

AD NO 33 029

ASTIA FILE COPY

Technical Report No. 2

OREAL FRINGE AREAS OF MARSH AND SWAMPLAND
A Photoidentification Key
for the Summer (Foliage) Season

THIS REPORT HAS BEEN DELIMITED
AND CLEARED FOR PUBLIC RELEASE
UNDER DOD DIRECTIVE 5200.20 AND
NO RESTRICTIONS ARE IMPOSED UPON
ITS USE AND DISCLOSURE.

DISTRIBUTION STATEMENT A

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED.

DISTRIBUTION LIST

Project NR 387-008
Contract No. Nonr-982(01)

Addressee	Addressee
Chief of Naval Research (4) Attention: Geography Branch Office of Naval Research Washington 25, D. C.	Officer-in-Charge (2) Attention: Mr. Page Truesdell U. S. Naval Photographic Interpretation Center U. S. Naval Receiving Station Anacostia, Washington, D. C.
Armed Services Technical Information Agency (5) Documents Service Center Knott Building Dayton 2, Ohio	Chief, Bureau of Yards and Docks (P-300) Department of the Navy (1) Washington 25, D. C.
Director, Naval Research Laboratory (6) Attention: Technical Information Officer Washington 25, D. C.	Chief of Naval Operations (Op-322F4) (1) Department of the Navy Washington 25, D. C.
Commanding Officer (1) Office of Naval Research Branch Office 1000 Geary Street San Francisco 9, California	Headquarters, U. S. Marine Corps (1) Intelligence Branch Arlington Navy Annex Washington 25, D. C.
Commanding Officer (1) Office of Naval Research Branch Office 346 Broadway New York 13, N. Y.	Engineer Intelligence Division (1) Office of the Chief Engineer Gravelly Point, Bldg. T-7 Washington 25, D. C.
Commanding Officer (1) Office of Naval Research Branch Office 1030 East Green St. Pasadena 1, California	Director of Intelligence (1) General Staff, U. S. Army Pentagon Building Washington 25, D. C.
Commanding Officer (1) Office of Naval Research Branch Office The John Crerar Library Bldg. 86 E. Randolph St. Chicago 1, Illinois	Photo Intelligence Section (2) Reconnaissance Branch Directorate of Intelligence, U. S. Air Force Room 4C104C, Pentagon Washington 25, D. C.
Commanding Officer (2) Office of Naval Research Navy #100 Fleet Post Office New York, New York	Director of Central Intelligence Agency (1) Attention: Map Division 2430 E Street, N. W. Washington 25, D. C.
	Office of Technical Services (1) Department of Commerce Washington 25, D. C.

Technical Report No. 2

BOREAL FRINGE AREAS OF MARSH AND SWAMPLAND
A Photoidentification Key
for the Summer (Foliage) Season

Keys by

Marle P. Meyer

A Contract Between

Geography Branch, Earth Sciences Division
Office of Naval Research, Navy Department

and

University of Oklahoma Research Institute

Project No. NR 387 008
Contract No. Nonr-982(01)

John W. Morris, Project Director

Harry E. Hoy, Associate Director

Department of Geography
University of Oklahoma
April, 1954

PREFACE

This report is the second in a series of three. Technical Report No. 1 is a background study of Boreal Fringe Areas of Marsh and Swampland. It contains detailed illustrated studies of the general physical and biological factors of such an area, as well as type studies for specific areas. Also included are chapters dealing with general factors in the formation of swamps and bogs, and the problems of transportation and road construction. Technical Report No. 1 should be studied and available as a reference when using this report.

Technical Report No. 3 follows the same general ideas as this report. It is a key for the winter (non-foliage) season.

Table of Contents

	Page
I. Photo Interpretation Keys	1
II. General Key to the Four Areas	6
General Instructions	7
Key	7
III. The Ely Area	9
Identifiable Vegetation and Ground Types	10
Upland Types	10
Lowland Types	12
Ely Area Key	15
Illustrations	20
IV. The Hubbard Area	30
Identifiable Vegetation and Ground Types	31
Upland Types	31
Lowland Types	33
Hubbard Area Key	35
Illustrations	41
V. The Koochiching Area	52
Identifiable Vegetation and Ground Types	53
Introduction	53
Upland Types	55
Lowland Types	56
Koochiching Area Key	59
Illustrations	66
VI. The Itasca Area	79
Identifiable Vegetation and Ground Types	80
Upland Types	80
Lowland Types	82
Itasca Area Key	85
Illustrations	90

List of Illustrations

Plate		Page
1.	Ely Area, Aspen, White Pine, Black Spruce, Spruce and Balsam Fir Mixture.	20
2.	Ely Area, Jack Pine, Spruce, Cut-over Jack Pine and Tamarack.	21
3.	Ely Area, Cut-over Black Spruce, Stagnant Spruce, Cut-over Jack Pine.	22
4.	Ely Area, White Spruce, Lowland Hardwoods, Floating Bogs and Muskegs	23
5.	Ely Area, Rock Outcrop, Tamarack, Lowland Brush, Jack Pine and Spruce	24
6.	Ely Area, Aspen-Paper Birch, Aspen-Spruce and Balsam Fir Mixture and Aspen-Jack Pine Mixture	25
7.	Ely Area, Spruce, Lowland Brush, Floating Bog and Rock Outcrop	26
8.	Ely Area, Variety and Density of Trees.	27
9.	Ely Area, Vegetation Tone	27
10.	Ely Area, Stagnant Spruce	28
11.	Ely Area, Birch, Aspen and Spruce	28
12.	Ely Area, Rock Outcrop near Mitchell Lake	29
13.	Ely Area, Rock Outcrop along shore of Basswood Lake	29
14.	Hubbard Area, Floating Sedge Mat, Marsh, Aspen and Jack Pine	41
15.	Hubbard Area, Floating Bog, Marsh, Farm Areas	42
16.	Hubbard Area, Upland Brush, Lowland Brush, Farm Lands	43
17.	Hubbard Area, Spruce, Aspen, Jack Pine, and Upland Brush and Jack Pine Cut-over Mixture.	44
18.	Hubbard Area, Aspen, Mixed Hardwoods, Jack Pine and Cut-over Jack Pine.	45
19.	Hubbard Area, Sand Bar, Marsh, Norway Pine and Jack Pine Mixture, Oak.	46
20.	Hubbard Area, Lowland Brush, Aspen, Jack Pine, Farm Land.	47
21.	Hubbard Area, Typical Farming Area.	48
22.	Hubbard Area, Kettle Surrounded by Birch Trees.	49
23.	Hubbard Area, Birch, Poplar and Pine Trees.	49
24.	Hubbard Area, Kettle Overgrown with Cattails.	50
25.	Hubbard Area, Hilltop Bog on Crest of Moraine	50
26.	Hubbard Area, Aspen and Jack Pine	51
27.	Hubbard Area, Jack Pine	51
28.	Koochiching Area, Stagnant Tamarack, Marsh, Floating Bog.	66
29.	Koochiching Area, Christmas Tree Bog, Muskeg.	67
30.	Koochiching Area, Tamarack.	68
31.	Koochiching Area, Mixed Vegetation Along Rivers	69
32.	Koochiching Area, Marsh Lands Intermixed with Christmas Tree Bog.	70
33.	Koochiching Area, Vegetation Change from Dry to Wet Areas	71
34.	Koochiching Area, Tamarack and Stagnant Spruce Mixtures	72

Plate		Page
35.	Koochiching Area, Lowland Brush, Marsh, and Muskeg. . . .	73
36.	Koochiching Area, Christmas Tree Bogs	74
37.	Koochiching Area, Soil Profile.	75
38.	Koochiching Area, Peat Bog.	75
39.	Koochiching Area, Marsh Grass	76
40.	Koochiching Area, Hardwoods	76
41.	Koochiching Area, Swamp Grasses and Bog Vegetation. . . .	77
42.	Koochiching Area, Bog Area Covered with Marsh Grasses . .	77
43.	Koochiching Area, Burned Over Area.	78
44.	Koochiching Area, Stagnant Spruce	78
45.	Itasca Area, Muskeg, Aspen, Grass and Ferns	90
46.	Itasca Area, Tamarack, Spruce, Lowland Brush and White Pine.	91
47.	Itasca Area, Stagnant Tamarack, Mixed Hardwoods and Aspen	92
48.	Itasca Area, Upland Brush Growing in a Cut-over Area. . .	93
49.	Itasca Area, Lowland Hardwoods, Lowland Brush, and Farms.	94
50.	Itasca Area, Birch and Aspen.	95
51.	Itasca Area, Cedar and Mixed Hardwoods.	96
52.	Itasca Area, Poplar and Birch	97
53.	Itasca Area, Aspen.	97
54.	Itasca Area, Alder, Tamarack and White Cedar.	98
55.	Itasca Area, Stagnant Spruce, Tamarack and Aspen.	98
56.	Itasca Area, Alder Swamp.	99
57.	Itasca Area, Tussock Grass Swamp.	99
58.	Itasca Area, Filled In Lake	100
59.	Itasca Area, White Cedar Swamp.	100

Chapter I

PHOTO INTERPRETATION KEYS

Along the southern edge of the Boreal Forest there are two dominant seasons, the summer when the trees are in foliage and the longer winter period when the trees are without foliage. During the short spring of the year, once the trees begin to leave out and the vines turn green, there is a rapid change from the dull colors of winter to the bright colors of summer. The length of the summer season, of course, varies with latitude, altitude, and climatic factors. In any case, however, as soon as fall weather starts the trees rapidly lose their leaves and the winter (non-foliage) season is soon in evidence. Because of the shortness of the spring and fall seasons, keys for only the summer, or foliage, season and for the winter, or non-foliage, season have been developed. This report is based upon photography flown in the months of June, July, August and September, thus it extends into early fall as well as covering the entire summer (foliage) season.

Photo interpretation keys are made for specific areas at specific times. At their very best they can aid in the identification of specific objects in the areas in which the photos were flown. This statement should not be interpreted to mean, however, that the keys are of no value in similar areas, for they can serve as definite guide posts wherever similar conditions exist. For example, the keys in this report are all based on definite areas within the state of

Minnesota. When applied to these particular areas, by personnel trained in photo interpretation, they can be used for identification purposes without a great deal of difficulty. In other parts of the world, however, these same keys do not have the high degree of validity they will have in Minnesota, even with the same trained personnel. Thus, in similar areas keys made for a specific region can serve only as guide posts for the photo interpreter working with the similar regions.

Regions that are comparable in land forms, climatic conditions, natural vegetation, and other physical factors have a great deal in common, regardless of whether they are in Europe or North America. Where man is absent the pattern of the world is very homogeneous. As soon as man steps into the picture the cultural factors must be added and many changes in the physical factors should be expected. To use any set of photo interpretation keys successfully the photo interpreter needs to know not only how to look at the photos and get them into stereo, but he also needs to know the activities of the people that live in the particular region or area being studied. A study of aerial photographs of the southern edge of the Boreal Forests in North America as compared with a similar area in Europe immediately points up the cultural contrast. As was indicated in Chapter X of Technical Report No. 1, in spite of these great cultural contrasts certain definite natural features remain common to both the area studied in the United States and the similar area in Europe.

Another large factor in the use of photo interpretation keys is the photos upon which the keys are based. No two sets of photos are

ever exactly alike. Differences in camera settings, the time of day at which the photography is flown, the brightness of the sunshine, the coloring of the vegetation, the amount of moisture in the atmosphere, the type of film being used, the experience of the photographer, the experience of the photo pilot, and numerous other natural and man-made factors all influence the way a photograph eventually appears. Considering the number of possibilities for variation in tone and texture and clarity of image it is remarkable that keys can be used even as guide posts.

In spite of all the above elements, however, many factors have a common denominator that must be sought for and carefully used when found. For example, certain types of vegetation, such as black spruce, invariably photographs dark regardless of time of day or season of year, while some other vegetation, such as marsh grass, photographs light. Coniferous vegetation usually is darker than deciduous and so on. Such factors as these must always be carefully considered by the interpreter in doing his work.

Different types of film such as infra-red and panchromatic and different kinds of filters will also greatly affect the final photograph. In this report the stereo pairs used for the Ely Area are based on infra-red photography, while those used for the other three areas are based on panchromatic. Even with these two different types of films certain characteristics are common to both. Again the spruce photographs dark in either case while the grass is considerably lighter in both instances. In some cases the infra-red photography made it

much easier to distinguish certain types of trees, while in other cases the panchromatic was the most effective in distinguishing one species from another. Thus, again the key can be used as a guide post, regardless of the type of photography or the part of the world in which the photography is flown, provided the two areas are physically similar.

The biggest factor in the usability of any photo interpretation key or guide is the photo interpreter himself. His previous training will undoubtedly influence his ability to use keys more than any other single factor. If his training is in geology, he will be able to understand land forms much quicker than one whose training is in architecture. Should his training be in botany he will undoubtedly be able to pick out swamps, bogs and marsh areas much more readily than many others because of his knowledge of the relationship of vegetation to physical features. The geographer and the architect who have been trained to look more closely at cultural factors will more easily understand land utilization or building usage than those previously mentioned. As was stated in Chapter I of Technical Report No. 1, the ideal photo interpreter would be one who has had training in architecture, botany, forestry, geography, and geology, plus a knowledge of photography. Since such a person is almost an impossibility to find the next greatest aid is the application of common sense to the keys or guides that have been worked out.

The use of a guide is not a complicated procedure. For example, the first thing that must be done is to locate as accurately as possible the area in which the photos were made. If for some reason the

photographs are not identified correctly the interpreter can follow the suggestions given under the general instructions, Chapter II, to determine which of the four areas is represented by the photo. A careful reading of the key and a study of the photograph will be needed to determine the area. Once the area has been determined, its particular key should be followed.

It will be noted that the key for each area has a series of numbers down both the left and the right hand side of the page. The numbers on the left side are in numerical order and are simply used to keep the overall key in its definite position and for references made by the numbers on the right side. For example, under Ely Area, key No. 1 gives a description of the area. If the area is one of hilltop, ridgetop and like features, the interpreter is referred to item No. 2 to continue his search. Should the photo indicate, however, that the region being considered is one of benches, or poorly drained upland basins, the interpreter is referred to item No. 13. Upon investigation of item No. 13 it will be noted that there are five divisions. As previously done after examining the items under part 13, it will be noted that certain ones are referred to other numbers for still further sub-division and breakdown, in which case another number appears along the right side of the page. In two instances, however, No. 13 gives a definite answer to the item for which the interpreter is seeking. In such cases the tree species, or the physical factors, are identified and the interpreter is referred to a plate number which will give him an example to compare with the photo that he is using.

Chapter II

GENERAL KEY TO THE FOUR AREAS

This chapter furnishes an introduction to the four specific areas being used as type areas for the keys. Although no photos are included with this chapter, it could be used if necessary to determine which of the following areas should be referred to should there be unidentified photographs.

GENERAL INSTRUCTIONS

Scan a series of photo pairs from each area in order to get a broad, over-all concept of the general pattern of: (1) landforms, (2) bodies of water, (3) streams, (4) vegetation, and (5) agricultural lands. The use of only one or two stereoscopic pairs may be misleading in that small, comparable zones may inadvertently be picked.

KEY

1. Country uniformly flat--no hills. No definite perceptible changes in elevation other than the bank bluffs on an occasional, rather sizeable meandering stream. Almost complete absence of lakes and ponds. Frequently, very straight north-south and east-west etched black lines thinly fringed in white cross the photos (drainage ditches).
Agricultural lands (patchworks of alternating white and light gray tones, 1-4 straight sides, roads and buildings present), rare, and confined to the riverside terraces of the larger streams. Vegetation characterized by many broad expanses of uniform blending tones with or without perceptible vegetation height. Roads very scarce. KOOCHICHING AREA
1. Country uniformly knobby, hilly, rolling: (1) with few sizeable lowland flats, or (2) varying between hilly topography and large, lowland flats. 2
2. Country mainly knobby, rolling, or hilly. Agricultural lands rather common--usually appear on at least 1 out of every 3 or 4 stereo pairs. Upland vegetation of a black or blackish tone, trees with conical, softly pointed crowns (NOT rounded crowns) very sparse and scattered. These dark trees are usually in sparse, scattered patches. 3
2. Country knobby, rolling and hilly. Agricultural lands so rare as to be considered non-existent. Upland vegetation of a black or blackish tone, and having small, pointed or beady crowns, or cone-shaped crowns, are prevalent and extensive--either in pure stands or in mixture with trees having fluffy, rounded, lighter-toned crowns. These dark trees, and their combinations, cover most of the uplands on at least 1/2 of the stereo pairs.

Lake shores, in general, are very abrupt--no evidence of sandy beaches or sand bars. Islands frequent. Lake shores irregular, somewhat angular.

Lowland flats with or without discernible vegetation are rather frequent (rarely extensive) and vary greatly in shape: linear, torturous armlike and sprawling like octopus tentacles out of a central lowland flat.

Roads infrequent. ELY AREA

3. Knobs, hills, uplands (flat or rolling) always visible. Lowland flat areas (not including lakes) fairly numerous but rarely occupy more than 50-125 acres. Small undrained depressions pockmark the entire landscape. Rarely will you find a stereo pair without them. Very often they contain circular, oval or oblong patches of water.

Lakes are common and often very large. Sand bars and beaches (wispy, filmy gray) are prevalent on the edges of all large water bodies. Lake shores smooth, not angular. Islands are rare. Agricultural lands are very common--many photos will have 25-50 per cent of their area in agricultural lands. Roads, consequently, are very numerous.

Small, scattered, patchy, uplands stands of distinct black, fuzzy textured, pointed trees are common, though never extensive to the extent of being the dominant vegetation cover on any one stereo pair. These will usually be evident on at least 5 out of 7 photographs. HUBBARD AREA

3. Knobs, hills and well-drained uplands (flat or rolling) common, but not necessarily present on every stereo pair. This is due to the occasional presence of very large lowland flats. The latter sometimes occupies all, or nearly all, the area covered by a stereo pair.

Lakes and ponds not as frequent as Hubbard County--water is usually visible on 1 out of 4 or 5 stereo pairs. Lake shores are smooth, not angular. Islands rare.

Cleared agricultural land rather common and appears on 1 out of 3 or 4 stereo pairs. Usually occurs in small patches and rarely occupies extensive areas in any photographs. Roads rather common.

Upland trees with soft black, pointed or conical crowns are uncommon and somewhat scattered--usually associated with lowland fringes and rarely appearing on the dry, well-drained uplands.

. ITASCA AREA

Chapter III

THE ELY AREA

A description of the various physical and cultural factors of the Ely Area is given in Technical Report No. 1, Chapter VI. Maps, diagrams, and cross-sections as well as aerial and ground stereo pairs are also presented in Technical Report No. 1. A study of that report will aid greatly in understanding the relationships within the Ely Area and will aid the interpreter greatly as he uses the key presented in this particular chapter.

A description of and remarks about both the upland and the lowland types of vegetation are presented before the key itself is started. Identifications are made directly on the aerial stereo pairs that are used with the key.

All vertical stereo pairs in this chapter are infrared.

