

PROGRESS REPORT - 1987

ISLE ROYALE NATIONAL PARK

SOIL INVENTORY

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PREFACE

The soil survey of Isle Royale National Park is a field based project to provide soil inventory maps, soil morphological and compositional data for classification of soils and, baseline data for an ongoing acid precipitation study. This report is a summary of accomplishments through December 1987. The information in this report represents a base for subsequent ecological or forest oriented research as well as applied information for Isle Royale National Park land management activities.

**WORKING DRAFT FOR
Comments And Review Only**

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INTRODUCTION

Soils, or that portion of the earth's land surface that supports biological activity, are a basic resource. Soils provide sustenance for the growth of plants, support for numerous engineered structures, and a place where societies dispose of wastes. An understanding of the distribution of different kinds of soils is essential to their effective study and management. In 1987 a field project was initiated to soil inventory the major soil areas of Isle Royale National Park. Specific objectives of this project are:

1. To soil inventory the soils on Isle Royale according to National Cooperative Soil Survey standards.
2. To describe, classify and sample soils in selected areas for an ongoing acid precipitation study on Isle Royale.
3. To prepare land management guidelines for the various kinds of soil areas on Isle Royale for the National Park Service.

This progress report contains three sections. Section one discusses accomplishments through December 1987. Section two discusses soil morphological and compositional data and gives examples of legends for soil interpretations. Section three is an Appendix composed of data for soil mapping units developed during the 1987 field season.

SECTION ONE -- ACCOMPLISHMENTS THROUGH DECEMBER 1987

Isle royale National Park is situated in the northwestern portion of Lake Superior 60 miles north west of Houghton, Michigan and 25 miles south east of Ontario, Canada. It is approximately 40 miles long and 6 miles wide. Total area, land and inland lakes, is approximately 160,000 acres. Isle Royale, because of its location, is part of Keweenaw County, Michigan.

A land economic soil inventory was completed for Keweenaw County in 1952. This inventory included Isle Royale. Soil maps exist for the mainland portion of Keweenaw, County, but, are none existent for the island. Personnal discussions with Mr William Colburn, retired soil scientist from the Michigan Dept. of Natural Resources, Land Division, and Dr E.P. Whiteside, retired Professor, Crops and Soil Sciences Dept., Michigan State University, who worked on the land economic survey do not know the where abouts of the original soil maps. Thus the soil inventory undertaken in the summer of 1987 had no previous work to refer too for guidance as to kinds of soils or soil landscape relationships to assist with developing a modern soil inventory.

Since this is a three year program, the island was divided into three 50,000 acre units; northeast one third; central one third and a southwest one third. The 1987 field season was confined to the northeast one third of the island.

Isle royale is a glaciated island underlain by a volcanic and sedimentary rocks. Soils derived from the glacial materials overlying the bedrock will be compositionally and morphologically different. Also, as a result of deglaciation, numerous post glacial lake shorelines occur which have modified the landforms on the island. Glacial landforms as well as shoreline locations on the island were extracted from publications by Huber (1973), Farrand (1960,1969)

Because of the anticipated complexity of the soils the first task was to develop soil-landscape patterns. The soil survey crew, Mr Gregg Anderson and Mr Stephen Sprecher, spent the month of June transecting the Northeast one third of the island. Transects were were made at right angles to the overall drainage patterns on the island. Transects utilized existing trails whenever possible. Random walks were made in areas where trails were absent. The soils were identified and classified on the

transects according to National Cooperative Soil Survey standards and USDA Soil Conservation procedures (Soil Survey Staff 1975, 1981). Field descriptions and soil profile notes were made for each soil observation. Examples of soil note card and soil description form are presented in the Appendix. Transect data was used to develop soil map legends and interpretative guides. Figures 1 and 2 are examples of the soil landform relationships developed from the transects.

Three levels of soil mapping were used for the soil inventory, July through September 1987. A level one for campgrounds, level two for trails and level four for all other areas. Level one is a high intensity soil inventory and utilizes large scale aerial photos, 1:5,000. Since these kinds of photos were not available, we used NPS copies of the campground maps. We were able to complete soil mapping on the following campgrounds: Chippewa Harbor, Three mile, Daisy Farm, McCargoe Cove, Rock Harbor, Tookers Island, East & West Chickenbone, Mott Island, Lane Cove, Lake Ritchie, Moskey Basin.

Level two soil survey is less intense and utilizes aerial photos through 1:24,000 scale. We used 1:15,840 (4 inch to mile) black and white IR photos. At this level soil areas as small as 5 acres can be shown. The level two inventory applies only to a 300 meter wide corridor with trails at the center. Approximately 51 miles of trails, 8,000 acres, were mapped at this level of intensity.

The level four soil survey differs from level one and two in that large soil areas of similar soils are mapped. Aerial photos at scales to 1:250,000 are used. At this smaller scale detail is limited. We used the National Cooperative Soil Survey level four concepts for developing soil maps at the 1:15,840 aerial photo scale. The level four soil mapping was selected because Isle Royale is a designated wilderness area. About 40,000 acres of mainland and offshore islands are level four soil inventory.

In addition to the soil survey activities, forty soil profiles were described and sampled for the ongoing acid precipitation study under the leadership of Dr Robert Stottlemeyer (NPS *acid precip. study*). Ten plots were located in the Wallace Lake area. Thirty more plots were randomly selected during the progress of the soil mapping. Fifteen were located in hardwood stands and fifteen in conifer forest types. Soils at each location were described according to US Soil conservation Service procedures.

Plots were located on a master topo map of the island. All profile descriptions have been transcribed onto USDA Soil conservation Service pedon coding format and stored on floppy disks. Copies of the profiles are presented in this report, Appendix, pg 129. Bulk samples were collected from each described horizon for pH and sulfur determinations. PHs' have been completed and a discussion follows in Section Two. PH values of the forty sampled profiles are comparable to soils on the mainland in Houghton and Keweenaw Counties.

Soil profile pHs; of those profiles sampled for the acid rain study, as well as for taxonomic purposes, were found to be comparable to mainland soils in Keweenaw and Houghton Counties , Michigan. Organic litter on the surface of the soils (Oi, Oe and Oa) is generally strongly acid on soils with acid profiles with white spruce and white birch forest cover. The litter is generally less acid on soils with higher soil pH values even with the same forest type cover. This reflects the nutrient cycling system on the island. Bases such as Ca, Mg etc maybe low in the more acid soils, especially in soils over bedrock where reserves have been depleted and soil volume is minimal.

The major problem with the soil survey during the 1987 field season was access to the mainland of Isle Royale. The survey crew was constrained because of limitations for docking, trail access and inclement weather (fog and rain). However, our goal to soil inventory one third of the island was accomplished.

An example of a soil inventory field sheet and discussion of soil map units shown on the map is presented in the Appendix, pg 171.

SECTION TWO - SOIL-LANDSCAPES, LEGENDS, SOIL INVENTORY, SOIL-ACID PPT PH DATA.

Soils, and the materials in which they have formed, have developed recognizable properties that allow, and justify, a system of classification. The technique of identifying and delineating soils, and other information, on maps is the process of soil survey. Soil survey are made cooperatively by federal and state agencies. The USDA Soil Conservation Service is the lead federal agency which has primary responsibility for soil survey activities. The joint effort of other federal and state agencies is the National Cooperative Soil Survey (NCSS). The soil survey of Isle Royale follows the procedures and standards of the NCSS (Soil Survey Staff 1975, 1981, Mokma and Frederick 1987). All soil survey information will be correlated by the Soil Conservation Service, Michigan, and eventually incorporated in the Keweenaw County (mainland) soil survey.

Because of the diversity of activities by the two man soil survey party (Mr Gregg Anderson, Mr Stephen Sprecher) during the 1987 field season, this section is divided into several units: soil - landscape studies, legend development, soil survey, and soil pH data for the acid ppt study. Also, since this is a three year program, Isle Royale was divided into three equal parts of about 50,000 acres each: northeastern 1/3; central 1/3; and southwestern 1/3. The discussion present in the following units pertains only to the northeastern one third of the island.

Soil-Landscape Study

The first phase with developing a soil survey is to study the general nature of the area to be inventoried. This includes soils, physiography, relief, drainage, vegetation, land use, identify soil management problems such as disposal of wastes, and review of soil and geologic publications pertinent to the survey area. The survey party spent the month of June and two weeks in July studying the soil and landscape relationships, drainage patterns and vegetation in the northern one-third of the island. This work also included the off-shore islands.

According to Huber (1973) Isle Royale landforms are the product of glacial override and retreat of the last major glaciation, Wisconsin, in the Lake Superior basin, circa 10,000 years B.P.. Upon deglaciation distinct post glacial lakes formed and filled the Lake Superior basin to elevations higher than present Lake Superior. Thus surficial materials on Isle Royale in which soils have developed are composed of varied and complex debris -

direct ice deposition to reworked materials that form wave cut benches, beach deposits, valley fills and cliffs.

Recognizing the fact that the potential exists for complex soil-landform patterns, a series of transects were developed to qualify the various kinds of soils and glacial, or post glacial great lakes, features. Transect locations were biased to accommodate the following observed landform morphology; (1) random walks southeast to northwest perpendicular to drainage courses and shoreline features of Beaver Bay, Minong and Nipissing post glacial great lakes (Huber 1973, Farrand 1960, 1969); (2) utilize existing hiker trails with random walks parallel to trails since the majority of hiker trails were perpendicular to drainage courses. (3) the majority of hiker trails and campgrounds had shoreline access with boat docking facilities.

Transects were made at Blakes Point, Rock Harbor to Scoville, Hidden Lake to Lookout Louise, Three Mile to Lane Cove, Daisy Farm to Mt Ojibway and Mt. Franklin, Chippewa Harbor to West Chickenbone, Moskey Basin to Greenstone Ridge, Greenstone Ridge trail to Windigao and back through Feldtmann to Siskiwit, McCargoe Cove to East Chickenbone and Minong Ridge Trail, Wallace Lake area, and numerous off shore islands.

On each transect soil profiles were exposed and morphological features recorded on soil note cards (illustration of soil note card in Appendix p17. Location of soil observation were random. However, if on a suspected shoreline feature soil borings were intentionally made. Locations of soil note cards were noted on USGA topographic map of Isle Royale (1973) and 7 1/2 min. USGS quadrangle maps (Table 1).

In addition to transect note cards, soil profiles were described according to NCSS procedures on forms SCS-213 (illustration is presented in Appendix p 18). Soil note cards and soil profile descriptions are essential with correlation of soils, classification, quality control and development of soil mapping legends. Figures 1 and 2 are generalized illustrations for two transects and soil encountered.

In general this phase of the soil survey resulted in the following: (1) the soil mantle over bedrock ranges from 10 to 40 inches, generally 20 to 30 inches; (2) soils are very gravelly and cobbly, especially on the old shorelines; (3) an organic blanket , <10 inches thick, occurs in the northeastern portion of the island from hidden lake area to Blakes Point. The Soil Conservation Service, Michigan, searched their national data files

TABLE 1 List of USGS 7 1/2 Minute Quadrangle Sheets for Isle Royale National Park.

<u>Name</u>	<u>Latitude</u>	<u>Longitude</u>
Belle Harbor	48°10'00", 48 17'30"	88° 30'
Feldman Ridge SE	47°45'00", 47 52'30"	89° 00'
Feldman Ridge SW	47°45'00", 47 52'30"	89° 15'
Lake Ritchie	47°57'30", 48 05'	88° 45'
Little Todd Harbor	48°00'00", 48 07'30"	89° 00'
Malone Bay	47°52'30", 48 00'	88° 45'
McCargoe Cove	48°07'30", 48 15'	88° 45'
Mott Island	48°00'00", 48 07'30"	88° 30'
Passage Island	48°10'00", 48 17'30"	88° 15'
Point Houghton	47°50'00", 47 57'30"	89° 00'
Rock Harbor Lodge	48°07'30", 48 15'	88° 30'
Sugar Mountain	47°52'30", 48 00'	89° 00'
Todd Harbor	48°00'00", 48 07'30"	88° 45'
Windigo	47°52'30", 48 00'	89° 15'

FIGURE 1 TYPICAL CROSS SECTION INLAND FROM THREE MILE CAMPGROUND TO MOUNT FRANKLIN

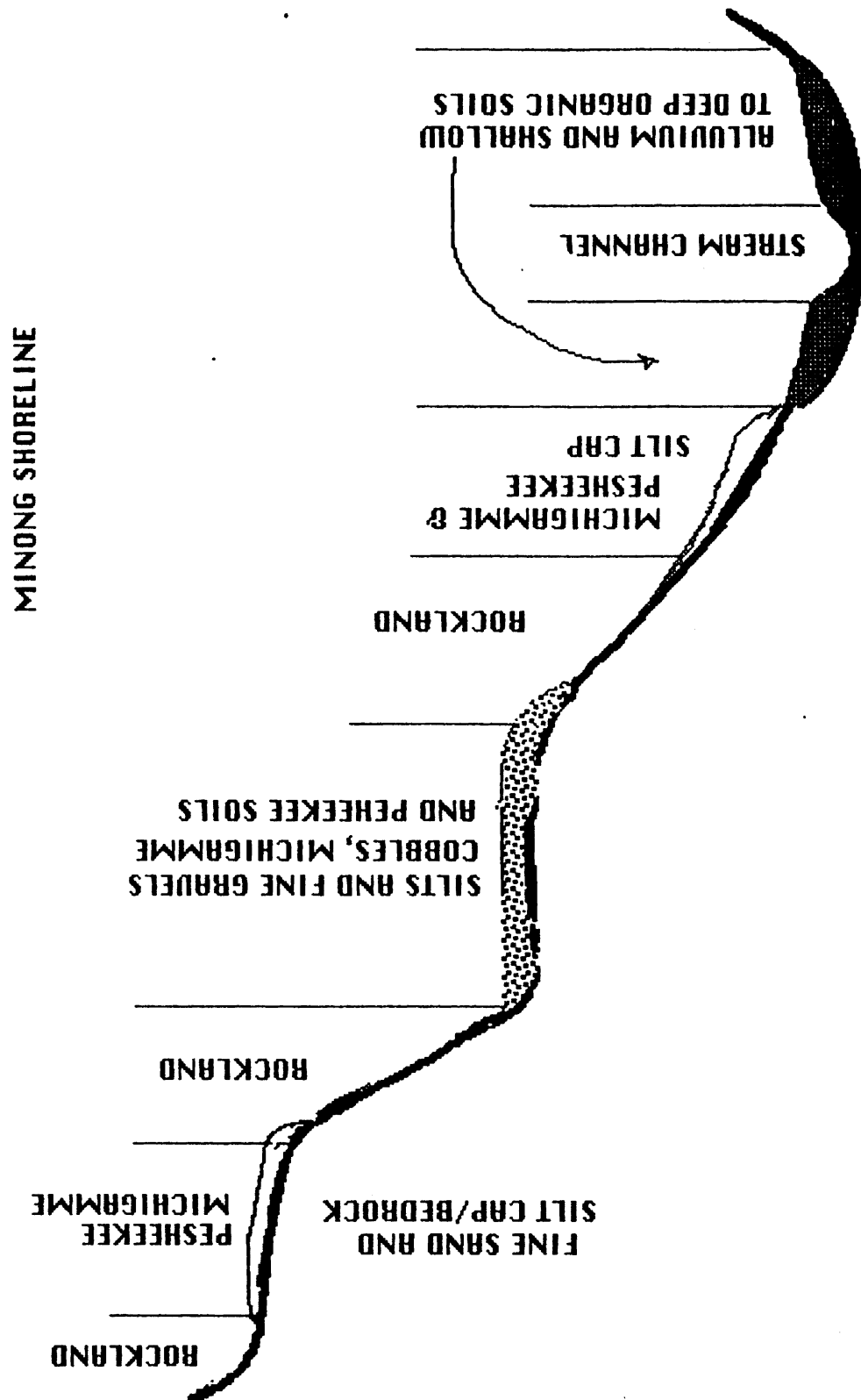
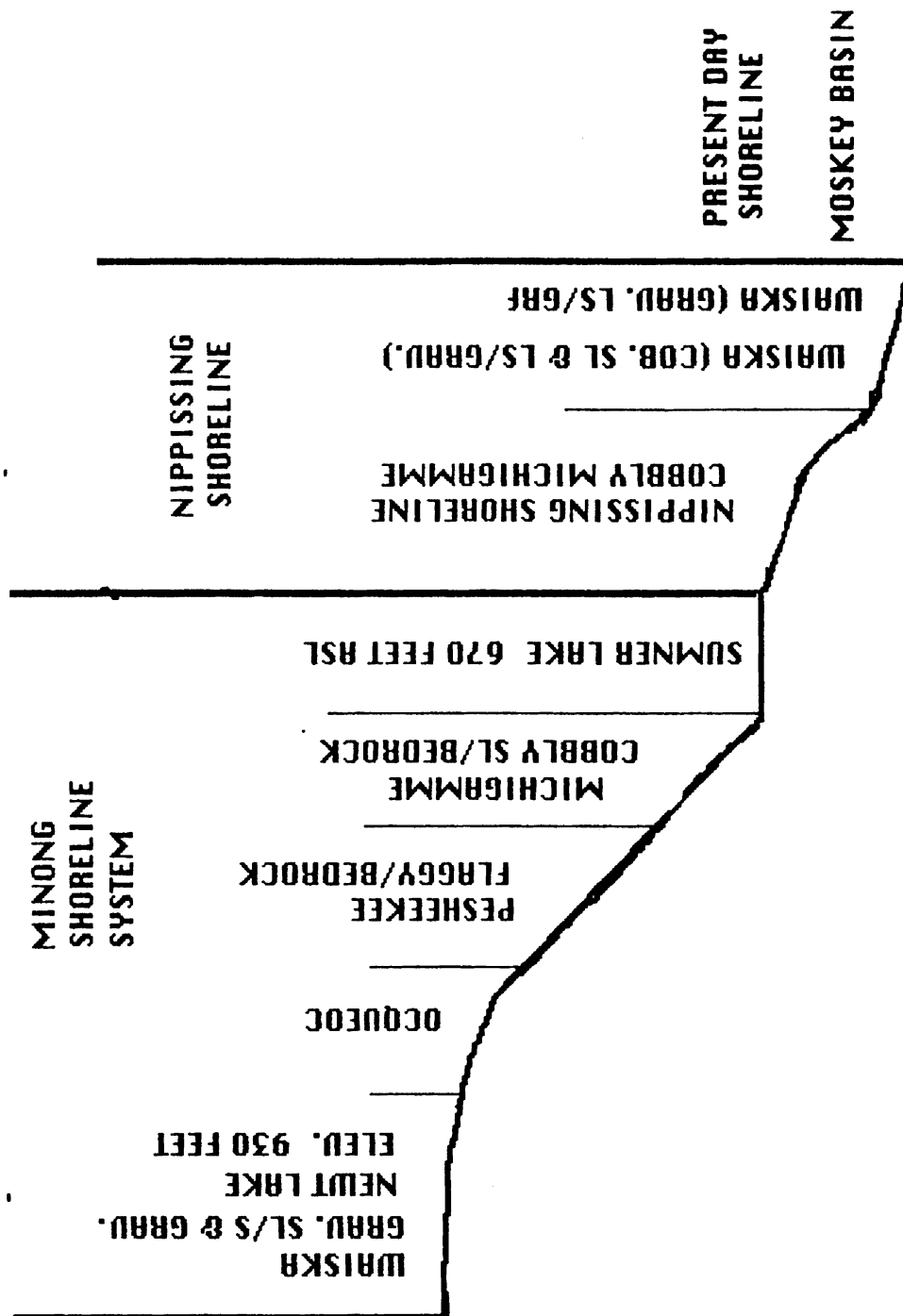


**FIGURE 2 NEWT-SUMNER-MOSKEY TRANSECT
ACROSS MINONG AND NIPPISSING
SHORELINES.**



and found a similar soil in the New England States. Name of the soil is Ricker; (4) soils in the northeastern one third of Isle Royale are similar to mainland Keweenaw and Houghton Counties, Michigan. However, they contain a higher percentage of gravel and cobbles. This reflects the influence of historical deglaciation and shoreline activities.

Soil Mapping Legends

Soil legends are prepared after preliminary field studies; i.e. the soil-landscape study previously discussed. Soil mapping legends are composed of two parts: (1) a descriptive legend which describes and classifies soils. The descriptive legend for the Isle Royale soil survey is presented in the Appendix pg 52 to 128. Also contained in the descriptive legend is the identification legend, and legend of special symbols, page 51 in the Appendix; (2) mapping aides such as genetic key, soil characterization notes about individual soils or map units (Soil Survey Staff 1981). We used a genetic key currently in use for the Houghton County, Michigan soil survey. No major problems were encountered with the use of the Houghton County genetic key. Appendix pg. 52 is the soil legend for the 1987 field season. This is subject to change as we progress southward on the island.

Once the legend is developed, soil map units are composed for field use. Soil map units are cartographic units, number and letter combinations, which show on the aerial photo base the location of particular soils, number, and associated percent slopes, letter. Soil map units are often referred to as delineations on the photo base. They are bounded by black inked lines. Thus the number, 0036 B, on the photo stands for Rockland - Peshekee soils on 3-15% slopes. The name relates to soil materials 10 to 20 inches over bedrock (Peshekee) and exposed bedrock (Rockland) as a heterogeneous mixture that could not be separated at the scale of mapping used. Slopes range from 3 - 15%. Descriptions for the soil map units are presented in the Appendix pages 129 to 164. All soil map unit codes used for the survey have been coded and recorded on PC floppies.

Based on transect data, four slope phases were chosen; A slopes (0-3%); B slopes (4-15%); C slopes (16-35%); and D slopes (>36%). The dip in the bedrock strata in the northeast portion of the island ranges from 15 to 30%, hence the C slopes. The escarpment along the northwest side of the island drops off from the Greenstone ridge trail at slopes greater than 45% and was mapped as D slopes. Terraces below bedrock ridges have 5 to

12% slopes and were mapped as B slopes. Most of the valleys between ridges are occupied by contemporary and abandoned beaver ponds with 0-1% , A, Slopes. Because the ridges drop abruptly into ponds there are very few somewhat poorly drained areas with 1 to 5% slopes.

Since one of tasks of the soil survey party is to describe and classify soils, descriptions of the soils and their taxonomy are presented in Appendix pg 129-164. The soils within the NE portion of Isle Royale are similar to the mainland. However, we found that they often contain higher amounts of gravel and cobble because of their landscape position; i.e. Beaver Bay, Minong and Nipissing shorelines. Waiska soils were found to be common to shorelines associated with the above mentioned post glacial lake stages.

All soil map unit descriptions and soil descriptions will be reviewed by other NCSS agencies for comment. This will be completed prior to the 1988 field season. A field review by NCSS cooperators may be necessary prior to the 1988 field season.

Soil Survey

A soil survey is a field based investigation of soils of a particular area supported by information from other sources. The kinds of soil in the survey area are identified and their extent shown on a map, i.e. aerial photo base. In addition to the actual field mapping of soils an accompanying report describes, defines, classifies and interprets the soils. Interpretations predict the behavior of soil under various use and management activities (Soil Survey Staff 1981).

Because Isle Royale is a wilderness area and will remain in its current status of development, three levels of soil mapping intensity were used. They are; (1) level one or a high intensity soil inventory of high use areas such as campgrounds; (2) level two or a medium intensity soil inventory of the hiker trails and (3) level four for all other areas. Soil legends were developed for each level of intensity of soil mapping (Soil Survey Staff 1981). Since all field recorded soil inventory data use numeric codes, we used the US Soil Conservation Service soil series number for accessing the national soil data base.

