

VEGETATION OF THE BRULE BASIN, PAST AND PRESENT

Brule River Survey: Paper No. 4

NORMAN C. FASSETT

The Brule River flows northward in eastern Douglas County, Wisconsin, to Lake Superior (Map 1). It is notable to geologists in that it occupies the valley carved by the outlet of the Glacial Lake Duluth, which was in the western end of what is now Lake Superior, during the recession of the Superior lobe of Substage 4 of Wisconsin glaciation. It has long been notable to sportsmen as a trout stream; indeed, this study was initiated for the purpose of determining whether there have been changes in the vegetation of the drainage basin which might be responsible for changes in the environment of the fish.

Map 2 was derived from a study of the notes of the government surveyors who laid out the section lines in the region in 1852-56. Map 3 was derived largely from the survey in 1932 by the Wisconsin Land Economic Inventory, somewhat modified by notes of the Wisconsin Geological Survey in 1925 and by personal observation in 1942-43. Details of the methods of deriving these maps will be discussed later.

The Brule Basin may be conveniently divided into four general areas, (1) the gorge of the upper Brule, shown by the brown band along the river on Maps 2 and 3, (2) the sand barrens, shown mainly by the stippled red on both sides of the upper Brule on Map 2, (3) the valley of Nebagamon Creek, the largest tributary, entering the Brule in T.47, R.10W., and (4) the lower Brule basin, embracing essentially the area in solid pink and solid orange on the northern third of Map 2.

THE BOG

The upper Brule is remarkable in that it flows northeastward in the ancient channel of a much larger stream, the outlet of Lake Duluth (which occupied what is now the west end of Lake Superior) in early post-glacial times, and flowed southwestward

to what is now the St. Croix River and eventually to the Mississippi. The route of this outlet, south and southwest through what is now the Brule, past Solon Springs and down the St. Croix, may be easily traced on Map 1. This channel was cut through sand, and is now occupied by a continuous bog (brown on both maps). On every section line crossing the river in this region the surveyors of 1852-56 recorded the fact that they entered a bog, covered largely with White Cedar, Tamarack, and Black Spruce. Their descriptions are quite consistent with that of Owen,¹ who wrote: "The whole country has a very singular aspect, with lakes [several lakes, represented as one continuous lake in the northern part of T.46N., R.10W. on Maps 2 and 3] of still water, connected by short and swift rapids, that meander through a dense growth of cedar and tamarack. . . . After navigating four lakes [Owen is traveling up-stream] . . . the Brule meanders through a series of cedar swamps, separating into several channels, the main one being sixty or seventy yards wide. . . . The river now very soon contracts its dimensions to a mere creek, just wide enough to float a canoe between the bushes that overhang its banks." In 1880, Sweet² wrote: "The head of the Brule is less than two miles from the Upper St. Croix lake [the head of the St. Croix River, which still flows to the Mississippi]. Several small spring branches unite with the main channel in the northern part of T.45N., R.11W., and the exceedingly sluggish stream winds through dense cedar, tamarac and alder swamps, for a distance of eight or ten miles."

These descriptions, some nearly a century old, are just as applicable today. Nearly all of the long narrow bog shown in brown on Map 1 is duplicated on Map 3. Plates 1-3 show various places along this bog as they now appear. In a few places (Plate 4) the trees have been cut and the land probably burned over; here the bog is quite spoiled and has gone to grass or sedge-meadow.

THE BARRENS

The Barrens, developed chiefly on an outwash sand plain, are shown on the maps by red stippled areas, and originally

¹ David Dale Owen, Report of a geological reconnaissance of the Chippewa Land District. Senate Executive Document 57; 58-61. 1848.

² E. T. Sweet, Geology of the western Lake Superior district. Geology of Wisconsin, 3:321-322. 1880.

(Map 2) extended for several miles on each side of the upper Brule. The appearance of this region three-quarters of a century ago can be best portrayed by a few verbatim excerpts from the notes of the surveyors.

On the line between T.45 and 46N., R.10W., in May, 1855. Travelling west between Sections 3 and 34:

- "40:00³ set $\frac{1}{4}$ section Post
 - Black Pine 5 N 28 W 45 links⁴
 - Black Pine 5 S 58 W 32 links
- "80:00 Set corner to Sections 3, 4, 33 and 34
 - Black Pine 5 N 54 W 28 links
 - Black Pine 5 N 80 E 28 links
 - Black Pine 5 S 5 E 51 links
 - Black Pine 5 S 20 W 61 links
- "Surface rolling.
- "Pine barrens."

A little calculation will show that these 5-inch Jack Pines, presumably the largest trees at that location, were spaced approximately 80 feet apart.

On the same line, west between Sections 5 and 32:

- "40:00 Set $\frac{1}{4}$ Section Post
 - Dead Black Pine 8 S 49 W 40 links
 - Dead Black Pine 9 N 28 E 50 links
- "80:00 Set corner to Sections 5, 6, 31 and 32
 - Dead Black Pine 10 N 45 W 53 links
 - Dead Black Pine 10 N 66 E 59 links
 - Dead Black Pine 10 S 50 E 31 links
 - Dead Black Pine 10 S 25 W 36 links
 - Black Pine 5 N 28 W 45 links
- "Black Pine Brush from 4 to 8 feet high as thick as it can stand. No green timber in sight."

After surveying a township (36 square miles) each surveyor wrote a brief description of it. The one for T.46N., R.9W., written in September, 1856, is characteristic of the regions shown as stippled red on Maps 2 and 3: "This is a Township of barrens that is almost worthless for agricultural purposes, or anything else, as there is but very little Timber in it, and that is scrubby Black Pine; and there is hardly a drop of water in the Township, in fact *now*, except [for?] small ponds in the South

³ These figures indicate chains from the section corner at which the surveyor commenced; there are eighty chains to a mile.

⁴ Black Pine is Jack Pine. *Pinus Banksiana*. The "5" indicates diameter at breast height, in inches. This tree was 45 links from the corner post, and the direction was 28 degrees west of north; a link is 7.92 inches.

end of it [outside the Brule basin], the Prairie that I have noted on the West side; can hardly be called a Prairie, as no very great time has elapsed since it was covered with small Pine which has been blown down, and burned up, remnants of which still lie on the ground." (Some of these surveyors may have been weak in the rules of punctuation, but they could write a vivid description.)

In the township just described there were occasionally no witness trees at all; for example, at the quarter-section between sections 18 and 19, the surveyor "Set quarter Section post in a Mound of earth and sod, drove charred stick 10 inches long." Not even a stick of uncharred wood was to be found!

The monotony of small Jack Pines was occasionally broken by a few scattered large Norway Pines (*Pinus resinosa*, called "Yellow Pine" by many surveyors). In T.46N., R.10W., going north between Sections 22 and 23, in August, 1854, the record runs:

"40:00 Set quarter Section Post
 Black Pine 6 N 34 E 22 links
 Black Pine 6 S 43 W 6 links
 "80:00 Set post corner to Sections 14, 15, 22 and 23
 Black Pine 10 N 45 W 1.40 links
 Yellow Pine 20 S 40 E 180 links
 "Surface rolling. Soil 3d rate
 "Timber Pine—brush."

In T.45N., R.10W., at the quarter-section post between sections 6 and 7, the record is: "Yellow Pine 20 S 35 E 1080 links. No other near." The nearest tree at this point was therefore more than 700 feet away, a large Norway Pine towering over the brush.

Description of T.46N., R.10W. as of 1856: "This is one of those barren Townships that is almost worthless for agricultural purposes. The Surface is rolling excepting that portion adjoining the Brula, which is very broken; the Brula River flows through a valley that is 150 or 200 feet below the general level of the country; on the east side of the River the Bluffs are steep, but on the West side the land rises gradually from the River bottom, so that the top of the Bluff cannot well be defined; the River bottom is one continuous Cedar Swamp that is miry and unfit for cultivation. The timber on the entire Township is worthless."

On Map 4 the figures indicate the diameter at breast height, in inches, of Jack Pines used as witness trees. A dot on a section line indicates that the species was recorded as present, but not used as witness trees. The significant thing about these trees as recorded on the map is the uniformity of size in many regions. There is a large area, for example, in T.45N., R.10W., where nearly all the trees are five inches in diameter. In southeastern T.46N., R.10W. there is another area of uniformity, the trees here being six inches. These large areas of trees of uniform size, and therefore uniform age, are without doubt due to the ability of this species to repopulate an area after a fire. Near the Brule River, and along the northwestern border of the range of the tree in this area, fires were not quite so frequent and widespread, and the Jack Pines were less uniform and reached a larger size.

Next to Jack Pine, the most abundant trees on the Barrens were Oaks. Occasionally an Oak reached a diameter of ten inches, but most of them were described as Oak Brush.

The barrens of 90 years ago, then, were a region of frequent fires, covered with small Jack Pine of a uniform size in each area, the size dependent upon the elapsed time since the last severe fire; occasionally a few large scattered Norway Pines were present. Oak trees and Oak Brush often accompanied and sometimes replaced the Pines.

The barrens as they appeared in 1942 are shown in Plates 5 to 7. They are frequently burned and nearly treeless; Plate 7 is in the area of the great fire of 1936. Often they are covered with small Jack Pine of a uniform size in each area (Plate 5). Occasionally a few large scattered Norway Pines are present (Plate 6). Oak trees and Oak Brush often accompany and sometimes replace the Pines.