IDENTIFIABLE
VEGETATION AND GROUP TYPES OF
THE ELY AREA, MINNESOTA

<u>Symbol</u>	<u>Description and Remarks</u>
---------------	--------------------------------

U P L A N D T Y P E S

- A. . . . ASPEN-PAPER BIRCH. Crowns soft, fluffy, cottony, rounded, light medium gray to white (usual). Trees, whether short or tall stands, tend to be of uniform height in the stand. By far the most common upland tree and occurs in pure stands or with other, darker trees. It is also the lightest toned upland tree. When the trees are fairly tall and somewhat scattered, the oblong shadows may give the appearance of a salt and pepper texture. Probe the shadows to be sure there are no small, pointed dark trees before calling it pure Aspen! Rock outcrops are common to Aspen stands when the stands are clumpy, the trees small crowned and short, and occur on rolling hills or knobs. Look for rounded patches of dark fuzzy, felt-like gray protruding through or between these stands--these are the rock outcrops. . . . (Plate 6)
- A/Pj . . ASPEN-JACK PINE MIXTURE. General pattern of stand is coarse mottled and blotchy. Tone grades from blotches of black or dark gray trees to light gray or white trees or groups of trees. The dark trees are rather tall, tend to be in pure clumps of uniform height. Crowns small and somewhat rounded, soft texture--appear as very tiny soft lead shot (Jack Pine). Mixed with scattered trees and groups of trees (same height and taller) having light gray to white fluffy, rounded crowns (Aspen). Black Spruce often invades the uplands in mixtures of this sort, but it is impossible to separate the Black Spruce from the Jack Pine--you must simply assume that there is probably some there. Very common.(Plate 6)
- A/SB . . ASPEN-SPRUCE AND BALSAM FIR MIXTURE. General pattern of the stand may either (1) be coarsely mottled and blotchy with tonal gradation from soft medium gray to light gray or white, or (2) coarsely mottled but not blotchy--more of a salt and pepper appearance due to mixing of the dark and light trees individually. In this latter case, the stands are often spaced slightly, which accentuates the salt and pepper texture due to shadow cast in openings. The light colored trees are unmistakably Aspen with their fluffy, rounded, whitish crowns, usually taller than the dark trees. The Spruce-Fir are soft textured, medium gray to dark medium gray, elongate, pointed, tapering crowns. Most common to drained upland flats and well-drained gentle slopes. Very common. . . .(Plate 1)

- A/S . . . ASPEN-SPRUCE. Coarsely mottled and blotchy. Grades from blotches of black or dark gray trees or groups of trees to light gray or white trees and/or groups of trees. These stands are extremely difficult to separate from A/Pj. The dark trees are uniform in height, usually somewhat shorter than the Aspen (light gray or white, soft, rounded crowns). Crowns of Spruce are small and very similar to Jack Pine but not so rounded--with close observation they may be seen to be somewhat more angular. Separation is possible only with practice. Fairly common. (Plate 1)
- Pj . . . JACK PINE. Crowns soft, small, rounded--appear as tiny, soft lead shot when the trees are closely packed. Trees tall, tend to be in clumps of equal height. Often have scattered trees (taller) with soft, rounded, light gray or white fluffy crowns (Aspen). Occur on hilltops, sidehills or well-drained knolls in or near low flatlands. Sometimes it is hard to decide whether a stand is Pj or A/Pj--usually you may assume that if there is less than 40 per cent coverage by the Aspen, it may be called a Pj stand. Common. (Plate 2)
- Pn . . . NORWAY PINE. Crowns very soft texture, medium dark gray, soft ragged appearance and rounded. Crown shadows oval. When closely packed in stands, the tree heights are very uniform and conform to the slope of the land (parallel). When isolated, crowns are very large, tall, soft, rounded with slight suggestion of taper at the tip. Only found in small patches--usually on upper slopes of hilltops. Not common. (Plate 1)
- Pw . . . WHITE PINE. Crowns very soft, fuzzy, medium gray to light medium gray (almost white on the sun side). Crowns slightly tapering but not conical. Only found in small patches and then rarely. Tend to grow on well-drained lower slopes or knolls facing or near lake shore or lowland flats. Difficult to separate from Norway Pine. (Plate 1)
- SB . . . WHITE SPRUCE-BALSAM FIR. Crowns medium dark gray, small, soft, pointed and tapering. Shadows elongate triangular (when visible). Trees rather short compared to adjoining stands, usually rather uneven in height. Never occur in extensive pure stands, usually mixed with Aspen in blotchy groups or as individual trees into a salt and pepper mixture. Found on gentle slopes, knolls, or well drained upland flats. Very common in mixture with Aspen. . . (Plate 1)
- SBCO . . CUT-OVER JACK PINE OR SPRUCE-FIR. Since both of these timber or types grow on approximately the same type of ground conditions, and often in mixture, it is impossible to tell which PjCO

species was cut off. It may be assumed, however, that it is Jack Pine primarily, because of its greater extent and higher value. Alternating, roughly parallel lines, usually crooked, about 1 mm wide. A sort of zebra-stripe of fish skeleton pattern. Varies from (1) alternating medium dark gray stripes (slash and brush) and light gray or white stripes (logging skid trails) and (2) alternating light gray stripes and white stripes. Tall scattered trees remaining have fluffy, white rounded crowns that seem to float. A few small, dark trees,(Plates 2, 3)

S UPLAND BLACK SPRUCE. (See description of A/S on page 11). Very difficult to tell from Jack Pine other than the fact that the crowns are slightly more angular and this type tends to frequent slightly lower elevations. Fairly common but not often extensive.(Plate 1)

UB UPLAND BRUSH. Soft, fluffy, pebbly to grainy texture, often somewhat mottled. Light to medium light gray (usually on the light or whitish side). Thinly scattered trees invariably present--usually Aspen with white, fluffy, rounded crowns that seem to float over the bumpy, soft textured ground. May also be a few small spruce or fir (medium to dark gray, tapered crowns). Very common.(Plates 2, 4)

Ro ROCK OUTCROPS. Look for knobs, knolls or hills with scant vegetation. Tone medium dark gray, velvety texture, softly mottled. ALWAYS darker in tone than upland brush. Occurs in conjunction with steep or sharply-knolled country. Little perceptible vegetation. Large areas give a feeling of roundness even when viewed without the stereoscope. Most commonly occur in hilly areas covered by short to medium height, clumpy, light gray to white, fluffy rounded crown trees (Aspen). These dark patches poke through as bald knolls or steep, bald faces. Common.(Plates 5, 6)

L O W L A N D T Y P E S

WS WHITE SPRUCE. This type is not common and may be said to be a Lowland-Upland "in-between." Crowns somewhat angular and of varying height--giving the stand a rough, decked appearance. Sometimes a few scattered trees mixed in which have hard, white rounded crowns (IMPORTANT). May tend to give these stands a salt-on-pepper appearance. Very commonly, more of these white-crowned trees can be found on the edges in greater numbers. This type does not often occur and is associated with moderately well-drained lowland flats.(Plate 4)

- Hs . . . LOWLAND HARDWOODS. Crowns rounded, sharp outlines, NOT FLUFFY, light gray to white, heights uneven. Trees slightly spaced--the shadows between and uneven height of trees tends to give a salt and pepper appearance. Rarely large stands, usually a border group of trees or band of trees along the edge of a large lowland flat or along the edge of broad, flat meandering stream courses, next to the bottom of hills:(Plates 4, 5)
- S. . . . BLACK SPRUCE. Black tone, small roughly rounded crowns, quite well defined. Height uniform, sometimes sloping upwards like a shed roof toward the outside edge of the flat lowland, upland basin, or flat drainage in which they occur. Shadows lacey, pointed, linear. PURE STANDS. Very common in small patches in upland poorly drained basins--tend to have rather extensive stands in the large lowland basins/stream courses. Very commonly found as a band or ring around a flat lowland having speckled texture (Sw)(Plates 2, 5)
- SCO. . . BLACK SPRUCE CUT-OVER. Very distinct "combed" or "Zebra-stripe" appearance. May be some thin rows of black, small crowned trees, but generally few noticeable trees standing. Alternating fuzzy medium dark gray stripes (slash, brush) and white stripes (skid trails). Fairly common. . (Plate 3)
- T. . . . TAMARACK. Tone medium to light gray. Crowns small, soft, tapering, shadows sharply pointed, triangular. Height fairly uniform, trees not usually tightly packed. Hillside edge of meandering stream courses or in the areas of large, irregular lowland areas. Not too common. (Plate 5)
- Sx . . . STAGNANT SWAMP. Few readily recognizable trees. Has a speckled appearance--tiny dark, pepper-like dots or flecks (linear) on a medium to medium light gray background. Texture soft and velvety, sometimes pebbly, sometimes mottled. Black dots or flecks may sometimes cast faintly visible linear or triangular shadows. This type is usually a muskeg comprised of Sphagnum Moss, Leatherleaf, Laborador tea and scattered stagnated small Black Spruce and/or Tamarack. True marsh and muskeg are not extensive nor easily recognizable in this part of the country on photos. Therefore, Stagnant Spruce and Tamarack Swamps, Marsh and Muskeg have been combined into this Stagnant Swamp classification. Common.(Plate 3)
- FB . . . FLOATING BOG. No recognizable trees, soft medium gray to dark gray, velvety, darkly mottled. Occurs along the edge of meandering streams, poorly drained ponds and many lake

bays. Sometimes lenses of water show up--isolated from the main body of water. Fairly common.(Plate 7)

W. . . .WATER. No vegetation, texture smooth, velvety, jet black (usually), very level. Can be white or light gray on one photograph due to reflection of the sun.(Plate 5)

LB . . . LOWLAND BRUSH. Soft, pebbly or grainy texture. Medium to light gray (sometimes almost white--velvety). Common on flats at the bottom of hills, narrow flat bottomed drainages with slight gradient, small upland basins that are poorly drained, and around the rim of large flats containing Spruce, Stagnant Swamp, ponds or sluggish streams.(Plate 5)

ELY AREA KEY

1. Hilltop, ridgetop, sidehill, knoll, upland flat, narrow gullies with steep gradient. 2
1. Benches or upland basins (poorly drained), gully or bottoms (valley) with shallow gradients, lowland flats or depressions. . . 13
2. Vegetation of definite perceptible height and shadow--crowns of the trees covering over 30 per cent of the area. 3
2. Vegetation of definite perceptible height and shadow covering less than 30 per cent of the area (usually some trees present). 12
3. Overall vegetation pattern mottled due to mixing of different tones of tree crowns. 4
3. Overall vegetation pattern uniform in tone. 8
4. Coarsely mottled and blotchy. Grades from blotches of black or dark gray trees to light gray or white trees--the blotches being formed by groups of trees of the same tone. 5
4. Coarsely mottled and blotchy. Grades from blotches of soft medium gray trees to light gray or white trees--the blotches being formed by groups of trees of the same tone. 6
4. Coarsely mottled but NOT particularly blotchy. More of a rough salt-and-pepper appearance due to quite uniform mixing of dark medium gray trees with taller light gray to white trees (Shadows help accentuate this unique texture). 7
5. Dark trees rather tall, tend to be in clumps of uniform height. Crowns small and somewhat rounded, soft texture--appear as very tiny soft lead shot. Mixed with scattered trees and groups of trees (same height or taller) having light gray to white fluffy rounded crowns. ASPEN-JACK PINE (A/Pj) Plate 6
5. Dark trees varying in height, but do so in a gradual, sloping manner. Small compact crowns, rather hard outlines roughly rounded. Shadows hard to find or see, but are small and pointed. Mixed with taller trees having light gray to white fluffy, rounded crowns. ASPEN-UPLAND BLACK SPRUCE (A/S) Plate 1
6. Soft textured, medium to medium dark gray, trees have pointed crowns with elongate, triangular, sharply pointed shadows. Darker trees almost invariably shorter than their companion trees which have light gray to white, fluffy, rounded crowns

() well-drained upland flats and well-

. ASPEN-SPRUCE AND BALSAM FIR (A/SB) Plate 1

7. Soft textured medium dark to medium gray trees have tapered crowns with elongate triangular sharply-pointed shadows (when visible with right sun angle). Almost invariably shorter than their companion trees which have light gray to white, fluffy rounded crowns. The spacing of the trees often tends to be loose and the trees uniformly mixed. Consequently, shadows and crowns of the shorter, darker trees fill the openings between the larger, lighter trees. Look for those sharply pointed shadows in the openings!
. ASPEN-SPRUCE AND BALSAM FIR (A/SB) Plate 6
8. Overall tone of vegetation dark gray or nearly black.9
8. Overall tone of vegetation soft, medium gray. 10
8. Overall tone of vegetation light gray to whitish. 11
9. Crowns soft, small, rounded--appear as tiny, soft lead shot when trees are closely packed. Trees tall, tend to be in clumps of equal height. Often have a few scattered trees (taller) with soft, rounded, light gray or white fluffy crowns. Occur on hilltops, sidehills or well-drained knolls in or near low flatlands. Very common. JACK PINE (Pj) Plates 2, 5, 6
9. Crowns small, soft, pointed. Shadows elongate, triangular, pointed (when visible). Trees rather short compared to adjoining stands, usually rather uneven in height. Usually have some scattered large trees with light gray to white fluffy rounded crowns immediately adjacent. Never occur over large areas in such pure stands--usually an isolated patch on a sidehill in the middle of a stand where these trees and the white crowned trees are mixed together. Found on gentle slopes or well-drained upland flats and knolls.
. WHITE SPRUCE-BALSAM FIR (SB) Plate 1
10. Crowns very soft, medium dark gray, soft ragged appearance and rounded. Crown shadows oval. When in closely packed stands, the tree heights are very uniform and conform to the slope of the land (parallel). When isolated, crowns are very large, tall, soft, rounded, with slight suggestion of taper at the tip. Only found in small patches--usually on upper slopes or hilltops. Not common. . NORWAY PINE (Pn) Plate 1
10. Crowns very soft, fuzzy, medium gray to light medium gray. Crowns slightly tapering, but not conical. Only found in small patches and then rarely. Tend to grow on well-drained lower slopes or knolls facing or near lake shores or lowland flats. Not common. WHITE PINE (Fw) Plate 1

11. Crowns soft, fluffy, cottony, rounded, light medium gray to whitish (usual). Trees, whether short or tall, tend to be of uniform height in the stand. By far the most common upland tree and occurs in pure stands or with other, darker trees. Is also the lightest toned tree. When the trees are fairly tall and somewhat scattered, the oblong shadows may give the appearance of a salt-and-pepper texture. Probe the shadows to be sure there are no small, pointed dark trees before you call it. ASPEN (A) Plates 1, 6
 (Note on Aspen-Birch stands: Rock outcrops are common to Aspen stands when the stands are clumpy, the trees small crowned and short, and occur on rolling hills or knobs. Look for rounded patches of dark, fuzzy, felt-like gray protruding between and through these stands--these are rock outcrops. Rarely more than a few scattered trees or bushes on these outcrops.) Plate 7
12. Soft, fluffy, pebbly to grainy texture, often slightly mottled. Light to medium gray (usually on the light or whitish side). Little feeling of vegetation height other than the thinly scattered trees that may be present. These trees are usually Aspen (white, fluffy, rounded crowns that seem to float over the soft-textured ground), and a few small Spruce or Fir (medium to dark gray, pointed crowns and shadows) scattered about. UPLAND BRUSH (UB) Plate 2
12. Alternating, roughly parallel lines, usually crooked, about 1 mm wide. A sort of "Zebra stripe" or "Fish skeleton" pattern. Varies from (1) alternating dark gray stripes (slash and brush) and light gray to white stripes (logging skid trails) to (2) alternating very light gray lines (slash and brush) and white lines (logging skid trails). Tall scattered trees have fluffy, white, rounded crowns that seem to float. Shorter trees, when present, have pointed medium gray crowns (SB). CUT OVER JACK PINE OR SPRUCE FIR (SBCO or PjCO) Plates 2, 3
12. Medium dark gray, velvety texture, softly mottled. Occurs in conjunction with steep or sharply knolled country. May be small, sharp knolls; steep hillsides; or large, rounded hills. Little perceptible vegetation. Large areas give a feeling of roundness even when viewed without the stereoscope. Most commonly occur in hilly areas covered by short to medium height, clumpy, light gray to white, fluffy, rounded-crown trees (A). These dark patches poke through as bald knolls or steep, bald faces. ROCK OUTCROP (Ro) Plate 7
13. Densely packed to slightly open stands of trees (occasional thin spots common). Individual crowns readily discernible as are the shadows on the edge of the stand when the sun is from an angle. 14

13. Loosely packed stands of trees. Individual crowns rather hard to see, but you get a good impression of height and shadow when the sun is at an angle.18
13. Extremely few recognizable trees. Areas have a speckled appearance...tiny, dark pepper-like dots or flecks on a medium gray to medium light gray background (soft and velvety). These dots or flecks may sometimes cast faintly visible linear or triangular shadows. Gray background often slightly mottled and pebbly. STAGNANT SWAMP (Sw) Plate 3
13. Extremely few (or none) readily recognizable trees--mottled, black, gray, smooth or pebbly appearance. DOES NOT have a definite speckled appearance.19
13. Very distinct "combed" or "Zebra stripe" appearance. May be some thin rows of black, small crowned trees, but generally few noticeable trees standing. Alternating fuzzy medium dark gray stripes and white stripes about 1 mm wide. The dark rows are slash and brush, the white are logging skid trails. BLACK SPRUCE CUT OVER (SCO) Plate 3
14. Tone black or nearly black.15
14. Tone medium gray.16
14. Tone light gray to white.17
15. Small, rounded to angular crowns. Height uniform, sometimes sloping upwards like a shed roof toward the outside edge of the flat lowland, upland basin, or flat drainage in which they occur. Shadows lacey, pointed. PURE STANDS. Very common in small patches in upland poorly drained basins, rather extensive stands in the large lowland basins, flats, or meandering stream courses. Very commonly found as a band or ring around a flat lowland having a speckled texture, or existing as a small "island" of trees in the middle of the Stagnant Swamps. . BLACK SPRUCE (S) Plates 2, 5, 7
15. Crowns somewhat angular and of varying height--gives the stand a rough, deckled appearance. Sometimes a few scattered taller trees mixed in, which have hard, white, rounded crowns (IMPORTANT). May tend to give these stands a salt-on-pepper appearance. Very commonly more of these white crowned trees (Hs) may be found in greater numbers on the edge of the stand. This timber type does not often occur--is associated with moderately well-drained lowland flats. WHITE SPRUCE (WS) Plate 4
16. Crowns small, soft, somewhat tapering. Tone medium gray to light gray. Shadows sharply pointed. Occurs on lowland flats

as an occasional patch at the hillside edge of meandering stream courses or in the arms of large, irregular lowland areas. Heights quite uniform, trees never tightly packed.
TAMARACK (T) Plate 5

17. Crowns small, soft, somewhat tapering. Tone light gray to almost white on the sun side. Shadows sharply pointed. Height fairly uniform--trees never tightly packed as a rule.
TAMARACK (T) Plate 2

17. Crowns rounded, sharp outlines (NOT fluffy), light gray to white, heights uneven. Trees not extremely tightly packed--slightly spaced--the shadows between trees and the unequal height of the trees tends to give a salt-pepper or coarsely speckled appearance. Rarely large stands--usually a border group of trees or band of trees along the edge of large lowland flats or along the edge of broad, flat meandering stream courses (next to the bottom of the hills). Not extensive nor does it occur frequently.
LOWLAND HARDWOODS (Hs) Plates 4, 5

18. Crowns tapered, lacey, shadows pointed and linear. Tone of trees dark gray, background medium light gray and felt-like. Often occasional "islands" of densely packed trees which are comparatively tall. Common to large, irregular lowland flats and small, upland poorly drained basins.
BLACK SPRUCE (S) Plate 7

19. Soft, pebbly or grainy texture--or just plain lumpy. Medium to light gray (sometimes almost white and felt-like). Common on flats at the bottom of hills, narrow flat bottom drainages with slight gradient, small upland basins and around the rim of large flats containing S, Sw, ponds or sluggish streams. Look for the soft, pebbly-grainy texture! . . .LOWLAND BRUSH (LB) Plates 5, 7

19. No recognizable trees, soft medium gray to dark gray, velvety, darkly mottled. No vegetation of discernible height. Occurs along the edge of meandering streams, poorly drained ponds or lakes. Sometimes lenses of water show up--isolated from the main stream or ponds.FLOATING BOG (FB) Plates 4, 7

19. No vegetation, texture smooth, velvety, very level, jet black. Can be white or light mottled gray on one photo due to reflection of the sun.WATER (W) Plate 5



Scale 1:15,840

Plate 1 - ELY AREA. Good examples of Aspen, White Pine, Black Spruce, Spruce and Balsam Fir mixture.



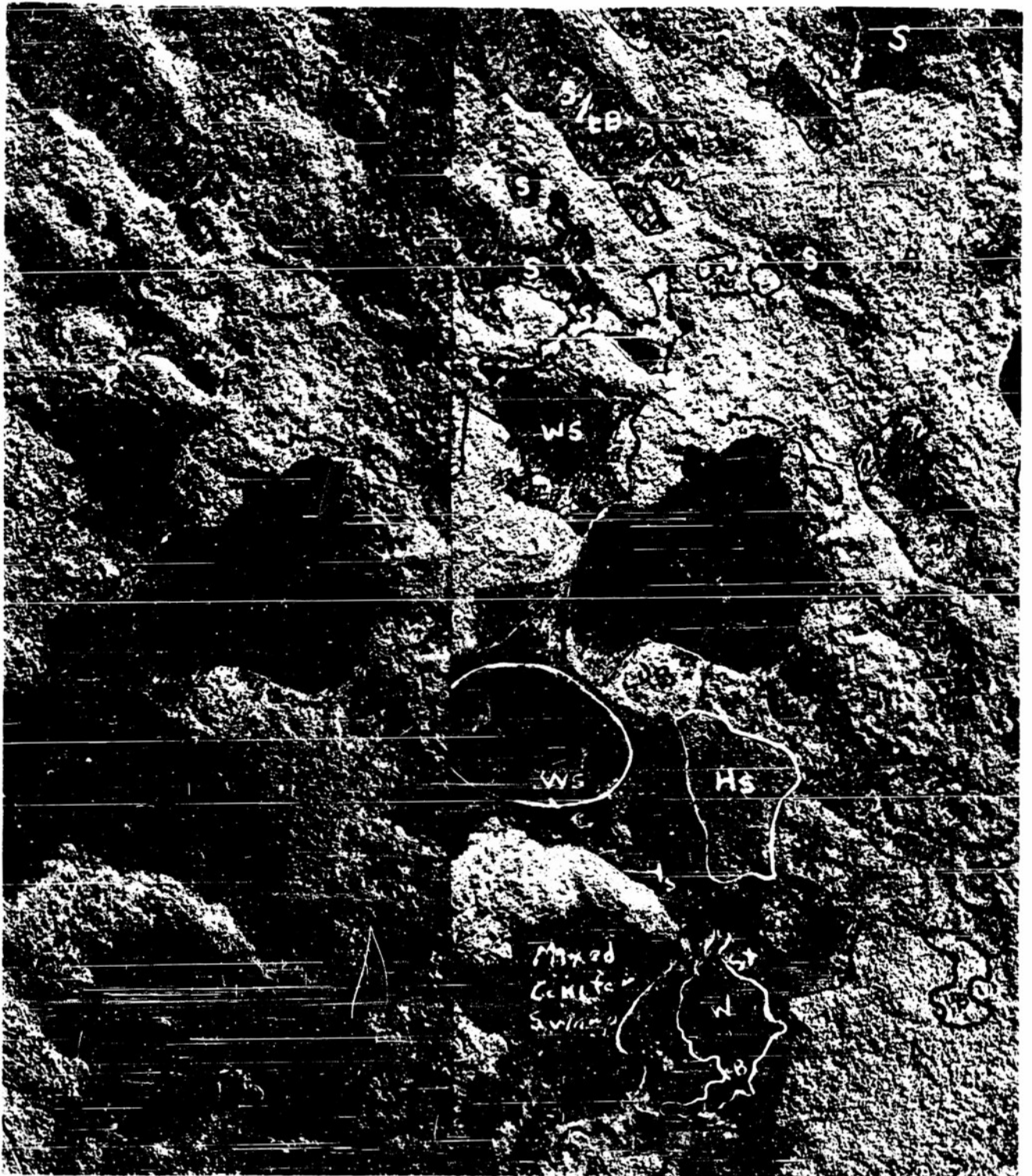
Scale 1:15,840

Plate 2 - ELY AREA. Examples of Jack Pine, Spruce, cut-over Jack Pine and Tamarack (light tone).