Level One - Soil mapping at this level was done primarily at campgrounds, and Rock Harbor or other high use areas. The mapping was done using trail sign schematics supplied by Isle Royale. These maps are

not drawn to scale, but are only illustrations of the areas. Consequently the soil maps only show relationships within the camp sites. Soil delineations shown on the maps generally coincide to with slope breaks or rock outcrops. Potential users of these maps should be able to correlate soil delineations on the maps with observable landform features; i.e. rock outcrops. Campsite maps and legend for level one is presented in Appendix p 52.. Base maps are generally 1:15,840 or larger.

Level Two - Level two soil mapping was used for hiker trails only. This consisted of soil mapping a 300 meter wide corridor with the trail as the center. The survey party found that a 300 meter wide strip was optimum in order to maintain their orientation and to have reasonable quality control. Since level two soil mapping is intensive, it appears as a blocked area on the aerial photos. We covered about 51 miles of trails, @ 160 acres/mile, or about 8,000 acres were inventoried. Base maps are generally 1:12,000 to 1:31,640. We used 1:15,840 scale (4 inches/mile).

Level Four - Level four soil inventory is an extensive soil survey. Soil map units for this level of soil mapping are composed of similar soils as they are associated with each other on the landscape. The soils are identified by transecting representative areas to determine soil patterns and composition of map units. Boundaries are often plotted by interpretation of landscapes and drainage patterns on aerial photos. The soil survey party stereoscoped NPS color IR negatives prior to transecting level four areas. Base map scale is generally 1:20,000 to 1:250,000 depending on the complexity of soil, landscapes, and intended use of the maps. Because of the soil patterns, landscapes and the fact that hiker trails will occur on many of the maps, we used the 1:15,840 scale.

National Cooperative Soil Survey procedures and standards were used for the soil survey (Soil Survey Staff 1975, 1981, 1987). Recent Michigan Department of Natural Resources 1:15,840 black and white IR aerial photos were used for field soil inventory work.

All soil mapping has been reviewed internally, joined and inked. The user must remember that all work is preliminary and subject to change as we progress southward across the island. Furthermore, suggested changes may be forthcoming after review by the Soil Conservation Service State Soil Scientist Staff, Michigan; i. e. soil legends, soil descriptions and soil map unit descriptions.

Soil-Acid PPT pH Data

Seventy profiles were sampled by horizon for pH determinations. Profiles were random samples within the northern one third of the island (Chippewa to MaCargo Cove campgrounds to Blakes Point). These 70 profiles include 40 sampled for the acid rain study (10 from Wallace Lake 15 from hardwood and 15 from conifer stands). All pH determinations were completed on the island using the water paste procedures.

The pH data is presented in Tables 2 to 5 and Figures 3 to 9 . All pH data in both tables and figures represent the average value for each horizon. No attempt was made to determine variances since this is a three year project and more profiles are to be sampled which may include soils sampled during 1987. The discussion that follows is general because of anticipated addition of similiar soils during the 1988 and 89 field season. The data is arranged as follows: organic soils were separated from mineral soils; mineral soils were stratified by depth to bedrock (soils less than 40 inchs thick), gravels and cobbles more than forty inches to bedrock; mineral soils deeper than 40 inchs to bedrock.

Organic Soils

Soil profile reaction values are typical for organic soils in this region. With the exception of Greenwood soils (Rasberry Island Bog) we found them to be more than 40% decomposed (hemic materials) and composed of woody materials. They occupy low areas between rock outcrops, drainageways and lake filed basins. Rasberry Island Bog for example is an example of a lake filled basin. Greenwood soil is a very acid bog, pH 3.3 to 3.5 (Table 2). These values are typical for Greenwood soils. They've formed in sphagnum moss. Organic soils represent natural filtering systems on the landscape and their pH mirrors the quality of water flowing through them. Soils adjacent these deposits are in the same reaction ranges.

Gravelly and Cobbly Soils

Table 3 shows the pH distribution for Allouez and Waiska soils. Figure 3 shows the distribution of pH within Waiska soils. Allouez was not plotted since only one profile was noted. Waiska is the most common gravelly and cobbly soil encountered in this portion of the island. It is common on the off shore islands and mainland on post glacial lakes Beaver Bay, Minong and Nipissing shorelines. Surface organic litter is strongly

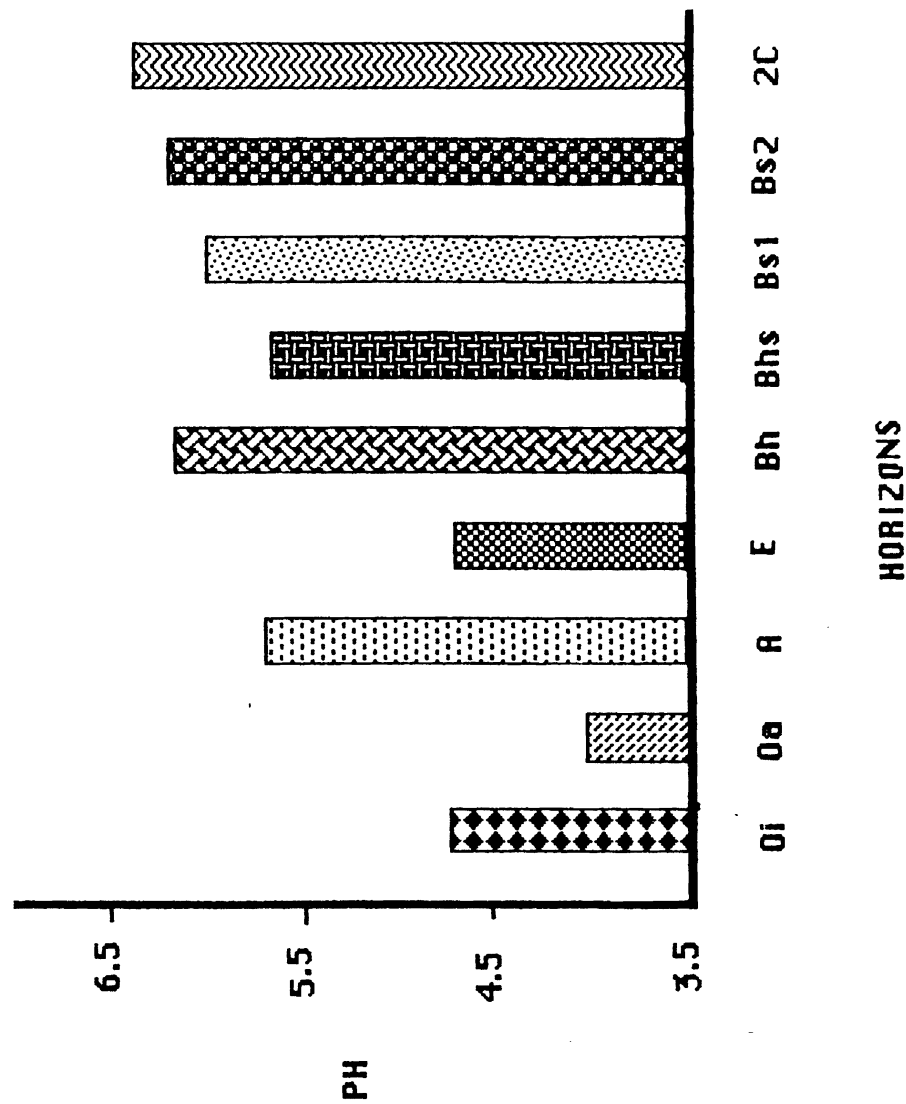
Table 2 Summary of pH determinations for organic soils on
Isle Royale. Isle Royale Soil Survey.

HORIZON	Soil				
	CARBONDALE 1 Site	DAWSON 1 Site	DORA 1 Site	GREENWOOD 1 Site	TACOOSH 1 Site
Surface					
0-12"					
Oi		6.2		3.5	5.4
Oe	4.9		6.0	3.3	
Oa	4.6	5.7			
Subsurface					
12-36"					
Oi		5.7		3.8	
Oe	5.1				
Oa	5.1	5.9	6.0		
Bottom					
> 36"					
Oi					
Oe				3.8	
Oa					
Mineral					
>12"					
Sand		5.9			
Loamy					5.8
Clay			6.6		

Table 3 Summary of pH determinations for gravelly and cobbly soils. Isle Royale Soil Survey.

HORIZON	<u>SOIL</u>	
	ALLOUEZ 1 SITE	WAISKA 17 SITES
Oi		4.7
Oa		4.0
A	6.0	5.7
E		4.7
Bh		6.2
Bhs	5.9	5.7
Bs1	6.1	6.0
Bs2		6.3
2C	6.2	6.4

FIGURE 3 PH OF WAISKA SOILS (COARSE LOAMY MATERIALS OVER GRAVELS AND COBBLES). ISLE ROYALE SOIL SURVEY. COMPOSITE OF NINE LOCATIONS.



acid with increasing pH with depth. Soil pH data is comparable to mainland Waika soils. Earthworm activity is strong and this may account for the pH increase in the A horizons. The lack of a leached E horizon in some profiles maybe the result of earthworm activity. Similiar relationships occur with soils on the mainland at the Ford Forestry Center.

Soils Less than Forty Inchs to Bedrock

Because of the extensive occurrence of bedrock at or near the surface in this portion of the island, Table 4 and Figures 4 to 6 were developed to contrast these soils. Of particular interest is the Ricker soils, <10" organic and mineral mineral materials over bedrock. Few, if any, soils such as Ricker occur in the Midwest. On Isle Royale they occur on recently uplifted bedrock surfaces, 9 - 3,000 years B. P.. Review of the NCSS soil data revealed that similiar soils occur in the New England States. The Soils classed as Ricker on Isle Royale will require NCSS correlation by NCSS personel. Soil reaction of the soils tabulated in the tables are comparable to similiar mainland soils. Earthworm activity was found to be intense in most areas where these soils occur.

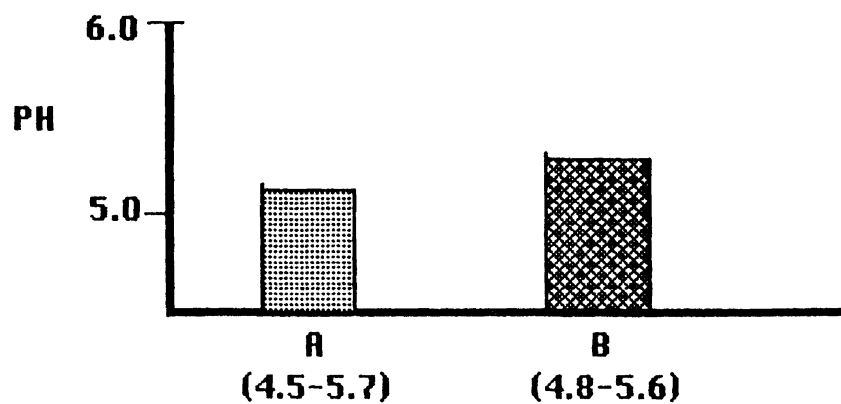
Soils Deeper than Forty Inchs to Bedrock

Not all of the land forms in the northeastern one third of the island have shallow soils. Table 5 and Figures 7 to F9 compare soil reactions for those profiles deeper than forty inchs. Several important trends are: soils that occur in portions of the landscape that have restricted internal soil drainage, soils noted as somewhat poor or poorly drained, have soil profiles with pHs' ranging from slightly acid surfaces to alkaline substratums. As previously discussed this represents a filtering action on the landscape; sandy or coarse textured soils (Champion and Pence soils) that are well drained have more acid profiles whereas well drained finer textured soils (Froberg) are less acid. A normal trend since finer textured soils in this region generally contain more bases. i.e. Ca, in their profiles. Leached E horizons are noticably absent in many of the profiles because of the earthworm activity.

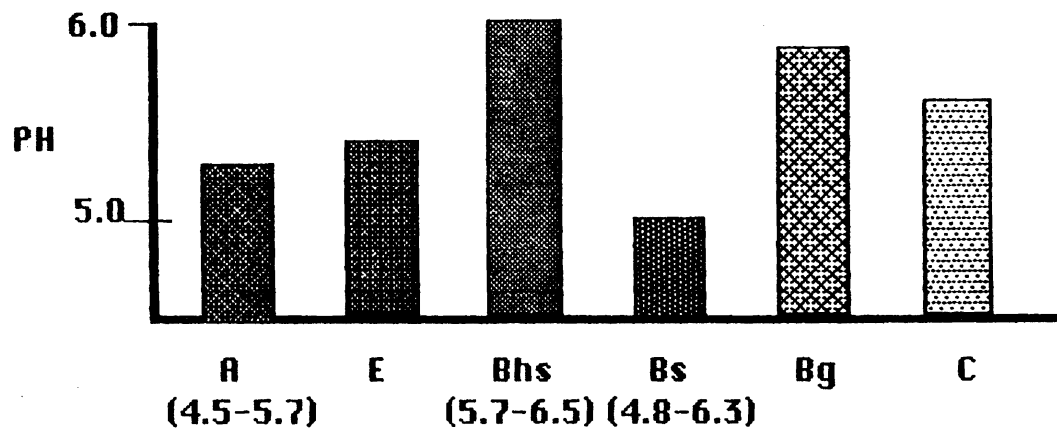
Table 4 Summary of pH determinations for mineral soil materials less than forty inches to bedrock. Isle Royale Soil Survey.

Horizon	Soil					
	Rockland	Ricker	Pesheekee	Deerton	Ishpeming	Michigamme
	<10" Min.	<10"	10-20"	20-40"	20-40"	20-40"
		Org & Min.	Loamy/ lg. Bed.	Sandy/ Sandst	Sandy/ lg. Bed.	Loamy/ lg. Bed.
	7 Sites	11 Sites	12 Sites	1 Site	3 Sites	18 Sites
Oi		5.2	4.4	4.5		5.9
Oe						
Oa	5.1	4.9	4.7			5.7
A	5.1	4.6		5.4	4.6	5.4
AE						5.7
E			3.8			5.9
Bhs			5.0	5.5	6.0	5.5
Bs1			5.5		5.0	5.8
Bs2			5.8			5.9
Bs3						6.0
Bg			6.1	5.9	5.9	
E'x						6.2
C			5.0		5.6	6.4

**Figure 4 PH of Shallow Mineral soils over bedrock.
Isle Royale Soil Survey.**



**ROCKLAND SOILS - MINERAL MATERIALS GENERALLY
6 TO 9 INCHES THICK OVER
IGNEOUS BEDROCK**



**ISHPEMING SOILS -- SANDY MINERAL SOILS GENER-
ALLY MORE THAN 20 INCHES
OVER IGNEOUS BEDROCK.**

FIGURE 5 PH OF PESHEEKEE SOILS (LOAMY MINERAL SOILS 10 TO 20 INCHES OVER IGNEOUS BEDROCK). ISLE ROYALE SOIL SURVEY. TWELVE LOCATIONS TALLIED.

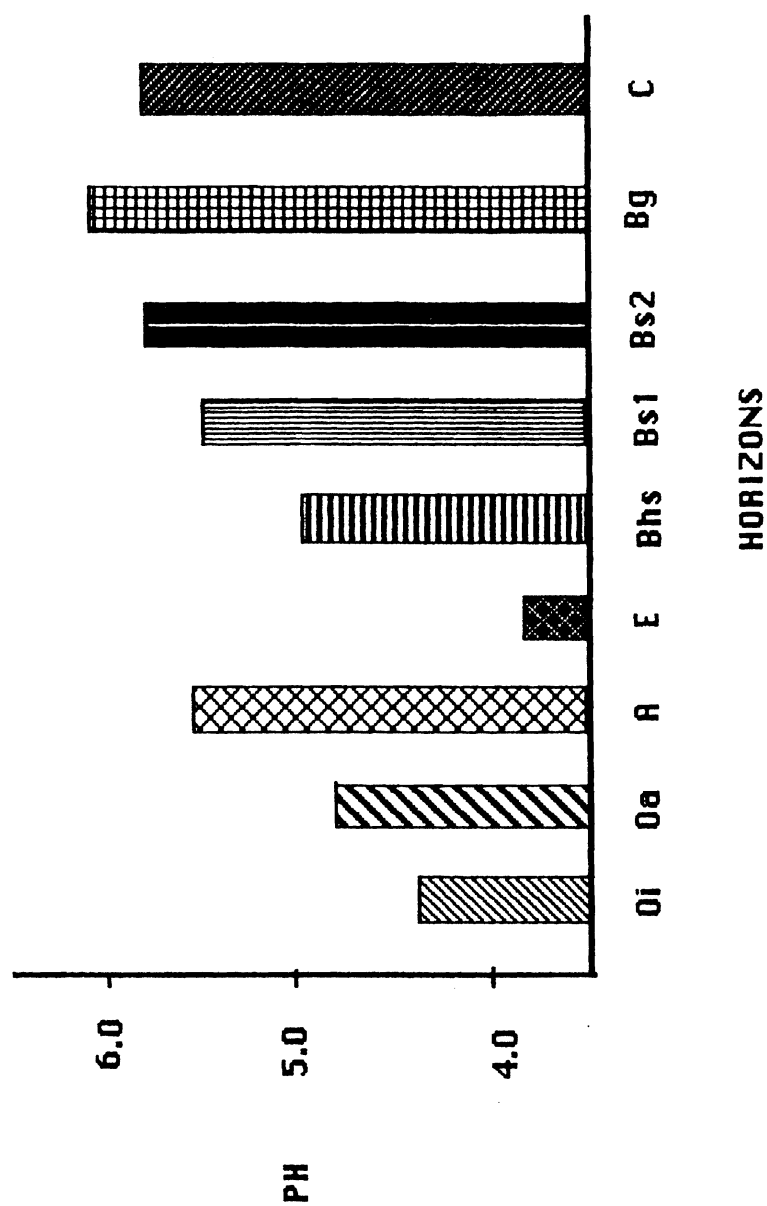


FIGURE 6 PH OF MICHIGAN SOILS (COARSE LOAMY MATERIALS OVER BEDROCK @ 20-40 INCHES). ISLE ROYALE SOIL SURVEY. COMPOSITE OF EIGHTEEN OBSERVATIONS.

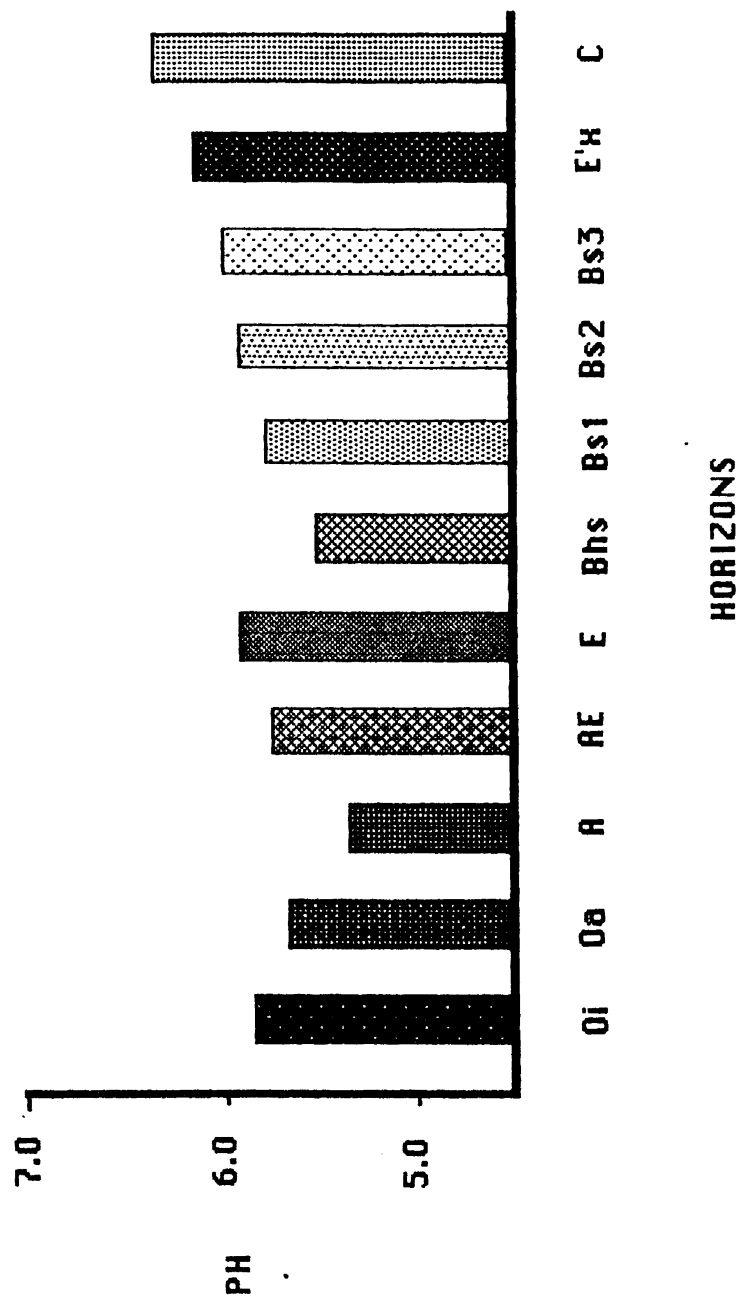


Table 5 Summary of pH determinations for mineral soils over 40 inches to bedrock. Isle Royale Soil Survey.

Horizon	SOIL					
	Allendale Sandy/Fine S.W.P.	Bowers Strat. Cl, Si. S.W.P.	Brevort Sandy/ Loamy P.D.	Bruce Strat. Silt F.S.	Champion Coarse Loamy Pan	Ubly Sandy/ Loamy
	1 Site	2 Sites	1 Site	1 Site	4 Sites	1 Site
Oi	6.0	6.0			5.0	
Oa	6.0		5.8	6.6	5.4	
A	6.1	5.6	5.7		5.9	4.9
AE	6.3				5.4	
EA			6.1			
EB						5.1
Bhs					5.0	
Bs1	6.9				5.8	5.4
Bs2	7.4					
Bsx					6.0	5.6
Bt1		6.3				
Bt2		6.5				
Bg			6.0	7.8		
BC		7.0	6.7			
2C		7.6	6.3	6.6	6.5	6.0

S.W.P. - Somewhat Poorly Drained, P.D. - Poorly Drained, Cl - Clay, F.S. - Fine Sand, Strat. - Stratified, Si. - Silt, Pan - Fragipan.

Table 5 (Con.)

HORIZON	SOIL				
	Fragiboralf Loamy	Froberg Fine/ Coarse	Hettinger Strat. C, C.L. P.D.	Menominee Sandy/ Loamy	Moquah Loamy Alluvium
	1 Site	2 Sites	1 Site	2 Sites	1 Site
Oa		4.8	6.6	6.3	6.8
A		5.6	6.8	6.1	
AE	5.0	5.7			
EA			6.8		
EB		5.3		5.7	7.0
Bs1 & Bg				6.0	7.2
Bs2 & Bw				6.2	7.2
Bs3				5.6	7.2
Bt	5.5	5.7			
Bt	5.7				
Bg			6.5		
BC			7.7		
2Ex	5.8			6.0	
2Bt	6.1			6.7	
2C	6.4	7.0		7.0	

P.D. - Poorly Drained, C.- Clay, C.L. - Clay Loam.

Table 5 (Con.)

HORIZON	SOIL		
	Ocqueoc Coarse Loamy/ Fine	Pence Coarse Loamy	Witbeck Coarse Loamy P.D.
	1 Site	1 Site	1 Site
Oe		4.5	
Oa		4.5	6.0
E	5.2		
Bs1	5.7	5.5	
Bw			6.2
Bs2	6.1	6.1	
Bg			6.2
Bs3		6.2	
2C		6.3	6.3

P.D. - Poorly Drained.