THE VALLEY OF NEBAGAMON CREEK

The surveyor's description of T.46N., R.11W. is short but brings out a significant point. "This Township is heavily timbered with Oak Maple Sugar,⁵ Aspen and Pine: and a dense undergrowth of Hazel and Aspen. The surface is rolling: and covered with rock: = trap rock. The soil is of the poorest quality. A great deal of the timber is down, patches of windfall

⁵The "Maple" of the surveyors is Red Maple; Sugar Maple is almost invariably called "Sugar."

thickly scattered over the entire Township." This description indicates diversity in forest cover, for Sugar Maple is a climax tree in this region, while Hazel and Aspen are usually the result of fairly recent burning. An expression of this diversity, as well as some indication of the reason, may be seen on Map 2. The valley of the Nebagamon occupies the western part of T.47N., R.10W., the southeastern part of T.47N., R.11W., and the northwestern half of T.46N., R.11W. This area is dissected by numberless bogs of various sizes (in brown on Map 2) and lakes. Under these conditions, fires, which seem to have been the major factor in setting back the ecological succession, would have been much less widespread than on the broad flat sandy barrens. Much of the region suffered from fire and was largely in Aspen (stippled orange on Map 2). But where somewhat protected from the spread of fires, in the neighborhood of lakes and bogs, mixed pine-hardwoods developed (orange on Map 2), or the succession even went to climax forest (yellow on Map 2).

Most of the soil in the valley of the Nebagamon is loam, but along its northwestern border, and thence running northeastward across the Brule valley, is the Copper Range, a ridge of trap rock (Map 11). Conditions on the Copper Range appear to have favored the development of climax forest; most of this forest was just outside the Brule Basin paralleling its northwestern border, but the strip of yellow northwest of the large bog in T.47N., R.11W. is the edge of this forest. Just northwest of this strip of yellow on Map 2, about a mile outside the Brule Basin, is the present-day town of Maple⁶ (Map 12).

Maps 9 and 10 show the locations of trees of five species, taken as indicators of climax forest.

When compared with Map 2, Map 3 shows considerable change in the land cover of this area. Much of the land is cleared, particularly in the vicinity of the larger lakes. Considerable portions of the bogs seem to have had their flora altered, so that some parts are now better classed as Black Ash, Red Maple and Elm (olive-green on Map 3) or Tagalder, Willow and Dogwood (stippled olive-green on Map 3) than as Tamarack. This is however a difficult point to judge, for all of these species were doubtless present on the bogs when the surveyors traversed them, and all are now present. Close study of the

⁶ "Maple," in this case, is without doubt Sugar Maple.

surveyors' notes, and then of the Land Economic Inventory maps and of the areas themselves, indicates that there have been in some areas changes in the proportions of each species, from a predominance of bog conifers to a predominance of broad-leaved species. But certainly Maps 2 and 3 cannot be interpreted literally to the extent of stating that any particular acre of ground has undergone a specified qualitative or quantitative change.

Comparison of bog areas on these maps also shows that much of what the surveyors indicated as bog is now covered with aspen.

Besides the possible destruction of much of the bog area, another result of the occupation of this region for about a century has been the degradation of the forests, so that most of what was mixed pine-hardwoods or climax forest on Map 2 is now Aspen scrub (Plate 8). Close inspection of Map 3 will show a few small remaining stands of White Pine (Plate 9), mixed forest, and even Sugar Maple.

THE LOWER BRULE BASIN

The soil in the lower Brule Basin is red clay, deposited under the waters of Glacial Lakes Duluth and Algonquin. The areas of red clay are shown approximately on Map 11. This clay has great water-holding capacity; it dried out much less easily than did the sand and the loam, and so was less subject to fires. This region was therefore the most heavily wooded of all the Brule Basin, and here grew the largest individuals of White Pine (Map 5), Fir (Map 7), and Aspen (Map 8).⁷

In September, 1852, T.49N., R.10W. was described as follows:

"This township has a clay soil. The surface is generally level back from the streams. The Streams except Brule River fail during the dry season but during the spring and fore part of the Summer offered plenty of water, running as they do through a clay formation. The valleys are narrow gullys or ravines.

"It is well timbered with White Pine in every part and Brule River offers every facility for a lumbering business. This stream rises in the small lakes south of the Summit; through which it breaks and discharges its self into the Lake after [falling?] over 100 distinct rapids in its de-

⁷ This probably includes both the Trembling Aspen and the Large-toothed Aspen. Perhaps the larger Aspens of the clay region were mostly the latter species.

scent. Every bend has its rapids through this township until it [flows?] into Section 10 [at the mouth of the stream] where the water becomes sluggish and deep.

"During the months of April and May the Indians and Trappers carry on a successful fishing business along the lake shore. Trout Whitefish and Siskowet being the principal kinds packed for the market.

"The waters of the small streams are so strongly chalybeate that the leaves turn them black in the fall."

The witness trees were, in order of frequency: White Pine, up to 30 inches and averaging 18 inches; Spruce (doubtless White Spruce), up to 16 inches and averaging 11 inches; White Birch, up to 19 inches and averaging 11 inches; Black Ash up to 16 inches; White Cedar up to 14 inches; Yellow Pine up to 20 inches; Fir up to 12 inches; Tamarack up to 16 inches (apparently growing larger on the clay than in the bogs); Red Maple up to 12 inches; Aspen up to 22 inches; and Black Oak. The trees most frequently mentioned in the summaries of each mile, were, in order, Spruce, Fir, Birch, Pine, Aspen, White Cedar, Tamarack, Ash and Red Maple, while the undergrowth was almost always described as Alder, Hazel and Green Ozier, sometimes Maple (probably the Mountain Maple, *Acer spicatum*).

This mixture is shown on Map 2 as Spruce-Fir. Woods of this type were seen in 1942-43 only on the high ground near the abandoned house on the west side of the river near its mouth (Plate 10). Elsewhere the forest has been destroyed by lumbering, fires, and agriculture, so that much of the area is now cleared land (Plates 11 and 13) and the rest has a scrubby growth of Alders, Willow and Red-osier Dogwood (stippled olive-green on Map 3), grading to Aspen and small Firs on the higher ground (stippled pink on Map 3; Plate 12). A few areas are shown on Map 3 as mixed Pine-hardwood (orange) and as Aspen (stippled orange), but actually these four types grade into each other and the boundaries must not be interpreted too strictly.

The description of T.48N., R.10W., written in August, 1852, reads as follows:

"This Township is well watered and well timbered. The Streams get low during the dry season but do not dry up entirely. The surface is gently rolling and hilly. The soil clay and sand, wet, adapted to the raising of Grass. The timber is large and valuable.

"Bois Brule River runs through the center of the township, is a rapid durable stream affording every facility for a Lumbering business. Mines are reported to have been worked in this Township on Section 18 or 19 but were not found by me. On Section 23 overlooking the river the Amygdaloid Trap Rock is Magnetic and resembles cast iron in lustre when broken. Traces of copper were found on Section 27.

"The local attraction of the needle was so great that the plain compass could not be used in the vicinity of hill extending across the Township."

The Copper Range (Map 11) was well forested; between Sections 22 and 27 the summary reads "Black Oak, Sugar, White Pine, Yellow Birch, Lind [= Basswood], Elm, Aspen, White Cedar, Fir, Spruce and Tamarac." The Sugar Maple, Basswood and Yellow Birch may be taken as indicators of climax forest. This hill (Plate 13) still shows the species which were originally listed; but the woods have been cut and burned, and the hardwoods are sprouting from the stumps (Plates 15 and 16).

As compared with the uniformity of the township directly to the north, this showed a smaller number of species on each mile, but greater variation between miles. Pines were general throughout the township, but where they were accompanied by Spruce and Fir the land has been shown on Map 2 as "Spruce-Fir forest," and where they were mixed with Oaks, Linden, Maple, etc. "mixed hardwood" has been the designation. Now, of course, the big pines are cut, and their charred stumps are in a dense growth of Aspen (Plate 16). A few good stands of forest remain along the River (Plate 14).

An area of about 8 square miles in the northwestern part of T.47N., R.10W. and the southwestern part of T.48N., R.10W. is shown as Alder-Dogwood-Willow on the recent map and as mixed hardwoods on the old map. This is a poorly drained area which seems to have a very mixed vegetation. The surveyors recorded Tamarack in every mile traversed (even excluding those reported in swamps), White Pine in every mile, the largest being 20 and 26 inches, Aspen, Birch, Spruce, Fir and White Cedar almost always, Maple and Yellow Pine often, and occasionally Yellow Birch, Black Ash, Sugar Maple and Elm. The undergrowth was usually described as Elder, Hazel, Green Ozier and Maple. Excluding the larger trees, this is much as the area is today; it is mostly covered with swamp shrubs, with a few trees

on the better-drained locations. Geologists Emrich and Schafer, in 1925, recorded T.47N., R.10W., between 7 and 8, as Alder, Maple, Ash, Birch, Cedar and Spruce. The Land Economic Survey, in 1933, recorded it as recently burned. The original vegetation of this area seems to have been much like that in T.49N., R.10W. shown as Spruce-Fir on the map, except that here the proportions of these two species are much lower.