Scale 1:15,840

Plate 3 - ELY AREA. Good examples of cut-over Black Spruce, Stagnant Spruce, cut-over Jack Pine.



Scale 1:15,840

Plate 4 - ELY AREA. Good examples of White Spruce, Lowland Hardwoods, Floating Bogs and Muskegs.



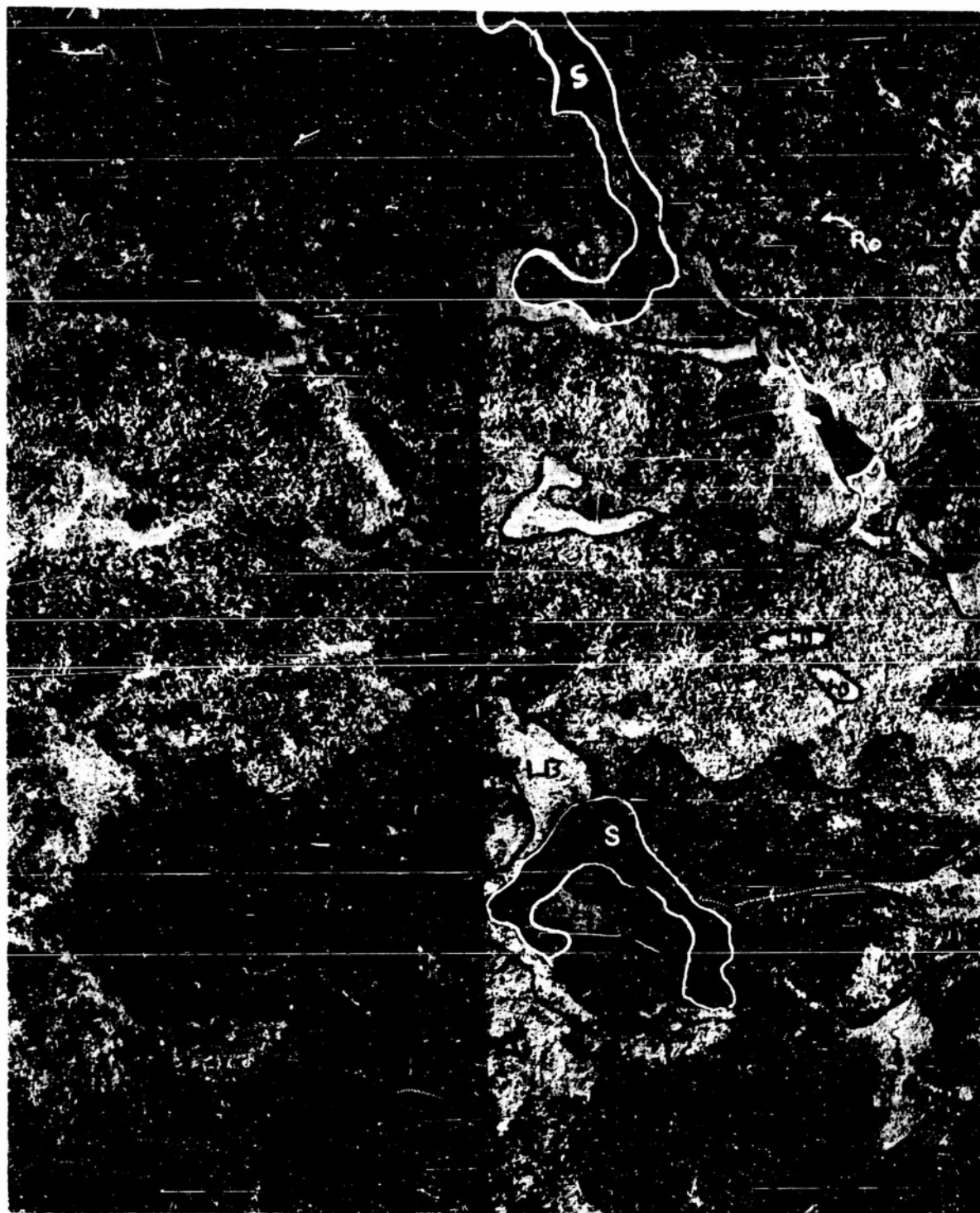
Plate 5 - ELY AREA. Outstanding example of Rock Outcrop with good examples of Tamarack (medium gray), Lowland Brush, Jack Pine and Spruce.

Scale 1:15,840



Scale 1:15,840

Plate 6 - ELY AREA. Examples of Aspen-Paper Birch, Aspen-Spruce and Balsam Fir mixture (salt-and-pepper texture), and Aspen-Jack Pine mixture.



Scale 1:15,840

Plate 7 - ELY AREA. Examples of Spruce (note softer, lighter crowns in Tamarack as compared with Spruce), Lowland Brush, Floating Bog and Rock Outcrop.

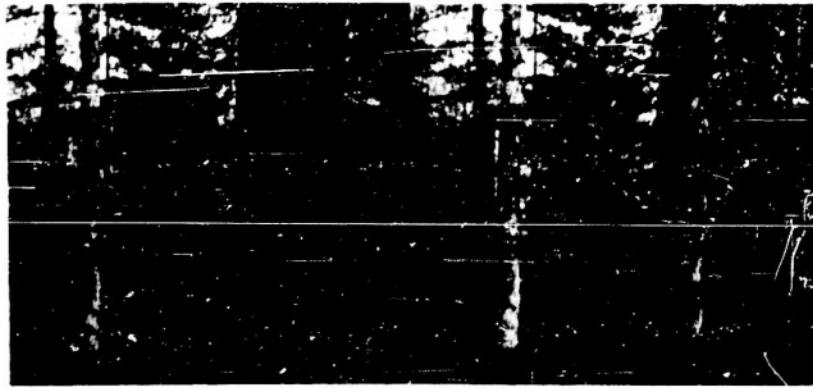


Plate 8 - ELY AREA. On Echo Trail north of Ely. Note variety of trees and the difference in density between the trees.

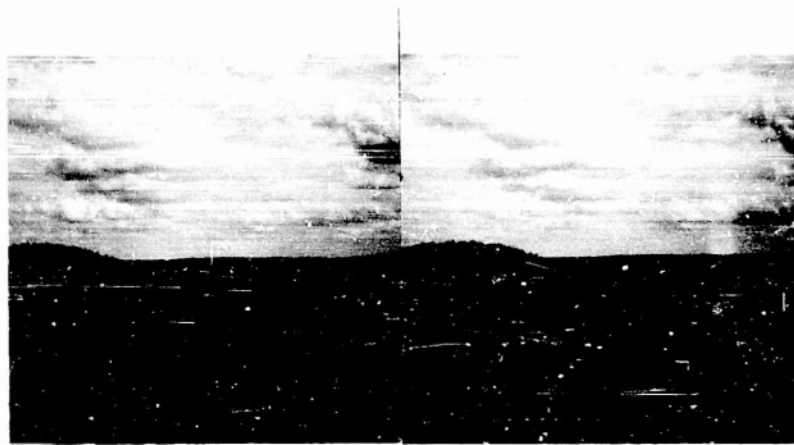


Plate 9 - ELY AREA. Looking east toward Ely. Note difference in trees by difference in degree of darkness (tone). The darker tones indicate the coniferous trees.

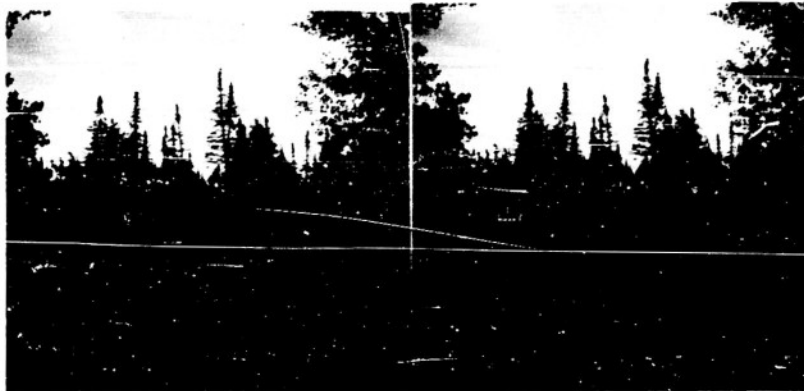


Plate 10 - ELY AREA. About 3 miles northeast of Winton Dam. Tall "turkey neck" like trees are stagnant Spruce.

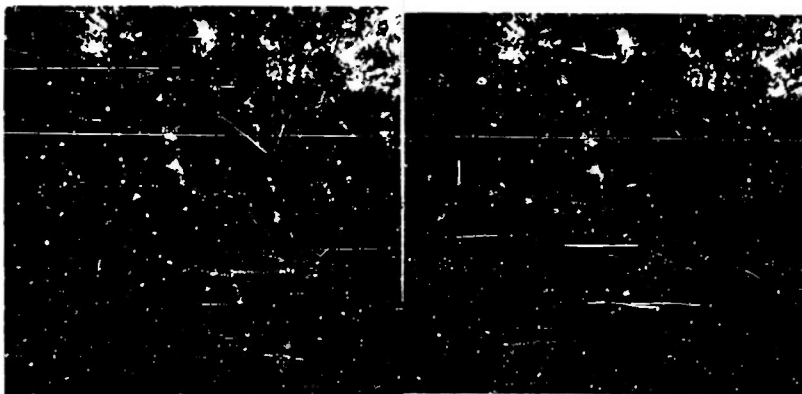


Plate 11 - ELY AREA. One-half mile northeast of Garden Lake. Vegetation largely a mixture of Birch, Aspen and Spruce.

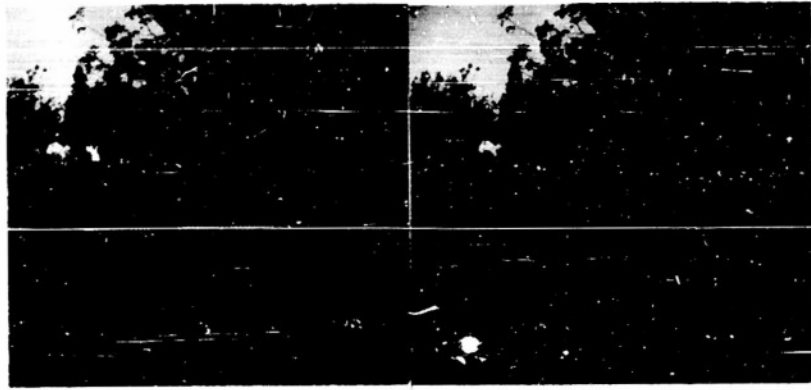


Plate 12 - ELY AREA. South of Ely near Mitchell Lake. Note size of Rock Outcrop which is practically surrounded by small vegetation.



Plate 13 - ELY AREA. Steep Rock Outcrop along the shore of Basswood Lake. Note that the steeper the Rock Outcrop the less the amount of large vegetation.

Chapter IV
THE HUBBARD AREA

The physical and cultural features of the Hubbard Area along with maps, cross-sections, diagrams, and ground and aerial photographs are given and described in Chapter VII of Technical Report No. 1.

Like the previous chapter in this report, descriptions and remarks about both the upland and lowland types of vegetation and characteristics are given previous to the key for the area. Again this key is followed by both aerial and ground stereo pairs with identifications made thereon.

IDENTIFIABLE
VEGETATION AND GROUND TYPES OF
THE HUBBARD AREA, MINNESOTA

<u>Symbol</u>	<u>Description and Remarks</u>
---------------	--------------------------------

U P L A N D T Y P E S

- A ASPEN-PAPER BIRCH. Tone medium gray (sometimes slightly mottled) on photographs taken during summer or late summer up to about late September. Tone white in fall when coloration has taken place--usually after the 1st of October. Crowns small, trees of very even height. Common over large areas (most common upland tree). Tend to blend gradually from dense, close-packed stands into scattered trees (crowns are larger when open grown), and back again into dense stands. This clumpiness, plus the lighter gray and velvety undergrowth in scattered stands, tends to give a mottled appearance in summer photos in particular. These trees are most distinctive when in tightly packed clumps; crowns are small, occasional openings appear as tiny black holes, and there may be numerous tiny, marshy depressions which lack trees (Plates 14, 15, 19)
- O OAK. Tone medium gray, crowns very small, closely packed. Occur on high flats or knolls above and near lakes--and then only in small patches. The dark gray to medium gray tone, and close packed tiny crowns are their most outstanding features. Associated with gravelly soils. It is extremely doubtful whether this species can be satisfactorily separated from Aspen-Birch. Tone, texture, and place of occurrence are practically identical. Further, it does not occur commonly enough to be noteworthy. (Plate 20)
- Hm MIXED UPLAND HARDWOODS. Tones may vary from almost white to dark medium gray, crowns variable in size, rounded, usually distinctly larger than adjacent timber. Trees of variable height. Common to lake shore bluffs, steep stream bluffs and moderately well drained lake shore knolls and ridges. Do sometimes occur on uplands away from any visible water bodies. When this takes place, they prefer gentle north slopes or slopes adjacent to marshy depressions. Fairly common near water bodies or stream courses. Never cover extensive areas. This type consists of Maple, Birch, Basswood, Aspen and Ash and is an indication of the richer, better-developed, moist, moderately-well drained soils. (Plates 14, 20)
- Pj JACK PINE. Overall vegetation tone black or nearly black. Very distinctive soft, black texture like the pile of a thick,

soft, carpet. Crowns fuzzy and hard to make out individually when the stands are dense. Trees of uniform height, normally in tight packed stands, but sometimes rather scattered. Most common in patches on flat or rolling uplands. A common upland tree on sandy, well-drained soils. . . .(Plates 18, 20)

Pn . . . NORWAY PINE. Crowns medium gray in tone, large, soft, rounded, rather feathery. Heights uniform. Trees tall, scattered, and crowns seem to float over lower, close grown trees of definitely discernible height, and of about the same tone as the taller trees. As is true for most high value tree species in a well settled area, the Norway Pine has been largely cut. It is virtually impossible to identify, even by an experienced forester, when it occurs in younger and smaller size classes. It is readily identifiable only when in the old, mature stage where it projects well above other trees. This is a rare occurrence, however, and then only in small stands. (Plate 14)

UB . . . UPLAND BRUSH. Light gray tone, sometimes faintly speckled. Overall texture soft, bumpy or pebbly with only a faint suggestion of height and shadow. May be a few scattered trees with faint, medium gray to light gray, rounded, fuzzy crowns and/or a few scattered soft, black specks. Very common in extensive hilly areas without roads or clearings--where they appear as medium to light gray mottles between definite timber stands of dark gray tone and equal height. The pebbly or grainy texture indicates that the brush is large and thick--probably mostly Hazel and small Aspen-Birch. (Plates 15, 19)

PJCO . . . JACK PINE CUT-OVER. Overall tone faintly or distinctly "zebra striped" or "combed" with alternating parallel, often crooked, medium gray and light gray or white lines. Somewhat speckled with black dots or flecks. The dark to medium gray stripes are the piles of slash, tops, brush, etc., and the white or light gray stripes are the logging skid trails. Roads are always adjacent to, or enter into, the area. When the zebra stripe pattern is very prominent, it indicates that the area has been logged over within the past few years. When faint, logging was done usually between 3-7 years ago. . . .
..... (Plates 17, 19)

F . . . FARM (UPLAND). Patchwork of alternating bands of light gray and white, usually with 2 to 4 sides straight and parallel. Very smooth texture, often mottled white and light gray on knoll tops. No discernible vegetation. Road (white ribbon) or roads always visible leading near, to, or through the area. Buildings usually visible either in the open, tucked into an isolated clump of trees, or in a timber stand adjoining the clearing. Some patches are often faintly striated due to cultivation. Upland farms can be one of two things: (1) actually

tilled fields, or (2) in some pasture crop (usual). Tilled fields are easily identified, particularly in the late summer or fall, as they have a finely striated, blotchy, light gray and white appearance. Fields in grain or forage crops are plain light gray to light medium gray--just what kind of crop it is cannot be predicted with any degree of certainty. (Plates 15, 16)

L O W L A N D T Y P E S

- S. . . . BLACK SPRUCE. Tone dark gray to black, crowns sharp-pointed, conical elongate, shadows elongate and triangular. Trees of even height and varying from dense to slightly open spacing--never so closely packed, usually, that the individual crowns are not easily discernible. Understory is never light gray--always a medium dark gray. Occasionally mixed with trees of the same shape, softer texture and lighter tone (TAMARACK). Common to large, flat, undrained depressions, or broad, meandering stream flats. The Tamarack usually occurs as a band or patch next to the Spruce, but separation is possible only near the center of the photograph where definition is good. Quite common. (Plates 15, 17, 19)
- T. . . . TAMARACK. Tone medium dark gray to dark gray; crowns soft, tapering, sharp-pointed, conical. Trees of even height, scattered or packed. Understory medium dark gray, velvety. Occur in depressional flats, along meandering streams--often in conjunction with trees of similar shape, but darker tone and sharper outline (BLACK SPRUCE). Tamarack is a deciduous tree and turns a brilliant yellow after fall frost. Panchromatic photos taken after the 1st of October will usually show the crowns to be a very light gray or white. Not common. (Plates 15, 17, 19)
- Hs . . . LOWLAND HARDWOODS. Tone varies considerably from one tree to the next. Crowns rounded, soft, large or small mixed. Tree heights variable. Occur along lake shores, lake shore flats, along banks of meandering streams or moist foothill bottom slopes, and along the edge of large, flat marshy basins. Not extensive or common. It is sometimes a moot question as to which is Upland Hardwood and which is Lowland Hardwood. Species composition is much the same and one can grade gradually into another. Be sure the site is low and wet before calling it Lowland Hardwood. Ash, Elm, Red Maple predominate. (Plate 19)
- M (Mse). MARSH. No vegetation of discernible height; soft, light gray, felt-like texture, smooth and quite uniform. Not distinctly mottled. Occurs in undrained depressions, flats around ponds, in depressions in farm clearings. Sedges, reeds, cattails or

marsh grass. Too wet for pasture or hayland, except at the edges of some of the larger ones. Always very wet. Quite common--it is a rare photograph which does not have a number of these.(Plates 14, 15)

FM . . . WET FARM MEADOW OR HAYLAND (WILD). Light gray tone, no vegetation of discernible height. Either (1) a shallow depression or low slope in conjunction with a farm or (2) isolated in a timbered area with a road or trail to it. Always depressional or poorly drained lower slope. Concentric bands or white dots or white flecks indicate hay piles, bales or windrows. These areas are intermittently wet--often submerged in spring and sometimes with heavy summer rains. Normally, these border marsh areas or flat basins dry out enough in middle or late summer to permit cutting for hay. Identifiable only if hay is cut or in the process of being cut, otherwise they look much the same as marsh--in this case, a road leading to it will identify it as a hay meadow.(Plates 18, 21)

W. . . . WATER. Very flat, smooth, sometimes with ripple marks. Due to reflection, it may show as almost white on one photograph--jet black on another. Large lakes will often have a very fine light gray, mottled, filmy-looking projection(s) along the shore line or extending out into the water. These are sand bars.(Plates 15, 19, 21)

FB . . . FLOATING BOG. Smooth, velvety, distinctly mottled (dark gray or black and medium dark gray). Occur as irregular zones around water bodies, or in the center of many undrained depressions, or adjacent to sluggish river or stream courses. These are usually floating sedge mats and are mottled due to the varying amounts of water showing through and the scattered small shrubs that sometimes grow on them. Fairly common.(Plates 15, 21)