FIGURE 7 PH OF CHAMPION SOILS (COARSE LOAMY MATERIALS). ISLE ROYALE SOIL SURVEY. FOUR LOCATIONS TALLIED

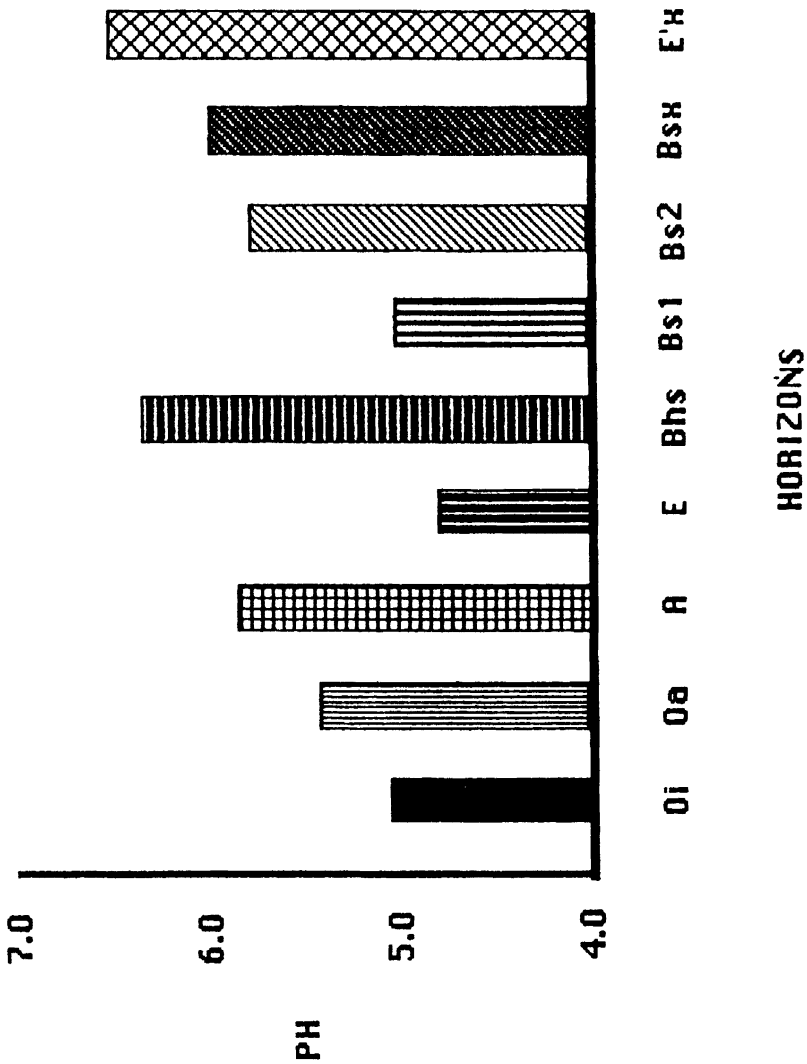
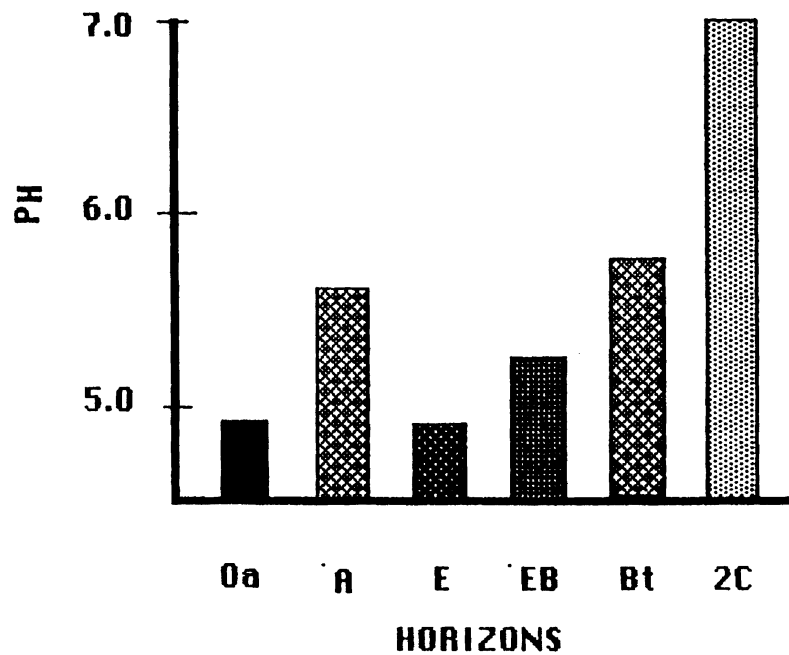
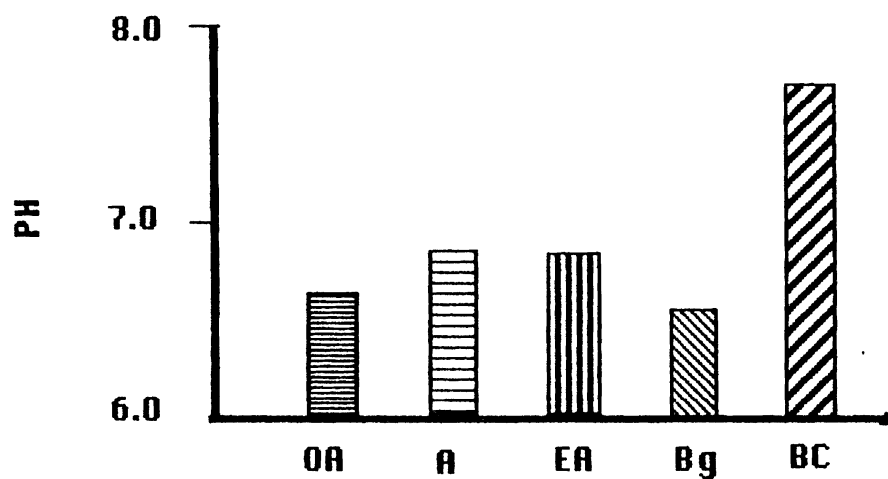


FIGURE 8 PH OF SELECTED SOILS REPRESENTATIVE OF FINER TEXTURED MATERIALS AT WALLACE LAKE AND MOSKEY CAMPGROUND AREA.

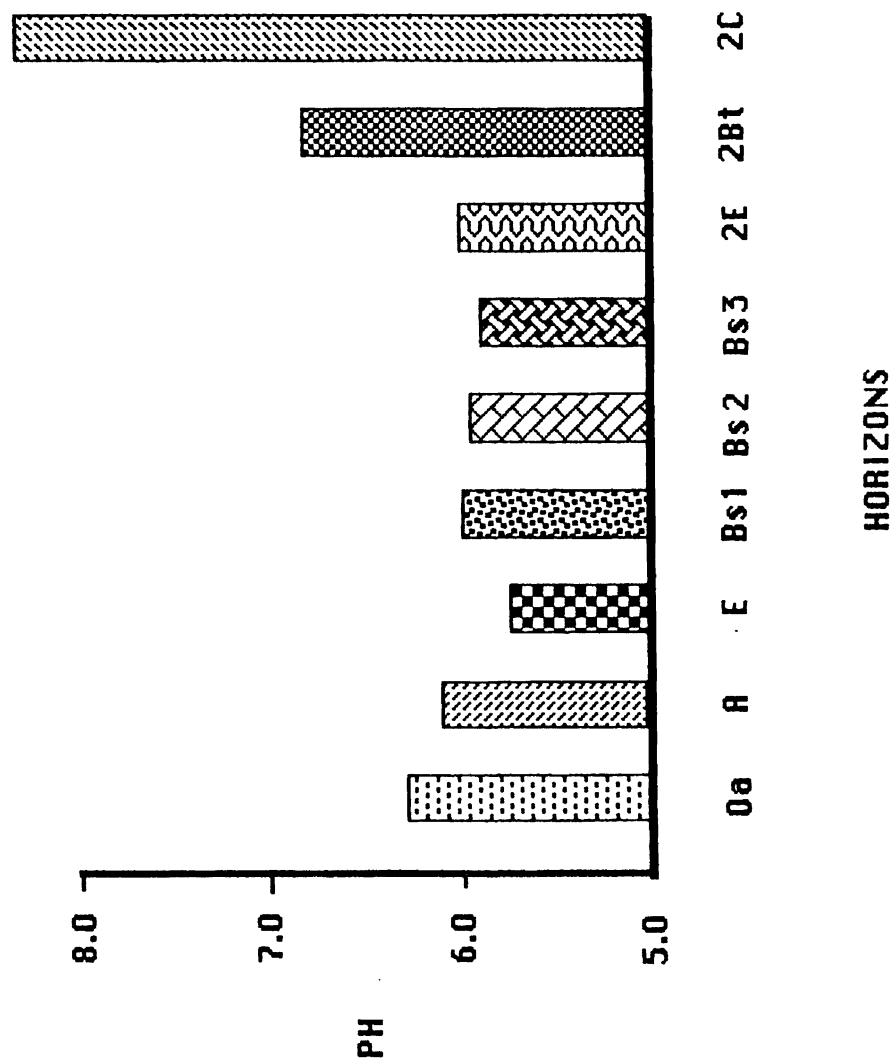


**FROBERG SOILS (FINE OVER COARSE LOAMY)
WALLACE ALKE**



**HETTINGER SOILS (POORLY DRAINED) STRATIFIED
SILTS, CLAYS, SILTY CLAY LOAMS. MOSKEY
CAMPGROUND AREA.**

FIGURE 9 PH OF MENOMINEE SOILS (SANDY OVER LOAMY MATERIALS). ISLE ROYALE SOIL SURVEY. TWO LOCATIONS TALLIED.



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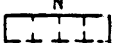
APPENDIX

This section of the annual report contains information referenced in Sections one and two. It is placed here because of the number of pages associated with each item. Also included are summary tables for selected items of data that were not discussed in the previous sections, but, represent data associated with the project.

<u>INDEX</u>	<u>PAGE</u>
1. Soil note card	17
2. SCS soil description form SCS-213	18
3. Copies of Soil- Acid ppt soil pedon descriptions .	19
4. Symbols used for soil mapping	51
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12. Example of soil map field sheet and soil map unit discussion	171

SOIL-WOODLAND CORRELATION - Field Data Sheet

GENERAL INFORMATION

	Sec. _____ Twp. _____ Rge. _____	LAND FORM Bottomla d _____ Ridgetop _____ Brd. leve upland _____ Rolling upland _____ Steep mins. land _____ Other _____	SLOPE Single _____ Complex _____ Gradient _____ Aspect _____ °/A Approx. length _____ Shape _____
	Elevation _____ ft. Precipitation _____ in. Annual _____ in. Gro. Sea. _____ in.	Functional plot _____ Position (circle one) : Low : Mid. : Uppr. : Not influ.	

[illegible]

INDEX FOR SOIL DESCRIPTIONS - SOIL-ACID PPT PH DATA**HARDWOODS**

<u>SOIL</u>	<u>PEDON CODING NO.</u>	<u>PAGE</u>
Ishpeming	01C082	20
Champion	02C084	21
Champion	03C085	22
Champion	04C087	23
Ubyly Var.	04E089	24
Superior	06NS088	25
Nunica	07N051	26
Bruce	08H050	27
Yalmer Fine V.	09M083	28
Waiska Sh. V.	10W017	29
Michigamma		
Ent. Var.	11C097	30
Froberg	12F128	31
Waiska Sh. V.	13WV134	32
Froberg Var.	14F136	33
Pesheek	15P137	34

CONIFER

Pence	01P135	35
Ishpeming	02I138	36
Witbeck (F. V.)	03W086	37
Pesheek	04M133	38
Michigamme	05M018	39
Onota Var.	06NS091	40
Ricker Var.	07RV042	41
Ricker	08R121	42
Ricker	09R140	43
Pesheek	002P10	44
Ishpeming	093P12	45
Pesheek	039P12	46
Waiska	138AW13	47
Champion	132C14	48
Ricker	1300R15	49

NOTE: PH values for the above description will found on pages
 165-166 (hardwoods); 167-168 (conifers). All descriptions require
 NCSS for taxonomy and names.

SERIES: ISHPEMING
SOIL SURVEY # S87-MI-083-082

NSSL ID #: 01C082

LOCATION: SW1/4 of SW1/4 of SEC. 33, T65N R36W.

LATITUDE: 47-58-50-N

LONGITUDE: 088-53-25-W

CLASSIFICATION: Sandy, mixed, frigid Entic Haplorthod

PHYSIOGRAPHY: Broad plain in glaciated uplands

GEOMORPHIC POSITION: backslope sideslope

MICRORELIEF:

SLOPE: 15% plane, south facing

ELEVATION: 919 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: -7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 2

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 30 irUNOFF: Rapid

PARENT MATERIAL: glacial till

DIAGNOSTIC HORIZONS: 0 to 6 inches Ochric 10 to 30 inches Spodic 30 to 39 inches Fragipan 39
to 0 inches Lithic contact

DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSO SAMPLE DATE: 07/87

Acid precipitation plot: hardwoods; 95% White Birch.

A-- 0 to 6 in; black (10YR 2/1) mucky silt loam; moderate coarse granular structure; friable; many 01 roots throughout and many 02 roots throughout; many 02 rounded worm casts; very strongly alkaline; abrupt smooth boundary.

BE-- 6 to 10 in; dark brown (7.5YR 3/2) sandy loam; weak fine subangular blocky structure; friable; many 01 roots throughout and many 02 roots throughout; common continuous distinct black (10YR 2/1) organic coats on rock fragments; coats; common 02 rounded worm casts; 10 percent pebbles; 15 percent cobbles; very strongly alkaline; clear wavy boundary. Common, patchy, distinct, clay skins on coarse (rock) fragments faces in this horizon.

Bs1-- 10 to 30 in; dark brown (7.5YR 3/4) loamy sand; weak medium subangular blocky structure; firm; few 01 roots throughout and few 02 roots throughout; 10 percent pebbles; very strongly alkaline.

B/Ex-- 30 to 39 in; dark brown (7.5YR 3/4) and brown to dark brown (7.5YR 4/2) loamy sand; moderate medium platy structure; very firm; 10 percent pebbles; very strongly alkaline. No roots.

R-- 39 to 39 in; / ; /.
Igneous bedrock

SERIES: CHAMPION
SOIL SURVEY # S87-MI-083-084

NSSL ID #: 02C084

LOCATION: NE1/4 of NE1/4 of SEC. 17, T64N R37W.

LATITUDE: 47-56-00-N

LONGITUDE: 089-01-30-W

CLASSIFICATION: Coarse-loamy, mixed, frigid Typic Fraglorthod

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 7% plane, west facing

ELEVATION: 1247 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Rangeland grazed

STONINESS:

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 12 in RUNOFF: Moderate

PARENT MATERIAL: glacial drift from mixed material

DIAGNOSTIC HORIZONS: 0 to 1 inches Ochric 1 to 12 inches Spodic 12 to 22 inches Fragipan

DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSSAMPLE DATE: 07/87

Acid precipitation plot: hardwoods 90% Sugar Maple, 10% White Birch.

Oi-- 2 to 1 in; strong brown (7.5YR 4/6) and dark reddish brown (5YR 2/2) KFB; strong medium granular structure; very friable; many O1 roots throughout and many O2 roots throughout; common O2 rounded worm casts; abrupt smooth boundary.

Oa-- 1 to 0 in; dark reddish brown (5YR 2/2) sapric material; strong medium granular structure; very friable; many O1 roots throughout and many O2 roots throughout; common O2 rounded worm casts; abrupt smooth boundary.

AB-- 0 to 1 in; dark brown (7.5YR 3/2) mucky silt loam; weak fine subangular blocky structure parting to strong fine granular; very friable; many O1 roots throughout and many O2 roots throughout; common O2 rounded worm casts; abrupt smooth boundary.
Horizon not sampled.

Bs-- 1 to 12 in; 43 (7.5YR 4/3) gravelly silt loam; common O1 faint yellowish red (5YR 4/6) and common O1 faint 33 (7.5YR 3/3) mottles; weak medium subangular blocky structure parting to strong medium granular; firm; common O1 roots throughout and common O2 roots throughout; 15 percent pebbles; 10 percent cobbles; abrupt smooth boundary.

2EBx-- 12 to 22 in; brown to dark brown (7.5YR 4/2) and brown to dark brown (7.5YR 4/4) GRF loam; moderate medium platy structure; very firm; few O1 roots throughout; common O1 vesicular pores; few patchy faint brown to dark brown (7.5YR 4/2) skeletalans (sand or silt) on vertical and horizontal faces of peds; 20 percent pebbles; clear wavy boundary.

C-- 22 to 59 in; brown to dark brown (7.5YR 4/4) very gravelly sandy loam; common O2 distinct yellowish red (5YR 4/6) mottles; massive; firm; 20 percent pebbles; 10 percent cobbles; very strongly alkaline.

SERIES: CHAMPION

NSSL ID #: 03C085

SOIL SURVEY # S87-MI-o83-085

LOCATION: NE1/4 of SE1/4 of SEC. 23, T64N R38W.

LATITUDE: 47-55-30-N

LONGITUDE: 089-05-00-W

CLASSIFICATION: Coarse-loamy, mixed, frigid Typic Fragiorthod

PHYSIOGRAPHY: Terrace; outwash or marine in glaciated uplands

GEOMORPHIC POSITION: on upper third of component backslope headslope

MICRORELIEF:

SLOPE: 14% plane, northwest facing

ELEVATION: 1083 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS:

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 11 in

RUNOFF: Moderate

PARENT MATERIAL: glacial outwash from mixed material

DIAGNOSTIC HORIZONS: 0 to 2 inches Ochric 2 to 11 inches Spodic 11 to 31 inches Fragipan

DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSSAMPLE DATE: 07/87

Acid precipitation plot: hardwoods; Sugar Maple, Yellow Birch.

Oi/a-- 1 to 0 in; 20 (0 2/0) KFB and sapric material; dark brown (7.5YR 3/4) dry; moderate medium granular structure; ; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.

E-- 0 to 2 in; weak red (2.5YR 4/2) GRF sandy loam; dark reddish gray (5YR 4/2) dry; weak fine subangular blocky structure; soft; common 03 roots throughout and many 02 roots throughout; 30 percent pebbles; abrupt smooth boundary.

Bhs-- 2 to 4 in; 33 (2.5YR 3/3) GRF fine sandy loam; weak fine subangular blocky structure; friable; common 03 roots throughout and very few to few roots; 30 percent pebbles; abrupt broken boundary.

Bs-- 4 to 11 in; dark reddish brown (5YR 3/4) GKF fine sandy loam; weak medium subangular blocky structure; firm; common 02 roots throughout and common 03 roots throughout; 20 percent pebbles; clear wavy boundary.

Bsx-- 11 to 31 in; brown to dark brown (7.5YR 4/4) very gravelly loamy fine sand; common coarse prominent brown to dark brown (7.5YR 4/2) mottles; strong C platy structure; extremely firm; few 02 roots throughout; 25 percent pebbles; 30 percent cobbles.

Vey cobbly, could not penetrate below 31 inches.

SERIES: CHAMPION

NSSL ID #: 04C087

SOIL SURVEY # S87-MI-083-087

LOCATION: NW 1/4 of SE 1/4 of SEC. 28, T64N R38W.

LATITUDE: 47-54-40-N

LONGITUDE: 089-08-00-W

CLASSIFICATION: Sandy, mixed, frigid Typic Fragiorthod

PHYSIOGRAPHY: Terrace; outwash or marine in glaciofluvial landform

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 11% plane, southeast facing

ELEVATION: 935 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: -7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 24 in RUNOFF: Rapid

PARENT MATERIAL: glacial outwash from mixed material over glacial till from mixed material

DIAGNOSTIC HORIZONS: 0 to 5 inches Ochric 5 to 24 inches Spodic 24 to 30 inches Fragipan

DESCRIBED BY: S. W. SPRECHER and G. T. ANDESAMPLE DATE: 07/87

Acid precipitation plot: hardwoods; Yellow and White Birch.

AE-- 0 to 5 in; dark reddish brown (5YR 3/2) loam; strong fine subangular blocky structure; friable; many 01 roots throughout and many 02 roots throughout; 05 percent pebbles; clear wavy boundary.

Bs1-- 5 to 10 in; dark reddish brown (5YR 3/4) loam; moderate medium subangular blocky structure; firm; common 01 roots throughout and common 02 roots throughout; common continuous distinct dark reddish brown (5YR 3/2) clay films on rock fragments; 05 percent pebbles; abrupt wavy boundary.

2Bs2-- 10 to 24 in; dark brown (7.5YR 3/4) loamy sand; weak fine subangular blocky structure; firm; few 01 roots throughout and few 02 roots throughout; 10 percent pebbles; 10 percent cobbles; abrupt wavy boundary.

2Bsx-- 24 to 30 in; brown to dark brown (7.5YR 4/2) GRF loamy sand; c 01 distinct dark brown (7.5YR 3/4) mottles; weak coarse platy structure; very firm; few 01 roots throughout; common very fine vesicular pores; 20 percent pebbles; 10 percent cobbles; clear smooth boundary.

2C-- 30 to 36 in; dark brown (7.5YR 3/2) GRF loamy sand and GRF loamy fine sand; massive; firm; 20 percent pebbles; 10 percent cobbles.

Stratified LFS, LS, SL. Stopped by rocks at 092 CM.

SERIES: UBLV Variant

NSSL ID #: 05E089

SOIL SURVEY # S87-MI-100-089

LOCATION: SE 1/4 of NW 1/4 of SEC. T63N R3/W.

LATITUDE: 47-53-30-N

LONGITUDE: 089-00-00-W

CLASSIFICATION: Coarse-loamy, mixed, frigid Alfic Fragiorthod

PHYSIOGRAPHY: Barrier bar in glaciofluvial landform

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 5% plane, north facing

ELEVATION: 689 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately slow

AIR TEMPERATURE: ANN: , SUM: , WIN:

SOIL TEMPERATURE: ANN: , SUM: , WIN:

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS:

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 15 iRUNOFF: Moderate

PARENT MATERIAL: glacial outwash from mixed material over glacial drift from mixed material

DIAGNOSTIC HORIZONS: 0 to 3 inches Ochric 6 to 15 inches Spodic 15 to 26 inches Fragipan

DESCRIBED BY: S. W. SPRECHER AND G. T. ANDESAMPLE DATE: 07/87

Acid precipitation plot: hardwoods; White Birch.

A-- 0 to 3 in; dark reddish brown (5YR 3/2) silt loam; strong medium granular structure; very friable; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; 05 percent pebbles; abrupt wavy boundary. Many earthworms.

E/B-- 3 to 6 in; reddish gray (5YR 5/2) and reddish brown (5YR 4/4) fine sandy loam and fine sandy loam; moderate medium granular structure; friable; common 01 roots throughout and common 02 roots throughout; common discontinuous faint skeletal (sand or silt) on faces of peds; coats; common 02 rounded worm casts; 07 percent pebbles; abrupt broken boundary.

Bs-- 6 to 15 in; reddish brown (5YR 4/4) and yellowish red (5YR 4/6) exterior fine sandy loam; moderate medium granular structure; friable; common 01 roots throughout and common 02 roots throughout; 07 percent pebbles; abrupt smooth boundary. Stone line at 27 CM.

2Ex-- 15 to 22 in; reddish brown (5YR 4/3) and yellowish red (5YR 4/6) exterior GRF sandy loam; moderate coarse platy structure; very firm; few 01 roots throughout and few 02 roots throughout; few very fine vesicular pores; 15 percent pebbles; abrupt smooth boundary.

2Btx-- 22 to 26 in; reddish brown (5YR 4/4) sandy clay loam; strong coarse platy structure; extremely firm; common very fine vesicular pores; few discontinuous faint reddish brown (5YR 4/3) clay films on faces of peds; 10 percent pebbles; abrupt smooth boundary.

2C-- 26 to 31 in; dark reddish brown (2.5YR 3/4) gravelly clay loam; massive; very firm; 10 percent pebbles; 10 percent cobbles. Cobbles at 80CM., could not penetrate with auger.

SERIES: SUPERIOR

NSSL ID #: 06NS088

SOIL SURVEY # S87-MI-083-088

LOCATION: SW 1/4 of SW 1/4 of SEC. 32, T64N R38W.