SOURCES FOR DATA

The exterior lines, which are those forming the boundaries of the township, were surveyed by the following deputy surveyors, in the following years:

Between Townships	46 & 47	North,	Range 9	West.	Geo. R. Stuntz,	1852
" "	47 & 48	" "	" 9	" "	" "	1852
" "	45 & 46	" "	" 10	" "	Albert C. Stuntz,	1855
" "	46 & 47	" "	" 10	" "	Geo. R. Stuntz,	1852
" "	47 & 48	" "	" 10	" "	" "	1852
" "	48 & 49	" "	" 10	" "	" "	1852
" "	45 & 46	" "	" 11	" "	Albert C. Stuntz,	1855
" "	46 & 47	" "	" 11	" "	Geo. R. Stuntz,	1852
Township 45	North,	between	Ranges 10 & 11	West.	Albert C. Stuntz,	1855
" 46	" "	" "	" 9 & 10	" "	" "	1856
" 46	" "	" "	" 10 & 11	" "	" "	1856
" 46	" "	" "	" 11 & 12	" "	" "	1856
" 47	" "	" "	" 9 & 10	" "	Geo. R. Stuntz,	1852
" 47	" "	" "	" 10 & 11	" "	" "	1852
" 48	" "	" "	" 9 & 10	" "	" "	1852

The surveyors and dates for the interior lines, which bound the 36 sections within each township, were:

Township	46	North,	Range 9	West.	Hiram C. Fellows,	1856
"	47	" "	" 9	" "	Geo. R. Stuntz,	1854
"	48	" "	" 9	" "	" "	1854
"	45	" "	" 10	" "	Hiram C. Fellows,	1856
"	46	" "	" 10	" "	" "	1856
"	47	" "	" 10	" "	Geo. R. Stuntz,	1852
"	48	" "	" 10	" "	" "	1852
"	49	" "	" 10	" "	" "	1852
"	45	" "	" 11	" "	Hiram C. Fellows,	1856
"	46	" "	" 11	" "	" "	1856
"	47	" "	" 11	" "	Geo. R. Stuntz,	1854
"	46	" "	" 12	" "	William E. Daugherty,	1856

These surveys were conducted from June to November; each township took a week or ten days. For each section corner and quarter-section (one in the middle of each mile) two witness trees were recorded; for section corners on exterior lines there were four witness trees. At the end of each mile the principal trees seen along that mile were listed. For each township there was a general summary.

These records were studied by Dr. John T. Curtis and the writer in the fall of 1942 and a map of the vegetation as of 1852-56 was drawn. When Dr. Curtis was called to conduct some work in Haiti the writer continued alone, later revising this map. In some cases, determining the vegetation of a section line has been easy. If only small Jack Pine of uniform diameter is listed, it is pine barrens, and if only small Aspen is listed, it is as obviously Aspen thicket. Bogs are easy, particularly since the surveyors made up maps showing the outlines of the bogs. It must be noted, however, on Map 2, that small bogs are shown only on section lines, since those in the interior of the sections were not seen by the surveyors.

Some sections have been very difficult to classify, and a few examples will be given to show the method of interpreting the meagre data.

T.47N., R.10W., west between sections 28 & 33. At the quarter-section post were recorded an Aspen 8 inches D.B.H., 35 feet from the post, and a Black Pine 6 inches D.B.H., 40 feet from the post. The summary of the mile was: Timber Pine Birch Aspen and Lind. Undergrowth Alder & Hazel, woods very thick. Seldom can you see more than 2 chains." Here the Basswood ("Lind") would suggest that the forest was developing toward climax, but it is listed last and was probably the least abundant; also, Basswood is so rare in the region that any occurrence would be noted. The witness trees are Jack Pine and Aspen, both some distance from the post, so the trees were not very closely spaced. Visibility is low due to density of growth, but this dense undergrowth is Alder and Hazel. The picture develops, therefore, as a sparse growth of medium-sized but fast-growing trees, probably not over 20 years old, with a dense scrubby undergrowth. This is recorded on Map 2 as Aspen scrub (stippled orange).

T.47N., R.10W., north between sections 1 & 12. At the quarter-section post were recorded a White Cedar 10 inches D.B.H. and a Yellow Birch 9 inches D.B.H. The summary was: "Spruce Yellow Birch Tamarack White Pine Aspen & Black Oak. Undergrowth Birch & Fir." The southern half of this section line was recorded as bog, which accounts for the Tamarack and the White Cedar; the latter was south of the quarter-section post and so located in the bog. The higher ground had Yellow Birch which is ordinarily taken as indicating climax forest, but here it was

mixed, not with Sugar Maple, but with Pine, Spruce, Oak and Aspen. This section line is therefore recorded on Map 2 as Mixed Pine and Hardwoods (orange).

These examples are given to show that there may be some question regarding the type of vegetation on any particular mile. However, it is the opinion of the writer that the generalizations drawn from these records are reliable; while Map 2 may not represent accurately each individual mile, it is correct in showing that the region southeast of the upper Brule was in Barrens, and that the regions about Lakes Nebagamon and Minnesuing were a mixture of bog, Aspen thicket, mixed forest, and Maple forest.

Map 3 was made up primarily from the Land Economic Inventory maps of Douglas County, published in 1933, and of Bayfield County, published in 1928. The classification of land cover used on these maps differs in some respects from that used on Map 3, so that there was in some cases a question of interpretation. A preliminary map made up from the Inventory maps was used in the field, and checked with conditions as observed in 1942 and 1943 by the writer, with the help and advice of Dr. John W. Thomson and Mr. E. F. Bean. While not assuming to make corrections on the Inventory maps, the writer has taken the privilege of making his own interpretation both of the Inventory maps and of the observed land cover. In many cases changes were necessary due to actual changes in cover since the Inventory surveys. Some of this area was surveyed by a party of the Wisconsin Geological Survey, and notes on the vegetation made by Geologists D. G. Emrich and Sidney Schafer. Again, their classification of land cover was different from those used by the Inventory survey and by the writer, but their notes have proved useful in several areas.

Maps 4-10, showing the ranges of individual species of trees, are compiled entirely from the surveyors' reports. The figures represent D.B.H., and each is placed near its appropriate section or quarter-section corner, in the direction, but not at the distance from the corner, in which the tree was recorded. A dot on a section line means that the species was mentioned in the summary of that mile.

The data concerning soils on Map 11 are from the General Soil Map of Wisconsin by A. R. Whitson and others, published

in 1926 by the Wisconsin Geological and Natural History Survey. Since the soils boundaries on this map were very general, and are moreover transferred to a larger scale by their use on Map 11, they must not be regarded as accurate within the Brule Basin, but rather to indicate broadly the areas of different soils. The rock outcrops on Map 11 are from the Land Economic Survey, and the location, but not necessarily the exact boundaries, of the Copper Range are sketched in from field observation.

VEGETATION AND WATER FLOW

While the BRULE BOG remains undamaged, the upper Brule River will continue to be as it is now; cutting the trees or burning the bog would reduce the Brule River to a warm-water stream, probably to one devoid of trout. In the BARRENS, water seeps into the sand and enters the Brule River as springs, in spite of the fact that the vegetation of the barrens has been burned since time immemorial; future burning will therefore do no damage. Much of the NEBAGAMON RIVER BASIN is now less heavily forested than it was in the past; partial restoration of the forests should be effected. The area of RED CLAY along Lake Superior presents a complex problem: the forest has been very largely destroyed and the water-holding capacity of the upper soil levels doubtless reduced, but erosion on farm lands and roadsides, and the slumping of clay banks, probably present the most serious problems.