LB . . . LOWLAND BRUSH. Only scattered trees (if any)--crowns, when present, cover less than 30 per cent of the area. General texture pebbly, grainy or bumpy. Medium to light medium gray tone. Common to the edge of large lowland flats, deep flat-bottom gullies with poor drainage, and undrained flat-bottom upland depressions. Very distinct tone. Very slight hint of shadow and vegetation height. Quite common. . . (Plate 20)

HUBBARD AREA KEY

1. Early summer photography. 2
1. Late summer photography 18
2. Hilltop, ridgetop, sidehill, knoll, upland flat, shallow
round-bottom depression. 3
2. Undrained flat-bottomed depression, flat stream courses,
lakeside flat, lake shore, or stream side at the base of
a bluff or hill. 12
3. Vegetation of definite perceptible height and shadow--crowns
of the trees covering over 30 per cent of the area. 4
3. Vegetation of definite perceptible height and shadow--crowns
of the trees covering less than 30 per cent of the area (some
trees are always present). 7
3. No vegetation of perceptible height--texture smooth or pebbly . . 11
4. Overall vegetation tone black or nearly black, distinctly
uniform. Trees tightly packed to somewhat loosely spaced. . 5
4. Overall vegetation tone medium gray to medium dark gray.
Sometimes slightly mottled. 6
5. Trees of uniform height, normally in tight-packed stands, but
sometimes rather scattered. Very distinct soft, black texture
like the pile of a thick, soft carpet. Crowns fuzzy and hard
to make out individually when the stands are dense. Most com-
monly occur in patches on flat or rolling uplands.
. JACK PINE (Pj) Plates 18, 20
6. Crowns soft, large, rounded, rather feathery. Heights uni-
form. Trees tall, scattered, and crowns seem to float over
lower, close-grown trees of definite discernible height, and
of about the same tone as the taller trees. Not common--
occur only rarely and then in small, scattered groups.
. NORWAY PINE (Pn) Plate 14
6. Crowns small, trees of VERY even height. Common over large
areas. Tend to blend gradually from dense, close-packed
stands into scattered trees with larger crowns, and back
again into dense stands. This clumpiness plus the lighter
gray undergrowth in scattered stands tends to give a mottled
appearance. These trees are most distinct when in tightly
packed clumps: crowns are small, occasional openings appear

as tiny black holes, and there are usually numerous tiny marshy depressions which lack trees. Occur almost everywhere upland--knolls, well-drained hillsides, hilltops and well-drained upland flats. ASPEN-BIRCH (A) Plates 14, 15, 19

6. Crowns very small, closely packed, medium gray to dark gray tone. High flats or knolls above or near lakes--and then only in small patches, similar in appearance but of darker tone than Aspen-Birch. Gravelly soils, excessively drained. OAK (O) Plate 20
6. Crowns variable in size--many distinctly larger than adjacent timber. Crowns rounded, of variable height (IMPORTANT) and variable tone--may vary from almost white to dark medium gray (IMPORTANT). Common to lake shore bluffs, steep stream bluffs and moderately well drained lake shore knolls and ridges. Do sometimes occur on uplands away from any visible water bodies. When this takes place, they prefer gentle north slopes or slopes adjacent to marshy depressions. Fairly common near water bodies or stream courses. Never extensive. UPLAND HARDWOODS (Hm) Plates 14, 20
7. Overall tone medium gray, DISTINCTLY speckled--black dots or flecks (many) on a medium to light soft gray background. 8
7. Overall tone faintly or distinctly "zebra striped" or "combed" with alternating parallel, often crooked, medium gray and light gray or white lines. Somewhat speckled with black dots or flecks. . 9
7. Overall tone light gray, sometimes faintly speckled. 10
8. When viewed under 4x stereo, black dots take on a faint, soft black, pointed appearance. Pointed black triangular shadows sometimes faintly visible. Background soft, rather fuzzy, light to medium gray--no feeling of height. Flat or rolling uplands commonly. SMALL JACK PINE AND UPLAND BRUSH (Pj and UB) Plate 19
9. Striped appearance very noticeable to rather faint. Be sure the ground is well drained upland flat, rolling upland, or hillside. The dark to medium gray stripes are the slashings, brush, etc., the light or white stripes are the logging skid trails. Roads are always adjacent to, or enter into, the area. JACK PINE CUT-OVER (PjCO) Plates 17, 19
10. Overall texture soft, bumpy or pebbly with only a faint suggestion of height and shadow. May be a few scattered trees with faint, medium to light gray rounded, fuzzy crowns and/or a few scattered soft black specks. UPLAND BRUSH (UB) Plate 15

10. Texture soft, light gray, minutely lumpy or mottled. Only a hint of definite shadows or crowns. Very common in extensively hilly areas without roads or clearings--where they appear as medium to light gray mottles between definite timber stands of dark gray tone and equal height. Hilltops, knolls, drained upland flats, well-drained gullies with steep gradient. UPLAND BRUSH (UB) Plate 15
11. Patchwork of alternating bands of light gray and white, usually with 2 to 4 sides straight and parallel. Very smooth texture, often mottled white and light gray on knoll tops. No discernible vegetation. Road (white ribbon) or roads always visible leading near, to or through area. Buildings usually visible either in the open, tucked into an isolated clump of trees, or in a timber stand adjoining the clearing. Some patches are often faintly striated due to cultivation. . . UPLAND FARM LAND (F) Plate 16
11. Isolated light gray patch or patches, no indication of vegetation on ground, very smooth. Road leading to it (often faint). UPLAND FARM LAND (F) Plate 15
12. Vegetation of definite perceptible height and shadow--crowns of the trees covering over 30 per cent of the area. . . . 13
12. Only scattered trees (if any)--crowns, when present, cover less than 30 per cent of the area. General texture pebbly, grainy or bumpy. 16
12. No vegetation of discernible height visible. Texture smooth 17
13. Tone dark gray to black. 14
13. Tone medium gray. 15
14. Crowns sharp-pointed, conical, shadows elongate and triangular. Trees of even height and varying from dense to slightly open spacing--usually never so closely packed, however, that individual crowns not discernible. Understory never light gray--always medium dark gray. Occasionally mixed with trees of same shape, softer texture and lighter tone (Tamarack). Flat depressions or meandering stream flats. BLACK SPRUCE (S) Plates 15, 17, 19
14. Crowns soft, sharp-pointed, conical. Trees of even height, scattered or packed. Understory medium dark gray, velvety. Not common. Occur in depressional flats, along meandering streams--often in conjunction with trees of similar shape, but darker tone and sharper outline (Black Spruce). TAMARACK (T) Plates 15, 17, 19

15. Crowns rounded, soft, large, of variable diameter and tone; heights variable (IMPORTANT). Occur along lake shores, lake shore flats, along banks of meandering streams or moist foothill bottom slopes and along the edge of large, flat marshy basins. Not extensive nor common.LOWLAND HARDWOODS (Hs) Plate 19
15. Crowns soft, pointed, shadows elongate and triangular. Trees of uniform height, understory medium to medium dark gray and velvety. Depressional flats, along meandering streams--often in conjunction with trees of similar shape, but of darker tone and sharper outline. Not common nor extensive.
.TAMARACK (T) Plates 15, 16, 17, 19
16. Medium to light medium gray tone. Common to the edge of large lowland flats, deep flat-bottom gullies with poor drainage, and undrained flat-bottom upland depressions. Very distinct medium to dark medium gray tone. Bumpy, pebbly or grainy texture. Very slight hint of shadow and vegetation height. May be a few scattered trees. Quite common.
.LOWLAND BRUSH (LB) Plate 20
17. Very flat, smooth, sometimes with ripple marks, giving it a metallic glint. Due to reflection, it may show as almost white on one photo--black on the other. Very striking boundaries on larger bodies.WATER (W) Plates 15, 19
17. Smooth, velvety, distinct mottled (dark gray or black and medium dark gray). Occur as irregular zones around water bodies or in the center of many undrained depressions.
.FLOATING BOG (FB) Plate 15
17. Soft, light gray, felt-like texture, very smooth and uniform. No vegetation with discernible height, only slightly mottled if at all. Occurs in undrained depressions, flats around ponds (may be patchy), in depressions in cleared areas.
.SEDGE MARSH (M) Plates 14, 15
17. Smooth, soft texture, light gray, no vegetation of discernible height. Either (1) a shallow depression or gentle low slope in conjunction with a farm, or (2) isolated in a timbered area with a road or trail leading to it. Always depressional or poorly drained lower slope. Concentric bands or white dots or white flecks indicate hay piles, bales, or windrows.
.WET FARM MEADOW (FM) Plate 18
18. Hilltop, ridgetop, sidehill, knoll, upland flat, shallow round-bottom depression. 19
18. Undrained flat-bottomed depression, flat stream courses,

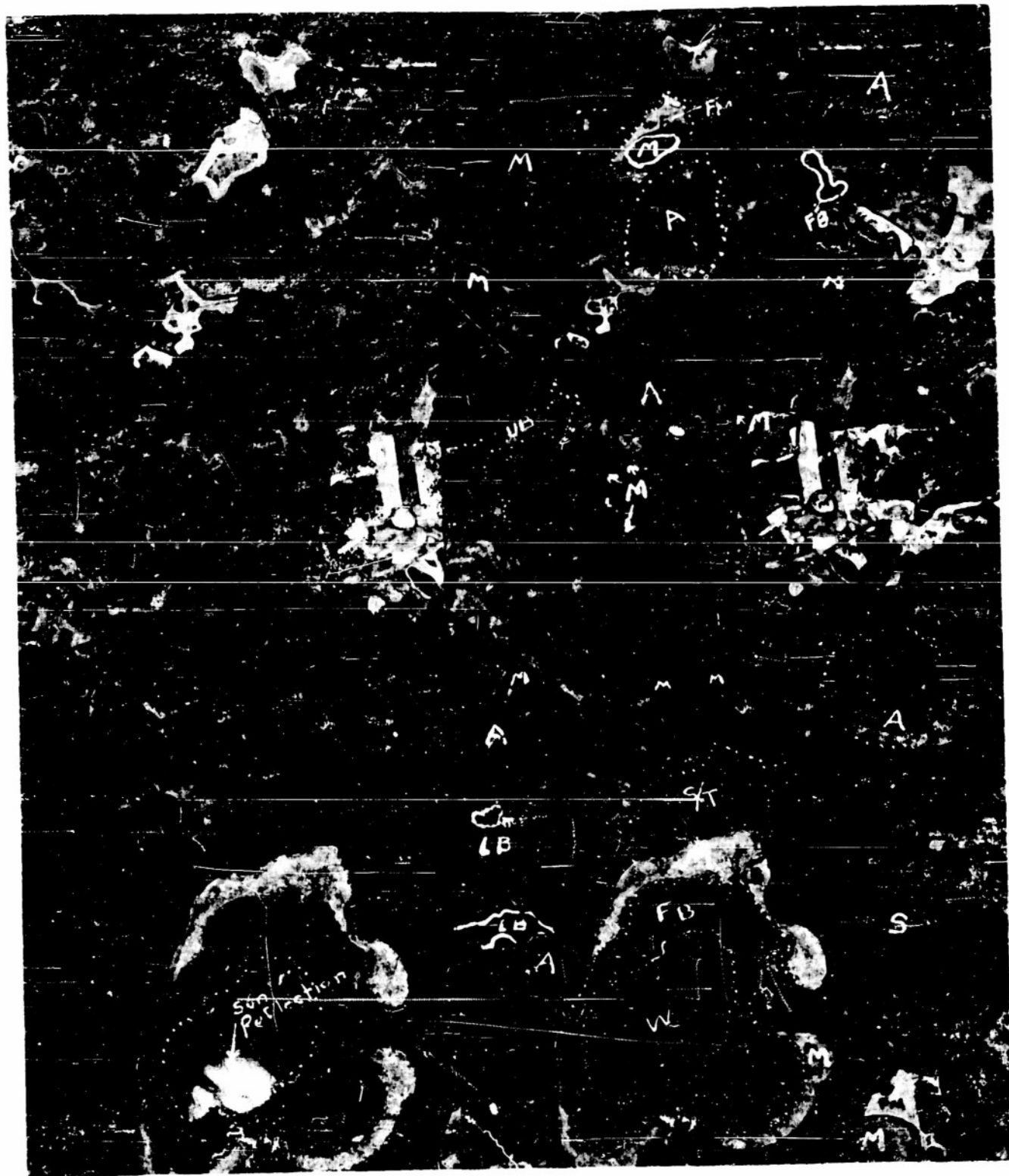
- lakeside flat, lake shore, or stream side at the base of a bluff or hill. 23
19. Vegetation of definite perceptible height and shadow--crowns of trees covering over 30 per cent of the area. 20
19. Vegetation of definite perceptible height and shadow--crowns of trees covering less than 30 per cent of the area (some trees present). 22
19. No vegetation of perceptible height, patchwork of alternating bands or blocks of light gray and white, usually with 2 to 4 sides straight and parallel. Very smooth texture, often mottled white and light gray on knoll tops. No discernible vegetation. Road or roads always visible leading near, to, or through, area. Buildings usually visible either in the opening, tucked into an isolated clump of trees, or in a timber stand adjoining the clearing. Some patches faintly striated. UPLAND FARM LAND (F) Plate 21
20. Overall vegetation tone black, distinct uniform. Trees tightly spaced to somewhat loosely spaced. Uniform height, very soft, black texture like the pile of a thick, soft carpet. Crowns fuzzy and hard to make out individually when the stands are dense. JACK PINE (Pj) Plate 21
20. Overall vegetation tone medium light gray to white, mottled or soft, blotchy. 21
21. Either white in tone or soft, blended blotchy (light gray to white). Crowns medium to small, trees of very even height. Crowns soft, rounded, mainly white. Common over large areas. Where trees become somewhat scattered, the slightly darker, velvety undergrowth gives the stand a blotchy, broken appearance. These trees are most distinct when in tightly packed clumps: crowns are small, occasional openings appear as tiny black pin pricks. ASPEN-BIRCH (A) Plate 21
21. Abruptly mottled, crowns variable in tone (medium gray to white); considerable variation in crown diameter and height- gives the stand a rough appearance. Lake shore bluffs, moderately well drained knolls, benches and ridges near marshes or bodies of water. Never extensive. . . . MIXED UPLAND HARDWOODS (Hm) Plate 21
22. Overall tone medium to light medium gray, often distinctly speckled with black dots or flecks. Usually scattered trees have white, rounded crowns. Ground texture grainy, pebbly, or minutely lumpy and with faint suggestions of shadows and height. UPLAND BRUSH (UB) Plate 21

23. Vegetation of definite perceptible height and shadow--crowns of the trees covering over 30 per cent of the area. 24
23. Only scattered trees (if any)--crowns, when present, cover less than 30 per cent of the area. General texture pebbly, grainy or bumpy. 25
23. No visible vegetation of discernible height, texture smooth. . 26
24. Tone black, trees sharp-tapered, pointed, dense or very slightly scattered. Shadows elongate, triangular. Never occur in large stands. Lowland flats.
BLACK SPRUCE (S) Plate 21
24. Tone medium light gray to light gray. Trees sharp-tapered, pointed, rather soft texture, dense or somewhat scattered. Shadows triangular. Never occur in large stands. Lowland flats.
TAMARACK (T) Plate 21
25. Tone light medium gray to light gray. Common to the edge of large lowland flats, deep flat-bottomed gullies with poor drainage, stream courses and undrained flat-bottomed upland depressions. Bumpy, pebbly or grainy texture very noticeable. May be a few scattered trees.
LOWLAND BRUSH (LB) Plate 21
26. Jet black, velvety, very smooth, no vegetation. May sometimes show up as white or light gray on one photo due to sun reflection.
WATER (W) Plate 21
26. Soft, light gray, felt-like texture, very smooth and uniform. No vegetation with discernible height, sometimes very slightly mottled. Undrained depressions, adjacent to lakes, ponds and streams.
SEDGE MARSH (M) Plate 21
26. Smooth, velvety, distinctly mottled, very dark gray to medium gray. Occur as irregular zones around water bodies, or in the center of many undrained depressions.
FLOATING BOG (FB) Plate 21



Scale 1:20,000

Plate 14 - HUBBARD AREA. Good examples of Floating Sedge Mat along marginal areas of lake, Marsh, Aspen and Jack Pine. (Early summer)



Scale 1:20,000

Plate 15 - HUBBARD AREA. Excellent example of change of tone and texture over open water in adjacent photographs. Good examples of Floating Bog, Marsh, and Farm areas. (Late summer)



Scale 1:20,000

Plate 16 - HUBBARD AREA. Examples of Upland Brush, Lowland Brush and Farm lands. (Late summer)



Scale 1:20,000

Plate 17 - HUBBARD AREA. Examples of Spruce, Aspen, Jack Pine, and Upland Brush and Jack Pine cut-over mixture. (Late summer)



Scale 1:20,000

Plate 18 - HUBBARD AREA. Examples of Aspen, Mixed Hardwoods, Jack Pine and cut-over Jack Pine areas. (Late summer)

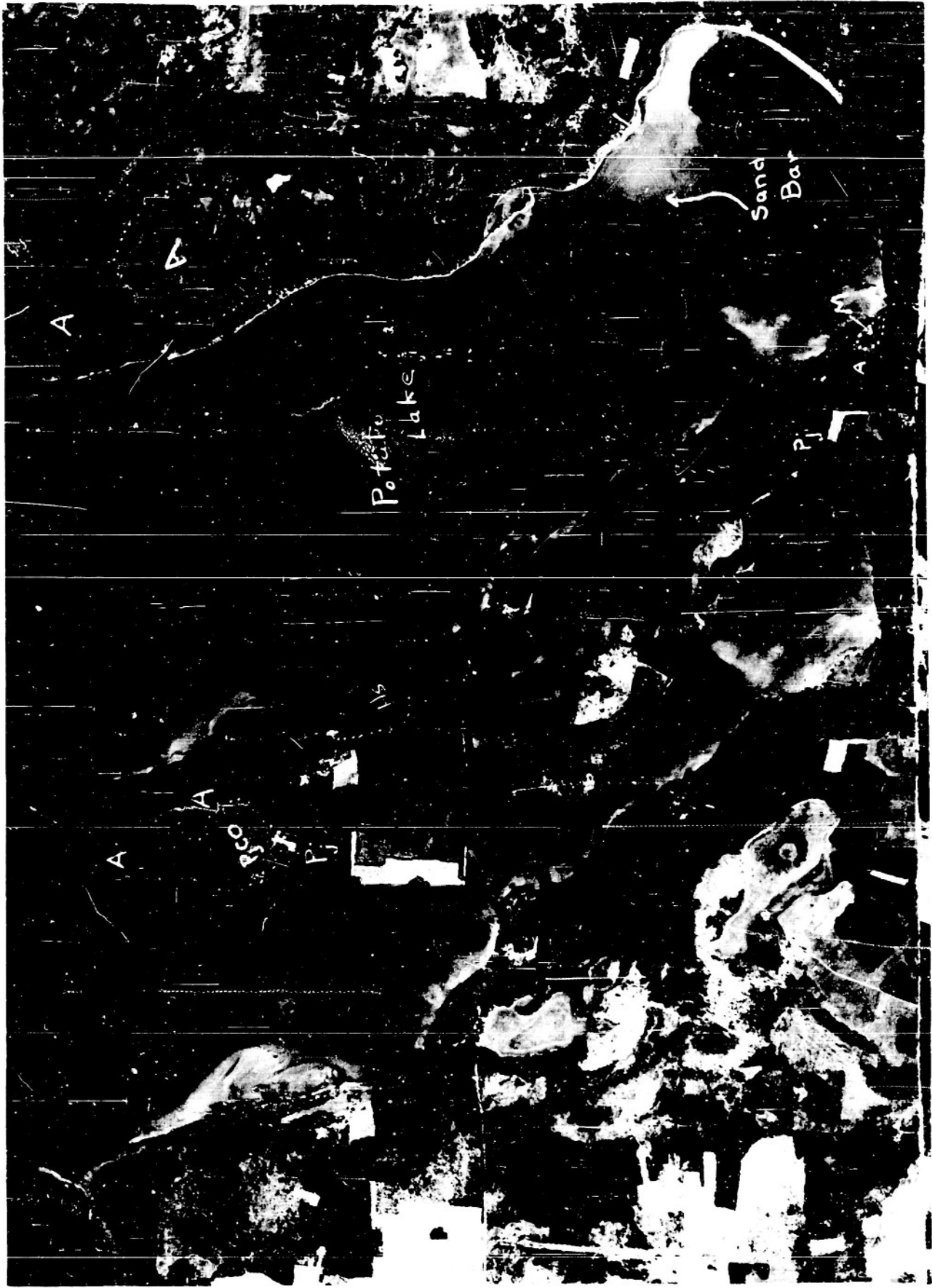
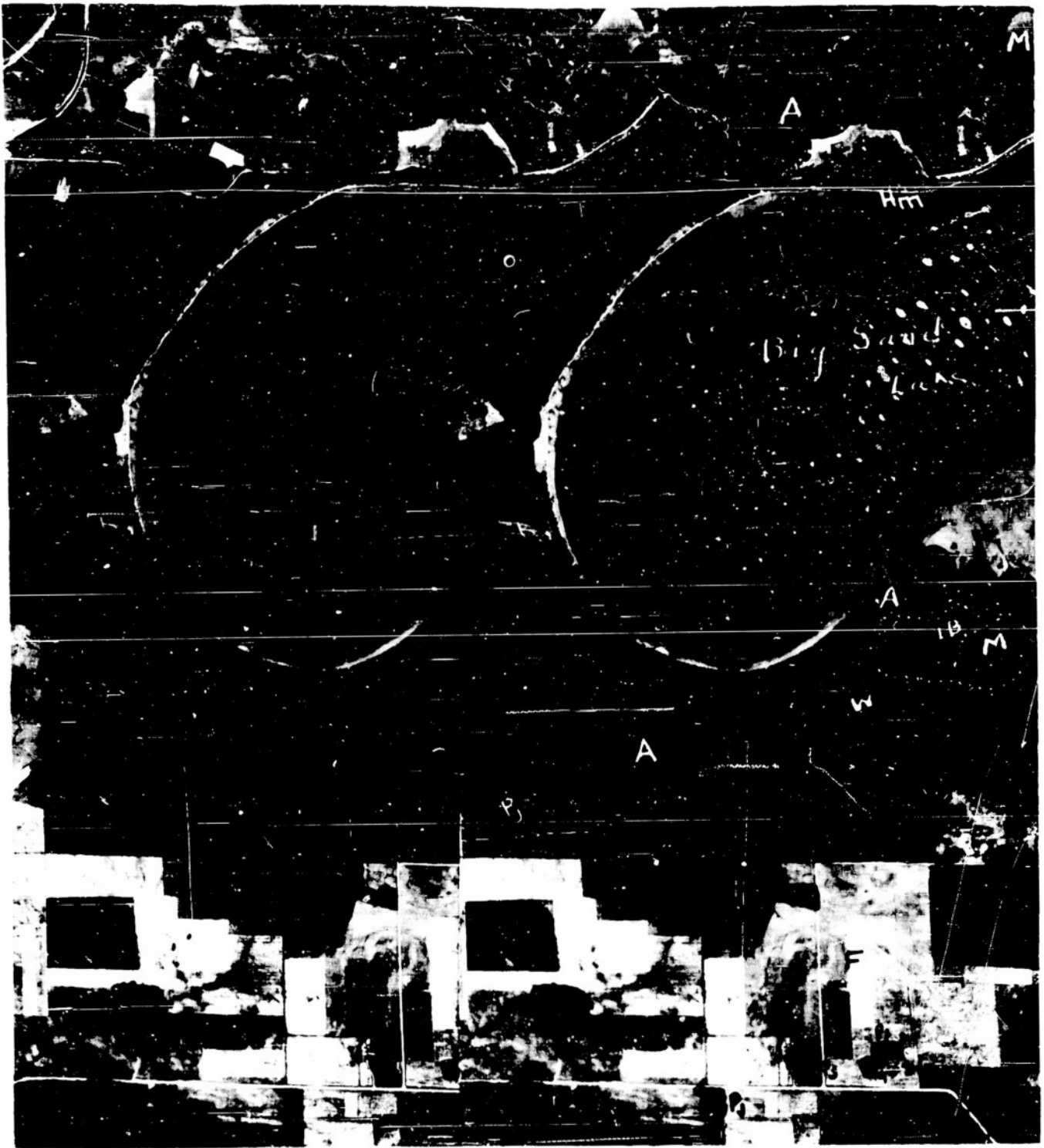