LATITUDE: 47-54-00-N

LONGITUDE: 089-10-00-W

CLASSIFICATION: Coarse-loamy over clayey, mixed Alfic Haplorthod

PHYSIOGRAPHY: Terrace; outwash or marine in glaciofluvial landform

GEOMORPHIC POSITION: on middle third of component summit crested hills

MICRORELIEF:

SLOPE: 14% plane, west facing

ELEVATION: 722 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: -7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS:

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 15 in RUNOFF: Rapid

PARENT MATERIAL: glacial outwash from mixed material over lacustrine from mixed material over glacial till from mixed material

DIAGNOSTIC HORIZONS: 0 to 8 inches Ochric 8 to 13 inches Argillic 15 to 21 inches Fragipan

DESCRIBED BY: S. SPRECHER and G. ANDERSON. SAMPLE DATE: 07/87

Acid precipitation plot: hardwoods; Yellow and White Birch.

A/B-- 0 to 8 in; loam and loam; dark brown (7.5YR 3/2) and brown to dark brown (7.5YR 4/4) dry; strong medium subangular blocky structure; slightly hard; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; clear wavy boundary.

Bt-- 8 to 13 in; brown to dark brown (7.5YR 4/4) loam; moderate fine subangular blocky structure; firm; common 01 roots throughout and common 02 roots throughout; D F faint brown to dark brown (7.5YR 4/4) clay films on faces of peds; 05 percent pebbles; clear wavy boundary.

Bx-- 13 to 15 in; brown to dark brown (7.5YR 4/2) sandy loam; moderate coarse platy structure parting to strong medium platy; very firm; common 01 vesicular pores; many continuous prominent brown (7.5YR 5/4) skeletans (sand or silt) on faces of peds; 05 percent pebbles; abrupt smooth boundary.

Ex-- 15 to 21 in; loam; dark reddish gray (5YR 4/2) dry; many 01 distinct reddish brown (5YR 4/3) mottles; moderate coarse platy structure; extremely firm; many continuous prominent reddish brown (5YR 4/4) skeletans (sand or silt) on faces of peds; 05 percent pebbles; abrupt wavy boundary.
Mottles in ped interiors.

Btx-- 21 to 24 in; dark reddish brown (5YR 3/3) clay loam; common 01 prominent strong brown (7.5YR 5/6) mottles; strong medium angular blocky structure; very firm; common 01 vesicular pores; common continuous distinct yellowish red (5YR 4/6) clay films on faces of peds; 05 percent pebbles.
Mottles in ped interiors.

2BC-- 24 to 30 in; reddish brown (5YR 4/3) clay; common 01 faint yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; firm; common 01 vesicular pores; few patchy distinct skeletans (sand or silt) on vertical and horizontal faces of peds.
Mottles in ped interiors.

2C-- 30 to 39 in; reddish brown (5YR 4/3) clay; common 01 faint reddish brown (5YR 4/4) and common 01 faint yellowish red (5YR 4/6) mottles; weak coarse subangular blocky structure; firm.
Mottles in ped interiors.

3C-- 39 to 45 in; reddish brown (5YR 4/4) sandy clay loam and cobbly clay loam; ; 25 percent cobbles.
Stratified sand, sandy clay loam and clay loam.

SERIES: NUNICA

NSSL ID #: 07N051

SOIL SURVEY # S87-MI-083-051

LOCATION: NE 1/4 of NW 1/4 of SEC. 5, T66N R34W.

LATITUDE: 48-04-00-N

LONGITUDE: 088-38-00-W

CLASSIFICATION: Fine, mixed Eutric Glossoboralf

PHYSIOGRAPHY: Terrace; outwash or marine in glaciofluvial landform

GEOMORPHIC POSITION: on upper third of component backslope headslope

MICRORELIEF:

SLOPE: 6% plane, south facing

ELEVATION: 607 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS:

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 8 to 16 in RUNOFF: Rapid

PARENT MATERIAL: lacustrine from mixed material

DIAGNOSTIC HORIZONS: 0 to 5 inches Mollic 8 to 16 inches Argillic

DESCRIBED BY: S. SPRECHER and G. ANDERSON. SAMPLE DATE: 06/87

cid precipitation plot: hardwoods; Alder, Ash, Aspen. Elevation and landscapes correlate with Nippissing shorelines. This profile may be of lacustrine origin.

A-- 0 to 5 in; dark brown (7.5YR 3/2) loam; strong medium granular structure; very friable; many 01 roots throughout and many 02 roots throughout; many 02 rounded worm casts; clear wavy boundary.

E/A-- 5 to 8 in; 53 (7.5YR 5/3) and dark brown (7.5YR 3/2) silt loam; common 01 faint 44 (7.5Yr 4/4) mottles; moderate fine subangular blocky structure; friable; many 01 roots throughout; common 02 rounded worm casts; very strongly alkaline; clear wavy boundary.
Many worm channels.

Bt1-- 8 to 11 in; reddish brown (5YR 4/4) clay loam; common 01 distinct yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; very firm; common 01 roots throughout; common discontinuous faint reddish brown (5YR 5/3) clay films on faces of peds; many patchy prominent dark gray (10YR 4/1) organic coats in root channels and/or pores; common 02 rounded worm casts; clear wavy boundary.
Many worm channels.

Bt2-- 11 to 16 in; reddish brown (5YR 4/4) clay; few 02 faint strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very firm; common 01 roots throughout; common continuous distinct reddish brown (5YR 5/3) clay films on vertical and horizontal faces of peds; common 02 rounded worm casts; very strongly alkaline; clear wavy boundary.
Many worm channels. Many, patchy, prominent, organic coatings in root channels and pores; color is 10YR4/1.

BC-- 16 to 22 in; reddish brown (5YR 4/3) clay loam; few 01 faint yellowish red (5YR 5/6) mottles; weak medium subangular blocky structure; very firm; few 01 roots throughout; common discontinuous faint reddish brown (5YR 5/3) clay films on vertical and horizontal faces of peds; very strongly alkaline; clear wavy boundary.

C-- 22 to 31 in; reddish brown (5YR 4/4) clay loam; massive; very firm; few 02 irregular soft masses of carbonate. Strata of clay were noted in the C horizon, 5 YR 5/2, which may be indicative of a lacustrine origin

SERIES: BRUCE R

NSSL ID #: 08H050

SOIL SURVEY # S87-MI-084-050

LOCATION: NE 1/4 of NW 1/4 of SEC. 5, T66N R34W.

LATITUDE: 48-04-00-N

LONGITUDE: 088-38-00-W

CLASSIFICATION: Fine-loamy, mixed, nonacid, frigid Aeric Haplaquept

PHYSIOGRAPHY: Abandoned Channel in glaciofluvial landform

GEOMORPHIC POSITION: on lower third of component toeslope sideslope

MICRORELIEF:

SLOPE: 4% convex, north facing

ELEVATION: 607 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: -7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Somewhat poorly drained

LAND USE: Forest land not grazed

STONINESS:

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 39 in RUNOFF: Moderate

PARENT MATERIAL: Forest land not grazed from mixed material

DIAGNOSTIC HORIZONS: 0 to 5 inches Ochric 8 to 20 inches Cambic

DESCRIBED BY: S. SPRECHER and G. ANDERSON SAMPLE DATE: 06/87

Acid precipitation plot: hardwoods; Alder, Ash, Aspen.

A-- 0 to 5 in; very dark gray (5YR 3/1) loam; weak medium granular structure; very friable; many 01 roots throughout and many 02 roots throughout; many 02 rounded worm casts; clear wavy boundary.

E/A-- 5 to 8 in; reddish brown (5YR 4/3) and very dark gray (5YR 3/1) loam and loam; few 02 distinct brown (7.5YR 5/2) and few 01 distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure parting to moderate medium subangular blocky parting to weak medium granular; friable; many 01 roots throughout and many 02 roots throughout; common patchy distinct skeletans (sand or silt) on vertical and horizontal faces of peds; many 02 rounded worm casts; clear wavy boundary.

Bg-- 8 to 10 in; brown to dark brown (7.5YR 4/2) very fine sandy loam; many 03 distinct brown to dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; common 01 roots throughout and common 02 roots throughout; abrupt smooth boundary.

Bw-- 10 to 17 in; strong brown (7.5YR 5/6) and brown to dark brown (7.5YR 4/2) exterior silty clay loam; common 02 distinct yellowish red (5YR 5/6) mottles; weak coarse subangular blocky structure; firm; common 01 roots throughout and common 02 roots throughout; clear wavy boundary.

BC-- 17 to 20 in; brown to dark brown (7.5YR 4/4) very fine sandy loam; many 03 prominent brown to dark brown (7.5YR 4/2) and common 01 distinct yellowish red (5YR 4/6) mottles; weak very coarse platy structure; firm; few 01 roots throughout and few 02 roots throughout; many patchy distinct skeletans (sand or silt) on vertical and horizontal faces of peds; clear wavy boundary.

2C1-- 20 to 30 in; reddish brown (5YR 4/4) silty clay loam; common 01 distinct yellowish red (5YR 4/6) and common 01 distinct strong brown (7.5YR 5/6) mottles; moderate very coarse platy structure; /, firm; common discontinuous distinct clay films on vertical and horizontal faces of peds; gradual wavy boundary.

2C2-- 30 to 39 in; reddish brown (5YR 4/3) silty clay loam; many 01 distinct reddish brown (5YR 4/4) mottles; moderate coarse platy structure parting to moderate FA blocky; /, firm.

SERIES: YALMER FINE VAR. NSSL ID #: 09M083
SOIL SURVEY # S87-MI-083-083
LOCATION: SE 1/4 of SW 1/4 of SEC. 2, T64N R37W.
LATITUDE: 47-58-00-N LONGITUDE: 088-58-00-W
CLASSIFICATION: Sandy over clayey, mixed, frigid Alfic Haplothod
PHYSIOGRAPHY: Terrace; outwash or marine in glaciated uplands
GEOMORPHIC POSITION: on upper third of component shoulder headslope
MICRORELIEF:
SLOPE: 8% convex, east facing ELEVATION: 919 ft MSL
PRECIPITATION: 33 inches Udic moisture regime MLRA: 93
WATER TABLE DEPTH: PERMEABILITY: Moderately slow
DRAINAGE: Moderately well drained LAND USE: Forest land not grazed
STONINESS: CLASS 1 EROSION OR DEPOSITION: Slight
PARTICLE SIZE CONTROL SECTION: 10 to 23 irUNOFF: Moderate
PARENT MATERIAL: glacial outwash from mixed material over glacial drift from mixed material
DIAGNOSTIC HORIZONS: 0 to 4 inches Ochric 7 to 23 inches Spodic 23 to 35 inches Fragipan
DESCRIBED BY: S. SPRECHER and G. ANDERSON SAMPLE DATE: 07/87

Acid precipitation plot: haerdwoods; White Birch, Sugar Maple, Yellow Birch. Horizon described in the evening with a light rain.

A-- 0 to 4 in; very dark gray (10YR 3/1) silt loam; strong medium granular structure; friable; many 01 roots throughout and many 02 roots throughout; many 02 rounded worm casts; abrupt smooth boundary.

EA-- 4 to 7 in; dark reddish brown (5YR 3/3) GRF loam; moderate fine subangular blocky structure; friable; many 01 roots throughout and many 02 roots throughout; 30 percent pebbles; abrupt smooth boundary.

Bs-- 7 to 23 in; dark reddish brown (5YR 3/4) GRF loamy sand; weak fine subangular blocky structure; firm; common 01 roots throughout and common 02 roots throughout; 20 percent pebbles; clear irregular boundary.

Bx-- 23 to 24 in; 33 (7.5YR 3/3) GRF loamy sand; moderate fine platy structure; very firm; 20 percent pebbles; abrupt broken boundary.
Discontinuous horizon.

Ex-- 24 to 35 in; reddish brown (5YR 4/3) GRF loamy sand; common 02 faint strong brown (7.5YR 5/6) mottles; moderate medium platy structure; extremely firm; 35 percent pebbles; abrupt smooth boundary.

2C-- 35 to 59 in; reddish brown (5YR 4/3) and dark reddish gray (5YR 4/2) GRF clay loam; massive; very firm; 25 percent pebbles; boundary.

SERIES: WAISKA SHALL. VAR
SOIL SURVEY # S87-MI-083-107
LOCATION: NW 1/4 of SW 1/4 of SEC. 8, T66N R33W.
LATITUDE: 48-07-30-N
CLASSIFICATION: Sandy-skeletal, mixed, frigid Lithic Haplorthod
PHYSIOGRAPHY: Terrace; outwash or marine in glaciofluvial landform
GEOMORPHIC POSITION: on middle third of component backslope sideslope
MICRORELIEF:
SLOPE: 14% convex, southeast facing
PRECIPITATION: 33 inches Udic moisture regime
WATER TABLE DEPTH:
AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7
SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6
DRAINAGE: Moderately well drained
STONINESS: CLASS 5
PARTICLE SIZE CONTROL SECTION: 10 to 24 in
PARENT MATERIAL: glacial drift from mixed material
DIAGNOSTIC HORIZONS: 0 to 6 inches Ochric 6 to 24 inches Spodic
DESCRIBED BY: S. SPRECHER and G. ABDERSON. SAMPLE DATE: 07/87

NSSL ID #: 10W107
LONGITUDE: 088-31-30-W
ELEVATION: 640 ft MSL
MLRA: 93
PERMEABILITY: Rapid

Acid precipitation plot: hardwoods; White Birch.

0i-- 3 to 0 in; KFB ; very dark gray (10YR 3/1) and brown to dark brown (7.5YR 4/4) dry; weak coarse platy structure; soft; many 01 roots throughout and many 02 roots throughout; few 02 rounded worm casts; abrupt wavy boundary.

0a-- 0 to 2 in; extremely gravelly SA ; very dark brown (10YR 2/2) dry; weak fine granular structure; soft; many 01 roots throughout and many 02 roots throughout; many continuous prominent organic coats on rock fragments; 40 percent pebbles; 20 percent cobbles; 20 percent cobbles; clear wavy boundary.
Organic carbon content appears greater than 20%.

Bhs-- 2 to 24 in; extremely gravelly coarse sand; dark reddish brown (5YR 3/3) dry; single grain; hard; many 01 roots throughout and many 02 roots throughout; many continuous prominent organic coats on rock fragments; 40 percent pebbles; 20 percent cobbles; 20 percent stones; abrupt irregular boundary.

2R-- 24 to 24 in; weathered bedrock.

SERIES: MICHIGAMME ENT VAR

NSSL ID #: 11C097

SOIL SURVEY # S87-MI-100-097

LOCATION: NW 1/4 of SE 1/4 of SEC. 6, T66N R33W.

LONGITUDE: 088-32-00-W

LATITUDE: 48-08-30-N

CLASSIFICATION: Coarse-loamy, mixed, frigid Typic Haplorthod

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 24% plane, southeast facing

ELEVATION: 787 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderate

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Well drained

LAND USE: Forest land not grazed

STONINESS:

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 17 in RUNOFF: Rapid

PARENT MATERIAL: glacial till from mixed material

DIAGNOSTIC HORIZONS: 0 to 1 inches Ochric 1 to 17 inches Spodic 17 to 28 inches Fragipan 35 to 0 inches Lithic contact

DESCRIBED BY: S. SPRECHER and G. ANDERSON. SAMPLE DATE: 07/87

Acid precipitation plot: hardwoods; Aspen, White Birch.

Oa-- 4 to 0 in; SA ; very dark gray (5YR 3/1) dry; weak very coarse platy structure; soft; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.

E/B-- 0 to 1 in; sandy loam; dark reddish gray (5YR 4/2) and dark reddish brown (5YR 3/3) dry; weak fine subangular blocky structure; loose; many 01 roots throughout and many 02 roots throughout; abrupt broken boundary. Discontinuous horizon.

Bs1-- 1 to 8 in; brown to dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; many 01 roots throughout and many 02 roots throughout; 05 percent pebbles; 05 percent cobbles; clear wavy boundary.

Bs2-- 8 to 17 in; dark yellowish brown (10YR 4/4) fine sandy loam; weak C subangular blocky structure; friable; common 02 roots throughout and common 03 roots throughout; 10 percent pebbles; 05 percent cobbles; clear wavy boundary.

Bt-- 17 to 24 in; dark yellowish brown (10YR 4/4) gravelly fine sandy loam; weak medium subangular blocky structure parting to moderate medium platy; firm; few 01 roots throughout and few 02 roots throughout; few 01 vesicular pores; few patchy faint skeletans (sand or silt) on faces of peds; 15 percent pebbles; 05 percent cobbles; abrupt wavy boundary.

Ex-- 24 to 28 in; brown to dark brown (10YR 4/3) gravelly loamy sand; weak medium subangular blocky structure parting to moderate fine platy; very firm; few 01 vesicular pores; 25 percent pebbles; 05 percent cobbles; clear wavy boundary.

C-- 28 to 35 in; dark yellowish brown (10YR 4/4) very gravelly sandy loam; massive; firm; 40 percent pebbles; 05 percent cobbles; abrupt smooth boundary.

R-- 35 to 35 in; unweathered bedrock.
Igneous bedrock

SERIES: FROBERG

NSSL ID #: 12F128

SOIL SURVEY # S87-MI-083-128

LOCATION: SW 1/4 OF NW 1/4 of SEC. 4, T65N R34W.

LATITUDE: 48-03-30-N

LONGITUDE: 088-38-00-W

CLASSIFICATION: Clayey over loamy, mixed Typic Eutroboralf

PHYSIOGRAPHY: Terrace; stream or lake in glaciofluvial landform

GEOMORPHIC POSITION: on lower third of component footslope sideslope

MICRORELIEF:

SLOPE: 6% plane, southeast facing ELEVATION: 656 ft MSL

PRECIPITATION: 33 inches Udic moisture regime MLRA: 93

WATER TABLE DEPTH: PERMEABILITY: Moderately slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained LAND USE: Forest land not grazed

STONINESS: CLASS 1 EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 11 to 20 iRUNOFF: Rapid

PARENT MATERIAL: lacustrine from mixed material over glacial drift from mixed material

DIAGNOSTIC HORIZONS: 0 to 2 inches Ochric 11 to 20 inches Argillic

DESCRIBED BY: S. SHETRON and S. SPRECHER. SAMPLE DATE: 09/87

Acid precipitation plot: hardwoods; Alder, Aspen, White Birch.

Oa-- 0 to 2 in; 20 (0 2/0) mucky sandy loam; very friable; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; abrupt smooth boundary.

E-- 2 to 8 in; reddish gray (5YR 5/2) sandy loam; few 02 faint brown to dark brown (7.5YR 4/4) mottles; weak coarse platy structure parting to moderate very fine subangular blocky; friable; many 01 roots throughout and M0 2T roots; abrupt wavy boundary.

BE-- 8 to 11 in; reddish brown (2.5YR 4/4) and reddish gray (5YR 5/2) clay loam; few 02 faint brown to dark brown (7.5YR 4/4) mottles; weak coarse platy structure parting to moderate very fine subangular blocky; firm; common 01 roots throughout and common 02 roots throughout; abrupt wavy boundary.

Bt-- 11 to 20 in; reddish brown (2.5YR 4/4) clay loam; massive parting to weak medium subangular blocky; firm; few 01 roots throughout and few 02 roots throughout; clear wavy boundary.

C1-- 20 to 27 in; reddish brown (5YR 4/3) loam; massive; firm; gradual wavy boundary.

C2-- 27 to 39 in; reddish brown (5YR 4/3) gravelly sandy loam; massive; firm; 40 percent pebbles.

SERIES: WAISKA SHAL. VAR

NSSL ID #: 13WV134

SOIL SURVEY # S87-MI-083-134

LOCATION: SW 1/4 of NW 1/4 of SEC. 26, T66N R35W.

LONGITUDE: 088-43-00-W

LATITUDE: 48-05-00-N

CLASSIFICATION: Loamy-skeletal, mixed, frigid Lithic Haplorthod

PHYSIOGRAPHY: Terrace; outwash or marine in glaciofluvial landform

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 8% convex, south facing

ELEVATION: 705 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: -7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 3

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 26 RUNOFF: Rapid

PARENT MATERIAL: unconsolidated sediments from mixed material over glacial drift from mixed material

DIAGNOSTIC HORIZONS: 0 to 3 inches Ochric 3 to 15 inches Cambic

DESCRIBED BY: S. SHETRON and S. SPRECHER. SAMPLE DATE: 09/87

Acid precipitation plot: hardwoods; Aspen.

A-- 0 to 3 in; very dark gray (5YR 3/1) extremely gravelly silt loam; strong coarse granular structure; very friable; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; 60 percent pebbles. Moderate earthworm activity.

Bw1-- 3 to 8 in; brown to dark brown (10YR 4/3) extremely gravelly sandy loam; single grain; very friable; many 01 roots throughout and many 02 roots throughout; 80 percent pebbles.

Bw2-- 8 to 15 in; dark yellowish brown (10YR 4/4) extremely gravelly sandy loam; single grain; very friable; common 01 roots throughout and common 02 roots throughout; 60 percent pebbles.

2C-- 15 to 26 in; brown to dark brown (7.5YR 4/4) gravelly sandy loam; common 02 distinct strong brown (7.5YR 5/6) mottles; massive parting to weak medium subangular blocky; friable; 20 percent pebbles.

R-- 26 to 26 in; unweathered bedrock.

SERIES: FROBERG VAR.

NSSL ID #: 14F136

SOIL SURVEY # S87-MI-083-136

LOCATION: NE 1/4 of SW 1/4 of SEC. 26, T66N R35W.

LONGITUDE: 088-42-30-W

LATITUDE: 48-05-00-N

CLASSIFICATION: Clayey over loamy, mixed Glossic Eutroboralf

PHYSIOGRAPHY: Terrace; outwash or marine in glaciofluvial landform

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 20% plane, southeast facing

ELEVATION: 640 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 16 to 24 iRUNOFF: Very rapid

PARENT MATERIAL: lacustrine from mixed material over glacial drift from mixed material

DIAGNOSTIC HORIZONS: 0 to 4 inches Ochric 16 to 24 inches Argillic

DESCRIBED BY: S. SHETRON and S. SPRECHER. SAMPLE DATE: 09/87

Acid precipitation plot: hardwoods; Aspen, and White birch.

A-- 0 to 4 in; very dark gray (10YR 3/1) gravelly silt loam; strong medium granular structure; friable; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; 30 percent pebbles; abrupt smooth boundary.

AE-- 4 to 12 in; brown (7.5YR 5/4) very channery silt loam; strong medium granular structure; firm; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; 40 percent channers; abrupt smooth boundary.

E/B-- 8 to 11 in; reddish brown (5YR 5/3) and reddish brown (2.5YR 4/4) silt loam; few 01 distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; common 01 roots throughout and common 02 roots throughout; few patchy distinct reddish brown (5YR 5/4) coats on vertical and horizontal faces of peds; clear irregular boundary. 5YR5/4 coatings on peds of "B" horizon material.

B/E-- 11 to 16 in; reddish brown (2.5YR 4/4) and reddish brown (5YR 5/3) silt loam; few 01 distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few 01 roots throughout; clear irregular boundary.

Bt-- 16 to 24 in; reddish brown (2.5YR 4/4) silty clay; moderate medium subangular blocky structure; very firm; few 01 roots throughout; common discontinuous distinct 53 (2.5YR5/3) clay films on vertical and horizontal faces of peds; abrupt smooth boundary.

2C-- 24 to 59 in; yellowish brown (10YR 5/4) gravelly sandy loam; massive; firm; few 01 roots throughout; 30 percent pebbles.

SERIES: PESHEKEE

NSSL ID #: 15P137

SOIL SURVEY # S87-MI-083-137

LOCATION: SE 1/4 of SW 1/4 of SEC. 22, T66N R34W.

