH	GRASS MARSH, HARDWOOD, POPPLE AND PINE CROP LAND	POPPLE AND PINE	POPPLE AND PINE	HARDWOOD, BALSAM AND WHITE BIRCH	POPPLE AND PINE	POPPLE, HARDWOOD AND TAMARACK	POPPLE, HARDWOOD, SPRUCE AND CEDAR SWAMP

LANGLADE COUNTY	TOWN 34 NORTH - RANGE 12 EAST			T 30 N - R 12 E.		
NAME OF LAKE	SUNKEN	LOST		THOMPSON		
LAKE IN SECTION	35, 36	30		7		
NEAREST TRADING POINT AND P.O.	PEARSON	PEARSON		PHLOX		
AREA IN ACRES	38	13		5		
MAXIMUM DEPTH IN FT.	SHALLOW	14		SHALLOW		
GAME FISH IN LAKE NOW	PERCH	N. PIKE SUNFISH PERCH		BROOK TROUT RAINBOW TROUT BROWN TROUT PERCH		
FISH SUITABLE FOR PLANTING		N. PIKE		BROOK TROUT		
LAKE HAS AN OUTLET OR IS LANDLOCKED	LANDLOCKED	PERIODIC OUTLET		OUTLET		
WATER IS	VERY SOFT CLEAR	SOFT BROWN		HARD CLEAR		
AQUATIC VEGETATION	SCARCE	SCARCE		SCARCE		
LAND COVER SURROUNDING LAKE	HARDWOOD HEMLOCK AND BALSAM	SPRUCE AND SWAMP LAND		HARDWOOD AND CLEARED LAND		
				* OUT OF PLACE		

NORTHERN COUNTIES WHERE NO COMPLETE LAKE INVENTORY HAS BEEN TAKEN

NO COMPLETE INVENTORY HAS BEEN TAKEN OF THE LAKES IN THE FOLLOWING NORTHERN COUNTIES, THOUGH LAKES ARE RELATIVELY NUMEROUS.

DUNN	LINCOLN	OCONTO
BARRON	FOREST	SHAWANO
TAYLOR	FLORENCE	WAUPACA
PRICE	MARINETTE	ONEIDA
CHIPPEWA	POLK	

AS ADDITIONAL LAKE INVENTORIES ARE MADE SUPPLEMENTAL REPORTS WILL BE ISSUED FOR THESE COUNTIES.

VILAS COUNTY	TOWN 39 NORTH - RANGE 10 EAST					TOWN 40 NORTH - RANGE 4 EAST						
NAME OF LAKE	ALDRICH	LOON	GORDON	SPRING	META	PINE	CLEAR	EMILY	BASS	LAC DU FLAMBEAU	ROSS ALLEN	MITTEN
LAKE IN SECTION	18	3, 4	10	11	1, 12	6, 7	4, 5	5 8	2, 3	1, 12, 13	2, 11	10, 15
TRADING POINT & P.O	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU
AREA IN ACRES	80	40	64	48	160	192	91	16	64	1 250	74	160
MAXIMUM DEPTH IN FEET									49	49	18	
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED
WATER IS						MEDIUM		VERY SOFT	VERY SOFT	MEDIUM	VERY SOFT	MEDIUM
LAND COVER SURROUNDING LAKE	BLACK SPRUCE	POPPLE WITH WHITE BIRCH	POPPLE NORWAY PINE	POPPLE SPRUCE	POPPLE WITH WHITE PINE	PINE	HARDWOOD	BLACK SPRUCE PINE	POPPLE WITH WHITE BIRCH	PINE - HARDWOOD	BLACK SPRUCE	POPPLE - PINE

VILAS COUNTY	TOWN 40 NORTH - RANGE 4 EAST						TOWN 40 NORTH - RANGE 5 EAST					
NAME OF LAKE	RICE	BILL'S	ISLAND	LITTLE CROOKED	SQUAW	BUCKSKIN	LONG	MUD	CRAWLING STONE	LITTLE CRAWLING STONE	HASKELL	JERMS
LAKE IN SECTION	19, 20	21, 22	14, 23, 24	22 23 26 27	33	35, 36 & T 39 N R 4 E	7, 8, 17, 18	8, 9	16, 17, 18, 19 20, 21, 28, 29	19, 20, 29, 30	30, 31	28, 33
TRADING POINT & P.O	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU
AREA IN ACRES	208	96	138	240	176	162	312	192	1 511	147	227	80
MAXIMUM DEPTH IN FEET		23		22	14	20			93	43		
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	INLET AND OUTLET	OUTLET	INLET AND OUTLET	OUTLET	OUTLET	LANDLOCKED
WATER IS	MEDIUM	VERY SOFT	VERY SOFT	VERY SOFT			MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	VERY SOFT
LAND COVER SURROUNDING LAKE	POPPLE HEMLOCK HARDWOOD MARSH	POPPLE LEATHER LEAF	POPPLE LEATHER LEAF WILLOW	POPPLE LEATHER LEAF PINE	POPPLE HARDWOOD WILLOW	POPPLE HARDWOOD TAMARACK	POPPLE BLACK SPRUCE GRASS MARSH PINE	POPPLE WILLOW HEMLOCK PINE	POPPLE - PINE LEATHER LEAF GRASS MARSH	BALSAM SCRUB OAK PINE	HARDWOOD WILLOW GRASS MARSH	HARDWOOD LEATHER LEAF GRASS MARSH

VILAS COUNTY	TOWN 40 NORTH - RANGE 5 EAST								TOWN 40 NORTH - RANGE 6 EAST			
NAME OF LAKE	WHITEFISH	WONDOCK	TWIN	GUNLOCK	SHISHEBOGOMA	FENCE	DEAD	BOLTON	CATFISH	STELLNACK	WISHOW	PLUMMER
LAKE IN SECTION	27, 28, 33 34	26, 27	26	25, 26, 35, 36	35, 36	2, 3, 9, 10, 11, 14, 15, 16 22, 23, 24, 26	3	12, 13	5, 6	6, 7	7, 18	5, 6, 7, 8
TRADING POINT & P.O	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE
AREA IN ACRES	208	48	96	339	300	3,314	64	152	224	98	58	224
MAXIMUM DEPTH IN FEET	23	40	30	40	28	93		30				20
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	MEDIUM		VERY SOFT			MEDIUM		MEDIUM	MEDIUM		VERY SOFT	
LAND COVER SURROUNDING LAKE	POPPLE WITH WHITE BIRCH	POPPLE WITH NORWAY PINE FOREST SWAMP	NORWAY PINE	POPPLE - OAK NORWAY PINE	POPPLE WITH NORWAY PINE FOREST SWAMP	HARDWOOD, PINE HEMLOCK	POPPLE BOG	HARDWOOD WITH SOME CONIFERS	HARDWOOD WITH SOME CONIFERS	POPPLE WITH WHITE BIRCH	BLACK SPRUCE NORWAY PINE	HARDWOOD WITH SOME CONIFERS

VILAS COUNTY	TOWN 40 NORTH - RANGE 6 EAST										TOWN 40 NORTH - RANGE 7 EAST	
NAME OF LAKE	DOLLAR	LITTLE SPIDER	VERNA	TRILBY	BASS LAKE	LITTLE MUSKIE	CECILIA	LITTLE STAR	ILA	LONG	BIG ARBOR VITAE	HURRAH
LAKE IN SECTION	3, 4	2, 3, 10, 11	10, 15	11, 12, 13, 14	14, 23	26	35	35, 36	27, 28, 33, 34	21, 22, 28	17, 18, 19, 20 21, 28, 29, 30	8, 17
TRADING POINT & P.O	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE
AREA IN ACRES	132	242	64	74	174	96	128	83	25	82	1,163	50
MAXIMUM DEPTH IN FEET					45	13					28	
LAKE HAS OUTLET OR IS LANDLOCKED.	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED
WATER IS	MEDIUM HARD	MEDIUM	MEDIUM	VERY SOFT	VERY SOFT	MEDIUM	MEDIUM	VERY SOFT	VERY SOFT	VERY SOFT	MEDIUM HARD	VERY SOFT
LAND COVER SURROUNDING LAKE	LEATHER LEAF HARDWOOD SPRUCE	POPPLE NORWAY PINE HARDWOOD	LEATHER LEAF BLACK SPRUCE	POPPLE LEATHER LEAF BLACK SPRUCE	POPPLE HARDWOOD WHITE PINE	POPPLE WHITE PINE NORWAY PINE	POPPLE HARDWOOD NORWAY PINE	POPPLE HARDWOOD NORWAY PINE	WILLOW BLACK SPRUCE CLEARED LAND	POPPLE BLACK SPRUCE NORWAY PINE	POPPLE HARDWOOD JACK PINE	POPPLE HARDWOOD