SUMMARY

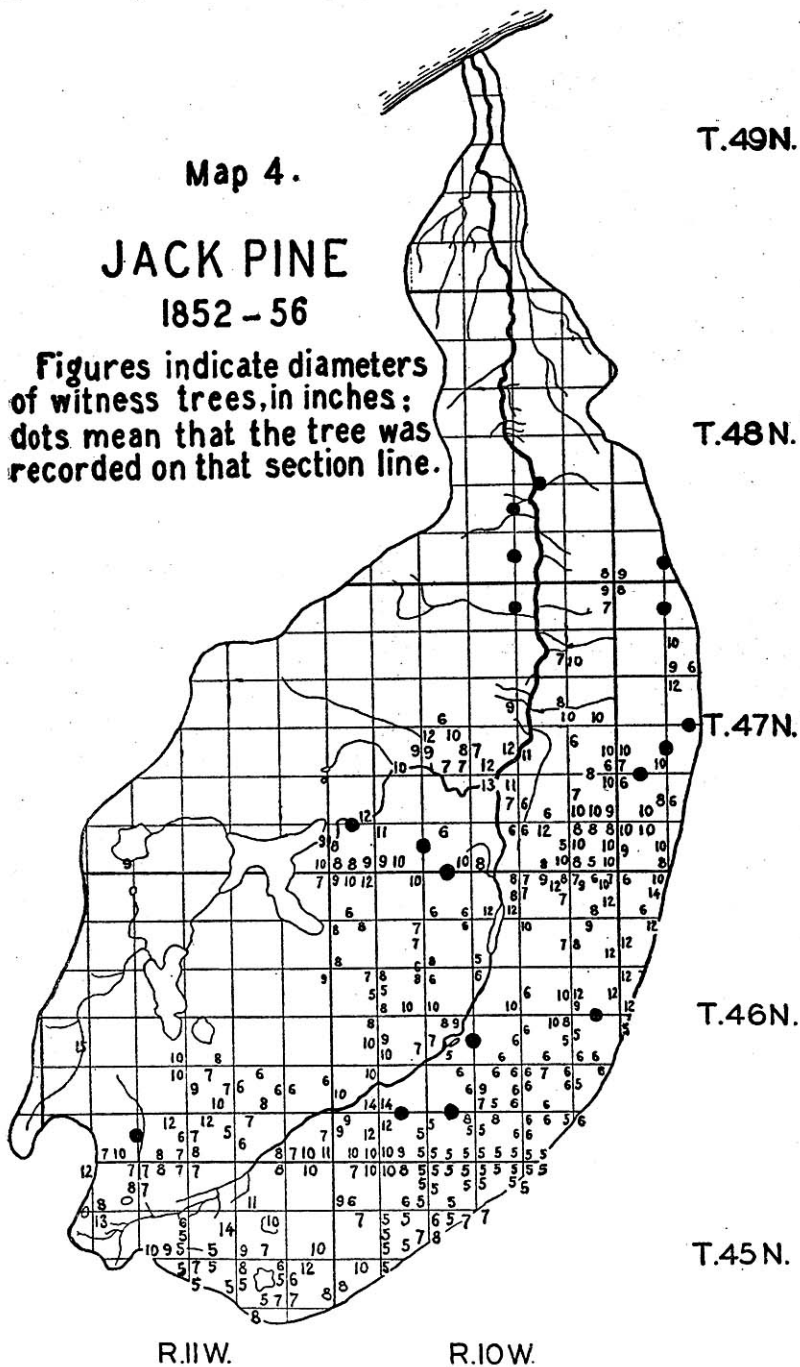
The vegetation of the drainage basin of the Brule River, which enters Lake Superior in northwestern Wisconsin, has been determined, as of 1852-56, by a study of witness trees and field notes recorded by the government surveyors of those dates, and as of 1932-43 by study of the Land Economic Survey maps of 1933 and by direct observations in the region. The bog, about a mile wide and ten miles long, which borders the upper Brule is in nearly its original condition, except for the removal of scattered large pines and the complete cutting and burning of a few small portions. The sandy Barrens, mostly southeast but also to some extent on the northwestern side of the upper Brule, is frequently burned over, with a usually sparse ground cover of small Jack Pines and scrub oaks, just as it was a century ago. The valley of the principal tributary, Nebagamon Creek, originally had a

land cover varying from pine barrens and Aspen scrub to mixed pine and hardwoods and Maple forest. This was because it was so dissected by lakes and bogs that fires were local, rather than widespread as in the Barrens. Much of this area is now cleared, the patches of maple and of pine are much reduced, and aspen scrub has largely replaced the better types of forest. The Copper Range, a ridge of trap rock crossing the Brule valley parallel to and about nine miles south of the Lake Superior shore, originally had a good growth of Maple-Yellow Birch forest, now early destroyed and represented by local areas of maple coppice. The red clay, bordering Lake Superior for about ten miles in this region, was covered with dense forest of White Pine, Spruce, Fir, White Birch, Black Ash, White Cedar, Yellow Pine, Aspen, etc., with an undergrowth of Alder, Hazel, Red Maple, Osier and Willow. The cutting, burning and pasturing has left most of this area with a shrubby growth of Alder, Hazel, Osier, and Willow, with some patches of Aspen and little Fir trees.

Map 4.

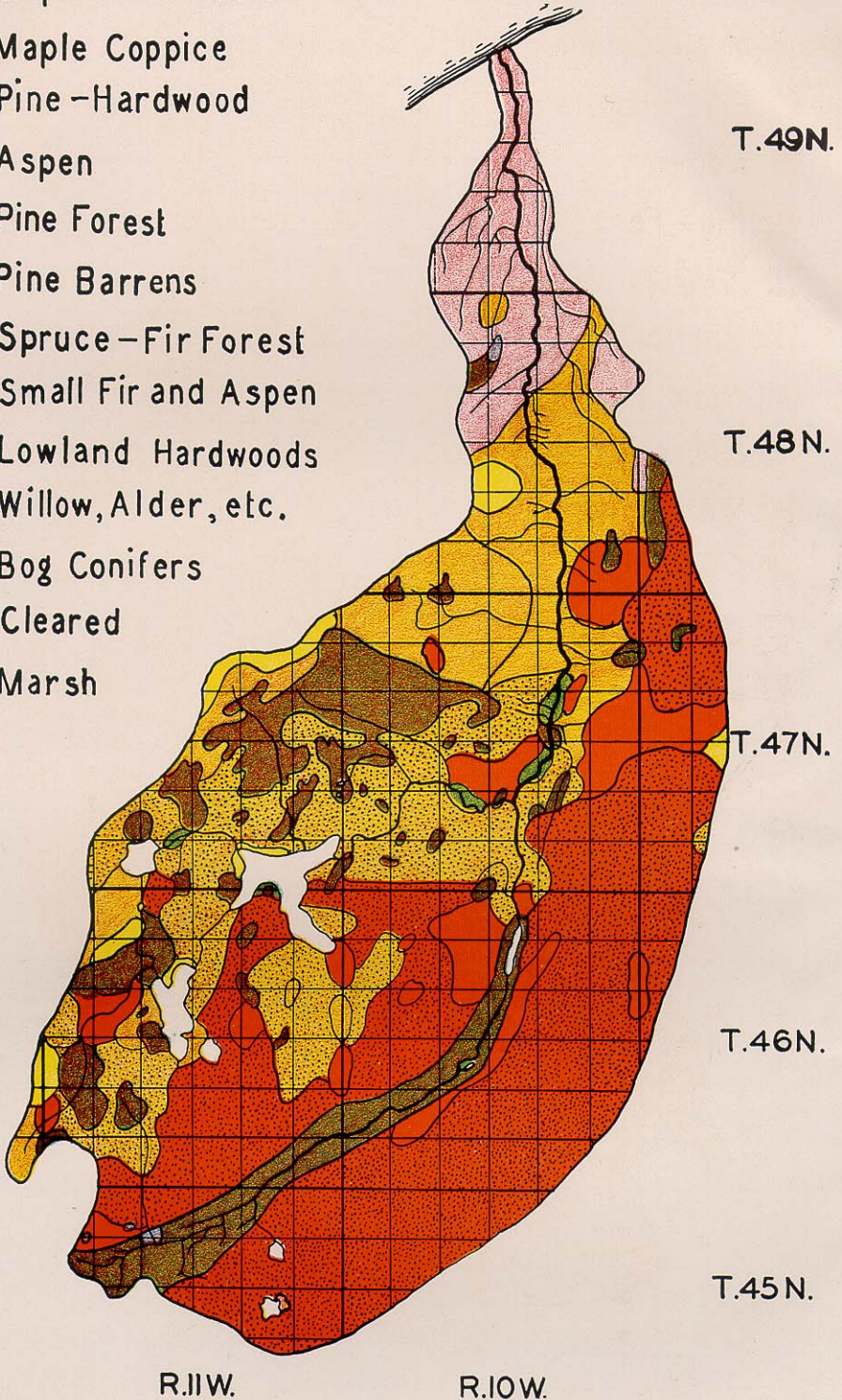
JACK PINE
1852 - 56

Figures indicate diameters of witness trees, in inches; dots mean that the tree was recorded on that section line.



1852-56

- Maple - Yellow Birch
- Maple Coppice
- Pine - Hardwood
- Aspen
- Pine Forest
- Pine Barrens
- Spruce - Fir Forest
- Small Fir and Aspen
- Lowland Hardwoods
- Willow, Alder, etc.
- Bog Conifers
- Cleared
- Marsh



T.49N.

T.48N.

T.47N.

T.46N.

T.45N.