LATITUDE: 48-05-00-N

LONGITUDE: 088-36-30-W

CLASSIFICATION: Loamy-skeletal, mixed, frigid Entic Lithic Haplorthod

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 1% plane, west facing

ELEVATION: 787 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 16 in RUNOFF: Very rapid

PARENT MATERIAL: glacial drift from mixed material

DIAGNOSTIC HORIZONS: 0 to 3 inches Ochric 7 to 16 inches Spodic

DESCRIBED BY: S. SHETRON and S. SPRECHER. SAMPLE DATE: 09/87

Acid precipitation plot: hardwoods; Aspen and White Birch.

A-- 0 to 3 in; dark reddish brown (5YR 3/2) GRF silt loam; strong medium granular structure; very friable; many 01 roots throughout and many 02 roots throughout; many 02 rounded worm casts; 15 percent pebbles; abrupt smooth boundary. Much earthworm activity.

AB-- 3 to 7 in; dark reddish brown (5YR 3/2) and dark reddish brown (5YR 3/4) very gravelly loam; weak medium subangular blocky structure; very friable; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; 40 percent pebbles; 30 percent cobbles; clear wavy boundary. Much earthworm activity.

Bs-- 7 to 16 in; dark reddish brown (5YR 3/4) and reddish brown (5YR 4/4) GRF sandy loam; weak fine subangular blocky structure; very friable; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; 30 percent pebbles; abrupt wavy boundary.

2R-- 16 to 16 in; unweathered bedrock.

SERIES: PENCE

NSSL ID #: 01P135

SOIL SURVEY # S87-M1-U83-135

LOCATION: NE 1/4, SE1/4 of Sec. 27, T66N, R35W

LATITUDE: 48-05-00-N

LONGITUDE: 088-43-00-N

CLASSIFICATION: Sandy, mixed, frigid Entic Haplorthod

PHYSIOGRAPHY: Upland slope in lake Plains

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 22% convex, southeast facing

ELEVATION: 240 ft MSL

PRECIPITATION: 85 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 39

RUNOFF: Very rapid

PARENT MATERIAL: Forest land not grazed from mixed material

DIAGNOSTIC HORIZONS: 0 to 2 inches Ochric 2 to 17 inches Spodic

DESCRIBED BY: S.G.Shetron and S. Sprecher SAMPLE DATE: 09/87

Acid precipitation plot conifers; white pine, white spruce, and white birch.

Oe-- 5 to 3 in; very dark grayish brown (10YR 3/2) HM ; weak medium platy structure; friable; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.

Oa-- 3 to 0 in; black (10YR 2/1) sapric material; moderate medium granular structure; friable; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.

E-- 0 to 2 in; brown (7.5YR 5/2) sandy loam; -- (----- -/-) - dry; weak fine subangular blocky structure; friable; common 01 roots throughout and common 02 roots throughout; abrupt smooth boundary.

Bs1-- 2 to 6 in; dark yellowish brown (10YR 4/4) very gravelly sandy loam; weak fine subangular blocky structure; friable; common 01 roots throughout and common 02 roots throughout; common continuous distinct black (10YR 2/1) organic coats on rock fragments; 40 percent pebbles; 30 percent cobbles; clear smooth boundary.

Bs2-- 6 to 14 in; dark yellowish brown (10YR 4/6) RV SL G; weak fine subangular blocky structure parting to single grain; friable; few 01 roots throughout and few 02 roots throughout; clear smooth boundary.

BC-- 14 to 17 in; yellowish brown (10YR 5/6) loamy sand; weak fine granular structure parting to single grain; friable; clear smooth boundary.

SAND LENS

C-- 17 to 59 in; brown (10YR 5/3) gravelly sandy loam; few 01 prominent strong brown (7.5YR 5/6) mottles; weak fine granular structure parting to single grain; friable; 25 percent pebbles.

SERIES: ISHPEMING

NSSL ID #: 021138

SOIL SURVEY # S87-MI-083-138

LOCATION: SE1/4 of SW1/4 of SEC.22, T66N R34W.

LATITUDE: 48-05-00-N

LONGITUDE: 088-36-30-W

CLASSIFICATION: Sandy-skeletal, mixed, frigid Entic Haplorthod

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on upper third of component backslope sideslope

MICRORELIEF:

SLOPE: 22% convex, southeast facing

ELEVATION: 787 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: -7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 24 in

RUNOFF: Very rapid

PARENT MATERIAL: Forest land not grazed from mixed material

DIAGNOSTIC HORIZONS: 9 to 24 inches Spodic

DESCRIBED BY: S.G.SHETRON and S.W.SPRECHER SAMPLE DATE: 09/87

Acid precipitation plot; conifers: Black Spruce, Balsam Fir.3

A-- 0 to 4 in; dark reddish brown (5YR 3/2) loam; weak coarse platy structure; 0, very friable; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; abrupt smooth boundary.
2

A/B-- 4 to 9 in; dark reddish brown (5YR 3/2) and dark reddish brown (5YR 3/4) very cobbly sandy loam; moderate medium subangular blocky structure; friable; many 01 roots throughout and many 02 roots throughout; 20 percent pebbles; 45 percent cobbles; clear wavy boundary.

Bs1-- 9 to 15 in; dark reddish brown (5YR 3/4) gravelly loamy sand; weak medium subangular blocky structure parting to weak medium granular; /, friable; many 01 roots throughout and many 02 roots throughout; 20 percent pebbles; clear wavy boundary.

Bs2-- 15 to 20 in; brown to dark brown (7.5YR 4/4) gravelly loamy sand; weak medium subangular blocky structure; /, firm; many 01 roots throughout and many 02 roots throughout; 20 percent pebbles; clear wavy boundary.

Bs3-- 20 to 24 in; dark brown (7.5YR 3/4) gravelly loamy sand; weak medium subangular blocky structure; /, firm; 20 percent pebbles; abrupt smooth boundary.

2R-- 24 to 24 in; gravelly unweathered bedrock.

SERIES: WITBECK (F. VAR.

NSSL ID #: 03W086

SOIL SURVEY # S87-MI-083-086

LOCATION: SW1/4 of NW 1/4 of SEC.28, T64N R38W

LATITUDE: 47-55-00-N

LONGITUDE: 089-08-30-W

CLASSIFICATION: Fine-loamy over sandy or sandy-skeletal, mixed, frigid Histic Humaquept

PHYSIOGRAPHY: Barrier bar in glaciofluvial landform

GEOMORPHIC POSITION: on middle third of component toeslope sideslope

MICRORELIEF:

SLOPE: 4% concave, north facing

ELEVATION: 623 ft MSL

PRECIPITATION: 33 inches Aquic moisture regime

MLRA: 93

WATER TABLE DEPTH: 27 inches - Apparent

PERMEABILITY: Moderately slow

AIR TEMPERATURE: ANN: 4, SUM: 17, WIN:-7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Poorly drained

LAND USE: Forest land not grazed

STONINESS:

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 39 in RUNOFF: Slow

PARENT MATERIAL: organic from mixed material

DIAGNOSTIC HORIZONS: 0 to 9 inches Histic 9 to 22 inches Cambic

DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSSON SAMPLE DATE: 07/87

Acid precipitation plot; conifers: N.W.Cedar, White Spruce.

Oa-- 0 to 9 in; black (10YR 2/1) sapric material; moderate medium granular structure; friable; many O1 roots throughout and many O2 roots; M O2 rounded worm casts; abrupt smooth boundary.

Bg1-- 9 to 17 in; very dark gray (10YR 3/1) cobbly clay loam; common O3 prominent brown to dark brown (7.5YR 4/4) and common O3 prominent brown to dark brown (7.5YR 4/2) mottles; weak very coarse subangular blocky structure; very firm; C O2 rounded worm casts; 30 percent cobbles; abrupt smooth boundary.

Bg2-- 17 to 22 in; dark grayish brown (10YR 4/2) sandy clay loam; many O3 prominent brown to dark brown (7.5YR 4/4), common O3 prominent gray (5Y 5/1), and common O3 prominent very dark gray (10YR 3/1) mottles; weak very coarse subangular blocky structure; very firm; C O2 rounded worm casts; 10 percent pebbles; abrupt smooth boundary.

2C1-- 22 to 59 in; brown to dark brown (7.5YR 4/4) loamy sand; many O3 prominent dark gray (10YR 4/1) mottles; single grain; firm; 10 percent pebbles.

SERIES: PESHEEKEE

NSSL ID #: 04M133

SOIL SURVEY # S87-MI-083-133

LOCATION: NE1/4 of SE1/4 of SEC.4, T65N R34W

LATITUDE: 48-03-30-N

LONGITUDE: 088-37-00-W

CLASSIFICATION: Coarse-loamy, mixed, frigid Lithic Haplorthod

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 6% convex, northeast facing

ELEVATION: 787 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 0

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 20 in RUNOFF: Rapid

PARENT MATERIAL: lacustrine from mixed material

DIAGNOSTIC HORIZONS: 0 to 0 inches Ochric 0 to 14 inches Spodic

DESCRIBED BY: S.G. SHETRON and S.W. SPRECHESAMPLE DATE: 09/87

Acid precipitation plot; conifers: White Spruce.

Oe-- 2 to 1 in; dark reddish brown (5YR 3/2) HM ; weak medium platy structure; friable; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.

Oa-- 1 to 0 in; 20 (0 2/0) sapric material; weak fine granular structure; friable; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.
Many charcoal fragments.

E-- 0 to 0 in; reddish gray (5YR 5/2) sandy loam; weak fine granular structure; friable; many 01 roots throughout and many 02 roots throughout; abrupt broken boundary.
Discontinuous horizon.

Bhs-- 0 to 3 in; dark reddish brown (5YR 3/3) loam; weak very fine subangular blocky structure; firm; many 01 roots throughout and many 02 roots throughout; abrupt wavy boundary.

Bs1-- 3 to 6 in; dark reddish brown (5YR 3/4) loam; weak fine subangular blocky structure; firm; many 01 roots throughout and many 02 roots throughout; clear wavy boundary.

Bs2-- 6 to 14 in; reddish brown (5YR 4/4) loam; weak fine subangular blocky structure; firm; many 01 roots throughout and many 02 roots throughout; 01 percent pebbles; clear wavy boundary.

EB-- 14 to 20 in; reddish brown (5YR 5/3) very gravelly sandy loam; weak coarse platy structure; firm; few 01 roots throughout and few 02 roots throughout; 30 percent pebbles; 15 percent cobbles; abrupt wavy boundary.

2R-- 20 to 20 in; unweathered bedrock.

SERIES: MICHIGAMME

NSSL ID #: 05M018

SOIL SURVEY # S87-MI-083-018

LOCATION: NE1/4 of SW1/4 of SEC.22, T66N R34W

LATITUDE: 48-05-30-N

LONGITUDE: 088-36-30-W

CLASSIFICATION: Coarse-loamy, mixed, frigid Typic Haplorthod

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 12% convex, south facing

ELEVATION: 787 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 28 in RUNOFF: Rapid

PARENT MATERIAL: glacial till from mixed material

DIAGNOSTIC HORIZONS: 0 to 4 inches Ochric 4 to 22 inches Spodic 28 to 31 inches Fragipan

DESCRIBED BY: S. W. SPRECHER and G. T. ANDE SAMPLE DATE: 06/87

Acid precipitation plot: conifers; White Spruce and White Pine. Horizons are irregular in depth and variable in texture.

A-- 0 to 4 in; loam; dark reddish brown (5YR 3/2) dry; strong fine granular structure; soft; 05 percent pebbles; very strongly alkaline; abrupt wavy boundary.

Bhs-- 4 to 5 in; loam; dark reddish brown (5YR 3/3) dry; moderate fine granular structure; soft; 05 percent pebbles; very strongly alkaline; clear irregular boundary.

Bs1-- 7 to 12 in; reddish brown (5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; 05 percent pebbles; very strongly alkaline; clear irregular boundary.
Common pockets of 7.5YR3/6 sandy loam.

Bs2-- 12 to 22 in; 45 (7.5YR 4/5) loam; weak medium subangular blocky structure; firm; 05 percent pebbles; 05 percent cobbles; very strongly alkaline; clear irregular boundary.

Bw-- 22 to 28 in; 45 (5YR 4/5) loam and sandy loam; moderate coarse subangular blocky structure; firm; 05 percent pebbles; 05 percent cobbles; very strongly alkaline; abrupt wavy boundary.

BCx-- 28 to 31 in; brown to dark brown (7.5YR 4/4) gravelly loamy sand; weak medium BL structure; very firm; 15 percent pebbles; 15 percent cobbles; very strongly alkaline; abrupt broken boundary.

2R-- 31 to 31 in; unweathered bedrock.

SERIES: ONOTA VAR. V NSSL ID #: 06NS091
SOIL SURVEY # S87-MI-083-091
LOCATION: SE1/4 of NE1/4 of SEC. 4, T63N R37W.
LATITUDE: 47-53-00-N LONGITUDE: 089-00-00-W
CLASSIFICATION: Sandy-skeletal, mixed, frigid Lithic Udorthent
PHYSIOGRAPHY: Barrier bar in glaciofluvial landform
GEOMORPHIC POSITION: on middle third of component backslope sideslope
MICRORELIEF:
SLOPE: 10% undulating, northeast facing ELEVATION: 656 ft MSL
PRECIPITATION: 33 inches Udic moisture regime MLRA: 93
WATER TABLE DEPTH: PERMEABILITY: Moderately rapid
AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7
SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6
DRAINAGE: Moderately well drained LAND USE: Forest land not grazed
STONINESS: CLASS 1 EROSION OR DEPOSITION: Slight
PARTICLE SIZE CONTROL SECTION: 0 to 12 in RUNOFF: Rapid
PARENT MATERIAL: solid rock from sedimentary material
DIAGNOSTIC HORIZONS: 0 to 2 inches Ochric
DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSSAMPLE DATE: 07/87

Acid precipitation plot: conifers; White Spruce, N. W. Cedar; White Birch.

A-- 0 to 2 in; loam; dark reddish brown (5YR 3/2) dry; strong fine granular structure; very friable; many 01 roots throughout and many 02 roots throughout; common 02 rounded worm casts; clear wavy boundary.

E-- 2 to 4 in; loamy fine sand; pinkish gray (5YR 6/2) and reddish brown (5YR 5/3) dry; moderate medium platy structure; very friable; common 01 roots throughout and common 02 roots throughout; 05 percent pebbles; abrupt broken boundary. Discontinuous horizon; 10% of lateral area.

Bs-- 4 to 12 in; reddish brown (5YR 4/4) GRF loamy sand; single grain; friable; common 01 roots throughout and common 02 roots throughout; few 02 rounded worm casts; 30 percent pebbles; abrupt smooth boundary.

CR-- 12 to 20 in; yellowish red (5YR 4/6) extremely gravelly coarse sand; single grain; friable; few very fine roots throughout; 80 percent pebbles; abrupt wavy boundary.
Decomposing sandstone.

2R-- 20 to 20 in; YWB.

SERIES: RICKER VAR.

NSSL ID #: 07RV042

SOIL SURVEY # S87-MI-083-042

LOCATION: SW1/4 of NW1/4 of SEC. 26, T67N R33W.

LATITUDE: 48-10-00-N

LONGITUDE: 088-27-30-W

CLASSIFICATION: Loamy, mixed, frigid Entic Lithic Haplorthod

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 25% convex, southeast facing

ELEVATION: 623 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderate

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 2

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 5 in RUNOFF: Very rapid

PARENT MATERIAL: eolian sand from mixed material

DIAGNOSTIC HORIZONS: 0 to 5 inches Spodic

DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSSAMPLE DATE: 06/87

Acid precipitation plot: conifers; White spruce and Balsam Fir.

Oi-- 3 to 0 in; dark reddish brown (5YR 2/2) KFB ; weak coarse platy structure; friable; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.

Bs-- 0 to 4 in; dark reddish brown (5YR 3/4) mucky silt loam; weak medium subangular blocky structure; friable; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.

2R-- 4 to 4 in; UMB.

SERIES: RICKER

NSSL ID #: 08R121

SOIL SURVEY # S87-MI-083-121

LOCATION: NE1/4 of SE1/4 of SEC.26, T67N R33W.

LATITUDE: 48-10-00-N

LONGITUDE: 088-27-30-W

CLASSIFICATION: , euic Terric Borofolist

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 15% convex, southeast facing

ELEVATION: 623 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 3

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 9 incRUNOFF: Very rapid

PARENT MATERIAL: organic from organic material

DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSSAMPLE DATE: 08/87

Acid precipitation plot: conifers; White and Black Spruce, Balsam Fir; White Birch.

Oi-- 0 to 3 in; KFB ; dark brown (7.5YR 3/2) dry; weak medium platy structure; slightly hard; many 01 roots throughout and many 02 roots throughout; very strongly alkaline; abrupt smooth boundary.

Oa-- 3 to 8 in; sapric material; very dark gray (10YR 3/1) dry; strong medium granular structure; slightly hard; many 01 roots throughout and many 02 roots throughout; abrupt smooth boundary.

OA-- 8 to 9 in; sapric material and silt loam; dark brown (7.5YR 3/2) dry; weak fine subangular blocky structure parting to strong medium granular; slightly hard; many 01 roots throughout and many 02 roots throughout; abrupt irregular boundary.

CR-- 9 to 12 in; very cobbly silt loam; 42 (7.7YR 4/2) dry; moderate medium platy structure; hard; few patchy distinct skeletons (sand or silt) on vertical and horizontal faces of peds; 30 percent pebbles; 30 percent cobbles; 20 percent stones; very strongly alkaline.

Nipissing shoreline bench, bedrock at or below 22CMs. cobbles limit further penetration.

SERIES: RICKER

NSSL ID #: 09R140

SOIL SURVEY # S87-M1-083-140

LOCATION: NE1/4 of NW1/4 of SEC. 19, T66N R33W.

LATITUDE: 48-07-00-N

LONGITUDE: 088-30-30-W

CLASSIFICATION: , euic Lithic Borofolist

PHYSIOGRAPHY: Upland slope in glaciofluvial landform

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 23% convex, southeast facing

ELEVATION: 623 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderate

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 2

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 5 incRUNOFF: Very rapid

PARENT MATERIAL: organic from organic material

DESCRIBED BY: S.W. SPRECHER

SAMPLE DATE: 09/87

Acid precipitation plot: conifers; White Spruce.

Oe-- 0 to 2 in; HM ; very dark grayish brown (10YR 3/2) and black (10YR 2/1) dry; strong coarse platy structure; slightly hard; many O1 roots throughout and many O2 roots throughout; abrupt smooth boundary.

Oa-- 2 to 5 in; sapric material; 00 (000 0/0) dry; strong coarse platy structure; slightly hard; many O1 roots throughout and many O2 roots throughout; abrupt broken boundary.
Discontinuous horizon.

E-- 5 to 5 in; mucky sandy loam; brown to dark brown (7.5YR 4/2) dry; weak medium platy structure; slightly hard; many O1 roots throughout and many O2 roots throughout; 20 percent pebbles; abrupt broken boundary.
Discontinuous horizon.

CR-- 5 to 7 in; HM ; very dark grayish brown (10YR 3/2) dry; massive; slightly hard; 98 percent channers; abrupt broken boundary.
Discontinuous horizon: organic mat between channers.

2R-- 7 to 7 in; unweathered bedrock.

SERIES: PESHEKEE

NSSL ID #: 002P10

SOIL SURVEY # S87-MI-083-010

LOCATION: SW1/4 of NE1/4 of SEC. 8, T66N R33W.

LATITUDE: 48-07-30-N

LONGITUDE: 088-30-00-W

CLASSIFICATION: Loamy-skeletal, mixed, frigid Lithic Haplorthod

PHYSIOGRAPHY: Terrace; outwash or marine in glaciofluvial landform

GEOMORPHIC POSITION: on lower third of component footslope sideslope

MICRORELIEF:

SLOPE: 5% convex, northwest facing

ELEVATION: 607 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 2

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 11 in RUNOFF: Moderate

PARENT MATERIAL: unconsolidated sediments from mixed material

DIAGNOSTIC HORIZONS: 0 to 2 inches Ochric 2 to 11 inches Spodic

DESCRIBED BY: S.G. SHETRON, S.W. SPRECHER a SAMPLE DATE: 06/87

Acid precipitation plot: conifers; White Spruce and Balsam Fir.

Oa-- 1 to 0 in; dark reddish brown (5YR 3/2) and very dark gray (5YR 3/1) HM and extremely gravelly loam; moderate very fine granular structure; friable; many 01 roots throughout and many 02 roots throughout; common discontinuous distinct organic coats on rock fragments; 75 percent pebbles; very strongly alkaline; abrupt smooth boundary. Much earthworm activity.

A-- 0 to 2 in; very dark gray (5YR 3/1) extremely gravelly sandy loam; weak fine subangular blocky structure; friable; many 01 roots throughout and many 02 roots throughout; common discontinuous distinct organic coats on rock fragments; 75 percent pebbles; very strongly alkaline; abrupt smooth boundary. Much earthworm activity.

Bhs-- 2 to 11 in; dark brown (7.5YR 3/2) and dark reddish brown (2.5YR 3/4) extremely gravelly sandy loam and extremely gravelly loam; single grain; friable; many 01 roots throughout and many 02 roots throughout; common discontinuous distinct organic coats on rock fragments; 75 percent pebbles; very strongly alkaline; abrupt irregular boundary. Pockets of 2.5YR3/4 with matrix of 7.5YR3/2.

2R-- 11 to 11 in; unweathered bedrock.

SERIES: ISHPEMING

NSSL ID #: 093P11

SOIL SURVEY # S87-MI-083-011

LOCATION: SE1/4 of NW1/4 of SEC. 34, T67N R33W.

LATITUDE: 48-10-00-N

LONGITUDE: 088-28-00-W

CLASSIFICATION: Sandy-skeletal, mixed, frigid Entic Haplorthod

PHYSIOGRAPHY: Terrace; outwash or marine in glaciofluvial landform

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 25% convex, east facing

ELEVATION: 607 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-70

SOIL TEMPERATURE: ANN: 30, SUM: 15, WIN: 66

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 2

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 9 to 14 in

RUNOFF: Very rapid

PARENT MATERIAL: glacial outwash from mixed material over residuum from sedimentary material

DIAGNOSTIC HORIZONS: 5 to 0 inches Ochric 4 to 14 inches Spodic

DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSSAMPLE DATE: 07/87

Acid precipitation plot: conifers; Balsam Fir and White Spruce.

Oi-- 5 to 4 in; KFB ; dark brown (7.5YR 3/2) dry; weak medium platy structure; very friable; many O1 roots throughout and many O2 roots throughout; abrupt smooth boundary.

Oa-- 4 to 0 in; black (5YR 2/1) sapric material; weak fine platy structure; very friable; many O1 roots throughout and many O2 roots throughout; abrupt wavy boundary.
Common charcoal fragments.

E/B-- 0 to 4 in; dark reddish gray (5YR 4/2) and dark reddish brown (5YR 3/4) extremely cobbly silt loam; weak medium subangular blocky structure; very friable; many O1 roots throughout and many O2 roots throughout; common continuous distinct black (5YR 2/1) organic coats on rock fragments; 15 percent pebbles; 30 percent cobbles; 30 percent stones; clear irregular boundary.

Bs1-- 4 to 10 in; dark reddish brown (5YR 3/4) extremely cobbly sandy loam; weak fine subangular blocky structure; very friable; common very fine roots throughout and common O1 roots throughout; 20 percent pebbles; 30 percent cobbles; 30 percent stones; gradual irregular boundary.

Bs2-- 10 to 14 in; dark reddish brown (2.5YR 3/4) extremely cobbly LCS ; moderate coarse platy structure; firm; common very fine roots throughout and common O1 roots throughout; 40 percent pebbles; 20 percent cobbles; 20 percent stones; abrupt smooth boundary.
Plates held together as mineral in a fibrous mat.