VILAS COUNTY	TOWN 40 NORTH - RANGE 7 EAST											T. 40 N. - R. 8 E.
NAME OF LAKE	KLONDIKE	SCAFFOLD	BENEDICT	DRY	ERICKSON	ROSS	FROG LEG	LONG	BIG BASS	PRONG	LITTLE ARBOR VITAE	BIG ST. GERMAIN
LAKE IN SECTION	4	8, 9	8, 17	16, 17, 20	18	10, 11, 14, 15, 16	2, 3	15, 22	22, 27	27	27, 28, 29, 32, 33, 34	17, 18, 19, 20, 21, 28, 29, 30
TRADING POINT & P O	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	ARBOR VITAE	SAYNER
AREA IN ACRES	32		40	124	183	221	124	102	252	64	432	1,625
MAXIMUM DEPTH IN FEET					11	15			38			31
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	INLET AND OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET
WATER IS	VERY SOFT		VERY SOFT		MEDIUM	MEDIUM	VERY SOFT	VERY SOFT	VERY SOFT		MEDIUM HARD	MEDIUM
LAND COVER SURROUNDING LAKE	HARDWOOD WITH SOME CONIFERS	HARDWOOD LEATHER LEAF	HARDWOOD, CONIFERS LEATHER LEAF	HARDWOOD WITH SOME CONIFERS	HARDWOOD-PINE	HARDWOOD-PINE	POPPLE WHITE BIRCH	POPPLE WHITE BIRCH PINE	POPPLE WHITE BIRCH PINE	POPPLE WHITE BIRCH PINE	POPPLE WHITE BIRCH PINE	POPPLE WHITE BIRCH PINE

VILAS COUNTY	TOWN 40 NORTH - RANGE 8 EAST						TOWN 40 NORTH - RANGE 9 EAST					
NAME OF LAKE	LAKE CONTENT	LOST	STELLA	FOUND	LITTLE ST GERMAIN	MOON	SNIPE	FINLEY	PICKEREL	MUSKELLONGE	BRAGONIER	Mc DONALD
LAKE IN SECTION	28, 29	2 3 9, 10, 11	2	11, 13, 14	23, 24, 25, 26, 27, 34, 35	25	15, 16, 21, 22	30, 31	4, 5	9, 16, 17	31, 32	31, 32
TRADING POINT & P O	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER
AREA IN ACRES	217	475	60	311	980	160	255	112	353	269	34	84
MAXIMUM DEPTH IN FEET					43	36	18	28	22	16		
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	VERY SOFT	MEDIUM HARD		MEDIUM	MEDIUM	VERY SOFT	VERY SOFT
LAND COVER SURROUNDING LAKE	POPPLE WITH WHITE BIRCH	POPPLE WITH WHITE BIRCH	BLACK SPRUCE & WHITE BIRCH	POPPLE WITH WHITE BIRCH SPRUCE	POPPLE WITH WHITE BIRCH PINE	HARDWOOD WITH SOME CONIFERS	POPPLE WITH WHITE BIRCH NORWAY PINE	POPPLE WITH WHITE BIRCH	POPPLE WITH WHITE BIRCH NORWAY PINE	BLACK SPRUCE & WHITE BIRCH NORWAY PINE	BLACK SPRUCE & WHITE PINE	BLACK SPRUCE & WHITE PINE

VILAS COUNTY	TOWN 40 NORTH - RANGE 9 EAST								TOWN 40 NORTH - RANGE 10 EAST		
NAME OF LAKE	NELSON	ALLEN	BOOT	RANGE	MUD LAKE	BASS	RICE	ROUND	LITTLE BASS	SPIRIT	DEERSKIN	FINGER
LAKE IN SECTION	21, 22, 27, 28	2	2, 11	1, 12	10	12	14	22, 23, 26, 27	26	11, 12	1&T.40N-R11E.	12
TRADING POINT & P O	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER
AREA IN ACRES	134	35	316		60	64	64	227	32	56	337	88
MAXIMUM DEPTH IN FEET	30		13	16				30			18	16
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED
WATER IS	VERY SOFT	MEDIUM	MEDIUM	VERY SOFT		MEDIUM	MEDIUM	VERY SOFT		SOFT	MEDIUM	SOFT
LAND COVER SURROUNDING LAKE	POPPLE WITH WHITE BIRCH CLEARED LAND	POPPLE WITH WHITE BIRCH SPRUCE	POPPLE WITH WHITE BIRCH PINE-SPRUCE	LEATHER LEAF WHITE PINE	BLACK SPRUCE LEATHER LEAF	POPPLE WHITE BIRCH PINE	CAT TAIL MARSH, BRUSH	POPPLE WHITE BIRCH	POPPLE WHITE BIRCH LEATHER LEAF	LEATHER LEAF CLEARED LAND	POPPLE WITH WHITE BIRCH	POPPLE WITH WHITE BIRCH

VILAS COUNTY	TOWN 40 NORTH - RANGE 10 EAST									TOWN 40 NORTH - RANGE 11 EAST		
NAME OF LAKE	HARMONY	DUCK	YELLOW BIRCH	OTTER	SILVER	EAGLE	SCATTERING RICE	DOLLAR	CATFISH	TAMBLING	CRANBERRY	BASS
LAKE IN SECTION	12, 13, 14	15, 16, 21, 22	21, 22, 27, 28	14, 15, 22, 23	27, 28	22, 23, 26, 27	13, 23, 24	26, 35	25, 35, 36-T40-R11E	19, 30	29, 30, 31, 32	20, 21, 29
TRADING POINT & P O	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER	EAGLE RIVER
AREA IN ACRES	88	129		184	60	969	166	99	900	192	568	320
MAXIMUM DEPTH IN FEET				29		23						
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET
WATER IS	VERY SOFT	MEDIUM HARD	MEDIUM HARD	MEDIUM HARD	SOFT	MEDIUM HARD	MEDIUM HARD	SOFT	MEDIUM HARD	SOFT	MEDIUM	MEDIUM
LAND COVER SURROUNDING LAKE	BLACK SPRUCE PINE - POPPLE	PINE-HARDWOOD	PINE WHITE BIRCH	PINE-HARDWOOD	POPPLE CLEARED LAND	POPPLE WHITE BIRCH PINE	POPPLE WHITE BIRCH PINE, SPRUCE	NORWAY PINE LEATHER LEAF POPPLE	POPPLE WHITE BIRCH PINE	BLACK SPRUCE WHITE BIRCH PINE	POPPLE BIRCH NORWAY PINE PINE	POPPLE WITH WHITE BIRCH

VILAS COUNTY	TOWN 41 NORTH - RANGE 5 EAST											
NAME OF LAKE	SPRUCE	LOWER SUGAR BUSH	SUGAR BUSH	BASS	POUPART	POKEGAMA	UPPER SUGAR BUSH	LITTLE SUGAR BUSH	WHITE SAND LAKE	SUNFISH	CROOKED	ZEE
LAKE IN SECTION	5,6,7	7,8,17,18	16,17,18,19,20,21	19,20	30,31	21,28,29,32,33	16	15,16,21,22	22,23,25,26,27, 36	22	10,11,14,15,22	3,4,9,10
TRADING POINT & P O	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU
AREA IN ACRES	104	192	398	164	72	1,144	176	80	1,350	80	400	48
MAXIMUM DEPTH IN FEET		31	32				31		13		72	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED
WATER IS		MEDIUM	MEDIUM HARD			MEDIUM HARD	MEDIUM HARD	MEDIUM HARD	MEDIUM HARD		VERY SOFT	
LAND COVER SURROUNDING LAKE	SEDGE MARSH LEATHER LEAF	HARDWOODS	TAGALDER, WHITE BIRCH, SPRUCE	HARDWOODS	LEATHER LEAF POPPLE- PINE	PINE -HARDWOODS	HARDWOODS	HARDWOODS	HARDWOOD WITH PINE & SPRUCE	BLACK SPRUCE HARDWOODS	HARDWOOD WITH SOME CONIFERS	POPPLE WITH WHITE BIRCH MARSH