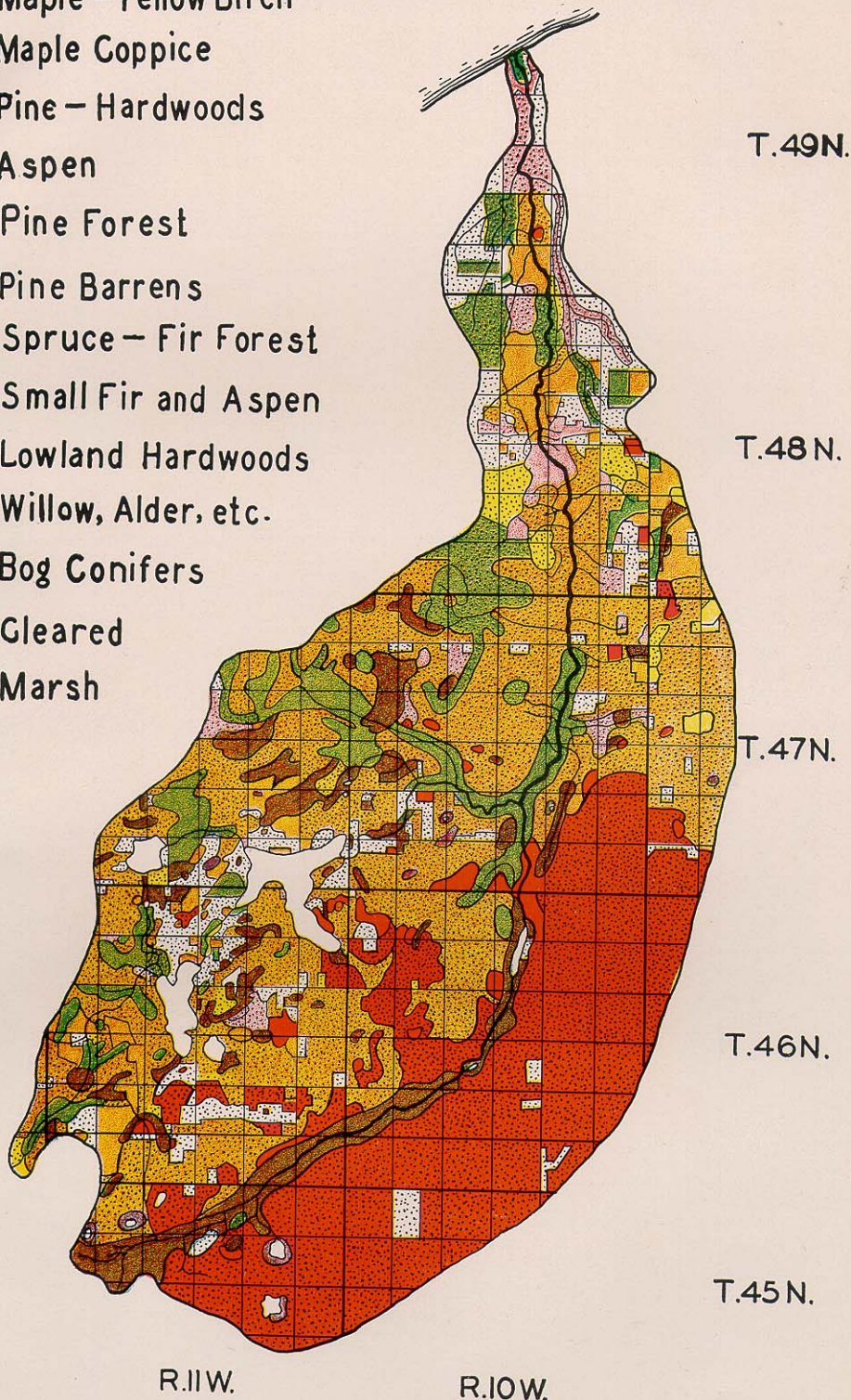
R.II.W.

R.I.W.

MAP 2

1932-43

- Maple - Yellow Birch
- Maple Coppice
- Pine - Hardwoods
- Aspen
- Pine Forest
- Pine Barrens
- Spruce - Fir Forest
- Small Fir and Aspen
- Lowland Hardwoods
- Willow, Alder, etc.
- Bog Conifers
- Cleared
- Marsh

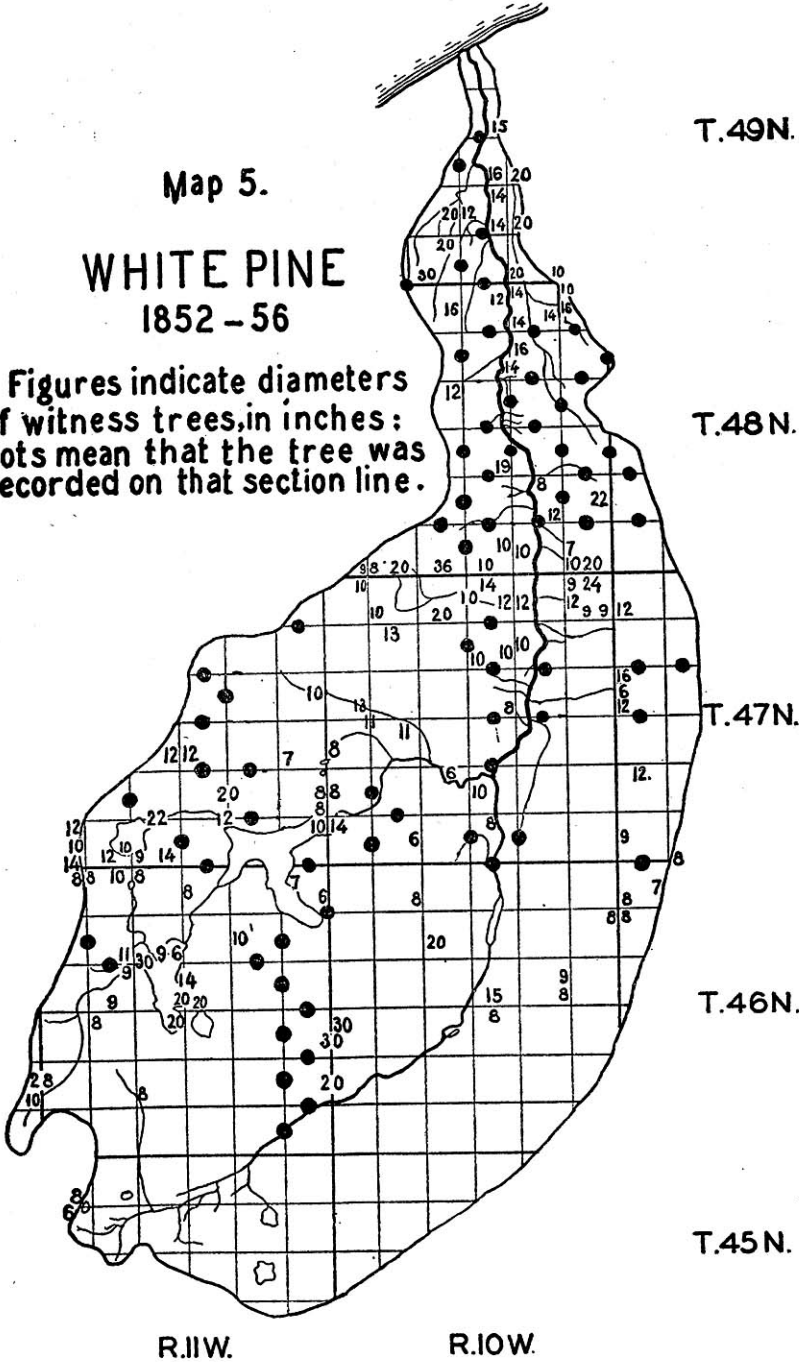


MAP 3

Map 5.

WHITE PINE
1852 - 56

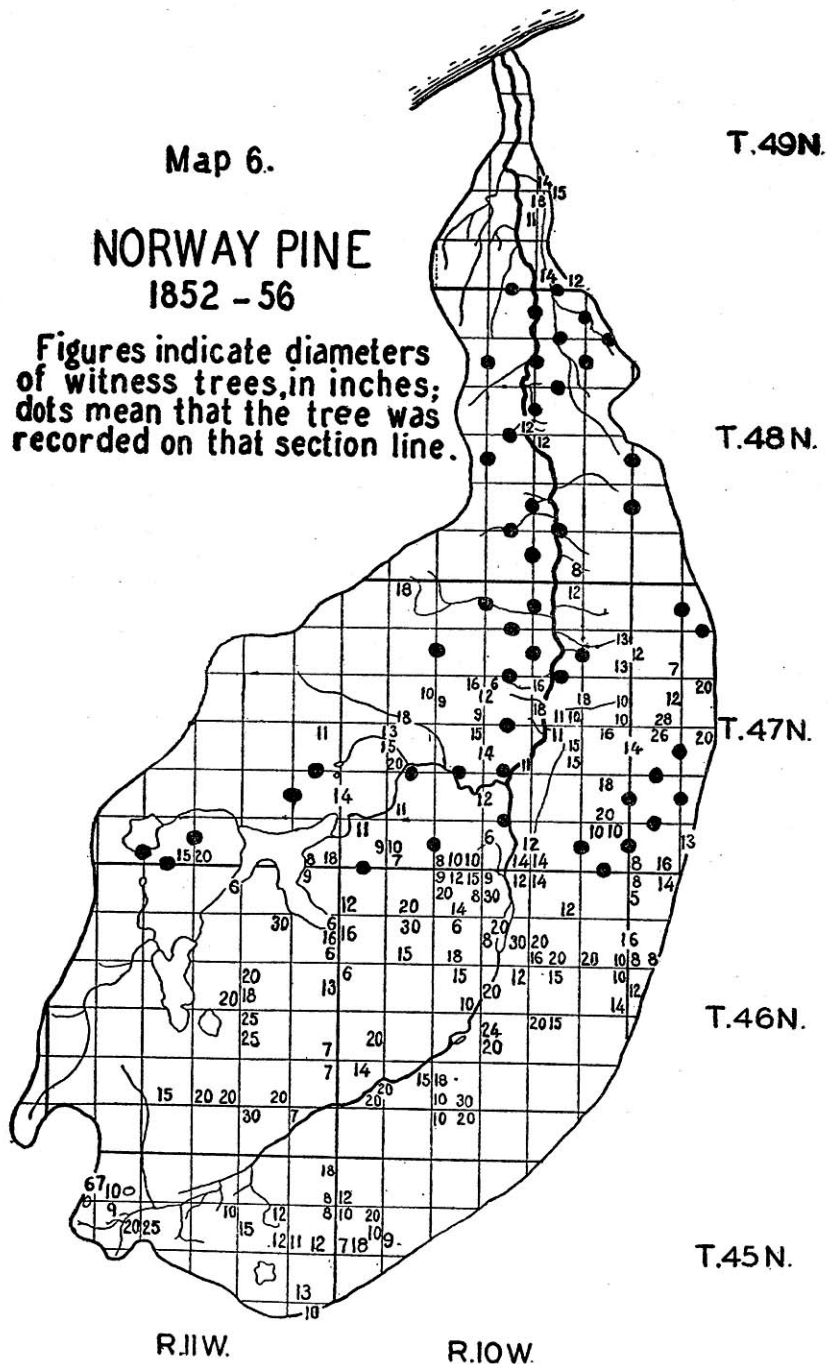
Figures indicate diameters of witness trees, in inches: dots mean that the tree was recorded on that section line.