CR-- 14 to 24 in; weathered bedrock.
Decomposing sandstone; can crush with the auger. Color 5YR3/4, texture CS.

SERIES: PESHEKEE

NSSL ID #: 039P12

SOIL SURVEY # S87-MI-083-012

LOCATION: NE1/4 of NE1/4 of SEC. 24, T67N R33W.

LATITUDE: 48-11-00-N

LONGITUDE: 088-26-00-W

CLASSIFICATION: Loamy, mixed, frigid Lithic Haplorthod

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on upper third of component shoulder headslope

MICRORELIEF:

SLOPE: 13% convex, south facing

ELEVATION: 640 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN: 7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: 6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 12 in

RUNOFF: Very rapid

PARENT MATERIAL: glacial drift from mixed material

DIAGNOSTIC HORIZONS: 0 to 2 inches Ochric 2 to 12 inches Spodic

DESCRIBED BY: S.W. SPRECHER and G.T. ANDERSSAMPLE DATE: 06/87

Acid precipitation plot: conifers; White Spruce and Balsam Fir.

A-- 0 to 2 in; dark reddish brown (5YR 3/2) loam; weak medium granular structure; very friable; many 01 roots throughout and many 02 roots throughout; very strongly alkaline.

Bs1-- 2 to 8 in; dark reddish brown (5YR 3/4) sandy loam; weak medium subangular blocky structure; friable; many 01 roots throughout and many 02 roots throughout; 15 percent pebbles; very strongly alkaline.

Bs2-- 8 to 12 in; dark reddish brown (5YR 3/3) GRF sandy loam; weak medium subangular blocky structure; friable; many 01 roots throughout and many 02 roots throughout; 20 percent pebbles; very strongly alkaline.
Very gravelly and hard to penetrate below 30 cms.

SERIES: WAISKA

NSSL ID #: 138AW13

SOIL SURVEY # S87-M1-083-013

LOCATION: NE1/4 of SW1/4 of SEC. 3, T66N R33W.

LATITUDE: 48-08-30-N

LONGITUDE: 088-28-30-W

CLASSIFICATION: Loamy-skeletal, mixed, frigid Typic Haplorthod

PHYSIOGRAPHY: Terrace; outwash or marine in glaciated uplands

GEOMORPHIC POSITION: on upper third of component backslope sideslope

MICRORELIEF:

SLOPE: 4% convex, southeast facing

ELEVATION: 623 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Rapid

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 5

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 32 in RUNOFF: Moderate

PARENT MATERIAL: unconsolidated sediments from mixed material

DIAGNOSTIC HORIZONS: 0 to 1 inches Ochric 1 to 32 inches Spodic

DESCRIBED BY: S.G. SHETRON, S.W. SPRECHER aSAMPLE DATE: 07/87

Acid precipitation plot: conifers; Spruce and Fir. Organic carbon content of fine earth fraction may be greater than 20% throughout solum; Nippising Beach deposit.

Oi-- 3 to 2 in; 20 (0 2/0) KFB ; weak medium platy structure; very friable; many O1 roots throughout and many O2 roots throughout; abrupt smooth boundary.
Charcoal fragments common.

Oa-- 2 to 0 in; 20 (0 2/0) sapric material; weak very fine granular structure; very friable; many O1 roots throughout and many O2 roots throughout; abrupt smooth boundary.

E-- 0 to 1 in; silt loam; dark reddish gray (5YR 4/2) dry; weak very fine granular structure; soft; many O1 roots throughout and many O2 roots throughout; many continuous prominent very dusky red (2.5YR2/2) organic coats on sand and gravel; 40 percent pebbles; 40 percent cobbles; very strongly alkaline; abrupt smooth boundary.

Bhs1-- 1 to 17 in; extremely gravelly silt loam; very dusky red (2.5YR 2/2) dry; weak very fine granular structure; soft; many O1 roots throughout and many O2 roots throughout; many continuous prominent very dusky red (2.5YR2/2) organic coats on sand and gravel; 30 percent pebbles; 40 percent cobbles; very strongly alkaline; gradual wavy boundary.

Bhs2-- 17 to 26 in; extremely gravelly silt loam; very dusky red (2.5YR 2/2) dry; weak very fine granular structure; soft; many O1 roots throughout and many O2 roots throughout; tubular pores; many continuous prominent very dusky red (2.5YR2/2) organic coats on sand and gravel; 20 percent pebbles; 50 percent cobbles; very strongly alkaline; clear smooth boundary.

Bs-- 26 to 32 in; extremely gravelly silt loam; dark reddish brown (2.5YR 3/4) dry; weak very fine granular structure; soft; few O1 roots throughout and few O2 roots throughout; many continuous prominent very dusky red (2.5YR2/2) organic coats on sand and gravel; 30 percent pebbles; 60 percent cobbles; abrupt irregular boundary.

2R-- 32 to 32 in; unweathered bedrock; ; many continuous prominent very dusky red (2.5YR2/2) organic coats on rock fragments.

SERIES: CHAMPION

NSSL ID #: 132C14

SOIL SURVEY # S87-MI-083-014

LOCATION: NW1/4 of SE1/4 of SEC. 7, T66N R33W.

LATITUDE: 48-07-36-N

LONGITUDE: 088-31-53-W

CLASSIFICATION: Coarse-loamy, mixed, frigid Typic Fragiorthod

PHYSIOGRAPHY: Terrace; outwash or marine in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 11% plane, southeast facing

ELEVATION: 617 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderately slow

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 3

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 10 to 25 iRUNOFF: Rapid

PARENT MATERIAL: glacial till from mixed material

DIAGNOSTIC HORIZONS: 0 to 3 inches Ochric 9 to 25 inches Spodic 25 to 34 inches Fragipan

DESCRIBED BY: S.G. SHETRON and S.W. SPRECHESAMPLE DATE: 09/87

Acid precipitation plot: conifers; White Spruce and Balsam Fir understory.

Oa-- 2 to 0 in; dark reddish brown (5YR 3/2) sapric material; weak medium platy structure; ; many O1 roots throughout and many O2 roots throughout; common O2 rounded worm casts; 20 percent pebbles; 20 percent cobbles; abrupt smooth boundary. Many earthworms.

A-- 0 to 3 in; very dark grayish brown (10YR 3/2) very gravelly loam; strong medium granular structure; very friable; many O1 roots throughout and many O2 roots throughout; many O2 rounded worm casts; 20 percent pebbles; 30 percent cobbles; abrupt smooth boundary. Many earthworms.

B/A-- 3 to 9 in; brown to dark brown (7.5YR 4/4) and dark brown (7.5YR 3/2) very gravelly sandy loam; weak C subangular blocky structure parting to strong medium granular; friable; many O1 roots throughout and many O2 roots throughout; common O2 rounded worm casts; 30 percent pebbles; 20 percent cobbles; clear wavy boundary. Many earthworms.

Bs1-- 9 to 17 in; dark reddish brown (5YR 3/4) very gravelly sandy loam; weak C subangular blocky structure parting to weak fine subangular blocky; friable; common O1 roots throughout and common O2 roots throughout; common O2 rounded worm casts; 30 percent pebbles; 20 percent cobbles; clear wavy boundary.

Bs2-- 17 to 21 in; brown to dark brown (7.5YR 4/4) gravelly loamy sand; weak medium subangular blocky structure parting to single grain; firm; common O1 roots throughout and common O2 roots throughout; 15 percent pebbles; 05 percent cobbles; abrupt smooth boundary.

Bs3-- 21 to 25 in; 43 (7.5YR 4/3) gravelly loamy sand; moderate medium platy structure; firm; 20 percent pebbles; clear smooth boundary.

Ex-- 25 to 34 in; dark grayish brown (10YR 4/2) gravelly loamy sand; moderate C platy structure; very firm; 20 percent pebbles.

Stones stopped excavation at 86cm.

SERIES: RICKER

NSSL ID #: 1300R15

SOIL SURVEY # S87-MI-083-015

LOCATION: NW1/4 of NW1/4 of SEC. 8, T65N R34W.

LATITUDE: 48-03-00-N

LONGITUDE: 088-38-00-W

CLASSIFICATION: , mixed, frigid Lithic Borofibrst

PHYSIOGRAPHY: Upland slope in glaciated uplands

GEOMORPHIC POSITION: on middle third of component backslope sideslope

MICRORELIEF:

SLOPE: 5% undulating, southeast facing

ELEVATION: 755 ft MSL

PRECIPITATION: 33 inches Udic moisture regime

MLRA: 93

WATER TABLE DEPTH:

PERMEABILITY: Moderate

AIR TEMPERATURE: ANN: 4, SUM: 16, WIN:-7

SOIL TEMPERATURE: ANN: 3, SUM: 15, WIN: -6

DRAINAGE: Moderately well drained

LAND USE: Forest land not grazed

STONINESS: CLASS 1

EROSION OR DEPOSITION: Slight

PARTICLE SIZE CONTROL SECTION: 0 to 3 incRUNOFF: Rapid

PARENT MATERIAL: eolian from mixed material

DIAGNOSTIC HORIZONS: 0 to 1 inches Ochric

DESCRIBED BY: S.G. SHETRON and S.W. SPRECHESAMPLE DATE: 09/87

Acid precipitation plot: conifers; Jack Pine and White Spruce.

Oi-- 3 to 0 in; very dark gray (5YR 3/1) KFB ; moderate medium platy structure; friable; many O1 roots throughout and many O2 roots throughout; abrupt smooth boundary.

A-- 0 to 1 in; 20 (0 2/0) mucky sandy loam; weak medium platy structure parting to moderate fine granular; friable; many O1 roots throughout and many O2 roots throughout; abrupt broken boundary.
Charcoal fragments common.

C-- 1 to 3 in; brown to dark brown (7.5YR 4/2) loam; moderate fine granular structure; friable; many O1 roots throughout and many O2 roots throughout; abrupt broken boundary.

CR-- 3 to 6 in; brown to dark brown (7.5YR 4/2) extremely channery loam; massive; friable; many O1 roots throughout and many O2 roots throughout; common continuous distinct (5YR /) organic coats on rock fragments; 85 percent pebbles; abrupt broken boundary.

2R-- 6 to 6 in; unweathered bedrock.

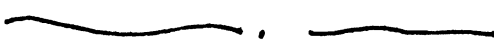
SYMBOLS USED FOR SOIL SURVEY MAPS

Escarpment 

Short Steep Slope 

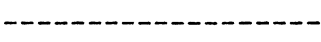
Rocky Spot 

Prominent Hill or Peak 

Natural Drainage Way (Permanent) 

Natural Drainage Way (Intermittent) 

Wet Spot 

Trail 

Area of Significant Habitation (Past or Present)
(Fisheries, Resorts, Village, etc)

Mine and Associated Dumps etc 

Campsite 

**INDEX TO LEVEL ONE SOIL MAPPING UNITS AND
CAMPGROUND MAPS**

<u>CODE</u>	<u>SOIL MAPPING UNIT</u>	<u>PAGE</u>
194	Nunica Taxajunct	53, 53A
405	Typic Haplaquods	54, 54A, 54B
410	Superior	55, 55A, 55B

CAMPGROUND MAPS

Chickenbone	56
Lane Cove	57
Mott Island	58
Chippewa Harbor	59
West Chickenbone	60
East Chickenbone	61
Rock Harbor	62,63, 64,65

NUNICA taxadjunct (194)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Glacial-fluvial deposits	Stratified lacustrine
Drainage	MWD	MWD
Slope	3-15%	1-35%
Taxonomy	Eutric Glossoboralfs Typic Eutrochrepts Typic Eutroboralfs	Eutric Glossoboralfs
Family	Fine, Fine-loamy	Fine
Landscape	Old lake basins	Lake plains
Surface		
Texture	SL-SiCL	SL-SiCL
C frags	0-5% ave, 0-90% range	?
Subsoil		
Horizons	variously BE, Bw, Bt	BE, Bt
Color	5-7.5YR 3-4/3-6	2.5-10YR 4/3-4
Texture	SiCL, CL, C stratified in lower B horizons with SCL, VFSL, SiL	SiCL, CL
C Frags	0-15% ave, 0-35% range	?
C Horizon		
Depth to	15-25"	18-36"
Texture	28-35% clay overall	28-35% clay overall
Strata	Stratified with any of S, SCL, SL, VFSL, SiL, CL, C	CL, SiCL, SiL, SiC
C Frags	0-15% ave, 0-35% range	?
Bedrock		
Depth to	>40" ave, >30" range	>40"
Comments	We used Nunica Taxadjunct for soils that are coarser in texture than Ontonagon and Kent but finer than loam. Stratification is also necessary. MWD soils with a fine partical size class are uncommon on the NE 1/3 of the island, and the one delineation of Nunica was in Moskey Basin campground mapped at the first order.	
File Name	NUNICA	

MAPPING UNIT: 194 (Nunica)

PHASES: none

SLOPES: 3-15%

SHAPE: irregular

LANDFORM: old lake basin

DRAINAGE: MWD

POSITION: back slopes

FLOODING: rare

SURFACE LAYER: silt loam to clay loam

SUBSURFACE LAYER: red clay loam and silty clay loam

UNDERLYING MATERIAL: stratified materials with significant
amounts of clay or clay loam

OTHER: clay rich stratified deposits in MWD position on landscape

SIMILAR INCLUSIONS:

DISSIMILAR INCLUSIONS: Bowers, Rockland

PERMEABILITY: slow

DEPTH TO HIGH WATER TABLE: >1 foot

USE LIMITATIONS: Trails: none

Campsites: none

Pit Toilets: moderate (percs slowly)

Buildings: none

FILE NAME: 1L194

TYPIC HAFLAQUODS (405)

ISLE ROYALE

ESTABLISHED SERIES

PM	Outwash
Drainage	SPD
Slope	1-8%
Taxonomy	Typic Haplaquods
Family	Sandy-skeletal
Landscape	Drainageways
Surface	
Texture	Sand, Ap
C Frags	0-15%
Subsurface	
Horizons	Bhs
Colors	5YR 3/2, 7.5YR 4/1 mottles
Texture	CS
C Frags	15-35% gravel
Depth	15-30"
Substratum	
Horizons	2C
Texture	S
C Frags	>35% cobbles, coarse gravels
Comments	This soil is mapped only at the Daisy Farm Campground where both the alluvial landform and the history of agriculture are unique on the island.
File Name	HAFLAQU.OD

MAPPING UNIT: 405A (Typic Haplaquods)

PHASES: A slopes (0-3%)

SLOPES: 0-3%

SHAPE: irregular

LANDFORM: alluvial delta

DRAINAGE: SPD

POSITION: toe slope

FLOODING: occasional

SURFACE LAYER: sand

SUBSURFACE LAYER: gravelly sand, Ap

UNDERLYING MATERIAL: cobbly sand

OTHER:

SIMILAR INCLUSIONS:

DISSIMILAR INCLUSIONS:

PERMEABILITY: rapid

DEPTH TO HIGH WATER TABLE: 1/2 foot

USE LIMITATIONS: Trails: slight (wetness)

Campsites: moderate (wetness)

Pit Toilets: severe (wetness)

Buildings: moderate (wetness)

FILE NAME: 1L405

MAPPING UNIT: 405B (Typic Haplaquods)

PHASES: B slopes (3-15%)

SLOPES: 3-8%

SHAPE: irregular

LANDFORM: alluvial delta

DRAINAGE: SPD

POSITION: foot slope

FLOODING: occasional

SURFACE LAYER: sand

SUBSURFACE LAYER: gravelly sand, Ap

UNDERLYING MATERIAL: cobbly sand

OTHER:

SIMILAR INCLUSIONS:

DISSIMILAR INCLUSIONS:

PERMEABILITY: rapid

DEPTH TO HIGH WATER TABLE: 1/2 foot

USE LIMITATIONS: Trails: slight (wetness)

Campsites: moderate (wetness)

Pit Toilets: severe (wetness)

Buildings: moderate (wetness)

FILE NAME: 1L405

SUPERIOR (410)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Sandy loam over clay	Sandy loam over clay
Drainage	WD, MWD	WD, MWD
Slope	3-35%	?
Taxonomy	Alfic Haplorthods	Alfic Haplorthods
Family	Coarse-loamy over clayey	Coarse-loamy over clayey
Landscape	Side slopes	?
Surface		
Texture	SL	LS-SL
C Frags	0-15%	?
Subsurface		
Color	5-10YR 3-4/3-4,	?
Texture	SL	SL-LS
Depth	10-20 inches	10-20 inches
Understory		
Horizons	2Bt, 2C	2Bt, 2C
Text	CL, C	C, SiC
Depth to	10-20"	10-20"
Comments	The only delineation of Superior during 1987 was in the Lake Ritchie Campground. We did not have an Established Series description, so identified the series from Mokma and Stroesen-reuther. 1982. Classification of Michigan Soils. Superior is probably an inclusion within delineations of Manistee at the second order.	
File Name	SUPERIOR	

MAPPING UNIT: 410B (Superior)

PHASES: B slopes (3-15%)

SLOPES: 3-15%

SHAPE: elongated

LANDFORM: abandoned lake basin

DRAINAGE: MWD

POSITION: shoulder slopes

FLOODING: none

SURFACE LAYER: sandy loam

SUBSURFACE LAYER: sandy loam

UNDERLYING MATERIAL: clay and clay loam

OTHER:

SIMILAR INCLUSIONS: Manistee, Michigamme

DISSIMILAR INCLUSIONS: Rockland (<10%)

PERMEABILITY: moderate through sandy loam, very slow through
clay

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: none

Campsites: moderate (steepness)

Pit Toilets: moderate (slope)

Buildings: moderate (slope)

FILE NAME: 11410

MAPPING UNIT: 410C (Superior)

PHASES: C slopes (15-35%)

SLOPES: 15-35%

SHAPE: elongated

LANDFORM: abandoned lake basin

DRAINAGE: MWD

POSITION: back slopes

FLOODING: none

SURFACE LAYER: sandy loam

SUBSURFACE LAYER: sandy loam

UNDERLYING MATERIAL: clay and clay loam

OTHER:

SIMILAR INCLUSIONS: Manistee, Michigamme

DISSIMILAR INCLUSIONS: Rockland (<10%)

PERMEABILITY: moderate through sandy loam, very slow through
clay

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (steepness)

Campsites: severe (steepness)

Pit Toilets: severe (slope)

Buildings: severe (slope)

FILE NAME: 1L410

Chickenbone Lake

Avoid polluting your own and others drinking water. Wash dishes, bodies and clothing away from the lake.

410B

0036
B

Individual Sites

172C, A

LAKE RITCHIE

410C

73
B

Stoves only - no campfires.
Boil or filter all water.

Group Sites

0036
B

410 =
Superior

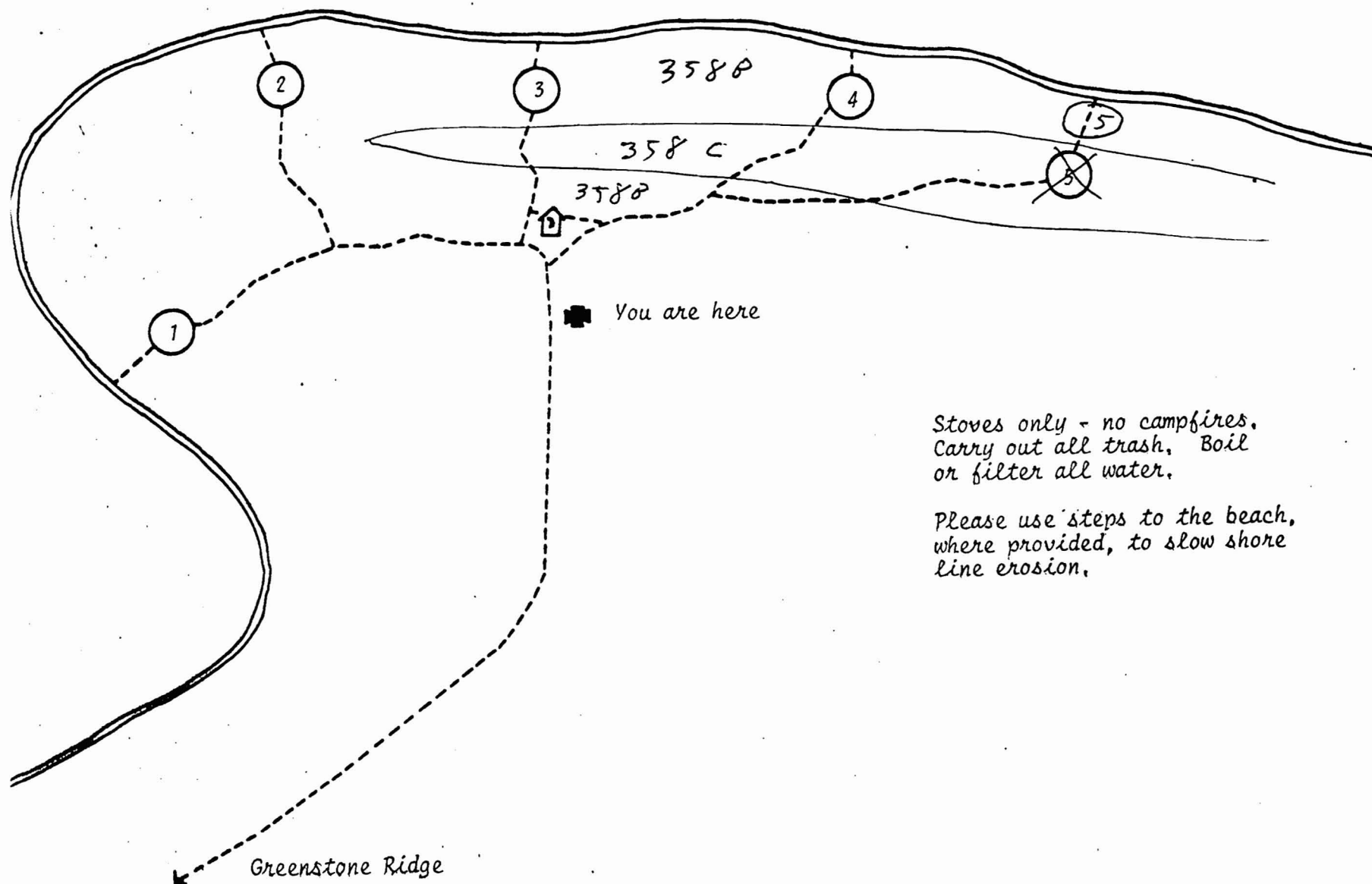
Sandy loam over clay
10-20'