Plate 19 - HUBBARD AREA. Good example of Sand Bar, Marsh, Norway Pine and Jack Pine mixture and Oak. (Late summer)

Scale 1:20,000



Scale 1:20,000

Plate 20 - HUBBARD AREA. Good examples of Lowland Brush, Aspen, Jack Pine and Farm land. (Late summer)



Scale 1:20,000

Plate 21 - HUBBARD AREA. Typical farming area near road and railroad.



Plate 22 - HUBBARD AREA. Approximately 2 miles south of Lake George looking into a Kettle that is surrounded by Birch trees.



Plate 23 - HUBBARD AREA. Looking across a Kettle in the central part of the moraine. Birch, Poplar and Pine trees in the area.



Plate 24 - HUBBARD AREA. Approximately 5 miles southwest of Lake George. Looking into a Kettle overgrown with Cattails.



Plate 25 - HUBBARD AREA. Hilltop Bog on the crest of the moraine in the eastern part of the area.

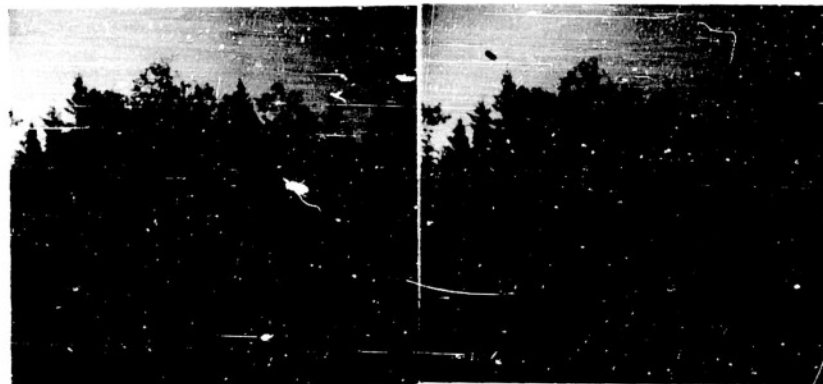


Plate 26 - HUBBARD AREA. Aspen in the foreground, Jack Pine in the background as seen from the Highway in the western part of the area.

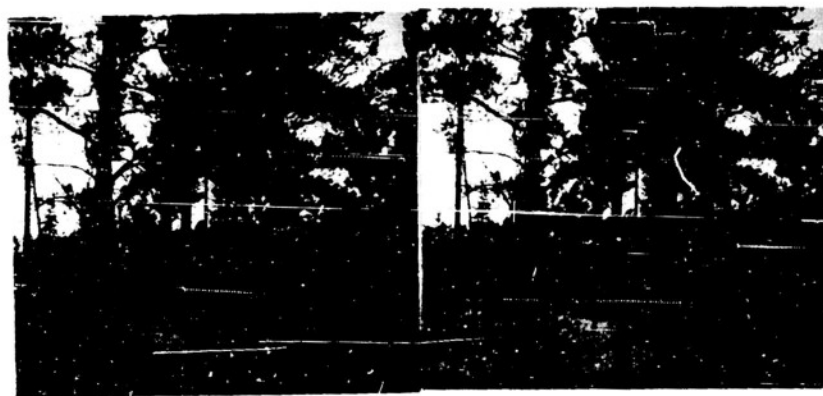


Plate 27 - HUBBARD AREA. Approximately 11 miles southeast of Lake George. Stand of Jack Pine.

Chapter V

THE KOCHICHING AREA

The physical and cultural factors of the Koochiching Area are discussed in detail in Chapter VIII of Technical Report No. 1. Cross-sections, maps and diagrams that apply to such an area as this are also given.

The Koochiching Area has in it more swamps, marshes and bogs than any of the other three areas. Because of this a brief introduction to the area is given before the description and remarks about the upland and lowland types of vegetation. The key follows the same pattern as that used in the previous keys for the Ely and Hubbard Areas.

IDENTIFIABLE
VEGETATION AND GROUND TYPES OF
THE KOOCHICHING AREA, MINNESOTA

Introduction

It is most difficult in the Koochiching Area to place many vegetation types positively in an "upland" or "lowland" site category in the ordinary sense. One would rather say simply that some areas are wetter than others. As one long-time local resident so aptly put it, "Uplands is where you wade through--lowlands is where you gotta swim."

Common to the sand bar, beach line, island and alluvial fan upland, where the peat is absent, thin, or spotty, are such types as Aspen, Mixed Hardwoods, Spruce-Fir, Aspen-Spruce-Fir, Upland Brush, Grass, and Farmlands. The forest stands mentioned are visibly distinct from most true swamp species because of their heterogeneity, clumpiness, and greater heights (tree heights). Consequently, they assume a sort of ragged "island" effect of various shapes in contrast to the normally uniform, homogeneous, often extensive swamp types adjacent. Farms, of course, exist only where there is better drainage, which is not often.

Of the upland species mentioned, Mixed Hardwoods in particular will occur all the way from the higher river bluffs down to the very wet river bottoms and swamp borders. Locale and the species mixed in with them is the best means of separation of upland to lowland, and at times that is most difficult to do. Spruce-Fir too, maintains itself in the upland to swamp transition zone quite successfully.

Based upon the rather sparse, but consistent, information

available in the Big Swamp, it appears that the swamp species are very good indicators of the sub-surface conditions of the great basins and channels that lie between the uplands. As an example the best Black Spruce will be found on the edge of the basins where the peat is shallow.

Two general conditions should be recognized in order to have a better understanding of the occurrence and appearance of the swamp species: (1) Shallow basins effectively filled with peat. With the proper conditions of depth of peat, increasing from the edges to the center, one would expect (in Black Spruce, for example) a sequence of Spruce to Christmas Tree Bog to Stagnant Spruce to Christmas Tree Bog to Spruce, as you progress across the bog. (2) Larger, deeper basins. In many of these, bog succession has not progressed to a point where the basin is effectively filled with a matted mass of solid peat. There is solid peat around the periphery, which makes a gradual transition toward the center of the bog from solid peat to a rather soggy, pulpy mass of dead plant materials to a shelf or floating mat of vegetation over the water in the center. In this latter zone, ponds of water are often evident.

A rather typical and ideal vegetation transition to the center of such a basin could well be Spruce or Spruce-Tamarack to Christmas Tree Bog to Stagnant Spruce or Tamarack to Muskeg to Lowland Brush and Marsh to Floating Bog.

Symbol

Description and Remarks

U P L A N D T Y P E S

- A ASPEN (Usually some BIRCH mixed). Crowns very soft, white or very light gray, fluffy, feathery, rounded. Ground readily visible through the thin crowns, shadows diminutive--which makes the crowns seem to float over the ground. May be clumpy, tree heights uniform within the clump. Common along stream courses and as "islands" of taller trees. Often mixed with Mixed Hardwoods and Spruce-Fir. (Plates 30, 31, 34)
- H MIXED HARDWOODS. Overall crown pattern very softly speckled, only when scattered white, feathery, fluffy crowns of ASPEN are present. Crowns are patchy, only rarely densely and tightly packed. No impressions of spires or pointed tips on crowns. Ground readily visible, crowns seem to float. Medium gray to light gray crowns with thin, feathery, lacey, floating crowns. Most common along stream courses. (Plates 31, 33, 34)
- A/SB . . . MIXED HARDWOODS OR ASPEN AND SPRUCE-FIR. Actually, Aspen usually predominates in mixtures with Spruce-Fir, but if it is necessary to make such detailed break-downs, these three combinations can usually be recognized. Recall that A has the white, tall, feathery, thin floating crown; H has the medium to medium light gray, tall, feathery, thin floating crown. SB is readily visible through the canopy as clumpy trees which are slender and conical, dark grey to blackish and outstandingly variable in height. Very common near meandering streams or as patchy "islands" of taller trees. Common. (Plates 30, 34, 35)
- H/SB
A/H/SB
- SB WHITE SPRUCE-BALSAM FIR. Tone dark gray to black, tree heights quite variable--tendency to be clumpy also, which gives stand a rather rough, jumbled appearance. Rarely extensive. Crowns dark gray to blackish, elongate and cone-like. When trees are scattered somewhat, crowns appear to extend in cone-like fashion from the ground up to the tip. Shadows elongate, triangular. Often a few scattered taller trees with whitish, feathery, thin, rounded crowns (NEVER cone-like). Most common near stream courses, or as jumbled "islands" of trees near extensive, uniform stands of shorter trees. . . . (Plates 30, 35)
- SBCO . . . SPRUCE-FIR CUT-OVER. Scattered trees remaining have either soft, feathery, rounded, white or light gray, floating crowns (Aspen or Hardwoods), and/or scattered, squatty, conical-crowned, dark trees with triangular shadows. Heavily "combed" appearance--parallel threadlike lines separated by ridges of

bushy vegetation (looks something like whipcord texture).
Lines 1/2 to 1.5 mm apart. Often darkly mottled and bumpy.
. (Plate 35)

- UB . . . UPLAND BRUSH. Few, if any, trees. Very light-mottled appearance. Scattered trees and clumps of trees, rather equal in height. Trees remaining have whitish, soft, feathery, rounded, thin, floating crowns--often very small. General background medium to light gray, bumpy, grainy or pebbly. Common adjacent to stream courses or broken, clumpy "islands" of tall trees. May be a few, squatty, conical, dark-crowned trees present. (Plates 30, 33)
- Gr . . . GRASS. Lacking in vegetation of discernible height. Very soft, white, velvety, not mottled. Occurs on top of banks of high bluffed streams. Not striated. Often have one or more straight sides, road or trail leading to or through and (rarely) a building visible. In this latter case it is a farm meadow or hayland. Not common. (Plates 30, 33, 34)
- F . . . FARMLAND. Very soft, white to light gray jumble of smooth patches--many of which have 2 to 4 straight sides and fit together like the pieces of a geometrical jig saw puzzle. Close examination of these patches will indicate very fine, faint striations. Found on the high bluff banks of larger streams or rivers. Patches sometimes oddly mottled with white on gentle knolls. Roads always visible leading into or through the areas. Where more than 3 to 4 of these patches exist together, buildings are normally visible. Not common. (Plates 29, 31)

L O W L A N D T Y P E S

- S . . . BLACK SPRUCE. Overall tone black or nearly black, tree heights very uniform--change by sloping like a shed roof or curving up and down into an elliptical blister. Trees intermediate in height between the tall trees in upland "islands" and the extensive bands of smaller trees bordering on treeless bogs. They normally are tallest next to the uplands and gradually slope down to the bog. May be slightly spaced at times and a little ragged, but the height variations are never extreme. Crowns small, granular, slightly pointed, shadows linear. Common. (Plates 29, 32)
- SCO . . . BLACK SPRUCE CUT-OVER. Identical to S above except for either (1) straight line roads 1 - 2 mm apart etched in the crowns or (2) a very heavily "combed" appearance--white lines about 1 mm apart, only a few scattered clumps or thin individual trees remaining. Gray, felt-like stripes between the white

lines. There are NO trees remaining with white, fluffy, floating, crowns. (Plates 30, 35, 36)

T. . . . TAMARACK. Crowns white or nearly white, sharply outlined, compact, roughly conical. Where slightly open, distinct elongate triangular shadows are visible. Uniform in height--good impression of height. Very common.(Plates 28, 30)

S/T. . . . SPRUCE AND TAMARACK. Overall crown tone harshly speckled white on black. Tree heights even and uniform, crowns uniform, compact and distinct (never lacey). White crowns somewhat conical when large, tiny and beadlike when small (T). Dark crowns often slightly shorter, uniform in height, granular, small, slightly pointed, shadows linear. Common. . (Plates 34, 35)

Sxs. . . . CHRISTMAS TREE BOG. Trees black or very dark gray, very uniform. Rather short, crowns very small, dark, slight suggestion of being pointed, shadows rather linear and hard to see. Extremely closely packed to slightly spaced with lighter gray undergrowth showing. Small "blisters" of taller trees of same species is common. Often have thin, white lines etched in the trees--usually straight, parallel, 1/2-3/4" apart and running either north-south and/or east-west (winter logging roads). Sometimes these stands occur as isolated, dark, tear-shaped islands in the middle of large, light gray, treeless bogs. Often very extensive. Intermediate in height between the true, good Spruce at the edge of the swamps and the very tiny trees out on the edge of the treeless bogs. Common.
.(Plates 28, 29, 32)

Sx STAGNANT SPRUCE. Black linear or sharp-pointed specks on a medium gray to light medium gray felt-like background. Common as transition bands between the main forest stands and the vast, treeless bogs. Specks sometimes widely scattered, sometimes clustered. (Plates 31, 33)

Tx STAGNANT TAMARACK. Many whitish, uniform, tiny, rounded specks which are very small tree crowns. Common as transition bands between S/T or T stands and the vast, treeless bogs. These tiny, light-toned crowns may be dense next to the main forest stands and become gradually smaller and more scattered as you progress out toward the treeless bog. Quite common.
.(Plates 28, 32)

T/Sx . . . TAMARACK OVER STAGNANT SPRUCE. Scattered white, rather conical, dense-crowned trees with sharply triangular shadows (T), rather tall, and standing over scattered, very small, dark, pointed trees with minute linear to elongate triangular shadows (Sx). Background soft, velvety, medium to medium light gray. Fairly common. (Plate 34)

- Sx/Tx. . MIXED STAGNANT SPRUCE AND STAGNANT TAMARACK. Very small dense or scattered, mixed white and light gray and dark gray or black trees of equal height. Individual crowns very tiny, sometimes tiny shadows are visible. When dense, you get a very distinct grainy or minute pebbly appearance. Tends to be a transition band between S/T or T and the treeless bogs. (Plates 29, 32)
- LB . . . LOWLAND BRUSH. Dark medium gray to medium gray mottled tones. Bumpy, rather coarse pebbly appearance. Actual crowns sometimes visible but have great variation in size and clumpiness, and very little discernible height. Common to the edge of large S, T, and stagnant swamps, and as bands along drainage ditches, bands around "islands" of tall trees in the middle of S or T swamps. Usually darker in tone than UB. Quite common. (Plates 31, 33)
- M (Mse) . MARSH. Very soft, velvety, lightly mottled (white and light gray). Some slightly darker, bumpy clumps of vegetation sometimes visible. Doesn't have a "wrinkled" appearance. Common adjacent to small, meandering streams with very shallow banks, around irregular patches of water not located out in large treeless bogs, and in rather broad bands far out in large, treeless bogs. (Plates 28, 30)
- Mk . . . MUSKEG. Soft, fluffy or downy texture; dappled with medium light gray velvety spots on a medium to medium dark gray background. No visible vegetation with discernible height. No black pointed specks. Meandering "paths" or "trails" visible and which originate from some adjacent patch of timber usually (deer trails). Common in large tracts in the vast, treeless expanses of bogs. Fairly common and extensive in these areas. Usually contingent with stagnant S or T swamps. (Plates 28, 32)
- FB . . . FLOATING BOG. A most peculiar light mottled "wrinkled" appearance. Appear as distinct large fan-like flowages out in the big treeless bogs. "Wrinkles" are transverse to the apparent line of flowage and are soft, fluffy white to light gray in tone and texture. Between the wrinkles are soft blackish, linear lenses or lines which represent exposed water. Look for faint "paths" or "trails" leading across these areas-- they (deer trails) will always cross on TOP of the wrinkles, not between them. Fairly common in big treeless areas. (Plates 28, 32)

KOOCHICHING AREA KEY

1. Definitely forested; that is, definite tree heights and individual tree crowns are readily visible. The crowns may be tightly packed, somewhat loosely spaced, or have occasional small openings--but effectively cover over 40 per cent of the area. 2
1. Only partially forested; definite tree heights and individual tree crowns are readily visible as clumps and/or scattered trees--but effectively cover less than 40 per cent of the area. 10
1. Actual tree crowns are rare or absent. May have (1) numerous, tiny, dark or white or dark and white mixed, rather pointed specks (Look closely!) which are in reality tiny crowns. These specks have little discernible height, very minute shadows, and are on a soft, medium to light gray, felt-like background; or (2) specks absent and general appearance alternately smooth and/or minutely pebbly or bumpy. 12
1. No vegetation of discernible height--soft, velvety, or felt-like texture. Smooth or "wrinkled." Uniform in tone or softly mottled in medium gray to light gray tone ranges. 15
2. Overall tone of crowns black to nearly black. Crowns small and not spreading. Tree height either very uniform or variable and jumbled. Sometimes a few scattered white-crowned trees. Sometimes softly mottled due to thinning of stand so that lighter gray background shows through. May have dark "blisters" due to gradual increase and decrease of tree height in elliptical patches (or lenticular). 3
2. Overall tone of crowns mottled (BLOTCHY), black or dark gray mixed with medium light gray to white. Heights very uniform. Often broad expanses of this type. 6
2. Overall tone of crowns softly or harshly SPECKLED (not blotchy). White or very light gray crowns on a background of medium dark gray to black trees. Dark trees are either very uniform in height, or variable and jumbled. Salt-on-Pepper or Salt-and-Pepper appearance. 7
2. Overall tone of crowns very softly SPECKLED. Fluffy, white, thin wispy crowns scattered through fluffy, medium light gray crowns of the same extreme. Heights slightly variable. Crowns usually quite tall, ground is visible through crowns without much difficulty, shadows diminutive,....gives the impression that the crowns are floating. Common along meandering stream courses. 8

2. Overall tone of crowns very soft, fluffy, white, rounded. Ground readily visible through crowns--which seem to float. Shadows diminutive. May be rather clumpy. Heights very uniform, but may vary from clump to clump. When clumpiness is present you may have very soft light gray to white mottling. Common along stream courses and as "islands" of tall trees. ASPEN (A) Plates 30, 31, 34

2. Overall tone of crowns very light gray or white. Individual crowns are compact (not feathery or fluffy), very uniform, may get a slightly mottled appearance when stands become rather open and the velvety, darker gray background shows through. Trees slightly conical when large; have distinct beady or grainy texture when very small. Shadows triangular. 9

3. Tree heights very uniform--change only by sloping like a shed roof or curving gradually up and down like a "blister." 4

3. Tree heights quite variable--tendency to be clumpy also--which gives stand a rather rough, jumbled appearance. Rarely extensive. Crowns dark gray to blackish, elongate and cone-like. When trees are scattered somewhat, crowns appear to extend in cone-like fashion from the ground up to the tip. Shadows elongate triangular. Often a few scattered taller trees with whitish, feathery, rounded, thin crowns (NEVER cone-like). Most common near stream courses, or as tall "islands" of trees near extensive, uniform stands of shorter trees. . . . WHITE SPRUCE-BALSAM FIR (SB) Plates 30, 35

4. Trees rather short, crowns very small, dark, slight suggestion of being pointed. Shadows rather linear and hard to see. Extremely close-packed to slightly spaced with lighter gray undergrowth showing. Small "blisters" of taller trees of same species is common. Often have thin furrows etched in the trees--usually straight, parallel, 1/2"-3/4" apart, and running either north-south or east-west or both (winter logging roads). Sometimes these stands occur as isolated, dark, tear-shaped islands in the middle of large, light gray, treeless bogs. Often very extensive. . . . CHRISTMAS TREE BOG (Sxs) Plates 28, 29, 32

(NOTE: Sooner or later the question will arise, ("When is Sxs large enough to be called S, and when is S small enough to be called Sxs?"). Actually, it is a rather arbitrary separation. Normally, Spruce will be tallest on the thin peat areas next to the clumps of Hardwoods and Spruce-Fir. As the peat deepens, the trees gradually get shorter and grow farther apart until they dwindle down to small specks. This is a complete transition all the way from S to Sxs to Sx. Select, as nearly as you can, the intermediate height stands--the trees will usually be slightly spaced and blisterery. Use this as a guide in areas where no S or Sx is contingent.)