Map 6.

NORWAY PINE 1852 - 56

Figures indicate diameters
of witness trees, in inches;
dots mean that the tree was
recorded on that section line.



T.49N.

T.48N.

T.47N.

T.46N.

T.45N.

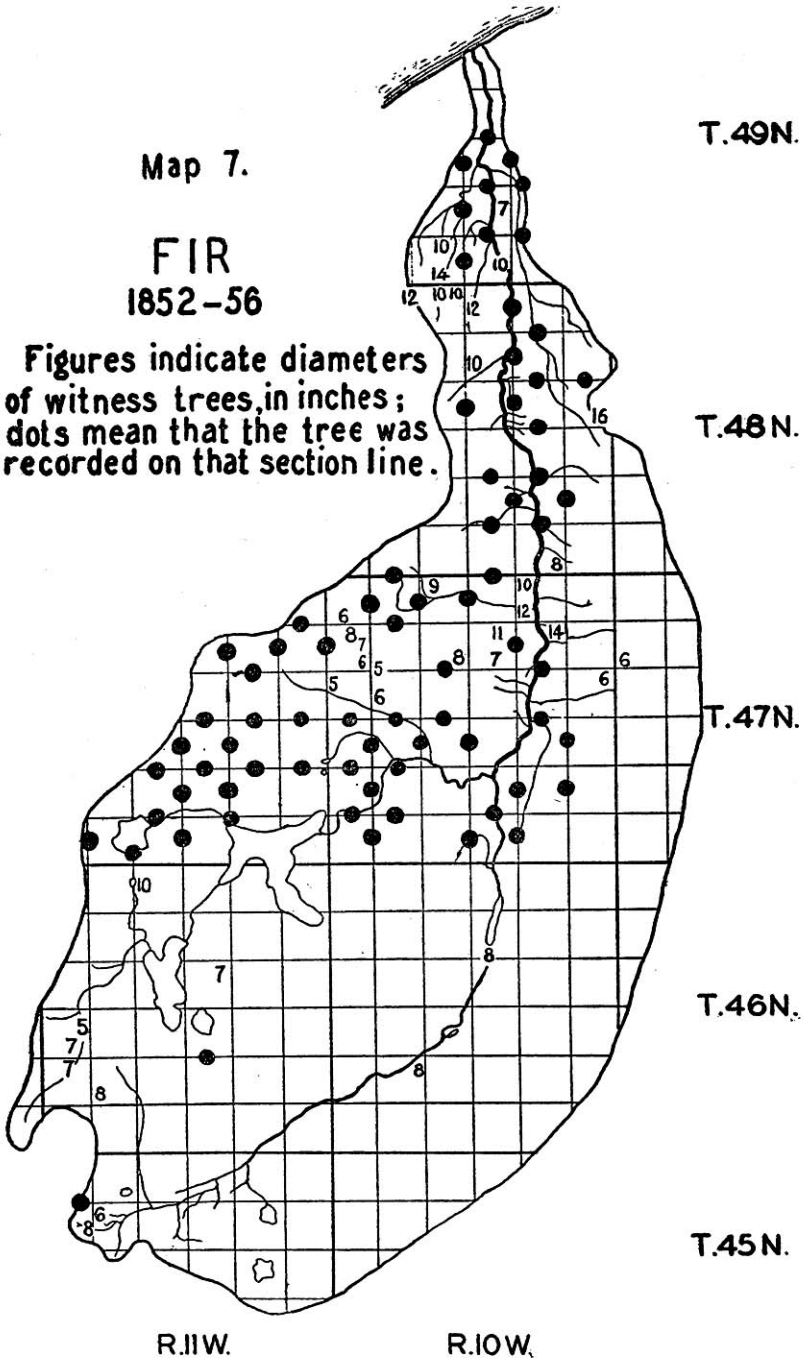
R.11W.

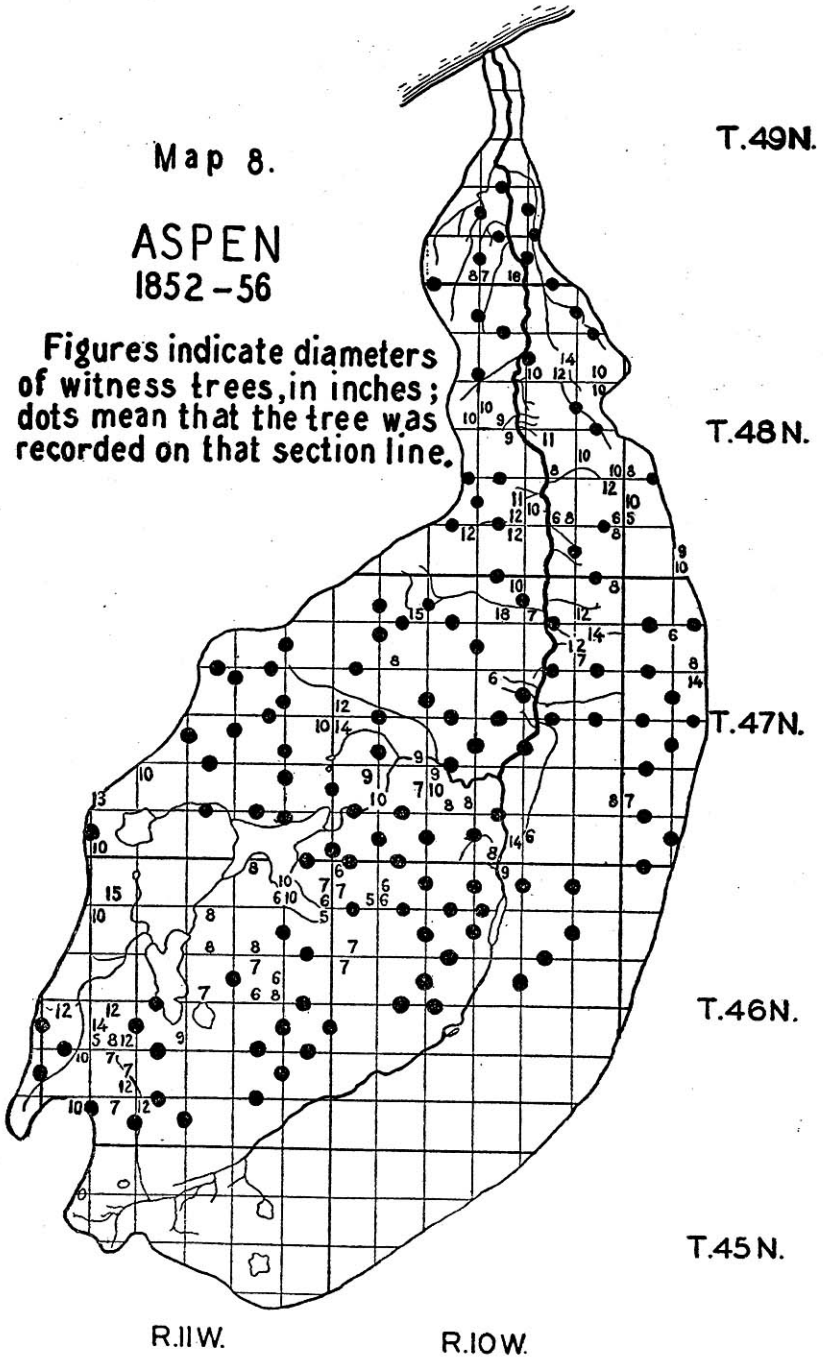
R.10W.

Map 7.

FIR
1852-56

Figures indicate diameters of witness trees, in inches; dots mean that the tree was recorded on that section line.