Alf. c. Haplothod
outwash over
Lacustrine

You are here

Moskey Basin and Chippewa Harbor

LANE COVE

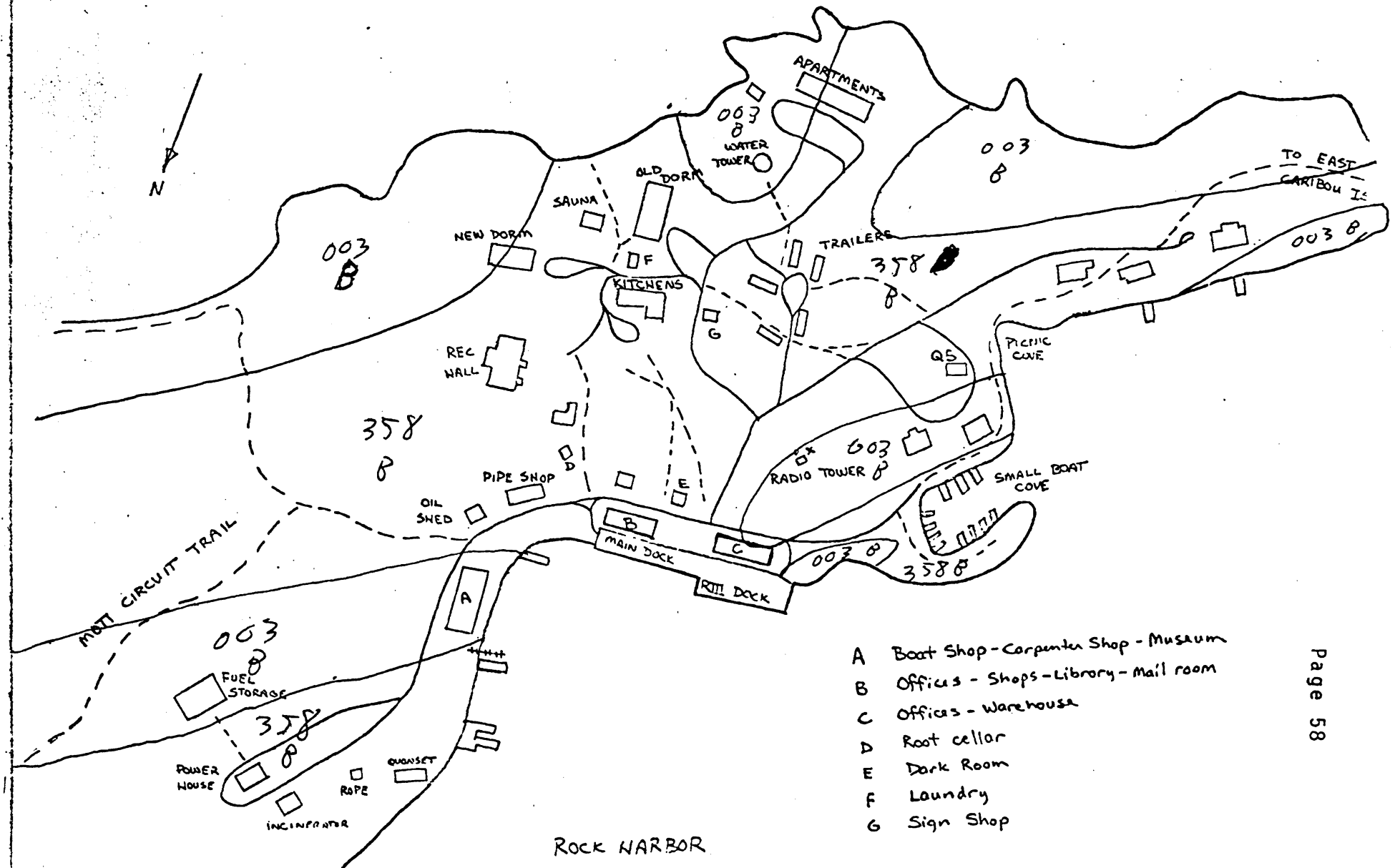


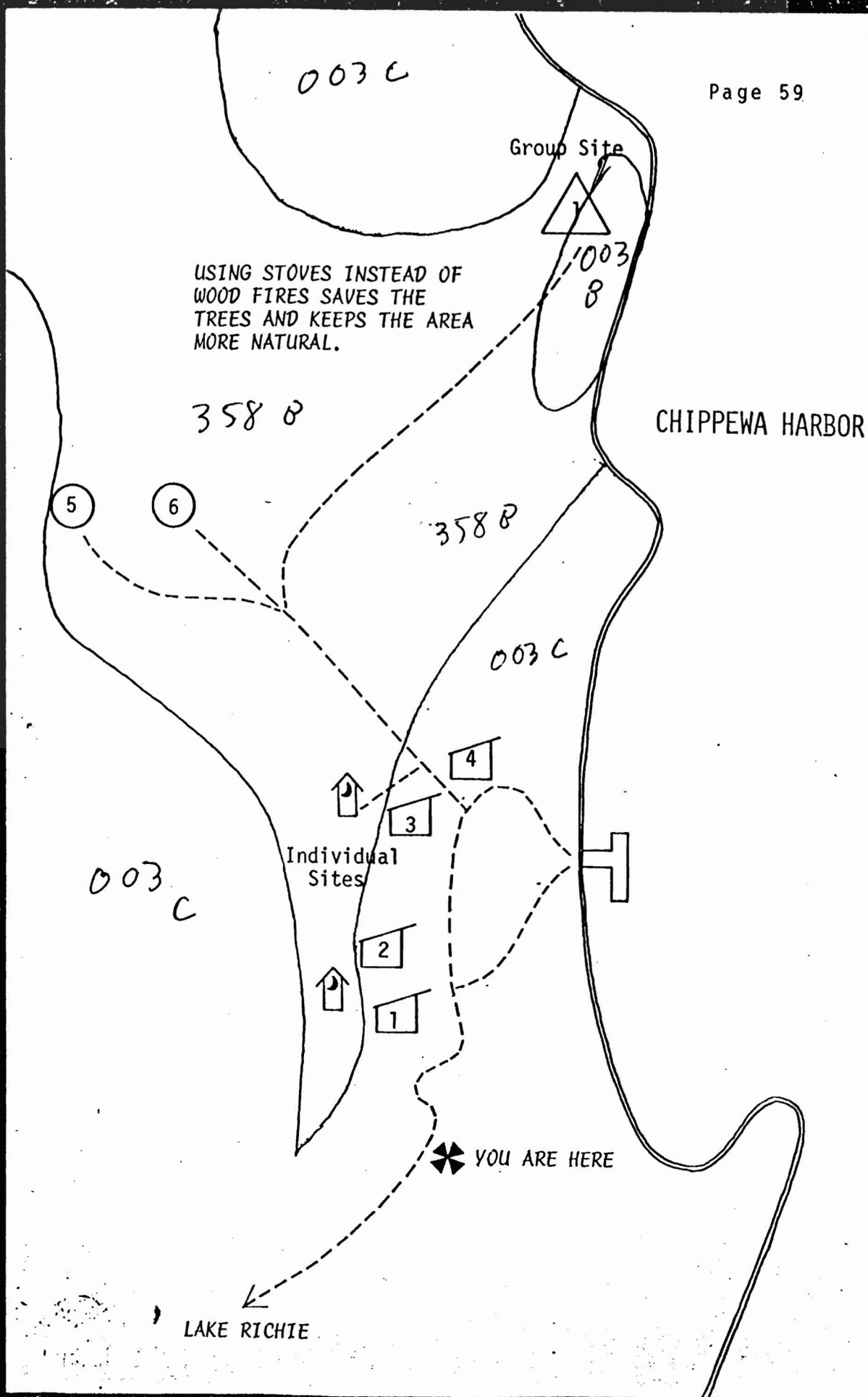
Stoves only - no campfires.
Carry out all trash. Boil
or filter all water.

Please use steps to the beach,
where provided, to slow shore
line erosion.

MOTT ISLAND

LAKE SUPERIOR





West
CHICKENBONE LAKE

Greenstone
Ridge

288C

Group Sites

288
B

288
C

288
B

157
A

288
D

157
A

Stoves only - no campfires.
Boil or filter all water.

288
B

Avoid polluting your own and
others drinking water. Wash
dishes, bodies and clothing
away from the lake.

Individual Sites

286
B

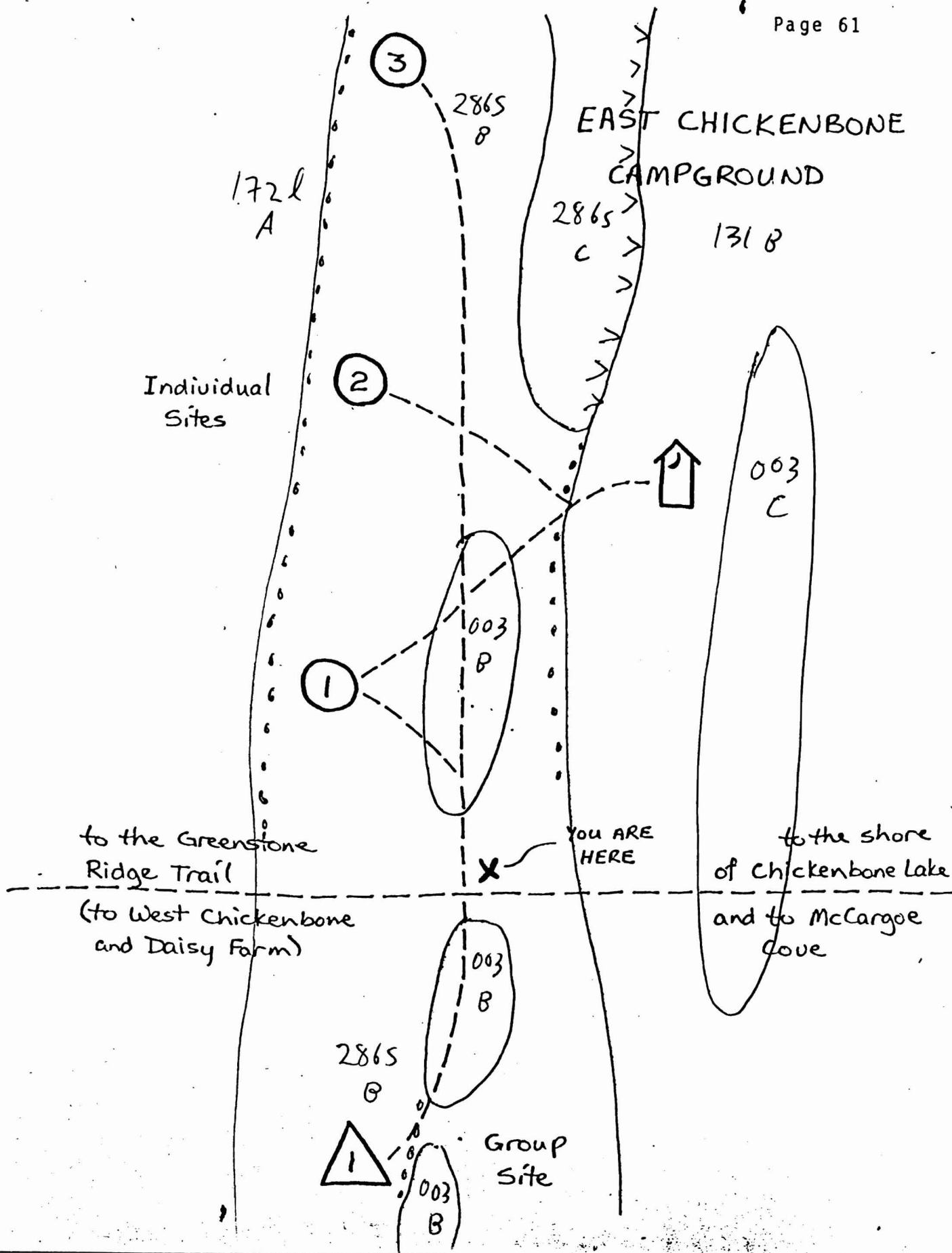
288
C

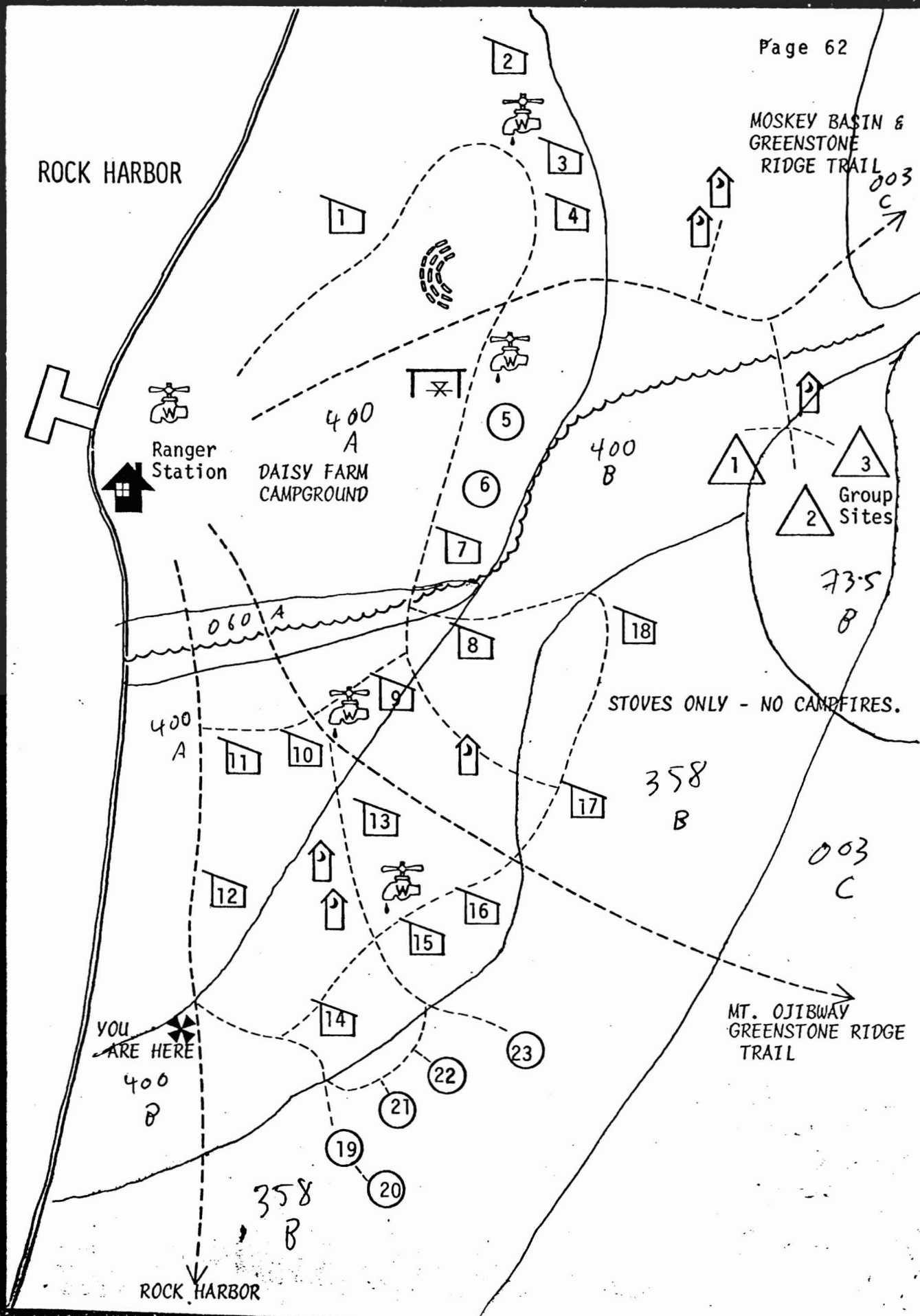
73
B

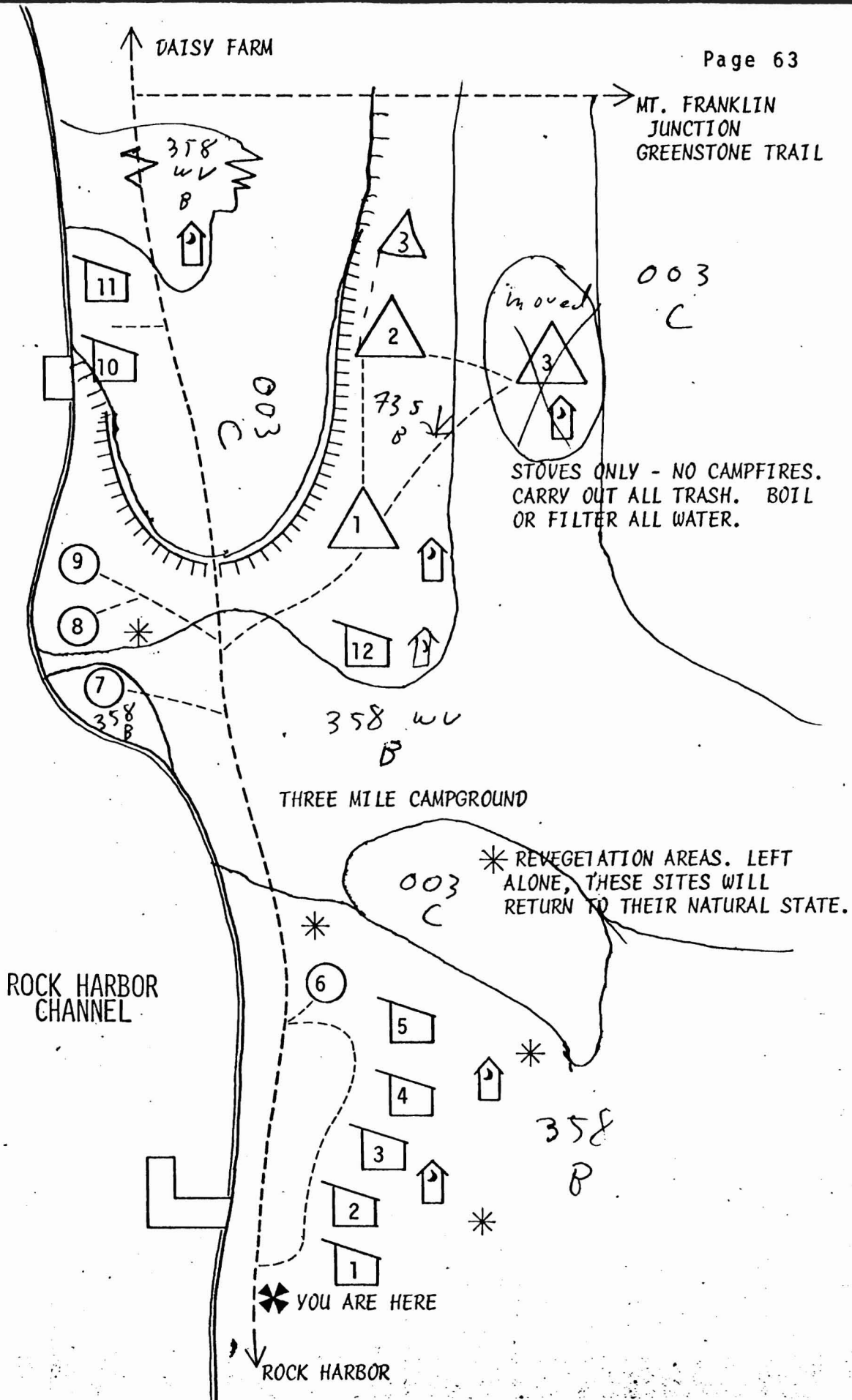
172C
B

You are here

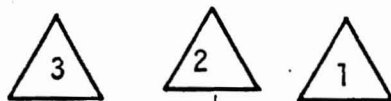
Mc Cargo Cove



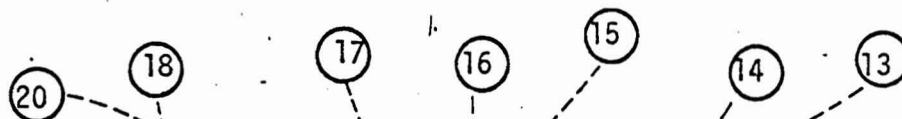




Group Sites



Individual Sites



358
P

358
P

SILENCE IS AN IMPORTANT
PART OF WILDERNESS AND
THE WILDERNESS EXPERIENCE.
PLEASE AVOID ALL
UNNECESSARY NOISE.

STOVES ONLY - NO CAMPFIRE.

003
P

003
P

RANGER STATION
& LODGE

THREE MILE CAMPGROUND

358
P

ROCK HARBOR CAMPGROUND

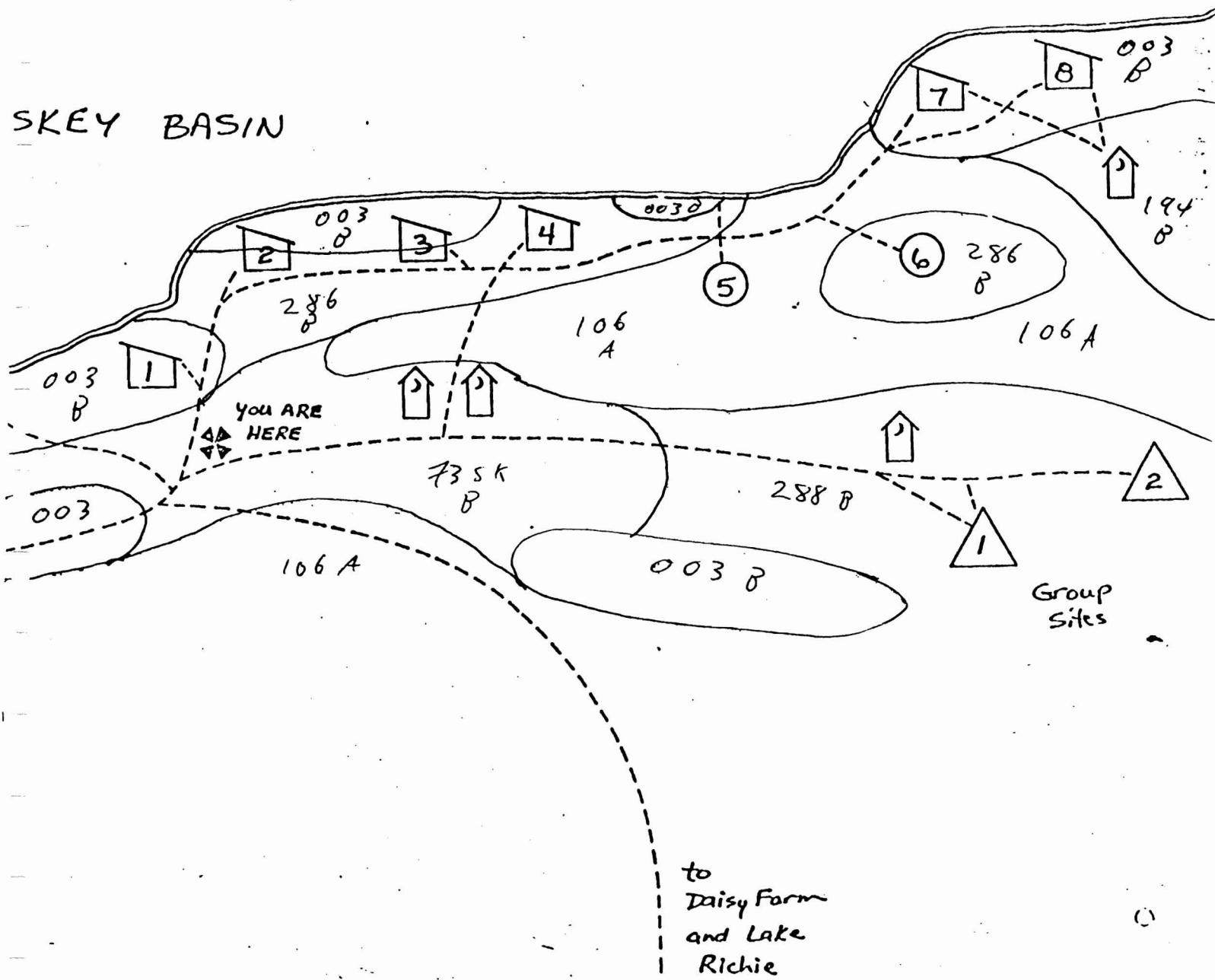
358
uv
P

YOU ARE HERE

358
P

Lake Superior

SKEY BASIN



**INDEX FOR LEVEL TWO MAPPING LEGEND
ISLE ROYALE SOIL SURVEY**

CODE	SOIL MAPPING UNIT	SLOPES	ACRES	PAGE
000	Rockland	B, C	980	68,69
001	Ricker	B, C	400	70,71
002	Typic Borofolist	C, D	170	72,73
0036	Rockland-Pesheek			
	Complex	B, C, D	330	74,75,76
026	Carbondale-Tawas		180	77
028	Carbondale-Tawas (Fine Var.)		150	78
029	Carbondale-Tawas (Fine Var.)		20	79
060	Tawas		60	80
50	Rubicon	B, C	80	81, 82
73	Michigamme	B, C, D	1,020	83, 84, 85
78	Rudyard		30	86
96	Iosco		30	87
106	Bowers Variant		140	88
107	Hettinger		10	89
131	Champion Variant	B, C	230	90, 91
140	Froberg	B, C	15	92, 93
155	Saynor		20	94
157	Pickford		10	95
159	Roscommon		30	96
172	Witbeck Variants (S, L, C)		180	97,98,99
183	Manistee		90	100
185	Allendale		10	101
193	Menominee		140	102
286	Pesheek	B, C, D	810	103,104 105
286 SPD	Pesheek (Wet Variant)		40	106
288	Ishpeming	B, C	170	107,108
322	Moquah Variant	B, C	50	109,110
322 SPD	Moquah Variant (Wet)		190	111
358	Waika	B, C	320	112,113
359 WV	Waika (Wet Variant)		480	114
400	Paavola		30	115
401	Rockland-Witbeck Assoc.		200	116
731	Michigamme-Pence Com.	B, C	520	117,118

NOTE: S=Sandy, L=Loamy, C=Clay; SPD=Somewhat Poorly Drained;
WV= Wet Variant.