VILAS COUNTY	TOWN 41 NORTH - RANGE 5 EAST			TOWN 41 NORTH - RANGE 6 EAST								
NAME OF LAKE	LITTLE TROUT	RICE	IKE WALTON	TWIN	MID. GRESHAM	UPPER GRESHAM	DAY	LOWER GRESHAM	STEARNS	LITTLE SAND	W. ELLERSON	MIDDLE ELLERSON
LAKE IN SECTION	2,3,10,11	1 & T41N.-R.6E.	12,13,24 & T41-R6E.	5	3,4,	3,4 &T.42N. R.6E.	1,2	9	31	30	29	28,29
TRADING POINT & P O	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU	LAC DU FLAMBEAU
AREA IN ACRES	862	387	1,366	48	98	350	147	128	180	32	96	60
MAXIMUM DEPTH IN FEET	91		60			26	59				4	48
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED
WATER IS	SOFT	MEDIUM	VERY SOFT	SOFT	MEDIUM	MEDIUM	VERY SOFT	MEDIUM	VERY SOFT		MEDIUM HARD	VERY SOFT
LAND COVER SURROUNDING LAKE	GRASS MARSH LEATHER LEAF CEDAR	WHITE BIRCH GRASS MARSH	HARDWOOD GRASS MARSH SPRUCE MASH	POPPLE WITH WHITE BIRCH	POPPLE WITH WHITE BIRCH	POPPLE WITH WHITE BIRCH PINE	SCRUB OAK RED MAPLE	SCRUB OAK RED MAPLE POPPLE	POPPLE WITH WHITE BIRCH	POPPLE WITH WHITE BIRCH	BLACK SPRUCE HARDWOOD	BLACK SPRUCE HARDWOOD

VILAS COUNTY	TOWN 41 NORTH - RANGE 6 EAST							TOWN 41 NORTH - RANGE 7 EAST				
NAME OF LAKE	EAST ELLERSON	CAMP	VANDERCOOK	LITTLE ROCK	SILVER	TROUT	DIAMOND	LITTLE JOHN	MANN	WEBER	RUTH	GENEVA
LAKE IN SECTION	28	27 & 34	36	26, 35 & 36	23, 24, 25 & 26	12,13,14& 24&41N. 7E	10&11	20,29	30,31,32	28,29,33	32,33	33
TRADING POINT & P O	BOULDER JCT	BOULDER JCT	BOULDER JCT	BOULDER JCT.	BOULDER JCT	BOULDER JCT.	BOULDER JCT.	SAYNER	SAYNER	SAYNER	SAYNER	SAYNER
AREA IN ACRES	178	72	96	39	185	4,801	128	160	240	35	.35	32
MAXIMUM DEPTH IN FEET		33	25	11	56	117	42	22	8	44		
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	VERY SOFT	VERY SOFT	VERY SOFT	VERY SOFT	MEDIUM	MEDIUM	VERY SOFT	MEDIUM	MEDIUM HARD	VERY SOFT	VERY SOFT	VERY SOFT
LAND COVER SURROUNDING LAKE	BLACK SPRUCE WHITE PINE	HARDWOOD WHITE PINE	HARDWOOD WHITE PINE	WHITE BIRCH HARDWOOD	POPPLE WHITE PINE NORWAY PINE	HARDWOOD NORWAY PINE WHITE PINE	POPPLE WHITE PINE GRASS MARSH	POPPLE HARDWOOD NORWAY PINE	HARDWOOD NORWAY PINE POPPLE	WHITE BIRCH NORWAY PINE	NORWAY PINE POPPLE	UPLAND HWDS.

NAME OF LAKE												
LAKE IN SECTION												
TRADING POINT & P O												
AREA IN ACRES												
MAXIMUM DEPTH IN FEET												
LAKE HAS OUTLET OR IS LANDLOCKED												
WATER IS												
LAND COVER SURROUNDING LAKE												

VILAS COUNTY	TOWN 41 NORTH - RANGE 7 EAST										TOWN 41 NORTH - RANGE 8 EAST	
NAME OF LAKE	LONG	CRYSTAL	BIG MUSKELLUNGE	ALLEQUASH	PALLETTE	ROCK	NEBISH	STARRETT	PLUM	BEAR	WHITE BIRCH	BALLARD
LAKE IN SECTION	34,33	27,26	15,16,21,22,27,28	9,10,15,16,17	3	2	10,11	13,14,24	25,36	13	5	3,4,5,9,10
TRADING POINT & P.O.	SAYNER	SAYNER	SAYNER	SAYNER	SAYNER	SAYNER	SAYNER	SAYNER	SAYNER	SAYNER	STAR LAKE	STAR LAKE
AREA IN ACRES	35	100	887	367	192	364	128	109	1,120	105	118	574
MAXIMUM DEPTH IN FEET		67	65	26	62	26	54	15	21	22	22	20
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET
WATER IS	VERY SOFT	VERY SOFT	MEDIUM	MEDIUM	VERY SOFT	SOFT	VERY SOFT	VERY SOFT	MEDIUM	VERY SOFT	MEDIUM	MEDIUM
LAND COVER SURROUNDING LAKE	POPPLE HARDWOOD BLACK SPRUCE	POPPLE NORWAY PINE	POPPLE NORWAY PINE SCRUB OAK	POPPLE HARDWOOD BLACK SPRUCE	POPPLE HARDWOOD	POPPLE HARDWOOD SPRUCE	POPPLE HARDWOOD	POPPLE HARDWOOD SCRUB OAK	POPPLE HARDWOOD PIN CHERRY	POPPLE HARDWOOD	POPPLE HARDWOOD SCRUB OAK	POPPLE HARDWOOD SCRUB OAK

VILAS COUNTY	TOWN 41 NORTH - RANGE 8 EAST								TOWN 41 NORTH RANGE 9 EAST			
NAME OF LAKE	IRVING	LAURA	LONE TREE	LITTLE STAR	RAZORBACK	STAR	RUTH	RICE	LILLIAN	STEWART	BAKER	STORMY
LAKE IN SECTION	3,4,10,11	1,2,12	9	10	16,17,20,21,28,29	10,14,15,16,21,22,23	25	18,19	31	20	2,3	1,2,11,12
TRADING POINT & P.O.	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE	STAR LAKE
AREA IN ACRES	419	530	113	96	501	1,086	32	69	80	48	30	620
MAXIMUM DEPTH IN FEET	8	40			31	65					23	86
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	MEDIUM	MEDIUM	VERY SOFT	MEDIUM	SOFT	MEDIUM		MEDIUM		VERY SOFT		SOFT
LAND COVER SURROUNDING LAKE	POPPLE HARDWOOD BLACK SPRUCE	POPPLE BLACK SPRUCE HARDWOOD	POPPLE HARDWOOD GRASS MARSH	POPPLE HARDWOOD TAMARACK	POPPLE NORWAY PINE HARDWOOD	POPPLE HARDWOOD NORWAY PINE	POPPLE SPRUCE	POPPLE BLACK SPRUCE GRASS MARSH	NORWAY PINE BLACK SPRUCE WHITE PINE	POPPLE NORWAY PINE WHITE PINE	POPPLE NORWAY PINE LEATHER LEAF	POPPLE NORWAY PINE HARDWOOD

VILAS COUNTY	TOWN 41 NORTH - RANGE 9 EAST				TOWN 41 NORTH - RANGE 10 EAST			TOWN 41 NORTH - RANGE 11 EAST			TOWN 41 NORTH - RANGE 12 EAST	
NAME OF LAKE	UPPER BUCKATABON	LOWER BUCKATABON	HUNTER	CAMP	PIONEER	SUCKER	PINE ISLAND	SOUTH TWIN	NORTH TWIN	MANNAL	LONG	CATHERINE
LAKE IN SECTION	13,14,23,24	23,22,27	25,26,36	33	23,24,26	33,34	35	17,18,19	3,4,5,7,8,9,10,16,17,18	15,22	5,7,8 AND TOWN NORTH	4
TRADING POINT & P.O.	CONOVER	CONOVER	CONOVER	CONOVER	CONOVER	CONOVER	CONOVER	PHELPS	PHELPS	PHELPS	PHELPS	PHELPS
AREA IN ACRES	700 INCLUDES (X)	(X)	306	59	450	61	80	644	2,951	104	907	40
MAXIMUM DEPTH IN FEET		41	42	18	27	10	18	40	40		89	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED
WATER IS	MEDIUM	MEDIUM	VERY SOFT		MEDIUM	MEDIUM		MEDIUM	MEDIUM		MEDIUM	
LAND COVER SURROUNDING LAKE	POPPLE LEATHER LEAF CATTAIL MARSH	POPPLE NORWAY PINE BLACK SPRUCE	NORWAY PINE JACK PINE	LEATHER LEAF GRASS MARSH WHITE PINE	POPPLE WHITE PINE CLEARED LAND	POPPLE TAGALDER CLEARED LAND	POPPLE PIN CHERRY	POPPLE HARDWOOD BLACK SPRUCE	POPPLE HARDWOOD HEMLOCK	POPPLE HARDWOOD	POPPLE HARDWOOD	HARDWOOD BLACK SPRUCE WHITE CEDAR