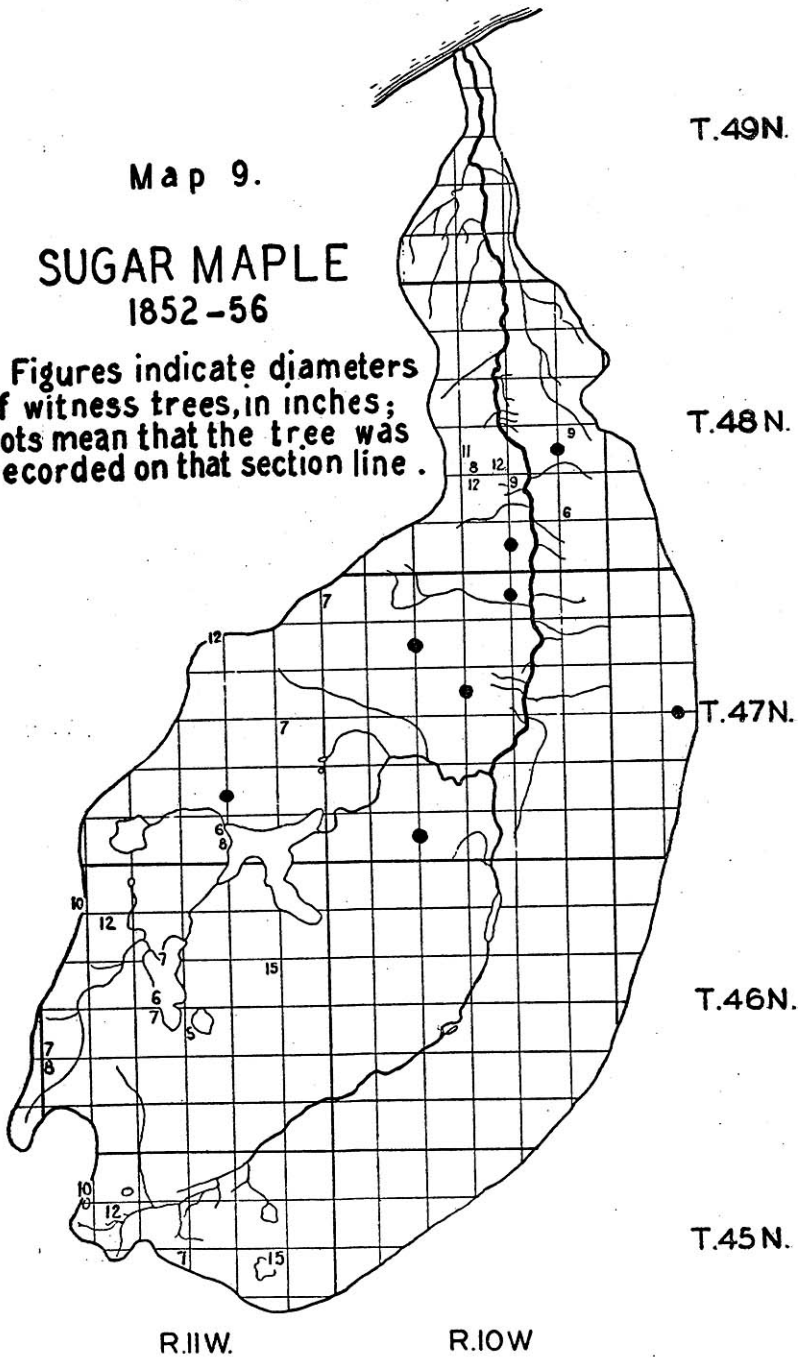




Map 9.

SUGAR MAPLE 1852-56

Figures indicate diameters
of witness trees, in inches;
dots mean that the tree was
recorded on that section line.

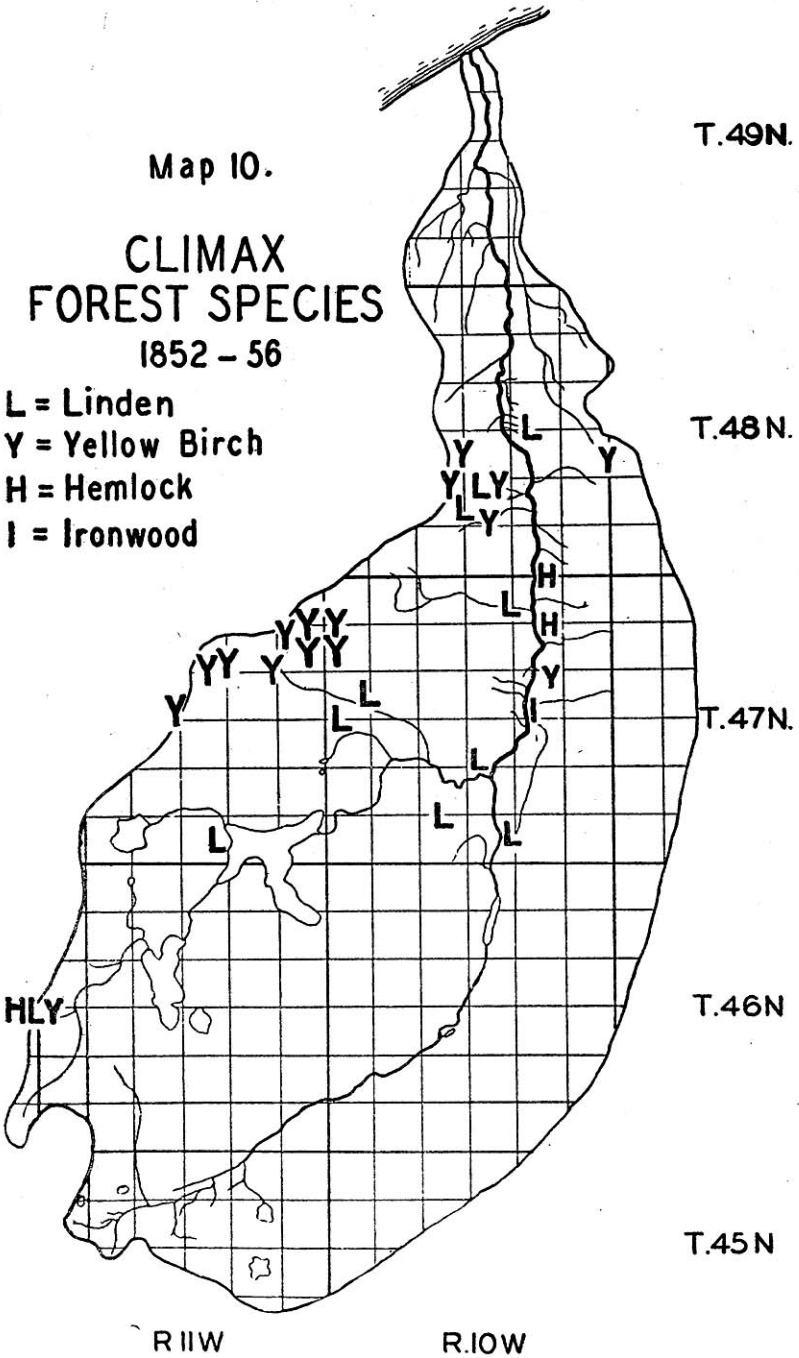


Map 10.

CLIMAX FOREST SPECIES

1852 - 56

- L = Linden
- Y = Yellow Birch
- H = Hemlock
- I = Ironwood

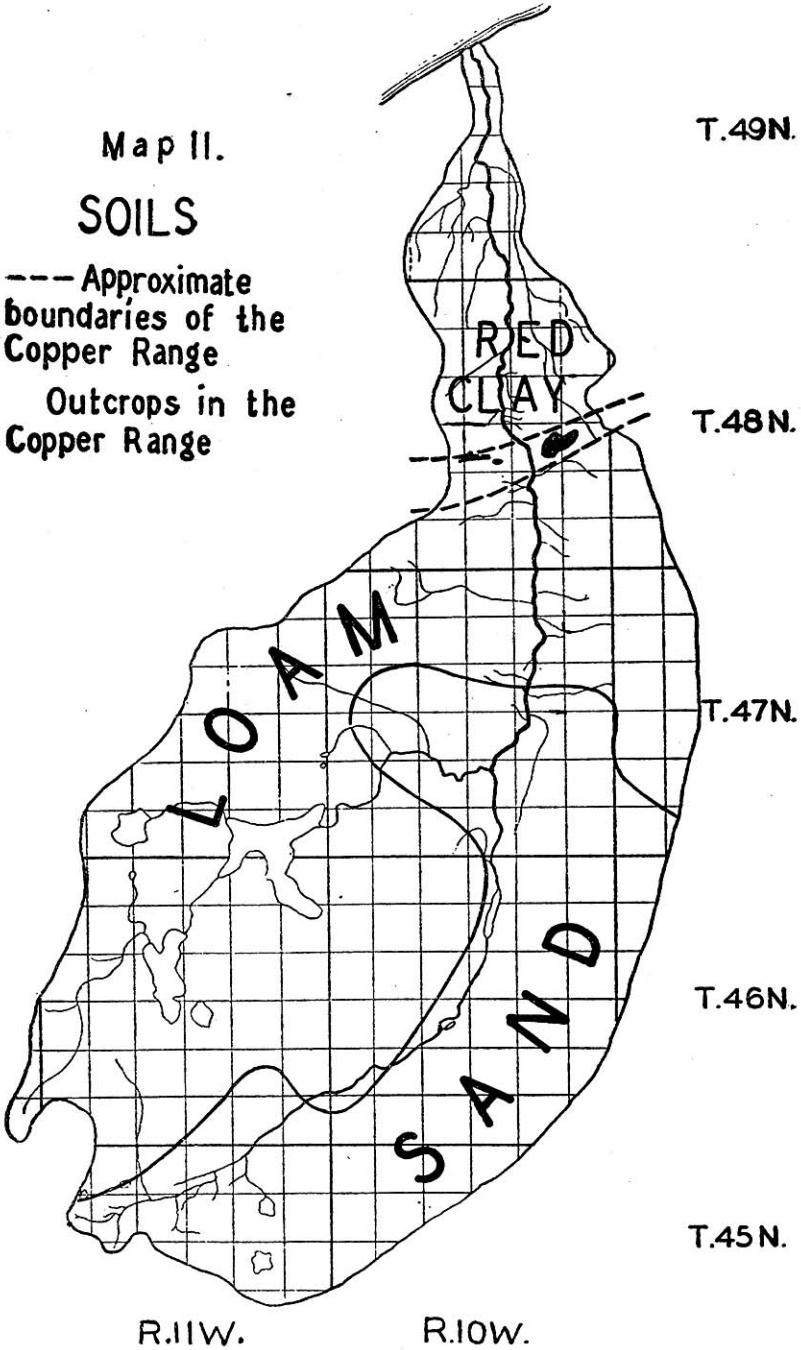


Map II.