4. Crowns small, roughly granular, pointed, shadows linear. Trees intermediate in height between the tall trees in "islands" and the extensive bands of smaller trees bordering on the treeless bogs. They normally begin and are tallest near such A, H, SB islands and gradually slope down in height. Occasionally some blisters. May be slightly spaced at times and a little ragged, but the height variations are never extreme. Common. . . . 5
5. Straight-line, parallel furrows (skid trails) etched in the crowns and spaced 1-2 mm apart. Gives stand a rather "combed" appearance. BLACK SPRUCE CUT OVER (SCO) Plates 30, 35
5. No straight-line, parallel furrows (skid trails) 1-2 mm apart etched in crown canopy. BLACK SPRUCE (S) Plates 29, 32
6. Trees intermediate in height between the tall, irregular "islands" and the small, bog-fringe trees. Light colored trees have small, white to light gray, compact, somewhat conical crowns. Shadows sharply tapering and pointed (T). Dark trees have hard, slightly pointed, granular texture. Crowns small, slightly pointed, linear shadows, uniform in height, but usually shorter than the T (S). Often occur as broad patches or bands. SPRUCE AND TAMARACK (S/T) Plates 28, 35
6. Softly mottled mixture of very tiny black and light gray tree crowns. Sort of sandy or extremely minute pebbly or grainy appearance. Heights very uniform. Tend to be a transition between S/T and/or T stands and the vast treeless areas of bog beyond. Trees tend to become more scattered as you move out toward the bog. STAGNANT SPRUCE-STAGNANT TAMARACK (Sx/Tx) Plate 32
7. Overall crown tone harshly speckled white on black. Tree heights even and uniform; crowns uniform and small, compact and distinct (never lacy or fluffy). White crowns somewhat conical when large, tiny and beadlike when small (T). Dark crowns often slightly shorter, uniform in height, granular, slightly pointed, shadows linear. Common. SPRUCE AND TAMARACK (S/T) Plates 34, 35
7. Overall crown pattern very softly speckled. Overstory of taller trees with rounded, feathery, thin crowns which seem to float and are semi-transparent, rather ragged and variable, white to light gray (A). Dark trees are readily visible through the light canopy, are slender and conical, variable in height and tend to be clumpy. May give a subdued dappled appearance (SB). Very common near meandering streams or as patchy islands of taller trees.

Overstory mainly fluffy, thin, white crowns. (A/SB)
 Overstory mainly fluffy, thin, medium light gray crowns. (H/SB)

Overstory a mixture of the white and light gray, fluffy crowns.
MIXED HARDWOODS OR ASPEN AND SPRUCE FIR (A/H/SB) Plates 30, 34, 35

8. Fluffy, feathery, floating white crowns (not always) present. In general, crowns are patchy, only rarely dense and tight-packed. Ground readily visible except on rare occasions when trees are young, small, and dense-grown. Shadows diminutive. Principle part of the stand is made up of medium gray to light gray trees with thin, feathery, lacey, floating crowns. Common along stream courses. HARDWOODS (H) or (A/H) when numerous white crowns present. Plates 31, 33, 34
9. Crowns distinct, sharply outlined, roughly conical, very white or very light gray in tone. Where slightly open, distinct elongate triangular shadows visible. Uniform in height--good impression of height. Very common. TAMARACK (T) Plates 28, 30
9. Many whitish, uniform, tiny, rounded specks which are very small tree crowns. Common as transition bands between S/T or T stands and the vast, treeless areas of bog. These tiny, light toned crowns may be dense next to the main forest stands and become gradually smaller and more scattered as you go out toward the treeless bog. Common. STAGNANT TAMARACK (Tx) Plates 28, 32
10. Scattered white, rather conical, compact crowns with sharply triangular shadows, rather tall (T), and standing over scattered, very small, dark, linear trees (may be almost specks or flecks) with minute, linear to elongate triangular shadows (Sx). Background soft, velvety, medium to medium light gray. Does not exhibit a "combed" appearance. Not too common. TAMARACK-STAGNANT SPRUCE (T/Sx) Plate 34
10. Very small, scattered, mixed white and blackish trees of equal height. Individual crowns small, readily visible, as are the tiny, pointed shadows. Uniformly and rather widely spaced (Important!). Medium gray to light gray, velvety background shows through very readily. STAGNANT SPRUCE-STAGNANT TAMARACK (Sx/Tx) Plate 29
10. Very light mottled appearance. Scattered trees and clumps of trees, rather equal in height (within the clump). Trees have whitish, soft, feathery, rounded, thin, floating crowns--often very small when in clumps (A). General background medium to light gray, bumpy, grainy or pebbly. Common adjacent to stream courses or broken, clumpy "islands" of tall trees. May be a few, squatty, conical, dark-crowned trees present. UPLAND BRUSH (UB) Plates 30, 33
10. Heavily "combed" appearance. Parallel threadlike white to light

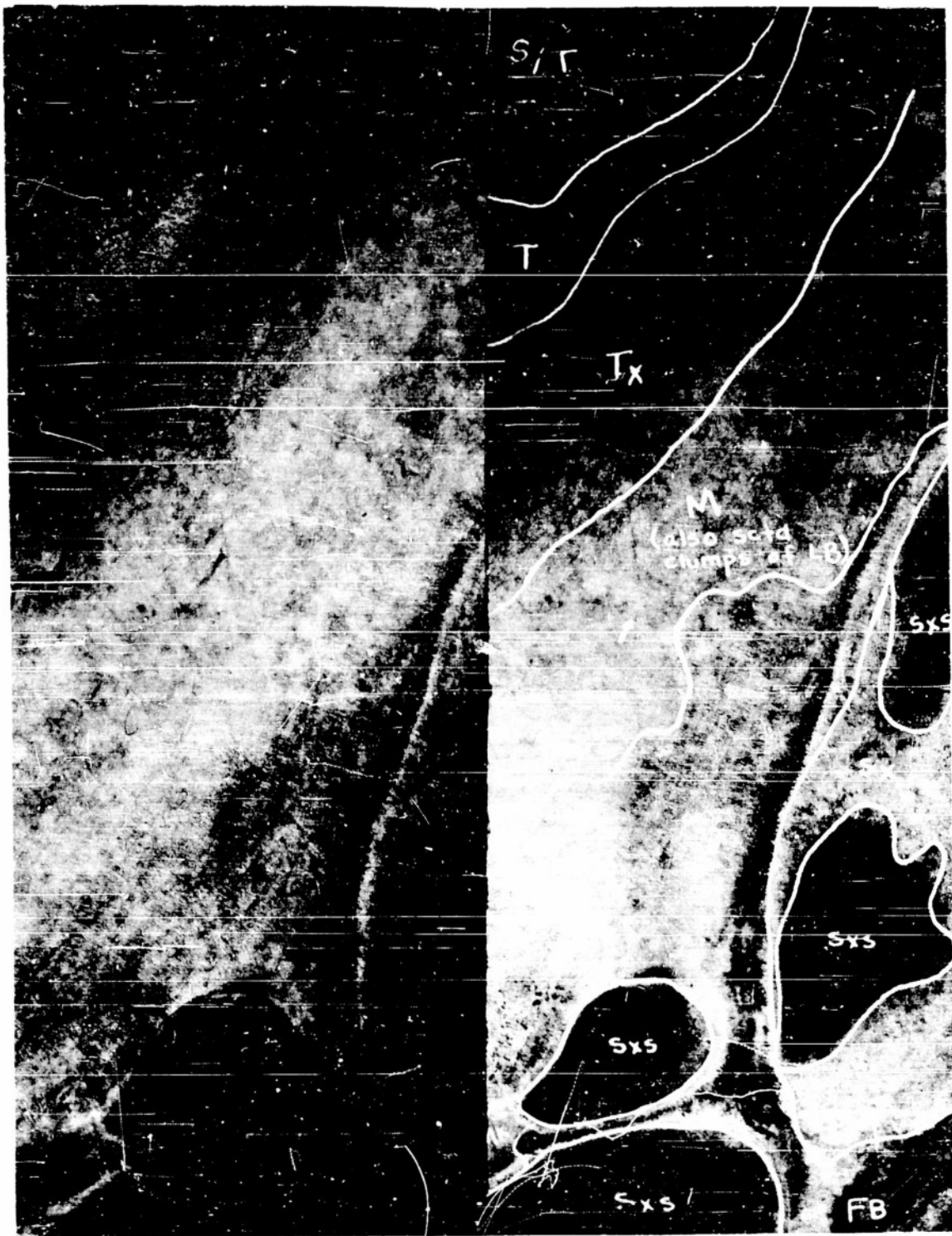
gray lines separated by faint ridges of bushy vegetation (looks something like whipcord texture). Scattered trees or very small clumps of trees remaining. 11

11. Scattered trees remaining either white, somewhat conical, compact crowns, with sharply-pointed triangular shadows (T); and/or small, dark, pointed-crown trees with linear shadows and which are smaller usually than the white crowned trees. (S). Fairly common in the edges of extensive stands of dark, small-crowned, uniform height trees.BLACK SPRUCE CUT-OVER (SCO) Plates 35, 36
11. Scattered trees remaining have either soft, feathery, rounded, white or light gray floating crowns (A or H), and/or scattered, squatty, conical crowned, dark trees with triangular shadows. Lines .5-1.5 mm apart. Often darkly mottled and bumpy. SPRUCE-FIR CUT-OVER (SBCO) Plate 35
12. Softly mottled usually. Note presence of many tiny specks or mass of hard, minute, grainy bumps which are dark, whitish, or dark and white mixed. Very common transition bands from definite timber stands or river courses into the vast expanses of treeless, deep-peat swamps. 13
12. Softly mottled usually. Texture varies from smooth velvety (lighter) patches to soft, velvety, rather coarsely bumpy or pebbly, medium (darker) gray patches. 14
13. Note presence of many black, pointed specks--sometimes widely scattered--sometimes clustered on a mottled, velvety, medium to light gray background. Often have vast expanses of this sort of vegetation on the rim of the treeless bog.STAGNANT SPRUCE (Sx) Plates 31, 33
13. Note presence of many, whitish, uniform, tiny, rounded specks which are very small tree crowns (T). Common as transition bands between S/T or T stands and the vast, treeless areas of deep peat bog. These tiny, light-toned crowns may be dense next to the main forest stands and become gradually smaller and more scattered as you go out toward the treeless bog. STAGNANT TAMARACK (Tx) Plates 28, 32
13. Softly mottled mixture of very tiny black and light gray tree crowns. Sort of sandy or extremely minutely pebbled appearance (grainy). Heights very uniform. Tend to be a transition band between S/T or T stands and the vast treeless areas of bog beyond. Trees tend to become more scattered as you move out toward the treeless bog.STAGNANT SPRUCE AND STAGNANT TAMARACK (Sx/Tx) Plate 32
14. Medium light gray to very light gray mottled tones usually. Bumpy, rather coarse pebbly appearance. Very small, soft

rounded crowns with little discernible height and great variability in appearance often noticeable. Sometimes tend to grade into smooth, whitish, velvety patches with no discernible vegetation (Grass). Very common on the back slopes leading away and down into the swamps from the streams with high banks. Also common adjacent to stands of whitish, feathery, floating crown trees. UPLAND BRUSH (UB) Plates 31, 33

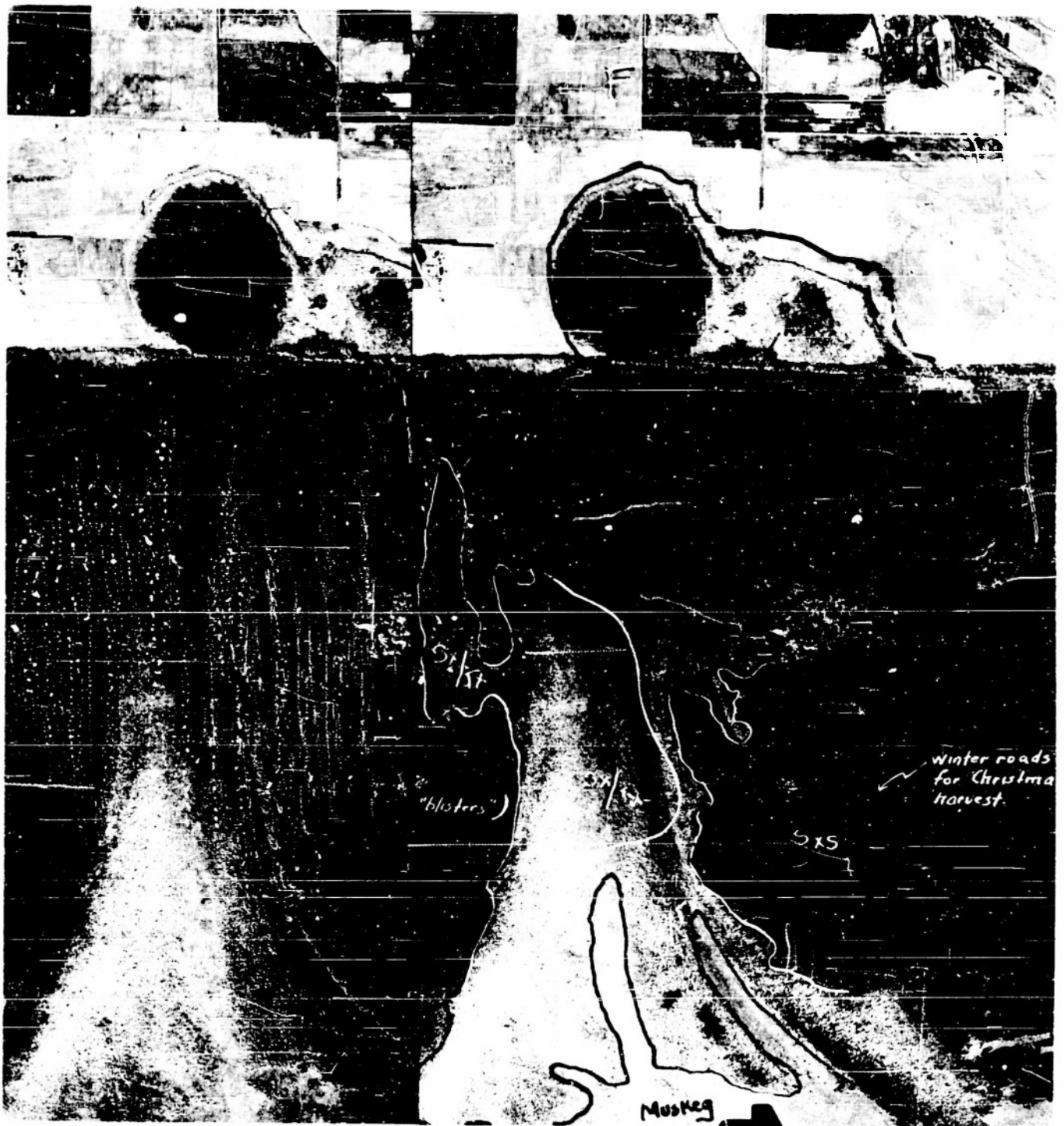
- 14. Dark medium gray to medium gray mottled tones. Bumpy, rather coarse, felt-like pebbly appearance. Actual crowns sometimes visible but have great variation in size and clumpiness (H), and very little discernible height. Common to the edge of large S, T, and stagnant swamps, and as bands around "islands" of tall trees in the middle of S or T swamps. Sometimes a few scattered white, conical-crowned trees or black, linear-crowned trees. Usually darker in tone than UB.
. LOWLAND BRUSH (LB) Plates 31, 33
- 15. Very soft, velvety, lightly mottled (white and light gray). Some slightly darker bumpy clumps of vegetation sometimes visible. Doesn't have a "wrinkled" appearance. Common adjacent to small, meandering streams with very shallow banks, around irregular patches of water not located out in large, treeless bogs, and in rather broad bands (not associated with water) in treeless bogs.
. MARSH (M) Plates 28, 30
- 15. Very soft, white, velvety, not mottled. Occurs on top of banks of high-bluffed streams. Definitely upland. Not striated. Not wrinkled. Often have one or more straight sides, road or trail leading to or through it, and (rarely) a building present. In this latter case it is a farm meadow or hayland. Not common.
. GRASS (Gr) Plates 30, 33, 34
- 15. Very soft, white to light gray jumble of patches--many of which have 2 to 4 straight sides, and fit together like the pieces of a geometrical jig saw puzzle. Close examination of these patches will indicate very fine, faint striations. Found on the high bluff banks of large or intermediate size streams. Patches sometimes oddly mottled with white on top of knolls. Roads always visible leading into or through the areas. Where more than 3 to 4 of these patches exist together, buildings are normally visible. Not common.
. FARMLAND (F) Plates 29, 31
- 15. Soft, fluffy texture, not wrinkled, dappled with medium light gray velvety spots on a medium to medium dark gray felt-like background. No visible vegetation with discernible height. Meandering "paths" or "trails" visible and which originate from some adjacent patch of timber usually (deer trails). Common in large tracts in vast, treeless expanses of bog. NOT minutely speckled! Fairly common and extensive.
. MUSKEG (Mk) Plates 28, 32

15. A most peculiar, light-mottled, "wrinkled" appearance. Appear as distinct, fan-like flowages or patches in big, treeless bogs. "Wrinkles" are transverse to the apparent line of flowage and are soft, fluffy white to light gray in tone and texture. Between the wrinkles are soft, blackish, linear lenses or lines which represent exposed water. Look for faint paths or trails leading across these areas (deer trails)--they will always cross on TOP of the wrinkles, not between. . . FLOATING BOG (FB) Plates 28, 32



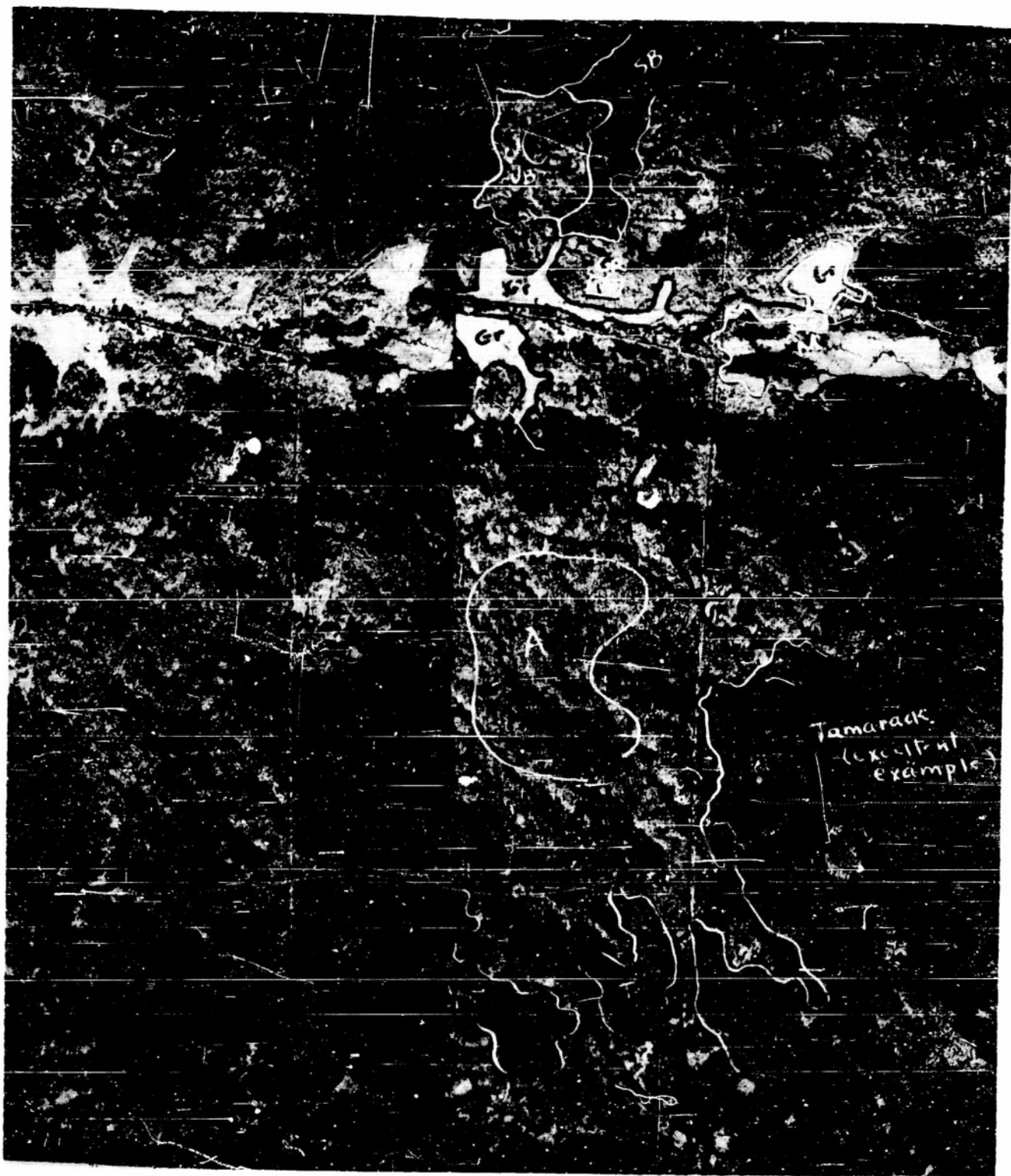
Scale 1:20,000

Plate 28 - KOOCHICHING AREA. This photo is a classic. Note the gradation from S/T → T → Tx → M → FB. The "paths" indicated by the arrows on the photo are deer trails and are an indication of the presence of very small vegetation in that they are so readily visible. Note how these trails pick their way through the Floating Bog always traveling between the dark lenses and patches (water).