VILAS COUNTY	TOWN 41 NORTH - RANGE 12 EAST					TOWN 42 NORTH - RANGE 5 EAST						
NAME OF LAKE	SAND	IMOGEN	DEWEY	SPECTALE	KENTUCK	CIRCLE LILY	DEAD PIKE	STAR	REST	MANITOWISH	ALDER	SPIDER
LAKE IN SECTION	2,3,4,9,10 AND TOWN N.	31,32	29,32	26,29	27,28,33,34 & TOWN SOUTH	6	20,21,29	15,16,22	3,4,9,10	14,22,23	25,26,36	12,13,14
TRADING POINT & P.O.	PHELPS	PHELPS	PHELPS	PHELPS	PHELPS	MANITOWISH	MANITOWISH	MANITOWISH	MANITOWISH	MANITOWISH	MANITOWISH	MANITOWISH
AREA IN ACRES	1,502	49	50	198	617	354	288	292	833	532	179	288
MAXIMUM DEPTH IN FEET	31			23	20			57		49		30
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET
WATER IS	MEDIUM		VERY SOFT	VERY SOFT	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM
LAND COVER SURROUNDING LAKE	LEATHER LEAF HARDWOOD	POPPLE HARDWOOD LEATHER LEAF	POPPLE HARDWOOD PIN CHERRY	POPPLE HARDWOOD PIN CHERRY	POPPLE WHITE CEDAR BLACK ASH	POPPLE HARDWOOD	POPPLE OPEN LAND	POPPLE	POPPLE HARDWOOD WHITE PINE	POPPLE JACK PINE	POPPLE WHITE PINE	POPPLE HARDWOOD SCRUB OAK

VILAS COUNTY	TOWN 42 NORTH – RANGE 5 EAST		TOWN 42 NORTH – RANGE 6 EAST									
NAME OF LAKE	STONE	CLEAR	ISLAND	BIG	NELSON	LITTLE CROOKED	WOOL	HARRINGTON	JAG	LITTLE RUDOLPH	EDITH	STREET
LAKE IN SECTION	11,14	1,12	18,19,20	4,5,6	31	1,2	13,14	15	26,27,34,35	28	28,35	23,25,26
TRADING POINT & P.O.	MANITOWISH	MANITOWISH	MANITOWISH	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.
AREA IN ACRES	272	538	873	945	49	116	33	80	192	56	65	47
MAXIMUM DEPTH IN FEET		30	36	65		23	31			11	20	25
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	MEDIUM		MEDIUM	MEDIUM HARD	SOFT	MEDIUM HARD		MEDIUM	VERY SOFT	VERY SOFT	VERY SOFT	VERY SOFT
LAND COVER SURROUNDING LAKE	HARDWOOD POPPLE SCRUB OAK	HARDWOOD POPPLE GRASS MARSH	HARDWOOD WHITE PINE	POPPLE SCRUB OAK	POPPLE NORWAY PINE WHITE PINE	POPPLE BLACK SPRUCE HARDWOOD	POPPLE BLACK SPRUCE OPEN LAND	SPRUCE LEATHER LEAF	POPPLE WHITE PINE SCRUB OAK	POPPLE HARDWOOD SCRUB OAK	POPPLE HARDWOOD SCRUB OAK	POPPLE HARDWOOD SCRUB OAK

VILAS COUNTY	TOWN 42 N.-R. 6 E.	TOWN 42 NORTH – RANGE 7 EAST										
NAME OF LAKE	NICKOLS	CLEAR CROOKED	WOLF	BOULDER	LITTLE RICE	GRASSY	ELIZABETH	OSWEGO	HIGH	FISH TRAP	BIG GIBSON	WHITE SAND
LAKE IN SECTION	24	6,7	6	7,8,17,18	16,17, 21	3	9, 16	10	1 AND IN TOWNS NORTH AND EAST	1,2,11	12 AND TOWN EAST	26,27,35
TRADING POINT & P.O.	BOULDER JCT.	BOULDER JCT	BOULDER JCT.	BOULDER JCT.	BOULDER JCT	BOULDER JCT.	BOULDER JCT	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.	BOULDER JCT.
AREA IN ACRES	32	664	SEE T43N – R.7E.	592	81	113	25	65	960	328	132	744
MAXIMUM DEPTH IN FEET	16	36		19	7	8		8	20	29		70
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET
WATER IS	VERY SOFT	SOFT	MEDIUM HARD	MEDIUM	SOFT	MEDIUM		VERY SOFT	MEDIUM HARD	MEDIUM		MEDIUM
LAND COVER SURROUNDING LAKE	POPPLE HARDWOOD SCRUB OAK	POPPLE HARDWOOD	POPPLE HARDWOOD	PINE HARDWOOD SCRUB OAK	TAGALDER LEATHER LEAF PINE	POPPLE LEATHER LEAF GRASS MARSH	POPPLE LEATHER LEAF	POPPLE WHITE PINE HARDWOOD	POPPLE PINE	POPPLE CATTAIL MARSH	POPPLE WHITE PINE	POPPLE WHITE PINE HARDWOOD

VILAS COUNTY	TOWN 42 NORTH – RANGE 7 EAST		TOWN 42 NORTH – RANGE 8 EAST					TOWN 42 NORTH – RANGE 9 EAST				
NAME OF LAKE	LOST CANOE	NELLIE	LITTLE GIBSON	JUTE	NIXSON	PARTRIDGE	DOROTHY DUNN	HILDA	INDIAN	FOREST	ISLAND	MOCCASIN
LAKE IN SECTION	34, 35	26	7, 8	4, 5 AND TOWN EAST	19, 30	28,32, 33	26, 27	19	17,18	3,4,5,9	8,9,16,17	11
TRADING POINT & P.O	BOULDER JCT	BOULDER JCT	BOULDER JCT	BOULDER JCT	BOULDER JCT	BOULDER JCT	BOULDER JCT	STAR LAKE	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES
AREA IN ACRES	212	40	69	155	120	223	88	64	86	512	414	80
MAXIMUM DEPTH IN FEET	44				5	16	23	13		48	50	21
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS	SOFT				MEDIUM	MEDIUM	SOFT	VERY SOFT	VERY SOFT	MEDIUM	VERY SOFT	VERY SOFT
LAND COVER SURROUNDING LAKE	POPPLE HARDWOOD WHITE PINE	POPPLE PINE	POPPLE SPRUCE SWAMP	POPPLE HARDWOOD PINE	POPPLE SPRUCE	POPPLE HEMLOCK WHITE CEDAR	POPPLE HARDWOOD	LEATHER LEAF OPEN LAND	PIN CHERRY	HEMLOCK HARDWOOD	HEMLOCK OPEN LAND	POPPLE

VILAS COUNTY	TOWN 42 NORTH – RANGE 9 EAST						TOWN 42 NORTH – RANGE 10 EAST					
NAME OF LAKE	ALICE	PICKEREL	EMIL	JOYCE	CLAIR	MARSHALL	BIG PORTAGE	DEER	HEART	LITTLE PORTAGE	RAZOR BACK	DENTON
LAKE IN SECTION	1,12	12,13	10	15	14,15,22,23	26,27	7,8,17,18	29,30	29	11	15	34
TRADING POINT & P.O	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES
AREA IN ACRES	67	34	35	20	72	125	528	51	64	220	64	48
MAXIMUM DEPTH IN FEET						8						
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET (SEASONAL)	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS		VERY SOFT	MEDIUM HARD	VERY SOFT		MEDIUM	SOFT			MEDIUM		
LAND COVER SURROUNDING LAKE	POPPLE NORWAY PINE	POPPLE NORWAY PINE	POPPLE HARDWOOD	POPPLE	POPPLE NORWAY PINE	POPPLE NORWAY PINE JACK PINE	POPPLE NORWAY PINE SCRUB OAK	LEATHER LEAF JACK PINE NORWAY PINE	POPPLE SCRUB OAK NORWAY PINE	POPPLE TAMARACK	WHITE PINE NORWAY PINE	POPPLE JACK PINE

VILAS COUNTY	T.42N.-R.10E.	TOWN 42-RANGE 11 E.				TOWN 43 N.-RANGE 5 E.						
NAME OF LAKE	BLUEGILL	LAC VIEUX DE SERT	PINE	BASS	LITTLE BASS	SOUTH TURTLE	NORTH TURTLE	RAINBOW	TAMARAC	BIRCH	LITTLE LONG	LITTLE PAPOOSE
LAKE IN SECTION	22	4.8.9.10.11.12.13.14.15.16.17	17.18.19	23.24.25.26	26.35	8.17.20	4.5	2.3	3.10	10.11.14	23	24.25
TRADING POINT & P.O.	CONOVER	LAND O LAKES	PHELPS	PHELPS	PHELPS	WINCHESTER	WINCHESTER	WINCHESTER	WINCHESTER	WINCHESTER	MANITOWISH	MANITOWISH
AREA IN ACRES	30	2898	78	152	56	403	314	150	84	503	48	40
MAXIMUM DEPTH IN FEET		19	36			43	47	38		49	59	
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET
WATER IS	SOFT	MEDIUM	VERY SOFT	MEDIUM		MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	SOFT	
LAND COVER SURROUNDING LAKE	SPRUCE JACK PINE	SPRUCE HARDWOODS	PINE POPPLE	HARDWOODS	HARDWOODS	HARDWOODS	POPPLE	HARDWOODS	BALSAM PIN CHERRY	POPPLE	POPPLE	POPPLE