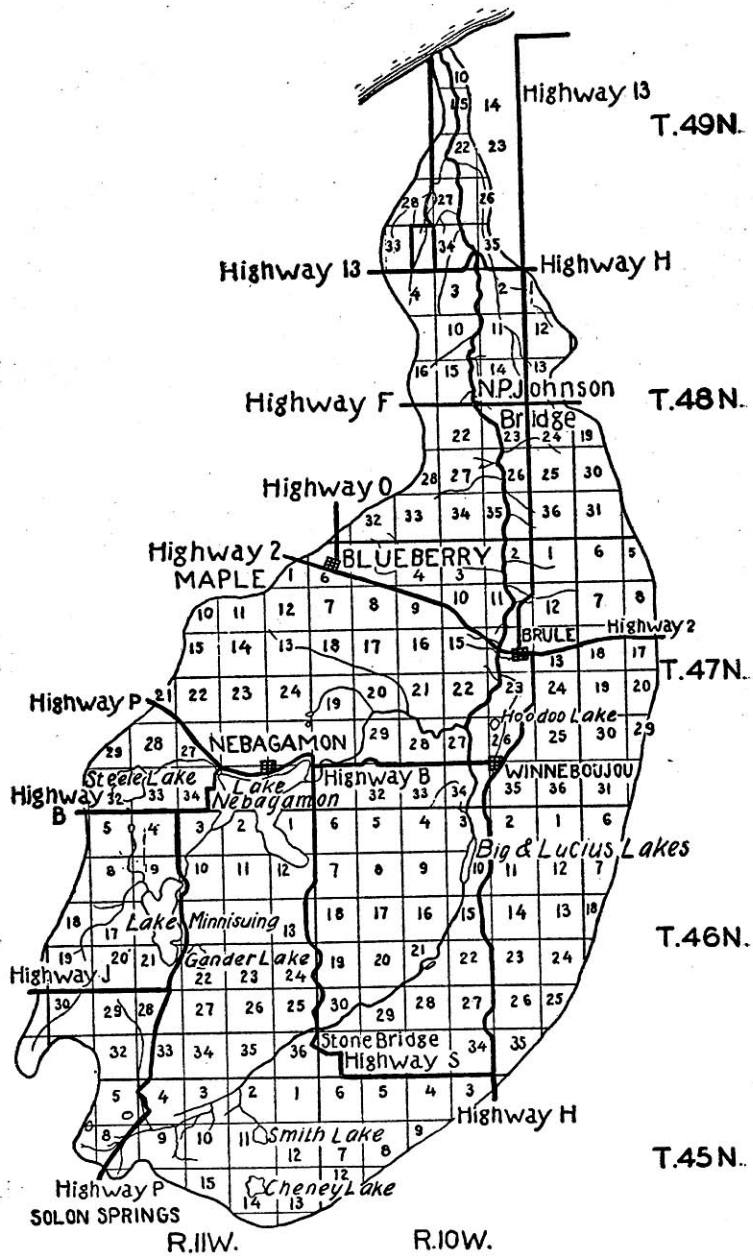
SOILS

--- Approximate boundaries of the Copper Range

Outcrops in the Copper Range



TOWNS HIGHWAYS AND BRIDGES LAKES



Map 12.

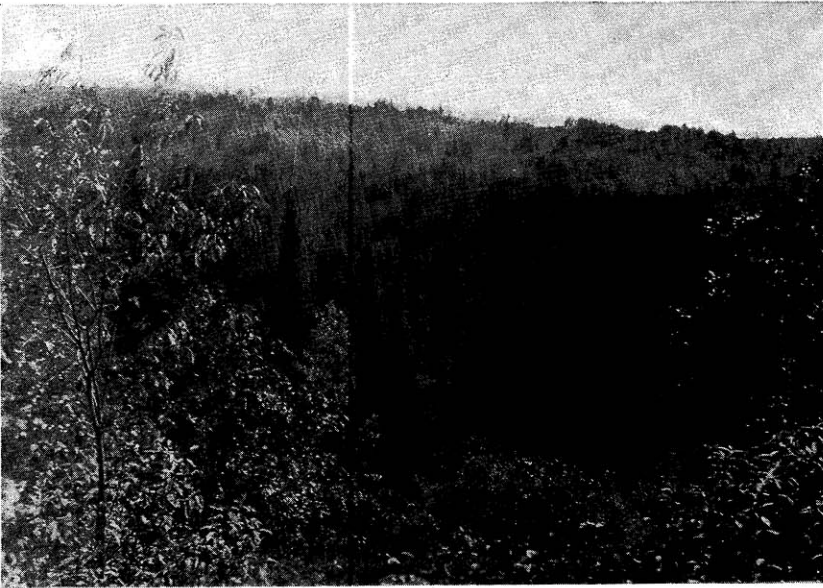


PLATE 1. Looking eastward across Brule Bog. Sec. 3, T.45N., R.11W. Photograph by Dr. J. W. Thomson.



PLATE 2. The Brule Bog near Cedar Island. Sec. 21, T.46N., R.10W.



PLATE 3. The Brule Bog near Stones Bridge. Sec. 30, T.46N., R.10W.



PLATE 4. The Brule Bog at Highway P. Sec. 8, T.45N., R.11W.



PLATE 5. The Barrens. Sec. 32, T.46N., R.10W.



PLATE 6. The Barrens. Sec. 32, T.46N., R.10W.

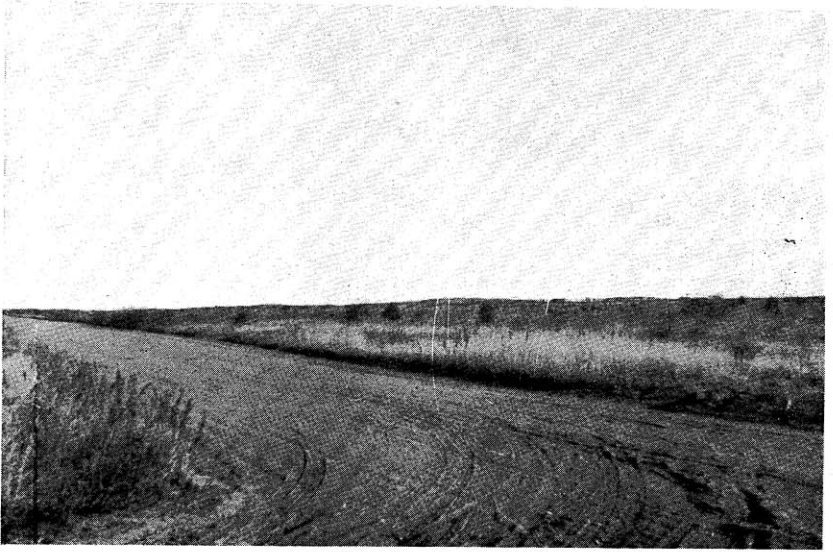


PLATE 7. The Barrens. Sec. 35, T.46N., R.10W.



PLATE 8. Aspen scrub. Sec. 5, T.45N., R.11W.



PLATE 9. White Pine on shore of Lake Nebagamon. Sec. 1, T.46N., R.11W.



PLATE 10. Fir forest at the mouth of the Brule River. Sec. 10, T.49N., R.10W.



PLATE 11. On the red clay, looking north. Sec. 23 and 24, T.48N., R.10W.



PLATE 12. Small Fir and Aspen on red clay. Sec. 15, T.48N., R.10W.

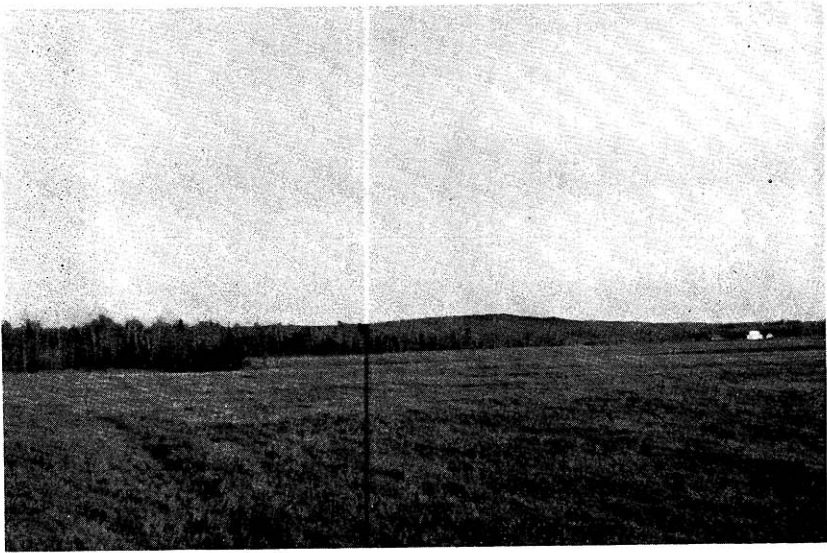


PLATE 13. Cleared land on the red clay, looking southward to the Copper Range. Sec. 15, T.48N., R.10W.



PLATE 14. Fir, Pine, Birch, etc., at N. P. Johnson Bridge. Sec. 15, T.48N., R.10W.



PLATE 15. Coppice growth on the Copper Range, looking northward to the red clay, cultivated in the middle-ground, mostly Willow and Tagalder in the background. Sec. 22, T.48N., R.10W.



PLATE 16. Pine stump, Aspen and Birch. Sec. 12, T.48N., R.10W.