Scale 1:20,000

Plate 29 - KOOCHICHING AREA. Note the transition from Spruce to Christmas Tree Bogs. Good example of muskeg.



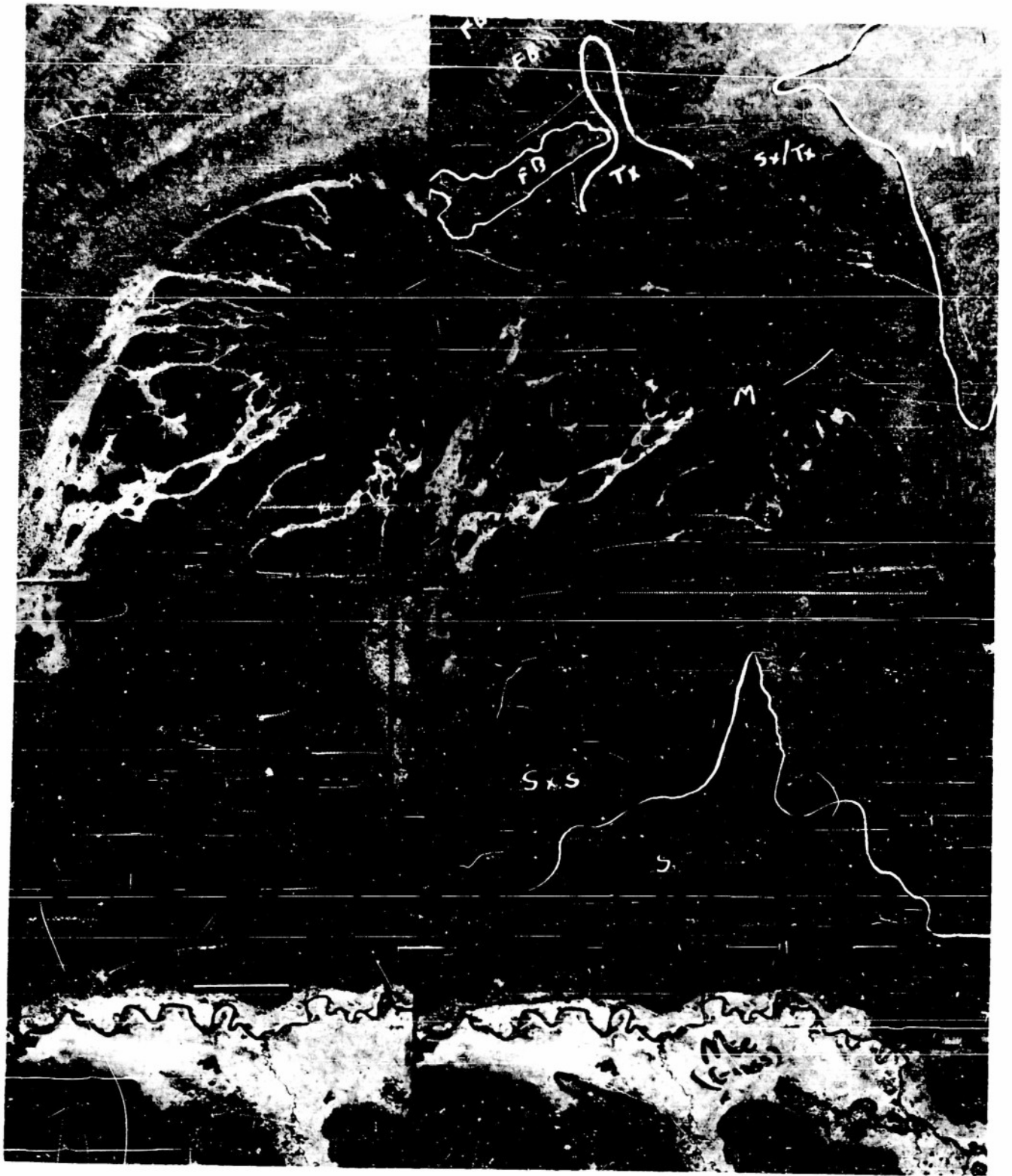
Scale 1:20,000

Plate 30 - KOOCHICHING AREA. Excellent example of tamarack.



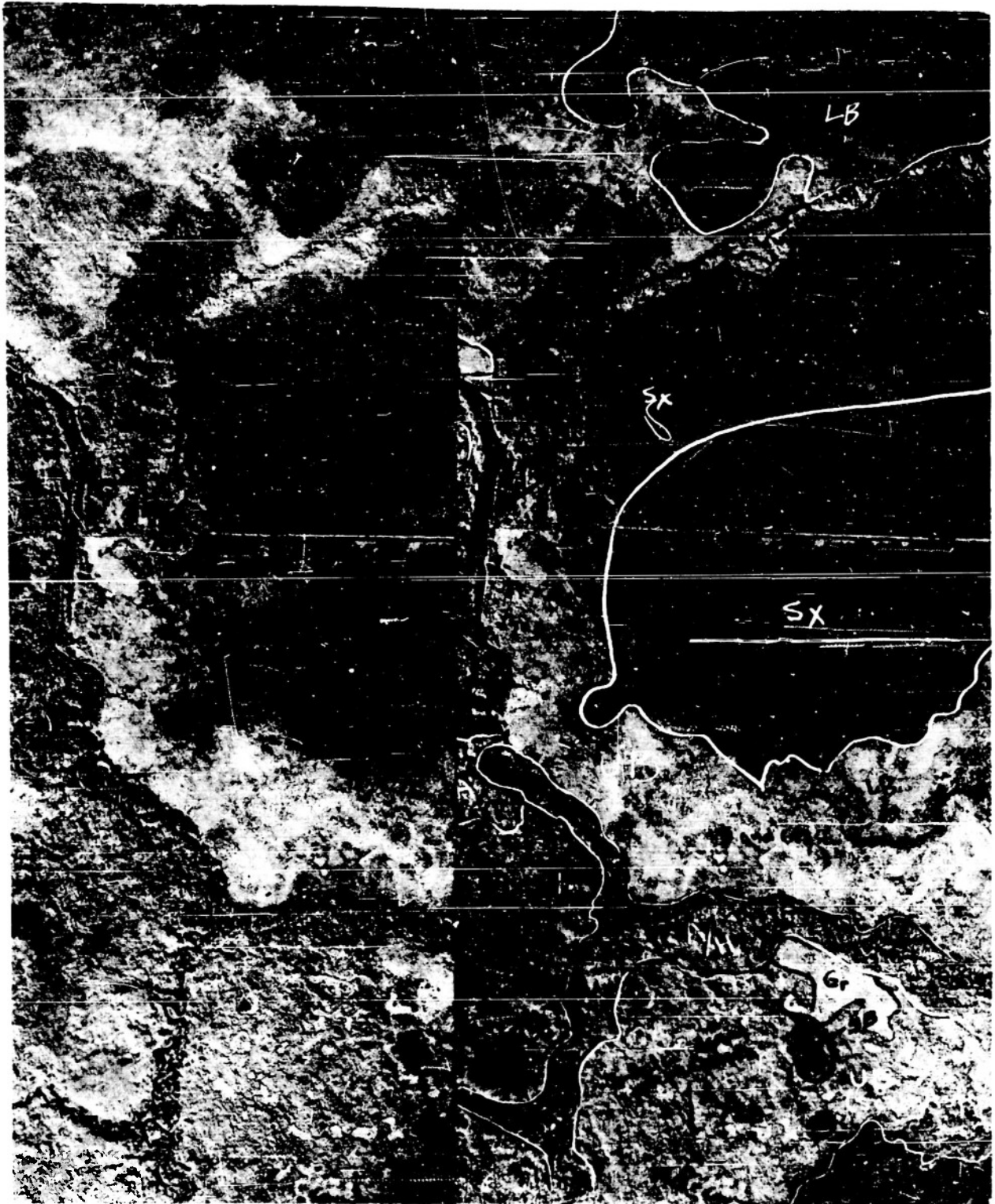
Scale 1:20,000

Plate 31 - KOCCHICHING AREA. Good example of the mixture of vegetation along the rivers which are the better drained areas.



Scale 1:20,000

Plate 32 - KOOCHICHING AREA. An excellent example of Marsh lands intermixed with a Christmas Tree Bog. Also good example of a Grass Marsh.



Scale 1:20,000

Plate 33 - KOOCHICHING AREA. Examples of the change from vegetation occupying the drier areas to vegetation occupying the wetter areas.



Scale 1:20,000

Plate 34 - KOOCHICHING AREA. Examples of Tamarack over Stagnant Spruce mixtures, Tamarack, Aspen and Mixed Hardwoods.



Scale 1:20,000

Plate 35 - KOCHICHING AREA. Excellent examples of Upland Brush as compared with Lowland Brush, Marsh, Muskeg and cut-over Spruce and Fir.



Scale 1:20,000

Plate 36 - KOOCHICHING AREA. Good examples of Christmas Tree Bogs that have been left standing in cut-over Spruce areas.

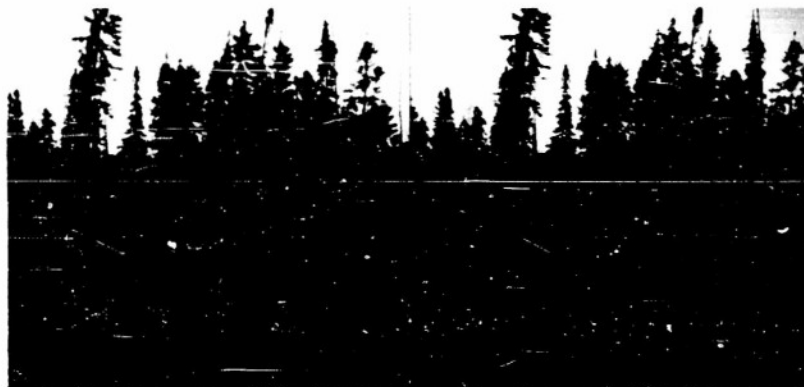


Plate 37 - KOOCHICHING AREA. About 4 miles southwest of Loman. The drainage ditch is approximately eight feet deep. Note the change of soil in the profile.

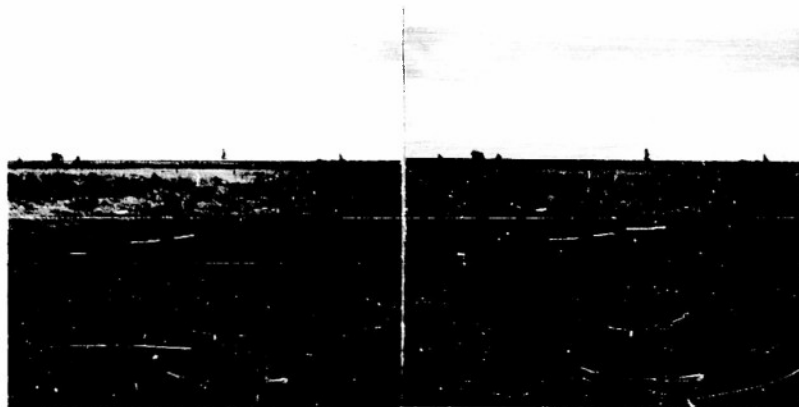


Plate 38 - KOOCHICHING AREA. Peat Bog area in the northern part of Koochiching county.

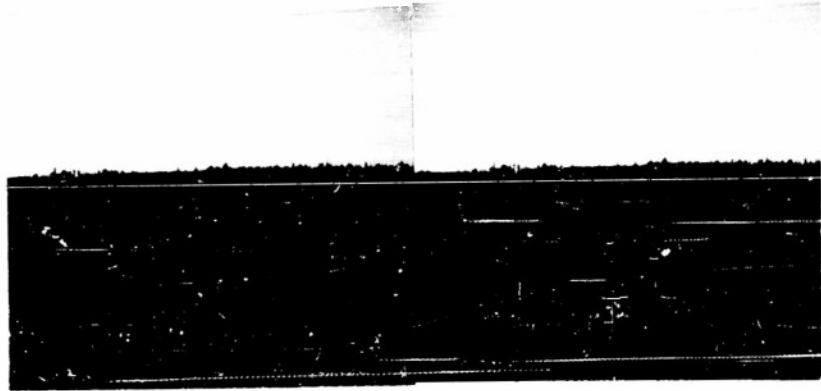


Plate 39 - KOCHICHING AREA. Approximately 14.3 miles west of Ray on Highway No. 217. Marsh Grass with Spruce in the background.



Plate 40 - KOCHICHING AREA. Approximately 1.3 miles south of Highway No. 11 on Highway No. 9 along Little Fork River. Note the mixture of Hardwoods growing along the bank of the River since the drainage here is better than it is inland away from the river.



Plate 41 - KOOCHICHING AREA. West of Big Falls on Fire Truck Trail. Note the combination of Swamp and Marsh items such as Swamp Grasses, stunted Spruce, water killed trees and bog vegetation.

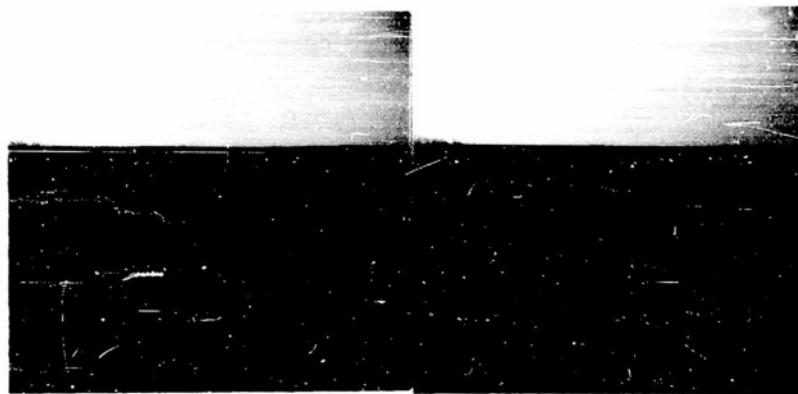


Plate 42 - KOOCHICHING AREA. Approximately 14 miles north of Waskish on Highway No. 72. A Bog area covered with Marsh Grasses. From an airplane, such a landscape gives almost a perfectly level picture and might lead one to the belief that underneath is solid land.



Plate 43 - KOCHICHING AREA. One mile west and one-half mile north of Frontier. Burned over area.

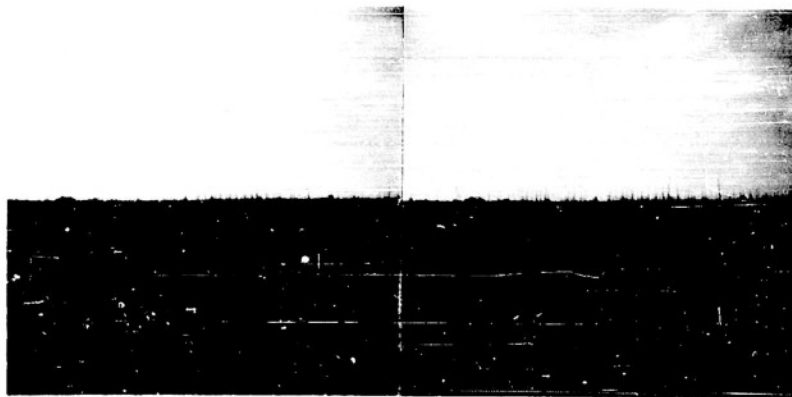


Plate 44 - KOCHICHING AREA. Approximately 7 miles south of the Rainy River on Highway No. 72. An area of stagnant Spruce.

Chapter VI

THE ITASCA AREA

In many respects the Itasca Area brings together, under one heading, the characteristics found most common in the Ely, Hubbard and Koochiching Areas. A detailed description of the Itasca Area is given in Chapter IX, Technical Report No. 1.

This key follows the same general pattern as set by the three previous keys. Descriptions and remarks of the upland and lowland types of vegetation precedes the actual key itself. Following the key are aerial and ground photographs which have marked upon them the identifications referred to in the key proper.