VILAS COUNTY	TOWN 43 N-R. 5 E.	TOWN 43 N.-RANGE 6 E.										
NAME OF LAKE	PAPOOSE	PRESQUE ISLE	KATINKA	CARLIN	MUD LAKE	ANNE	RED	VAN VLIET	MERMAID	HORSEHEAD	ARMOUR	CRAB
LAKE IN SECTION	24.25	5.6.7.8.9.17.18	18.19	17.19.20	16.17	29.30	20.29	16.20.21	3	2.3.11	2.3.10.11	14.15.21.22.23.26.27
TRADING POINT & P.O.	MANITOWISH	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR
AREA IN ACRES	452	1197	217	152	80	72	34	176	32	249	307	852
MAXIMUM DEPTH IN FEET	64	79	60	41		33	23	16		22	44	59
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET
WATER IS	MEDIUM HARD	MEDIUM HARD	VERY SOFT	VERY SOFT	MEDIUM HARD	VERY SOFT	VERY SOFT	MEDIUM HARD	VERY SOFT	MEDIUM	SOFT	SOFT
LAND COVER SURROUNDING LAKE	PINE POPPLE	POPPLE HARDWOOD	HARDWOODS POPPLE	POPPLE	HARDWOODS CEDAR	POPPLE	POPPLE	HARDWOOD CEDAR	OPEN LAND	HARDWOODS	HARDWOODS	HARDWOODS

VILAS COUNTY	TOWN 43N - RANGE 6 E							TOWN 43 N - RANGE 7 E.				
NAME OF LAKE	ROUND	BEAR	LITTLE CRAB	SANFORD	BELLE	OXBOW	ANNA	UPPER AIMER	LOWER AIMER	KNIFE	CANTEEN	RUDOLPH
LAKE IN SECTION	26.35	25.36	22.24.26	25	13	1.12	12.13	5	5 6	7	8	7.17.18
TRADING POINT & P.O.	BOULDER JCT	BOULDER JCT	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR
AREA IN ACRES	247	96	81	80	63	599	227	48	32	30	22	66
MAXIMUM DEPTH IN FEET						49						16
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET
WATER IS					VERY SOFT	SOFT	VERY SOFT	VERY SOFT	VERY SOFT	VERY SOFT	VERY SOFT	VERY SOFT
LAND COVER SURROUNDING LAKE	HARDWOOD	HARDWOOD	HARDWOOD	HARDWOOD	HARDWOOD POPPLE	POPPLE SPRUCE	POPPLE	POPPLE	POPPLE	HARDWOODS	PIN CHERRY POPPLE	HARDWOODS

VILAS COUNTY	TOWN 43 N - RANGE 7 E											
NAME OF LAKE	LYNX	RED BASS	FLORA	BATTINE	LITTLE PRESQUE	LONE PINE	WILDCAT	MUD	TWIN ISLAND	BEAVER	DUNN	MC CULLOUGH
LAKE IN SECTION	18.19	18.19	19.20.29.30	8	3	9.10.15.16	27.28.33.34	27	2.10.11	14	12.13	13.23.24
TRADING POINT & P.O.	WINEGAR	WINEGAR	BOULDER JCT	WINEGAR	WINEGAR	WINEGAR	BOULDER JCT	BOULDER JCT	BOULDER JCT	BOULDER JCT.	BOULDER JCT	BOULDER JCT.
AREA IN ACRES	326	32	160	48	64	152	321	24	224	80	59	208
MAXIMUM DEPTH IN FEET		20	18				41			18		17
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET
WATER IS	VERY SOFT	VERY SOFT	VERY SOFT			SOFT	HARD		HARD	MEDIUM		MEDIUM
LAND COVER SURROUNDING LAKE	HARDWOOD	PIN CHERRY BALSAM	HARDWOOD	PIN CHERRY	CEDAR	PIN CHERRY	POPPLE	POPPLE PIN CHERRY	PIN CHERRY	HARDWOOD	HARDWOOD	POPPLE

VILAS COUNTY	TOWN 43N. - R.7E.	TOWN 43 NORTH - RANGE 8 EAST										
NAME OF LAKE	MORTON	ROACH	GEORGE	TENDERFOOT	PALMER	SANBORN	CORRINE	COCHRAN	JONES	CRAMPTON	BIG	BEN
LAKE IN SECTION	23,24,26	7	7	7,8,18	15,16,20,21	18,19	17, 20	20, 21	28, 29	14, 15	13,14,23,24	25,26,35,36
TRADING POINT & P.O.	WINEGAR	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES	LAND O'LAKES
AREA IN ACRES	161	48	32	360	708	250	48	96	53	53	772	52
MAXIMUM DEPTH IN FEET	25		40	28	15	20					25	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET
WATER IS	MEDIUM	VERY SOFT	VERY SOFT	MEDIUM	MEDIUM HARD	MEDIUM		MEDIUM	MEDIUM	VERY SOFT	MEDIUM	
LAND COVER SURROUNDING LAKE	POPPLE LEATHER LEAF	HARDWOOD BLACK SPRUCE LEATHER LEAF	POPPLE HARDWOOD BLACK SPRUCE	POPPLE HARDWOOD BLACK SPRUCE	HARDWOOD BALSAM	POPPLE BALSAM HARDWOOD	HARDWOOD SPRUCE	HARDWOOD NORWAY PINE CEDAR	SPRUCE	HARDWOOD HEMLOCK	HARDWOOD SPRUCE	HARDWOOD SPRUCE

VILAS COUNTY	TOWN 43 NORTH - RANGE 9 EAST								TOWN 43 NORTH - RANGE 10 EAST		TOWN 44 NORTH - RANGE 5 EAST	
NAME OF LAKE	WEST BAY	HELEN	HARDIN	MAMIE	SPRING	ANDERSON	DONAHUE	BLACK OAK	LITTLE BASS	CHARLOTTE	LAKE GEORGE	NO MAN'S
LAKE IN SECTION	19	27	27, 29, 31	17,18,28,29	27	26, 31	25, 36	26,35,36	30,31	32,33	19,30	17,20
TRADING POINT & P.O.	LAND O'LAKES	LAND O' LAKES	LAND O' LAKES	LAND O'LAKES	LAND O' LAKES	LAKE O' LAKES	LAND O'LAKES	LAND O' LAKES	LAND O' LAKES	LAND O'LAKES	WINCHESTER	WINCHESTER
AREA IN ACRES	772	80	134	348	200	65	107	599	104	347	120	202
MAXIMUM DEPTH IN FEET	26			16		64		80			71	26
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	OUTLET
WATER IS		MEDIUM	VERY SOFT	MEDIUM	MEDIUM HARD	MEDIUM HARD	VERY SOFT	SOFT	VERY SOFT	MEDIUM	VERY SOFT	SOFT
LAND COVER SURROUNDING LAKE	HARDWOOD POPPLE	HARDWOOD POPPLE	HARDWOOD	POPPLE BALSAM OPEN LAND	HARDWOOD POPPLE CEDAR	HARDWOOD	HARDWOOD LEATHER LEAF SPRUCE	HARDWOOD WHITE PINE NORWAY PINE	HARDWOOD	HARDWOOD GRASS MARSH CATTAIL MARSH	HARDWOOD WHITE PINE	HARDWOOD WHITE PINE WHITE CEDAR

VILAS COUNTY	TOWN 44 NORTH - RANGE 5 EAST				TOWN 44 NORTH - RANGE 6 EAST				
NAME OF LAKE	CONSTANCE	ADELADE	ROCK	HARRIS	MURPHY	CATHALINE	OSCAR	STATE LINE	LITTLE HORSEHEAD
LAKE IN SECTION	30,31	32	28, 33	23,25,26,35,36	29	31	32	26, 34, 35	34,35
TRADING POINT & P.O.	WINCHESTER	WINCHESTER	WINCHESTER	WINCHESTER	WINEGAR	WINEGAR	WINEGAR	WINEGAR	WINEGAR
AREA IN ACRES	80	51	128	492	32	32	96	34	80
MAXIMUM DEPTH IN FEET	51	61	20	50	49	46	21	32	
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET
WATER IS	VERY SOFT		MEDIUM	MEDIUM	VERY SOFT	VERY SOFT	VERY SOFT	MEDIUM	MEDIUM
LAND COVER SURROUNDING LAKE	HARDWOOD WHITE PINE	HARDWOOD PIN CHERRY	SPRUCE PIN CHERRY HEMLOCK	HARDWOOD POPPLE SPRUCE	POPPLE	POPPLE CLEARED LAND	POPPLE SPRUCE	HARDWOOD POPPLE	PERMANENT PASTURE

VILAS AND ONEIDA COUNTIES

WATER DETERMINATIONS FOR LAKES IN VILAS COUNTY WERE MADE BY THE NATURAL HISTORY SURVEY WHICH HAS HAD A BIOLOGICAL STATION AT TROUT LAKE FOR MANY YEARS. THE SURVEY'S LAKE SOUNDINGS WERE LACKING FOR SOME LAKES. THESE WERE SOUNDED BY THE LAND ECONOMIC INVENTORY CREW. ALL WATER DETERMINATIONS AND SOUNDINGS FOR ONEIDA COUNTY LAKES IN THIS REPORT WERE ALSO TAKEN FROM THE NATURAL HISTORY SURVEY RECORDS. SOME LAKES IN ONEIDA COUNTY ARE STILL NOT REPORTED.

ONEIDA CO.	T 35N-R 10E	TOWN 36N - RANGE 7E			TOWN 36N - RANGE 8E				T 36N.-R. 9 E	T. 36N.-R.10E	T 36N.-R.11E	T.37N.-R.6E
NAME OF LAKE	PELICAN	LOON	WASHBURN	WOLF	CRESCENT	EMMA	SAWYER	SQUASH	GEORGE	N. PELICAN	VENUS	BASS
LAKE IN SECTION	13.14.15.22.23.24.25	26	12.13	26	7.8.17.18.20.21	21.28		18.19	11.14.15	4.5	20	11.14
TRADING POINT & P.O.	PELICAN LAKE	WOODBORO	WOODBORO	WOODBORO	RHINELANDER	RHINELANDER		WOODBORO	RHINELANDER	ROOSEVELT	MONICO	GOODNOW
AREA IN ACRES	3520				1070			590	262	685		51
MAXIMUM DEPTH IN FEET	40.5		26	9	24	17	22		21	20	19	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	MEDIUM BROWN		SOFT BROWN	VERY SOFT BROWN	MEDIUM BROWN	SOFT BROWN	SOFT BROWN	SOFT SLIGHTLY BROWN	MEDIUM BROWN	SOFT BROWN	MEDIUM BROWN	
LAND COVER SURROUNDING LAKE	MIXED FOREST	LEATHER LEAF BOG	POPPLE, SPRUCE SWAMP	POPPLE BLACK SPRUCE	HARDWOOD, POPPLE	HARDWOOD, POPPLE		POPPLE, HARDWOOD	HARDWOOD	POPPLE, CONIFERS	CLEARED LAND PASTURE	POPPLE, BIRCH

ONEIDA CO	T 37 N.- R.8E	TOWN 37N - RANGE 7E								TOWN 37 N. - RANGE 8 E.		
NAME OF LAKE	LITTLE BEARSKIN	ALVA	BEAVER	BIRCH	LITTLE MUSKELLUNGE	LITTLE HORSESHOE	GOODYEAR	E HORSEHEAD	LONG	COON	FLANNER	HOOK
LAKE IN SECTION	11,12	10,11		6	5	16	26	9,10,15,16	3,10	19, 20	28,33	29, 32
TRADING POINT & P O	GOODNOW	GOODNOW		GOODNOW	GOODNOW	GOODNOW	GOODNOW	GOODNOW	GOODNOW	RHINELANDER	RHINELANDER	RHINELANDER
AREA IN ACRES	209	165		230		139	20	171			160	40
MAXIMUM DEPTH IN FEET		36		27	40	16		26	40	22		
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED		LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED
WATER IS		SOFT BROWN			MEDIUM BROWN	MEDIUM BROWN		MEDIUM BROWN	SOFT SLIGHTLY BROWN	SOFT CLEAR	SOFT BROWN	SOFT BROWN
LAND COVER SURROUNDING LAKE	POPPLE BIRCH	HARDWOOD CONIFERS		HARDWOOD, POPPLE	HARDWOOD CONIFERS	HARDWOOD	POPPLE	HARDWOOD	HARDWOOD CONIFERS	POPPLE CONIFERS	POPPLE, CONIFERS	POPPLE, HARDWOOD

ONEIDA CO.	TOWN 37 NORTH	RANGE 8 EAST			TOWN 37 NORTH	RANGE 9 EAST						T 37N - R 10E
NAME OF LAKE	TOWN LINE	MILDRED	SHERRY	SILVER BASS	SILVER	PINE	ROUND	MOEN	BOOM	CRYSTAL	SYLVAN	STELLA
LAKE IN SECTION	35	19,20,29	18-19	22	6	4,5,9	19,20	25,36	30, 31, 32	6 & 7 NORTH	5,6	1,2,11,12
TRADING POINT & P O	RHINELANDER	RHINELANDER	RHINELANDER	RHINELANDER	RHINELANDER	RHINELANDER	RHINELANDER	ROOSEVELT	RHINELANDER	RHINELANDER	RHINELANDER	STARKS
AREA IN ACRES	80	412	80		95	125	247	450	170	40	80	463
MAXIMUM DEPTH IN FEET				27	29	32				33	12	10
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET
WATER IS	VERY SOFT SLIGHTLY BROWN	VERY SOFT BROWN	VERY SOFT BROWN	VERY SOFT BROWN	SOFT CLEAR	VERY SOFT BROWN		SOFT BROWN	MEDIUM BROWN	VERY SOFT CLEAR	VERY SOFT BROWN	MEDIUM BROWN
LAND COVER SURROUNDING LAKE	HARDWOOD CONIFERS	HARDWOOD POPPLE	HARDWOOD	JACK PINE SCRUB OAK	POPPLE BIRCH	POPPLE CONIFERS	POPPLE, CONIFERS	HARDWOODS CONIFERS	HARDWOOD CONIFERS	POPPLE - CONIFERS	POPPLE BIRCH	HARDWOOD

ONEIDA COUNTY	T 37 N - R 10 E	TOWN 38 NORTH	RANGE 5 EAST	TOWN 38 NORTH	RANGE 6 EAST							
NAME OF LAKE	STONE	SUNSHINE	BEUN OR HARRIET	RAYMOND OR LAKE SEVENTEEN	KATHERINE	MILLER	MOORE OR HARRINGTON	LOWER KAUBACHIEN	YAWKEY	EAST TWIN	GARTH OR COLLINS	HARRIS
LAKE IN SECTION	29,30,31,32	27, 34	24	17, 18	2, 3, 10, 11, 14, 15	1, 12		4, 9	15, 22	30	21, 28	26
TRADING POINT & P O	ROOSEVELT	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST
AREA IN ACRES	266	180	352	217	640	90		224	109	19	111	77
MAXIMUM DEPTH IN FEET		8	20	38	23		24	59	69	19	20	27
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED		OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET
WATER IS		SOFT BROWN			SOFT SLIGHTLY BROWN		VERY SOFT CLEAR	MEDIUM BROWN	VERY SOFT CLEAR		MEDIUM BROWN	
LAND COVER SURROUNDING LAKE	POPPLE IMPROVED LAND			JACK PINE POPPLE	HARDWOOD MIXED CONIFERS	POPPLE MIXED CONIFERS		POPPLE MIXED CONIFERS	POPPLE	POPPLE	POPPLE	

ONEIDA COUNTY	TOWN 38 NORTH - RANGE 6 EAST					TOWN 38 NORTH - RANGE 7 EAST						
NAME OF LAKE	UPPER KAUBASCHEIN	BLUE	LOST	BEARSKIN	SILVER	NEWMAN	NORTH TWO	SOUTH TWO	LITTLE CARR	LITTLE TOMAHAWK	Mc GRATH	Mc NAUGHTON
LAKE IN SECTION	9, 10, 15, 16	28	26,27,34,35	35,36	5,6	33	15,16	15 16 21 22	9	8	8-17	28,35
TRADING POINT & P O	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	HAZELHURST	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE
AREA IN ACRES	275		57	365	58	158	224	307	60	134	63	260
MAXIMUM DEPTH IN FEET	24	27		27		16	33	69	24	50	18	
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET		OUTLET
WATER IS	SOFT	SOFT		MEDIUM SLIGHTLY BROWN	SOFT CLEAR	VERY SOFT SLIGHTLY BROWN	VERY SOFT CLEAR	VERY SOFT CLEAR	VERY SOFT CLEAR	MEDIUM GREEN	VERY SOFT CLEAR	MEDIUM BROWN
LAND COVER SURROUNDING LAKE	POPPLE HARDWOOD	POPPLE	POPPLE SPRUCE	POPPLE HARDWOOD	MIXED CONIFERS	HARDWOOD- POPPLE	HARDWOOD-POPPLE	POPPLE SCRUB OAK SWAMP	POPPLE-HARDWOOD SWAMP	HEMLOCK-HARDWOOD SWAMP	SWAMP - POPPLE	CEDAR, POPPLE SWAMP