IDENTIFIABLE
VEGETATION AND GROUND TYPES OF
THE ITASCA AREA, MINNESOTA

<u>Symbol</u>	<u>Description and Remarks</u>
---------------	--------------------------------

U P L A N D T Y P E S

- A ASPEN-PAPER BIRCH. Crowns of trees definitely rounded, no impression of spire-like or pointed tops. Crowns generally very uniform in size, vary in tone from medium gray to light gray in a soft, blotchy fashion. Often clumpy. Lighter-toned trees have a very soft, fluffy crown (Aspen)--darker trees (Birch) are almost identical in texture and size, differ only in tone. Trees sometimes thin out between clumps and crowns become slightly larger. The most common and extensive vegetation type. Usually, when Birch is present, it is so well mixed with the Aspen as to not warrant separation--on occasion, however, fairly extensive stands will occur that will be separable.(Plates 50, 51)
- Hm MIXED UPLAND HARDWOODS. Crowns of trees definitely rounded, no impression of spire-like or pointed tops. Crowns generally show considerable variation in tone, diameter, and height--gives a mottled (not blotchy) appearance. Crowns very sharply outlined for the most part, not fuzzy, individual branches often readily visible on larger trees. Overall bumpy appearance. Very common on well-drained hills, knolls and flat uplands.(Plates 50, 51)
- A/SB/C . MIXED CEDAR, ASPEN AND SPRUCE-BALSAM FIR. Crowns squatty, pointed, rather dark in tone. Stands rather open, heights variable and have a ragged appearance. Texture quite soft (Cedar). Occur in well drained flats--indicated by the presence of soft, gray, fluffy, round-crowned trees (taller) which are of uniform height (Aspen). Look for these latter trees in mixture, plus some SB usually, otherwise you will be prone to call it a lowland type. Not common. .(Plate 51)
- Pn NORWAY PINE. Tone dark gray to almost black, texture very soft. Trees rather pointed, tall, individual branches hard to see definitely. Slightly irregular oval shadows (when visible). Small groups, pure stands of uniform height. Not at all common. Only found on very well-drained upland flats or ridges.(Plates 47, 49)
- Pw WHITE PINE. Tone medium dark to medium gray. Clearly defined and fingerlike crowns due to spreading branches being readily visible. Spreading, spire-like tops give a rough

"star" or "halo" appearance. Occur in small groups, often in mixture with softly rounded crowned trees and/or smaller trees with slim, cone-shaped crowns. Most commonly found adjacent to lowland flats (appear as "islands" because of their height); low, well-drained slopes and farm clearings. Not common nor extensive. (Plate 46)

SB . . . WHITE SPRUCE-BALSAM FIR. Crowns tapering, slender, cone-shaped, soft texture, medium gray. Great variability in height--gives stand a softly jumbled, rough appearance. Occurs on well-drained flats, lower slopes next to marshes, swamps or depressions. Not extensive nor common in these pure stands--usually in combination with taller, medium to light gray round-crowned trees. (Plate 49)

A/SB . . . ASPEN MIXED WITH SPRUCE-FIR. Mixture of tall, light gray, fluffy, round-crowned trees (rather scattered) and patches of shorter, medium dark gray trees with tapering, slim, cone-like crowns. Rough, jumbled stands, rather open. These stands are often a great hodge-podge of Mixed Upland Hardwoods, Aspen, and Spruce-Fir. Mixture may be groups of trees or scattered individuals. Rarely are the stands ever tightly packed, consequently there will often be small openings with felt-like texture which signifies the presence of upland brush. These are usually not large enough to separate, but are a good indication of the general condition of the stand. (Plates 48, 50)

UB . . . UPLAND BRUSH. Texture bumpy, pebbly, rough, or felt-like. Often have scattered trees with slim, cone-like crowns and/or trees with soft, fluffy, rounded, crowns (tall). If the brush is large, you may actually get a good impression of small, rounded crowns, shadow, and some height. If such is the case, compare the brush height with adjacent trees--if the normal height of what you suspect to be brush is less than 1/3 the height of the surrounding trees, then it is safe to call it UB. (Plates 48, 51)

HCO. . . UPLAND HARDWOODS CUT-OVER. Texture rough, felt-like or grainy. Looks identical to UB, EXCEPT for the fact that there will be crooked white lines in the stand (logging skid trails) and there will always be roads adjacent to, or leading into the area. Usually scattered trees with soft, round crowns. It is a moot question as to what species has been cut or is being cut. Sometimes by looking at the untouched, adjacent stands, you can get some idea of whether Aspen, Birch or some Mixed Upland Hardwood species is being cut. . . . (Plate 47)

F. . . . UPLAND FARM. Very distinct light gray patch or patches. Roads always visible in or near areas; buildings usually tucked into

an isolated group of trees. Parallel lines and striations usually indicate tilled fields--such areas invariably very light gray in tone. Fields that are quite uniform in tone (darker), slightly mottled, or having minute white bumps, flecks, or faint, wavering lines are upland meadows or hay fields--these white markings being either hay piles, bales, or windrows. (Plates 49, 50)

LOWLAND TYPES

C. . . . CEDAR. Crowns squatty, slightly pointed, rather dark in tone. Stands open and ragged due to variability in height and crown diameter. Trees small, texture soft. Often mixed with taller trees with softly rounded crowns (Hs). This type is extremely hard to find--Cedar looks a good deal like small SB, it does not occur often nor in large patches. It is very doubtful as to whether the untrained observer could separate out this species by itself. No examples are present in the photographs of this species when it occurs in a definite lowland position. (Plate 51)

Hs . . . MIXED LOWLAND HARDWOOD. See the description on Hm. Hs looks exactly the same as Hm--its differentiation is strictly a matter of site. There may often tend to be more smaller, lighter crowns in the Hs, but is apparent only to the trained eye. Look for it on swamp borders and flat stream courses. (Plates 49, 51)

T. . . . TAMARACK. Texture soft, tone light medium gray to light gray (almost white on the sun side). Heights generally very uniform. Tapered, rather rounded conical, small crowns. Fairly common--sometimes very extensive stands. Unless the tone of the photographs is constant, it will be virtually impossible to separate this species from Black Spruce. Plates 46 and 51 have been selected to show what the true contrast SHOULD be.

S. . . . BLACK SPRUCE. Crowns small, but rather sharply outlined, slightly angular from vertical top view, tone medium gray, shadows small, somewhat linear. Fairly common, but usually not extensive. Separation from T will be the primary difficulty. (Plate 46)

SCO. . . BLACK SPRUCE CUT-OVER. Since the S stands are scattered and often rather small, they are not subject to cutting by well-organized cutting operations of large companies. Rather, cutting is usually done by some local farmer and is rather haphazard. Stands are rather loose because of selection of the better trees, roads (skid trails) wind rather aimlessly about.

There are always farm clearings or main roads near by. . . .
.(Plate 51)

Tx . . . STAGNANT TAMARACK. Soft, felt-like or slightly pebbly dark gray background. Trees have soft textured, tapering slightly conical crowns--widely scattered. Tone of trees is light gray (almost white on the sun side) to light medium gray. Contrast between trees and background is most striking. Not common.(Plate 47)

Sx . . . STAGNANT SPRUCE. Soft, felt-like or slightly pebbly medium gray background. Trees are dark, pointed, linear, form a rather close-packed dark band around the outside edge of the lowland flat. Heights slope gradually downward toward the center--trees become widely scattered and very small in the center of the marsh (black flecks or specks). . .(Plate 49)

LB . . . LOWLAND BRUSH. Soft, strongly bumpy, pebbly or grainy texture (coarse)--sometimes slightly mottled. Few or no scattered trees. Can definitely see many individual brush crowns, small, partial crown shadows. Look at the area without the stereoscope--usually you will be able to see the pebbly texture very clearly. Common to stream course flats, shallow drainages, undrained depressions, borders of large lowland flats.(Plates 48, 49)

M(Mse) . MARSH. Very soft, felt-like or velvety, very light gray tone. Occurs in small patches often next to meandering streams, in small undrained depressions and between patches of lowland brush. Never extensive--occurs often in very small patches.(Plate 48)

Mk . . . MUSKEG. Soft, velvety, mottled, medium and light gray. Dappled appearance with soft light gray spots on dark blotches. Also, look for what appear to be irregular, dark little paths or lines--as though someone had walked across the area and left a faint trail. Not common.(Plate 45)

FB . . . FLOATING BOG. Mottled, somewhat bumpy, has isolated arms or tiny ponds of water. Found adjacent to meanders of sluggish streams in flat valleys, or around ponds in undrained depressions. Not common.(Plates 45, 48)

W. . . . WATER. Very smooth, jet black or blackish, flat--sometimes flecked with white due to reflection of the sun on one of the photographs. Quite common.(Plate 48)

FM . . . FARM MEADOW (LOWLAND). Lowland clearing, roads or farm buildings visible adjacent to, or in the near vicinity. Adjacent

uncleared vegetation will often be a swamp species of some type. Also, when a depression crosses a farm clearing, and which depression is a darker gray than the surrounding upland fields, call it FM. These are wet much of the year, but are used for pasture and occasionally a cutting of hay.(Plate 46)

ITASCA AREA KEY

1. Hills, knolls, well-drained upland flats and intermediate flat basins, lower slopes, steep stream bluffs. 2
1. Lowland flats, undrained flat-bottomed depressions, gullies with slight gradient, flat stream courses. 9
 2. Trees of definite height, observable crown and shadow-crowns of trees cover over 30 per cent of the area 3
 2. Trees of definite height, observable crown and shadow--crowns of trees cover less than 30 per cent of the area. 7
 2. No discernible vegetation. May be occasional dark mottles, striations, white flecks or dots. 8
3. Crowns of trees definitely rounded, no impression of spire-like or pointed tops, may have scattered trees (shorter) with definite slender conical crowns. Very common, often extensive. 4
3. Crowns rather rounded in the straight vertical view, but taper near the tip into a roughly pointed or halo-like spire. Trees large, uniform in height, usually dark (outstandingly) in tone. Occur in small patches and are not common. 5
3. Crowns very definitely tapered, slender, cone-like. Heights variable and give a rough appearance to pure stands. Common in mixture with round-crowned trees of lighter tone. Not common in pure stands. 6
3. Crowns squatty, pointed, rather dark in tone. Stands rather open, heights variable and have a ragged appearance. Texture quite soft. (Cedar). Occur in well-drained flats--indicated by the presence of soft, gray rounded-fluffy crowned trees (taller) which are of uniform height. Look for these latter trees in mixture, otherwise you will be prone to call it a lowland type. Not common. MIXED CEDAR, ASPEN AND SPRUCE-BALSAM FIR (A/SB/C) Plate 51
4. Crowns generally very uniform in size, vary in tone from medium to light gray in a soft, blotchy fashion. Often clumpy. Lighter-toned trees have a very soft fluffy crown (Aspen)--darker trees (Birch) are almost identical in texture and size, differ only in tone. Trees sometimes thin out between clumps and crowns become slightly larger. Very common and extensive. ASPEN (A) Plates 50, 51
4. Crowns show considerable variation in tone, diameter, and height--gives a mottled (not blotchy) appearance. Crowns

very sharply outlined for the most part, not fuzzy, individual branches often readily visible on larger trees. Overall bumpy appearance. Very common on well-drained hills, knolls and flat uplands. . MIXED UPLAND HARDWOODS (Hm) Plates 50, 51

5. Tone dark gray to almost black, texture very soft. Trees rather pointed, tall, individual branches hard to see definitely. Slightly irregular oval shadows (when visible). Small groups, pure stands of uniform height. Not at all common. Only found on very well-drained upland flats or ridges. NORWAY PINE (Pn) Plates 47, 49

5. Tone medium dark to medium gray. Texture clear and fingerlike due to spreading branches being readily visible. Spreading, spire-like tops give a rough "star" or "halo" appearance. Occur in small groups, often in mixture with softly rounded crowned trees and/or smaller trees with slim, cone-shaped crowns. Most commonly found adjacent to lowland flats (appear as "islands" because of their height); low, well-drained slopes and farm clearings. Not common. WHITE PINE (Pw) Plate 46

6. Crowns tapering, slender, cone-shaped. Soft texture, medium gray, great variability in height--gives stand a softly jumbled, rough appearance. Occurs on well-drained flats, lower slopes next to marshes, swamps or depressions. Not extensive nor common in these pure stands--usually in combination with taller, medium to light gray round crowned trees. WHITE SPRUCE-BALSAM FIR (SB) Plate 49

6. Mixture of tall, light gray, softly rounded crowns (rather scattered) and patches of shorter, medium dark gray trees with tapering, slim, cone-like crowns. Rough, jumbled stands, rather open. Common. ASPEN MIXED WITH SPRUCE-FIR (A/SB) Plates 48, 50

7. Texture bumpy, pebbly, rough, or felt-like. Often have scattered trees with slim, cone-like crowns; or trees with soft, tall, rounded crowns. May actually get a good impression of small rounded crowns, shadow and some height, due to the brush being large. If such is the case, compare their height with adjacent trees--if the normal height of the ground vegetation is less than 1/3 of the average height of the trees in adjacent stands, call it. Fairly common. UPLAND BRUSH (UB) Plates 48, 51

7. Texture rough, felt-like or grainy. Roads near, or running through area. Twisting, torturous white lines in area indicate logging skid trails. Usually scattered trees with soft, round crowns. UPLAND HARDWOODS CUT-OVER (HCO) Plate 47

8. Very distinct light gray patch or patches. Roads always visible in or near areas. Buildings usually tucked into an isolated group of trees. Parallel lines and striations usually indicate tilled fields--such areas invariably very light gray in tone. Fields that are quite uniform in tone (darker), slightly mottled, or having white bumps, flecks, or faint, wavering lines are upland meadows or hay fields.
. UPLAND FARMS (F) Plates 49, 50
9. Trees of definite height, observable crown and shadow--crowns of the trees cover over 30 per cent of the area. 10
9. Trees of definite height, observable crown and shadow--crowns of the trees cover less than 30 per cent of the area. 13
9. No discernible vegetation visible, softly mottled or uniform in tone and texture. 14
10. Crowns rounded, variable in size, tone and height. May be some scattered trees with small, tapered, slim cone-like crowns. 11
10. Crowns small, faintly pointed, tapering. Shadows elongate triangular--may be rather linear. Trees slightly spaced or tightly packed. Heights quite uniform. 12
10. Crowns squatty, slightly pointed, rather dark in tone. Stands open and ragged due to variability in height and crown diameter. Trees small, texture soft. Often mixed with taller trees with softly rounded crowns.
. CEDAR (C) Plate 51
11. Crowns show considerable variation in tone, diameter and height--giving a mottled (not blotchy) appearance. Texture not particularly soft--crowns clearly outlined so that individual branches often visible on larger trees. Bumpy appearance. Fairly common swamp fringe type. . . MIXED LOWLAND HARDWOODS (Hs) Plates 49, 51
12. Texture soft, tone light medium gray to light gray (almost white on sun side when stands rather open). Tapered, rather rounded conical, small crowns. Fairly common--sometimes very extensive stands. TAMARACK (T) Plates 46, 51
12. Texture rather hard, tone medium gray, crowns small, rather angular from top view, linear. Shadows small, somewhat linear. Fairly common, but usually not extensive.
. BLACK SPRUCE (S) Plate 46
12. Texture rather hard, tone medium to dark medium gray, crowns small, linear, somewhat ragged due to spacing. Shadows

small, somewhat linear. Numerous trails or lines (either straight or crooked) cutting through stand. Main roads or farm clearings always adjacent.
BLACK SPRUCE CUT-OVER (SCO) Plate 51

- 13. Soft, felt-like or slightly pebbly dark gray background. Trees are soft texture, have tapering, rather conical crowns--widely scattered. Tone of scattered trees is light gray (almost white on sun side) to light medium gray. Contrast between trees and background is most striking. Not common.
 STAGNANT TAMARACK (Tx) Plate 47
- 13. Soft, felt-like or slightly pebbly medium gray background. Trees are dark, pointed, linear, form a rather close packed dark band around the outside edge of the lowland flat. Heights slope gradually downward toward the center--trees become widely scattered and very small in the center of the marsh (like flecks or specks of black pepper).
 STAGNANT SPRUCE (Sx) Plate 49
- 13. Soft, strongly bumpy, pebbly or grainy texture (coarse)-- sometimes slightly mottled. Few or no scattered trees. Can definitely see many individual brush crowns, small, partial crown shadows. Look at the area without the stereoscope--usually you will be able to see the pebbly texture very clearly. Common to stream course flats, shallow drainages, undrained depressions, borders of large lowland flats.
 LOWLAND BRUSH (LB) Plates 48, 49
- 14. Very soft, felt-like or velvety, very light gray tone. Occurs in small patches often next to meandering streams, in small undrained depressions and between patches of lowland brush. Never extensive--occurs often in very small patches.
 MARSH (M) Plate 48
- 14. Soft, velvety, mottled, medium and light gray. Dappled appearance with soft light gray spots on dark blotches. Also, look for what appears to be irregular, dark little "paths" or lines-- as though someone had walked across the area and left a faint trail. Not common.
 MUSKEG (Mk) Plate 45
- 14. Mottled, somewhat bumpy, has isolated arms or ponds of water. Found adjacent to meanders of sluggish streams in flat valleys, or around ponds in undrained depressions. Not common.
 FLOATING BOG (FB) Plates 45, 48
- 14. VERY smooth, jet black or blackish, flat--sometimes flecked with white due to reflection of the sun on one of the photographs.
 WATER (W) Plate 48
- 14. Lowland clearings. Roads or farm buildings visible adjacent to, or in the near vicinity. Adjacent uncleared vegetation

will often be a swamp species of some type. Also, when a
depressional area crosses a farm clearing, and which depres-
sion is a darker gray than the surrounding fields (upland)
call it. FARM MEADOW (FM) Plate 46



Scale 1:10,000

Plate 45 - ITASCA AREA. Good examples of Muskeg, Aspen, Grass and Ferns.



Scale 1:10,000

Plate 46 - ITASCA AREA. Good contrast between Tamarack and Spruce.
Also good examples of Lowland Brush and White Pine.



Scale 1:10,000
Plate 47 - ITASCA AREA. Excellent example of stagnant Tamarack in a Muskeg area. Also regions of Mixed Hardwood and Aspen.



Scale 1:10,000
Plate 48 - ITASCA AREA. Good example of Upland Brush growing in a cut-over area in which there are a few small Norway Pine, Mixed Hardwood, Aspen and Floating Bog.



Scale 1:10,000

Plate 49 - ITASCA AREA. Examples of Lowland Hardwoods, Lowland Brush, and Farms along the river bank.



Scale 1:10,000

Plate 50 - ITASCA AREA. Compare the normal tonal quality of Birch with the Aspen adjacent to it. The Birch area in the lower left corner of the picture is darker than usual. This black tone is the fault of the photography.



Scale 1:10,000

Plate 51 - ITASCA AREA. Good examples of Cedar and Mixed Hardwoods.

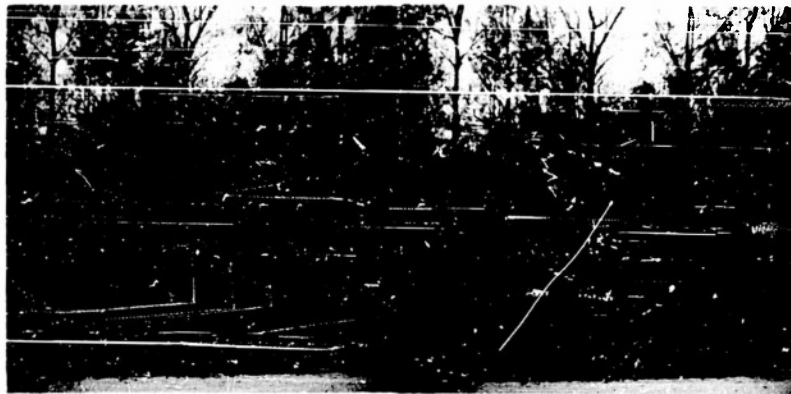


Plate 52 - ITASCA AREA. Approximately 1.5 miles south of Swan Lake Bridge. Dense growth of Poplar and Birch.



Plate 53 - ITASCA AREA. Approximately 2 miles southeast of Warba. Uniform stand of Aspen.



Plate 54 - ITASCA AREA. Looking northwest along an old logging road northeast of Warba. Alder, Tamarack and White Cedar coming in.



Plate 55 - ITASCA AREA. Approximately 17 miles southeast of Grand Rapids. Stagnant Spruce in the background, Tamarack mid-distance, and Aspen in the foreground.



Plate 56 - ITASCA AREA. Dry Lake southeast of Grand Rapids. Much of Lake bed is covered with Alder. Note stand of Popple on higher land in Lake.



Plate 57 - ITASCA AREA. Approximately 2 miles southeast of Warba on Highway No. 12. A Tussock grass swamp, water is clear and approximately three feet deep.

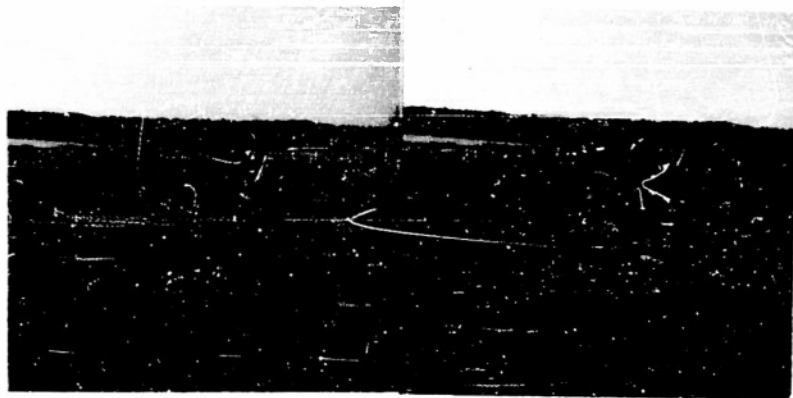


Plate 58 - ITASCA AREA. Shore of Pughole Lake north of Grand Rapids. Grass and Reeds make level area look like solid ground from the air, however they are standing in water that is between three and four feet deep.

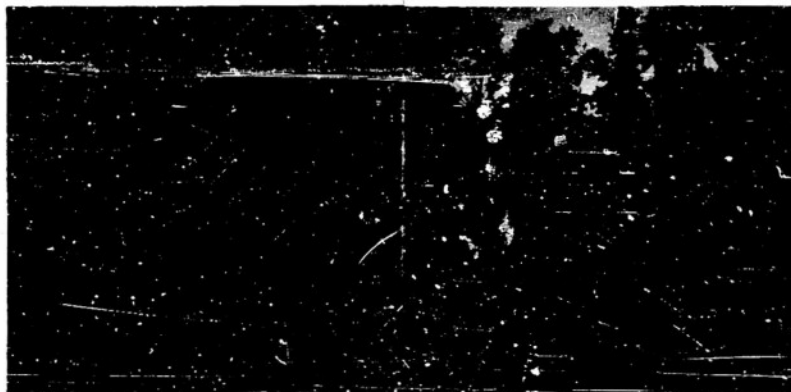


Plate 59 - ITASCA AREA. White Cedar swamp south of Warba. Note Cat-tails in wettest part of swamp.