ONEIDA COUNTY	TOWN 38 NORTH - RANGE 7 EAST								TOWN 38 NORTH - RANGE 8 EAST			
NAME OF LAKE	WIND PUDDING	TWENTY - ONE	HODSTRADT	HORSEHEAD	FLIEGEL	BIG CARR	BIRD	BROWN	MUSKELLUNGE	OSWEGO	CURRAN	STONE
LAKE IN SECTION	20,21,28,29			10,11,14,15,22,23	3	9, 16, 17	7	31,30	3,9,10	2	24,25	15,22
TRADING POINT & P O	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	Mc NAUGHTON	Mc NAUGHTON	Mc NAUGHTON	Mc NAUGHTON
AREA IN ACRES	314	40	115	525	10	320	134	60	222	82	125	57
MAXIMUM DEPTH IN FEET	31		35	12	52	75	42			9	29	13
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED
WATER IS	SOFT BROWN	VERY SOFT SLIGHTLY BROWN	VERY SOFT CLEAR	MEDIUM HARD BROWN	VERY SOFT CLEAR	VERY SOFT CLEAR				VERY SOFT CLEAR	SOFT BROWN	SOFT BROWN
LAND COVER SURROUNDING LAKE									HARDWOOD CONIFERS	SWAMP HARDWOOD	HARDWOOD	CEDAR BALSAM

ONEIDA COUNTY	TOWN 38 NORTH - RANGE 8 EAST							TOWN 38 NORTH - RANGE 9 EAST				
NAME OF LAKE	KATE PIER	LONG	YOUNG OR TURTLE	TOM DOYLE	TWIN	TWO SISTERS	BROWN	JENNIE WEBBER	MUD	PICKEREL	BASS	SUGAR CAMP
LAKE IN SECTION	23	9, 10, 16	14	21,22,28	22	16,17,18,19,20	9,10,16	35	22	17,18 & 36-8,12,13		1,2 & 36-7,10
TRADING POINT & P O	Mc NAUGHTON	Mc NAUGHTON	Mc NAUGHTON	Mc NAUGHTON	Mc NAUGHTON	Mc NAUGHTON	Mc NAUGHTON	RHINELANDER	RHINELANDER	Mc NAUGHTON	THREE LAKES	THREE LAKES
AREA IN ACRES	41	172	82	158	21	909	310	197	82	108	54	666
MAXIMUM DEPTH IN FEET	13	38		27	14	64	20					30
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	LANDLOCKED
WATER IS	MEDIUM BROWN	SOFT BROWN		SOFT BROWN	SOFT BROWN	MEDIUM BROWN	SOFT SLIGHTLY BROWN	SOFT BROWN				VERY SOFT CLEAR
LAND COVER SURROUNDING LAKE	BALSAM WHITE PINE	HARDWOOD CONIFERS	POPPLE BIRCH	HARDWOOD POPPLE	BLACK SPRUCE	MIXED HARDWOOD CONIFERS	HARDWOOD CONIFERS	MIXED FOREST	POPPLE	HARDWOOD		HARDWOOD

ONEIDA COUNTY	TOWN 38 NORTH - RANGE 9 EAST			TOWN 38 NORTH RANGE 10 EAST					TOWN 38 NORTH RANGE 11 EAST			
NAME OF LAKE	TAMARAC	TIM LENNON	INDIAN	LILLIE	THUNDER	COOK	HUTCHINSON	BURNHAM	MUD	MOCCASIN	JULIA	LAUREL
LAKE IN SECTION	26,27	19,30 & 36-8,24,25	1 & 36-6 10	7 8	2,3,9,10,11,12,14 15,16,22,23	22	22,23	5,6,7,8	16,17	9	1,12 & 36-12	4
TRADING POINT & P O	RHINELANDER	Mc NAUGHTON	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES
AREA IN ACRES	133	166	482	70	1,796	33	31	95	109	96	160 IN T-36N R11E	
MAXIMUM DEPTH IN FEET	24	14	20		6.5	19				22	45	19
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	
WATER IS	SOFT BROWN	SOFT BROWN	MEDIUM BROWN		SOFT BROWN	SOFT BROWN				SOFT SLIGHTLY BROWN	MEDIUM BROWN	MEDIUM BROWN
LAND COVER SURROUNDING LAKE	HARDWOOD CROPLAND	POPPLE SPRUCE	HARDWOOD POPPLE	HARDWOOD CONIFERS	UPLAND AND LOWLAND FOREST	UPLAND HARDWOOD	SWAMP HARDWOOD	HARDWOOD CONIFERS	HARDWOOD CONIFERS	BALSAM TAMARACK		

ONEIDA COUNTY	TOWN 38 NORTH - RANGE 11 EAST											
NAME OF LAKE	LITTLE MOCCASIN	BIG	BIG STONE	MAPLE	MEDICUS	BASS	WHITEFISH	VIRGIN	SPIRIT	CROOKED	DEER	DOG LAKE
LAKE IN SECTION	8, 9	15,20,21,22,28	3, 4, 10	6	4, 5 & 39-11,33	33,34	13	10,11,14,15	4,5,8,9	26,27	9, 10	15,16
TRADING POINT & P O	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES	THREE LAKES
AREA IN ACRES	40	887	556	91	640	40	160	267	348	160	188	173
MAXIMUM DEPTH IN FEET		10	57	7	13	17	24	18	19	10	16	10
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET
WATER IS		SOFT BROWN	SOFT SLIGHTLY BROWN	MEDIUM BROWN	SOFT CLEAR	SOFT SLIGHTLY BROWN	MEDIUM BROWN	MEDIUM BROWN	MEDIUM BROWN	MEDIUM BROWN	MEDIUM BROWN	MEDIUM BROWN
LAND COVER SURROUNDING LAKE	POPPLE HARDWOOD	MIXED FOREST	MIXED FOREST	HARDWOOD CONIFERS	HARDWOOD CONIFERS	POPPLE N. PINE		HARDWOOD CONIFERS	HARDWOOD MIXED CONIFERS	POPPLE BIRCH		NORWAY PINE WHITE PINE

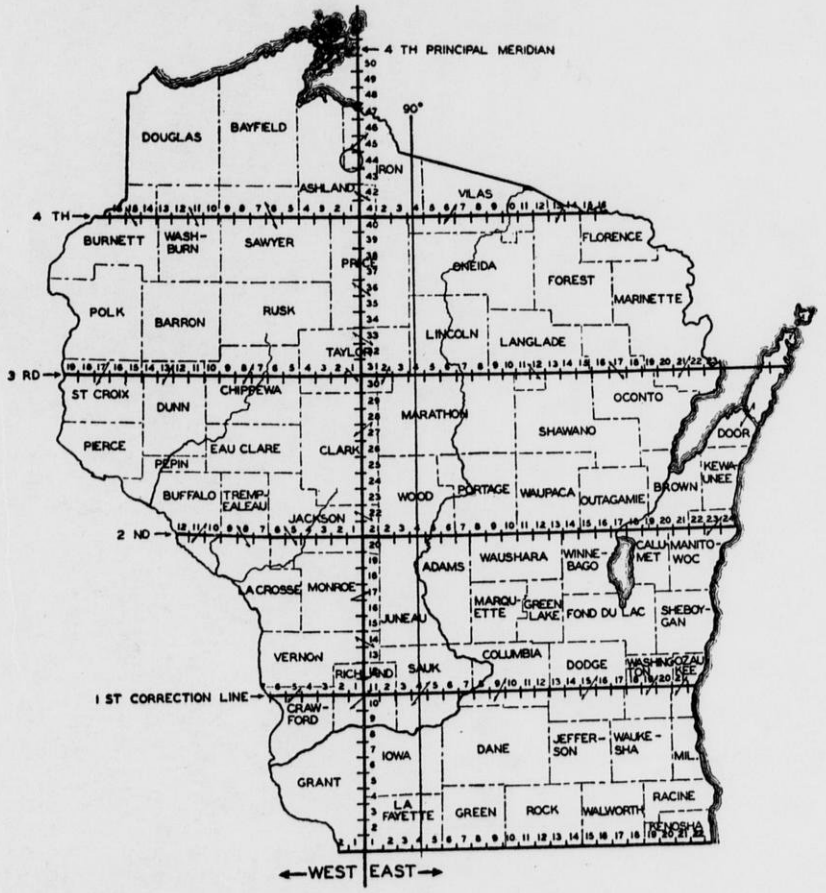
ONEIDA COUNTY	T.38N - R11E	TOWN 39 NORTH - RANGE 4 EAST							TOWN 39 NORTH - RANGE 5 EAST			
NAME OF LAKE	ELM	STONE	GREAT BASS	CLEAR OR SQUAW	BAYCOTT	BUCKSKIN	CLEAR	SQUAW	TORPY	MALBY	MARION	MERCER
LAKE IN SECTION	13	27, 34	12,13	2,3,10,11	23,26	1,2,11,12 & 40-4,36	2,3,10,11	6 & 40-4	9,10	12		13,14
TRADING POINT & P O	THREE LAKES	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA
AREA IN ACRES	37	158	139	243	63	540	162	864	48	55	96	371
MAXIMUM DEPTH IN FEET	24		20	20		20	20	13	24		16.5	22
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED	LANDLOCKED		OUTLET
WATER IS	MEDIUM BROWN		SOFT BROWN	SOFT SLIGHTLY BROWN		MEDIUM BROWN	SOFT BROWN	SOFT SLIGHTLY BROWN	VERY SOFT SLIGHTLY BROWN	VERY SOFT SLIGHTLY BROWN	VERY SOFT CLEAR	MEDIUM BROWN
LAND COVER SURROUNDING LAKE		POPPLE CONIFERS	POPPLE BIRCH BALSAM	POPPLE HARDWOOD	POPPLE LEATHER LEAF	POPPLE BALSAM		POPPLE CONIFERS				

ONEIDA COUNTY	TOWN 39 NORTH - RANGE 5 EAST							TOWN 39 NORTH RANGE 6 EAST				
NAME OF LAKE	BOOTH	FRANKLIN	DIAMOND	SUNDAY	MILLER	SQUIRREL	SHISHEBAGAMA	HILL	TOMAHAWK	M. KENNA	SNAKE	BLUE OR RUSK
LAKE IN SECTION	6,7	18	7,18	3,10	10,11,14,15	5,8,9,16,17 18,19,20,30	1,2,3 10,11,12 & 40-5	8,9	24,25 36-6,7 39-7 36	26,27	2	20,28,29,32,33
TRADING POINT & P O	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	TOMAHAWK	MINOCQUA	WOODRUFF	MINOCQUA
AREA IN ACRES	189	186	132	109	51	1,568	858	46	3648	109		220
MAXIMUM DEPTH IN FEET	33	20	17	42		34	29	14	73 8	42	20	44
LAKE HAS OUTLET OR IS LANDLOCKED	OUTLET	LANDLOCKED		LANDLOCKED	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	OUTLET	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	MEDIUM SLIGHTLY BROWN	VERY SOFT CLEAR	MEDIUM BROWN	VERY SOFT BROWN		MEDIUM BROWN	MEDIUM SLIGHTLY BROWN	SOFT BROWN	MEDIUM BROWN	SOFT CLEAR	SOFT BROWN	SOFT
LAND COVER SURROUNDING LAKE									MIXED FOREST	POPPLE WHITE BIRCH	CROPLAND URBAN LAND	HARDWOOD CONIFERS

ONEIDA COUNTY	TOWN 39 NORTH RANGE 6 EAST				TOWN 39 NORTH - RANGE 7 EAST							
NAME OF LAKE	BULLHEAD	CARRIE	CURTIS	KEWASOKGAN	BUFFALO OR HERTZEL	GILMORE	KANARD	CLEAR	MADELINE	DORTHY	WALKER	WOHELO
LAKE IN SECTION		14			11,12	13,24		9,10,15,16,12,21	5 8 & T 40 N R 7E	35	8	27
TRADING POINT & P O	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	MINOCQUA	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE
AREA IN ACRES	77	120		2067	141	288		922	166	154	40	
MAXIMUM DEPTH IN FEET	17		14	55.8	24	27	33	87		27	17	38
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	LANDLOCKED		OUTLET	LANDLOCKED	OUTLET		LANDLOCKED		LANDLOCKED	LANDLOCKED	
WATER IS	VERY SOFT CLEAR		VERY SOFT CLEAR		VERY SOFT CLEAR	MEDIUM BROWN	MEDIUM BROWN	VERY SOFT CLEAR	MEDIUM SLIGHTLY BROWN	VERY SOFT CLEAR	SOFT BROWN	SOFT BLUE
LAND COVER SURROUNDING LAKE		URBAN LAND		MIXED FOREST								

ONEIDA COUNTY	TOWN 39 NORTH - RANGE 7 EAST						TOWN 39 NORTH RANGE 8 EAST					
NAME OF LAKE	SURESHOT	SWEENEY	BASS	MUD OR BIRCH	CARROL	HASHROOK	LITTLE PICKEREL	NOKOMIS	PICKEREL	BASS HATCHERY	SILVER	WOODCOCK
LAKE IN SECTION	23	14,15,22,23	15,16,21,22		4,5,8,9	26 25	4	23,24,26	5,6 7,8	8,17,18,7	13,24	32,33
TRADING POINT & P O	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	TOMAHAWK LAKE	WOODRUFF	TOMAHAWK LAKE	WOODRUFF	WOODRUFF	MINOCQUA	TOMAHAWK LAKE
AREA IN ACRES	20	186		128	288	314		488	288	58	102	76
MAXIMUM DEPTH IN FEET	32		55	27	23	37		73	17	24	33	
LAKE HAS OUTLET OR IS LANDLOCKED	LANDLOCKED	OUTLET	LANDLOCKED		OUTLET	LANDLOCKED	LANDLOCKED	LANDLOCKED	OUTLET DAMMED	OUTLET	LANDLOCKED	LANDLOCKED
WATER IS	VERY SOFT CLEAR	MEDIUM BROWN	VERY SOFT SLIGHTLY BROWN	MEDIUM BROWN	MEDIUM BROWN	SOFT SLIGHTLY BROWN	SOFT BROWN	MEDIUM BROWN	MEDIUM BROWN	VERY SOFT CLEAR	VERY SOFT SLIGHTLY BROWN	
LAND COVER SURROUNDING LAKE	POPPLE & SWAMP	POPPLE - HARDWOOD	POPPLE - HARDWOOD		POPPLE - HARDWOOD	SWAMP - POPPLE	POPPLE BALSAM	POPPLE	POPPLE	POPPLE	POPPLE	POPPLE

MAP OF WISCONSIN, SHOWING THE PRINCIPAL MERIDIAN, BASE LINE, CORRECTION LINES AND NUMBERS OF THE TOWNSHIPS AND RANGES.



THE LAKES OF WISCONSIN

By L. B. Nagler

Straight Lake, Crooked Lake, Narrow Lake and Flat;

Bear, and Deer, and Beaver Lakes; Fox and Wolf, and Cat.

Otter, Moose, and Elk Lakes; Boulder Rock and Stone;

Boot, and Shoe, and Elbow Lakes; and Limb, and Rib, and Bone.

Pickerel, Trout, and Bass Lakes, and Muskellunge, and Perch;

Maple, Pine and Balsam Lakes; Butternut, and Birch.

Mosquito, Fly, and Spider Lakes; Yellow, Red, and Black;

John's and George, and Willy Lakes; Casey, Dan and Jack.

Lakes Virgin, Grace, and Beauty; Lake Helen, Lake Corrine;

Thunder, Storm, and Cyclone Lakes; White, and Blue, and Green

A Devil Lake, an Angel Lake, a Spirit, and a Fay;

A Phantom Lake, a Ghost Lake, and a Bogy Man's, they say.

There's Duck Lake, Gull Lake, Pigeon Lake, and Goose;

Indian Lake, and Squaw Lake, and pretty Lake Papoose.

Kosh'ko-nong, Mendo'ta, Wa-be'sa, Court d'Oreilles;*

Po-keg'a-ma, Min-oc'qua, Mus-ke'go, Puk'a-way.

Ke-gon'sa, and Ash-wau'be-non, To-tog'a-tic, and Loon;

Pe-wau'kee Lake, Wau-pac'a Lake, Mono'na Lake, and Moon

Many Rice and Berry lakes, and Long Lakes by the score;

Sunfish, Pike, and Sucker Lakes, about a hundred more.

At least two thousand others, and every one is fine;

If you would know what's in them just drop the fish a line.

* Pronounced coo'de-ray.