MAPPING UNIT: 000B (Rockland)

PHASES: B slopes

SLOPES: 5-10% ave; 3-15% range

SHAPE: elongated

ACREAGE: 3-10 acres/delineation

LANDFORM: exposed tilted bedrock

DRAINAGE: WD and MWD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: if present, fibric or hemic OM or thin, mucky
silt loam A

SUBSURFACE LAYERS: if present, loamy sand to silt loam B or C,
1 to 8 inches thick.

UNDERLYING MATERIAL: bedrock, sometimes fractured.

OTHER: bedrock variably smooth to sharply irregular surface,
making depth of soil irregular.

SIMILAR INCLUSIONS: Ricker (Lithic Borofolist), and Peshekee
(<20 inches thick).

DISSIMILAR INCLUSIONS: Michigamme ($<10\%$) and Ishpeming ($<10\%$);
Champion ($<5\%$). Total dissimilar inclusions 5-15%.

PERMEABILITY: moderately rapid to bedrock

RUNOFF: moderately rapid on soil; extremely rapid on rock; sub-
surface flow extremely rapid at rock-soil interface.

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: slight (steepness)
Campsites: severe (too shallow, steep)
Pit Toilets: severe (too shallow)
Buildings: severe (too shallow, steep)

FILE NAME: 2L000

MAPPING UNIT: 000C (Rockland)

PHASES: C slopes

SLOPES: 20-30% ave; 15-35% range

SHAPE: elongated; broad

ACREAGE: 3-25 acres/delineation

LANDFORM: exposed tilted bedrock

DRAINAGE: wd

POSITION: side slopes

FLOODING: none

SURFACE LAYER: if present, fibric or hemic OM or thin, mucky
silt loam A

SUBSURFACE LAYERS: if present, loamy sand to silt loam B or C,
1 to 8 inches thick.

UNDERLYING MATERIAL: bedrock, sometimes fractured.

OTHER: bedrock variably smooth to sharply irregular surface,
making depth of soil irregular.

SIMILAR INCLUSIONS: Ricker (Lithic Borofolist), and Peshekee
(<20 inches thick).

DISSIMILAR INCLUSIONS: Michigamme ($<10\%$) and Ishpeming ($<10\%$);
Champion ($<5\%$). Total dissimilar inclusions 5-15%.

PERMEABILITY: moderately rapid to bedrock

RUNOFF: moderately rapid on soil; extremely rapid on rock; sub-
surface flow extremely rapid at rock-soil interface.

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (steepness)
Campsites: severe (too shallow, steep)
Pit Toilets: severe (too shallow)
Buildings: severe (too shallow, steep)

FILE NAME: 2L000

MAPPING UNIT: 001B (Ricker)

PHASES: B slopes

SLOPES: 8-12% ave; 5-15% range

SHAPE: elongated

ACREAGE: 3-20 acres/delineation

LANDFORM: exposed tilted bedrock

DRAINAGE: mwd, wd

POSITION: side slopes

FLOODING: none; ponding in small closed depressions

SURFACE LAYER: fibric to sapric OM

SUBSURFACE LAYERS: sapric OM; usually underlain by thin mineral
E horizon (<2 inches thick)

UNDERLYING MATERIAL: bedrock, sometimes fractured.

OTHER: bedrock variably smooth to sharply irregular surface,
making depth of soil irregular.

SIMILAR INCLUSIONS: Rockland and Peshekee (<20 inches thick).

DISSIMILAR INCLUSIONS: Michigamme (<10%); Poorly drained Lithic
Borosaprists (<5%). Total dissimilar inclusions 5-15%.

PERMEABILITY: moderately rapid to bedrock

RUNOFF: moderately rapid, depending on hydrophobic properties of
organic surface material.

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: severe (fragile)
Campsites: severe (too shallow, fragile)
Pit Toilets: severe (too shallow)
Buildings: severe (too shallow, steep)

FILE NAME: 2L001

MAPPING UNIT: 001C (Ricker)

PHASES: C slopes

SLOPES: 20-30% ave; 15-35% range

SHAPE: elongated

ACREAGE: 10-30 acres/delineation

LANDFORM: exposed tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: fibric or hemic OM

SUBSURFACE LAYERS: sapric OM; usually underlain by thin mineral
E horizon (<2 inches thick)

UNDERLYING MATERIAL: bedrock, sometimes fractured.

OTHER: bedrock variably smooth to sharply irregular surface,
making depth of soil irregular.

SIMILAR INCLUSIONS: Rockland and Peshekee (<20 inches thick).

DISSIMILAR INCLUSIONS: Michigamme (<10%); Total dissimilar
inclusions 5-15%.

PERMEABILITY: moderately rapid to bedrock

RUNOFF: rapid

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: severe (fragile), moderate (too steep)
Campsites: severe (too shallow, steep, fragile)
Pit Toilets: severe (too shallow)
Buildings: severe (too shallow, steep)

FILE NAME: 2L001

MAPPING UNIT: 002C (Typic Borofolist)

PHASES: C

SLOPES: 20-30% ave; 15-35% range

SHAPE: elongated

ACREAGE: 3-20 acres/delineation

LANDFORM: old beaches and escarpments

DRAINAGE: wd

POSITION: beach terraces

FLOODING: none

SURFACE LAYER: fibric OM

SUBSURFACE LAYERS: fibric, hemic, or sapric OM

UNDERLYING MATERIAL: rock fragments (coarse gravels to boulders)
with sapric and hemic OM in interstices.

OTHER:

SIMILAR INCLUSIONS: Ricker (Lithic Borofolists); Rockland (0-10
inches of mineral); skeletal Peshekee (<20 inches
mineral) among rock fragments and Waiska (mineral
among beach cobbles).

DISSIMILAR INCLUSIONS: Michigamme (<15%); Poorly Drained
Lithic and Terric Borosaprists (<5%) in closed
depressions. Total dissimilar inclusions <15%.

PERMEABILITY: moderately rapid

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (slope, stoniness)
Campsites: severe (slope, stoniness, shallow)
Pit Toilets: severe (stoniness, low absorption)
Buildings: severe (slope, stones, depth to
bedrock)

FILE NAME: 2L002

MAPPING UNIT: 002D (Typic Borofolist)

PHASES: D slopes

SLOPES: 45-55% ave; >35% range

SHAPE: elongated

ACREAGE: 20-50 acres/delineation

LANDFORM: escarpments

DRAINAGE: EWD

POSITION: talus slopes

FLOODING: none

SURFACE LAYER: fibric OM

SUBSURFACE LAYERS: fibric, hemic or sapric OM

UNDERLYING MATERIAL: rock fragments (stones and boulders)
with sapric and hemic OM in interstices.

OTHER:

SIMILAR INCLUSIONS: Ricker (Lithic Borofolists); Rockland (0-10
inches of mineral); skeletal Peshekee (<20 inches
mineral) among rock fragments.

DISSIMILAR INCLUSIONS: Michigamme (<15%).

PERMEABILITY: moderately rapid

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: severe (slope, stoniness)
Campsites: severe (slope, stoniness, shallow)
Pit Toilets: severe (stoniness, low absorption)
Buildings: severe (slope, stones, depth to
bedrock)

FILE NAME: 2L002

MAPPING UNIT: 0036B (Rockland - Peshekee Complex)

PHASES: B slopes

SLOPES: 3-15%

SHAPE: broad

ACREAGE: 15-50 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: rock; thin sandy loam to silt loam in soil

SUBSURFACE LAYER: rock; entic Bs or cambic loam in soil

UNDERLYING MATERIAL: bedrock 0-20 inches

OTHER: soil 1-10 inches thick and soil 10-20 inches thick too
complexly intermingled on landscape to practically
map separately

SIMILAR INCLUSIONS: Rockland (40-70%), Peshekee (20-50%);
Ricker, Ishpeming (+/- shallow), Michigamme

DISSIMILAR INCLUSIONS: Champion, Pence (<15%)

PERMEABILITY: moderately rapid to bedrock

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: slight (steepness)
Campsites: severe (shallow, steepness)
Pit Toilets: severe (shallow, steepness)
Buildings: severe (shallow, steepness)

FILE NAME: 2L0036

MAPPING UNIT: 0036C (Rockland - Peshekee Complex)

PHASES: C slopes

SLOPES: 20-30% ave, 15-35% range

SHAPE: broad

ACREAGE: 15-50 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: rock; thin sandy loam to silt loam in soil

SUBSURFACE LAYER: rock; entic Bs or cambic loam in soil

UNDERLYING MATERIAL: bedrock 0-20 inches

OTHER: soil 1-10 inches thick and soil 10-20 inches thick too
complexly intermingled on landscape to practically
map separately

SIMILAR INCLUSIONS: Rockland (40-70%), Peshekee (20-50%);
Ricker, Ishpeming (+/- shallow), Michigamme

DISSIMILAR INCLUSIONS: Champion, Pence (<15%)

PERMEABILITY: moderately rapid to bedrock

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (steepness)
Campsites: severe (shallow, steepness)
Pit Toilets: severe (shallow, steepness)
Buildings: severe (shallow, steepness)

FILE NAME: 2L0036

MAPPING UNIT: 0036D (Rockland - Peshekee Complex)

PHASES: D slopes

SLOPES: >35%

SHAPE: broad

ACREAGE: 15-50 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: rock; thin sandy loam to silt loam in soil

SUBSURFACE LAYER: rock; entic Bs or cambic loam in soil

UNDERLYING MATERIAL: bedrock 0-20 inches

OTHER: soil 1-10 inches thick and soil 10-20 inches thick too
complexly intermingled on landscape to practically
map separately

SIMILAR INCLUSIONS: Rockland (40-70%), Peshekee (20-50%);
Michigamme

DISSIMILAR INCLUSIONS:

PERMEABILITY: moderately rapid to bedrock

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: severe (steepness)
Campsites: severe (shallow, steepness)
Pit Toilets: severe (shallow, steepness)
Buildings: severe (shallow, steepness)

FILE NAME: 2L0036

MAPPING UNIT: 026 (Carbondale-Tawas Association)

PHASES: none

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 3-20/delineation

LANDFORM: valleys between exposed rock strata

DRAINAGE: PD, VPD

POSITION: drainageways; dammed beaver ponds

FLOODING: frequent

SURFACE LAYER: sapric OM deriving from sphagnum and grass

SUBSURFACE LAYERS: sapric and hemic OM deriving from herbaceous
and woody materials.

UNDERLYING MATERIAL: sandy or sandy skeletal alluvium and
outwash deeper than 51 inches in bog center and
between 16 and 51 inches on bog margins.

OTHER:

SIMILAR INCLUSIONS: Carbondale 70-90%, Tawas 10-30%;
Loamy and fine variants of Tawas, sandy,
loamy, and fine families of Histic Humaquepts,
Roscommon: all PD or VPD.

DISSIMILAR INCLUSIONS: Rock outcrops (<10%).

PERMEABILITY: moderately slow to moderately rapid in organic
materials, rapid in sandy underlying material.

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness)
Campsites: severe (wetness)
Pit Toilets: severe (wetness, pollution)
Buildings: severe (subsidence, wetness)

FILE NAME: 2L026

MAPPING UNIT: 028 (Carbondale - Tawas [fine tax] Association)

PHASES: none

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 3-20/delineation

LANDFORM: valleys between exposed rock strata

DRAINAGE: PD, VPD

POSITION: drainageways, dammed beaver ponds

FLOODING: frequent

SURFACE LAYER: sapric OM deriving from sphagnum and grass

SUBSURFACE LAYERS: sapric and hemic OM deriving from herbaceous
and woody materials.

UNDERLYING MATERIAL: clayey alluvium, till, and/or lacustrine
material deeper than 51 inches in bog center and
between 16 and 51 inches on bog margins.

OTHER:

SIMILAR INCLUSIONS: Carbondale 70-90%, Tawas (fine tax) 10-30%;
Tawas and Tawas (loamy taxadjunct); Histic
Humaquepts; Pickford and Bergland: all PD and VPD.

DISSIMILAR INCLUSIONS: rock outcrops (<10%)

PERMEABILITY: moderately slow to moderately rapid in organic
materials; slow and very slow in clayey
underlying material.

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness)
Campsites: severe (wetness)
Pit Toilets: severe (wetness, pollution)
Buildings: severe (subsidence, wetness)

FILE NAME: 2L028

MAPPING UNIT: 029 (Carbondale - Tawas [loamy tax] Association)

PHASES: none

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 3-20/delineation

LANDFORM: valleys between exposed rock strata

DRAINAGE: PD, VPD

POSITION: drainageways, dammed beaver ponds

FLOODING: frequent

SURFACE LAYER: sapric OM deriving from sphagnum and grass

SUBSURFACE LAYERS: sapric and hemic OM deriving from herbaceous
and woody materials.

UNDERLYING MATERIAL: loamy alluvium and outwash deeper than 51
inches in bog center and between 16 and 51 inches
on bog margins.

OTHER:

SIMILAR INCLUSIONS: Carbondale 70-90%, Tawas (loamy tax) 10-30%;
Tawas and Tawas (fine taxadjunct); loamy,
sandy, and fine families of Histic Humaquepts;
Hettinger: all PD and VPD.

DISSIMILAR INCLUSIONS: rock outcrops (<10%)

PERMEABILITY: moderately slow to moderately rapid in organic
materials; moderately slow and slow in loamy
underlying material.

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness)
Campsites: severe (wetness)
Pit Toilets: severe (wetness, pollution)
Buildings: severe (subsidence, wetness)

FILE NAME: 2L029

MAPPING UNIT: 060 (Tawas)

PHASES: none

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 3-10/delineation

LANDFORM: valleys between exposed rock strata

DRAINAGE: VPD

POSITION: drainageways, beaver ponds

FLOODING: frequent

SURFACE LAYER: sapric OM deriving from sphagnum and grass

SUBSURFACE LAYERS: sapric and hemic OM deriving from herbaceous
and woody materials.

UNDERLYING MATERIAL: sands between 16 and 51 inches below
surface

OTHER:

SIMILAR INCLUSIONS: Tawas (loamy and fine taxadjuncts); Histic
Humaquepts (various families); Carbondale

DISSIMILAR INCLUSIONS: rock outcrops (<10%)

PERMEABILITY: moderate in organic surface, rapid in underlying
sands

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness)
Campsites: severe (wetness)
Pit Toilets: severe (wetness, pollution)
Buildings: severe (subsidence, wetness)

FILE NAME: 2L060

MAPPING UNIT: 50B (Rubicon)

PHASES: B slopes (3-15%)

SLOPES: 10-15%

SHAPE: broad

ACREAGE: 10-30 acres/delineation

LANDFORM: glaciated, tilted bedrock strata

DRAINAGE: EWD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: sandy A

SUBSURFACE LAYER: sandy, entic Bs

UNDERLYING MATERIAL: sand

OTHER:

SIMILAR INCLUSIONS: Croswell, Ishpeming, Menominee

DISSIMILAR INCLUSIONS: Rockland (<5%), Peshekee (<10%)

PERMEABILITY: rapid

DEPTH TO HIGH WATER TABLE: >3 feet

USE LIMITATIONS: Trails: none
Campsites: moderate (steepness)
Pit Toilets: moderate (poor filter, steepness)
Buildings: moderate (steepness, strength)

FILE NAME: 2L50

MAPPING UNIT: 50C (Rubicon)

PHASES: C slopes (15-35%)

SLOPES: 20-25% ave, 15-35% range

SHAPE: broad

ACREAGE: 10-30 acres/delineation

LANDFORM: glaciated, tilted bedrock strata

DRAINAGE: EWD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: sandy A

SUBSURFACE LAYER: sandy, entic Bs

UNDERLYING MATERIAL: sand

OTHER:

SIMILAR INCLUSIONS: Ishpeming, Menominee

DISSIMILAR INCLUSIONS: Rockland (<5%), Peshekee (<10%)

PERMEABILITY: rapid

DEPTH TO HIGH WATER TABLE: >3 feet

USE LIMITATIONS: Trails: moderate (steepness)
 Campsites: severe (steepness)
 Pit Toilets: severe (poor filter, steepness)
 Buildings: severe (steepness, strength)

FILE NAME: 2L50

MAPPING UNIT: 73B (Michigamme variant: Entic Haplorthods)

PHASES: B slopes (3-15%)

SLOPES: 8-12% ave; 3-15% range

SHAPE: elongated

ACREAGE: 20-50 acres/delineation

LANDFORM: glaciated tilted bedrock

DRAINAGE: MWD, WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: fibric litter layer overlying loamy and silt loamy
eolian and erosional deposits.

SUBSURFACE LAYER: sandy loam to silt loam, entic Bs with
occasional weakly developed fragipan at bottom of
solum.

UNDERLYING MATERIAL: unweathered bedrock, generally igneous but
in some locations sedimentary.

OTHER: <40 inches to bedrock.

SIMILAR INCLUSIONS: Peshekee, Champion (+/- shallow variant),
Pence.

DISSIMILAR INCLUSIONS: rock outcrops (<15%); Witbeck
in closed depressions.

PERMEABILITY: moderate

DEPTH TO HIGH WATER TABLE: infrequent saturation during
throughflow at bedrock surface.

USE LIMITATIONS: Trails: slight (steepness)
Campsites: moderate (steepness)
Pit Toilets: moderate to severe (shallow)
Buildings: moderate (steepness)

FILE NAME: 2L73

MAPPING UNIT: 73C (Michigamme variant: Entic Haplorthods)

PHASES: C slopes (15-35%)

SLOPES: 20-30% ave; 15-35% range

SHAPE: elongated

ACREAGE: 50-150 acres/delineation

LANDFORM: glaciated tilted BEDROCK

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: fibric litter layer overlying loamy and silt loamy
eolian and erosional deposits.

SUBSURFACE LAYER: sandy loam to silt loam, entic Bs with
occasional weakly developed fragipan at bottom of
solum.

UNDERLYING MATERIAL: unweathered bedrock, generally igneous but
in some locations sedimentary.

OTHER: <40 inches to bedrock.

SIMILAR INCLUSIONS: Peshekee, Champion (+/- shallow variant),
Pence.

DISSIMILAR INCLUSIONS: rock outcrops (<15%);

PERMEABILITY: moderate

DEPTH TO HIGH WATER TABLE: infrequent saturation during
throughflow at bedrock surface.

USE LIMITATIONS: Trails: moderate (steepness)
Campsites: severe (steepness)
Pit Toilets: moderate to severe (shallow)
Buildings: severe (steepness)

FILE NAME: 2L73

MAPPING UNIT: 73D (Michigamme variant: loamy Entic
Haplorthods)

PHASES: D slopes, >35%

SLOPES: 50-60% ave; >35% range

SHAPE: elongated

ACREAGE: 50-100 acres/delineation

LANDFORM: glaciated tilted bedrock

DRAINAGE: EWD

POSITION: escarpments

FLOODING: none

SURFACE LAYER: fibric litter layer

SUBSURFACE LAYER: stoney and bouldery sandy loam to silt loam,
entic Bs.

UNDERLYING MATERIAL: weathered bedrock, generally igneous but
in some locations sedimentary.

OTHER: <40 inches to bedrock.

SIMILAR INCLUSIONS: Peshekee (skeletal), Typic Borofolists

DISSIMILAR INCLUSIONS: rock outcrops (<15%)

PERMEABILITY: very rapid

DEPTH TO HIGH WATER TABLE: no water table present

USE LIMITATIONS: Trails: severe (steepness)
Campsites: severe (stoniness, steepness)
Pit Toilets: severe (steepness, stones)
Buildings: severe (steepness)

FILE NAME: 2L73

MAAPPING UNIT: 78 (Rudyard)

PHASES: none

SLOPES: 0-4%

SHAPE: irregular

ACREAGE: 3-10 acres/delineation

LANDFORM: lakebeds, deltaic deposits

DRAINAGE: SPD

POSITION: upper edges of drainage ways and contemporary lake
shores

FLOODING: occasional

SURFACE LAYER: thin silt loam, clay loam, to silty clay A horizon

SUBSURFACE LAYER: mottled red clay

UNDERLYING MATERIAL: red clay; on Isle Royale no to few
carbonates

OTHER:

SIMILAR INCLUSIONS: Bowers

DISSIMILAR INCLUSIONS: PD Pickford, Bergland, Hettinger, in total
5-15%.

PERMEABILITY: very slow

DEPTH TO HIGH WATER TABLE: water table occasionally perched to
surface

USE LIMITATIONS: Trails: severe (clay, wetness)
Campsites: severe (clay, wetness)
Pit Toilets: severe (permeability, wetness)
Buildings: severe (wetness, shrink-swell)

FILE NAME: 2L78

MAPPING UNIT: 96 (Iosco)

PHASES: none

SLOPES: 3-6% ave, 1-8% range

SHAPE: irregular

ACREAGE: 3-15 acres/delineation

LANDFORM: valleys between bedrock ridges

DRAINAGE: SPD

POSITION: side slopes adjacent to drainage ways

FLOODING: rare, though saturation during the spring must be occasional

SURFACE LAYER: fibric and hemic litter layer overlying thin, sandy A horizon

SUBSURFACE LAYER: sandy, mottled, entic Bs

UNDERLYING MATERIAL: heavy sandy loam, silt loam, sandy clay loam

OTHER:

SIMILAR INCLUSIONS: Croswell, Allendale, and Au Gres

DISSIMILAR INCLUSIONS: Ishpeming (5-10%), rock outcrop (5-10%), Menominee (5-10%), totalling <15%.

PERMEABILITY: rapid in sandy upper story, slow in loamy lower story.

DEPTH TO HIGH WATER TABLE: one foot (?)

USE LIMITATIONS: Trails: moderate (wetness)
Campsites: severe (wetness)
Pit Toilets: severe (wetness)
Buildings: severe (wetness)

FILE NAME: 2L96

MAPPING UNIT: 106 (Bowers variant)

PHASES: none

SLOPES: 2-5% ave, 0-6% range

SHAPE: elongated

ACREAGE: 5-15 acres/delineation

LANDFORM: abandoned shallow lake basins

DRAINAGE: SPD

POSITION: adjacent to drainage ways and lakes

FLOODING: occasional

SURFACE LAYER: thick organic or organic rich silt loam to clay loam

SUBSURFACE LAYER: mottled, red clay loam and silty clay loam

UNDERLYING MATERIAL: stratified materials with significant amounts of clay or clay loam

OTHER: clay rich stratified deposits in SPD positions in landscape

SIMILAR INCLUSIONS: Rudyard, Iosco

DISSIMILAR INCLUSIONS: poorly drained Hettinger, Pickford, and Witbeck, totalling <10%. Rock outcrop 5%

PERMEABILITY: slow

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness, clayey surface)
Campsites: severe (wetness)
Pit Toilets: severe (wetness, permeability)
Buildings: severe (wetness)

FILE NAME: 2L106

MAPPING UNIT: 107 (Hettinger)

PHASES: none

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 5-10 acres/delineation

LANDFORM: abandoned lake basins

DRAINAGE: PD

POSITION: depressional areas

FLOODING: frequent

SURFACE LAYER: sapric OM on top of silt loam to silty clay loam A

SUBSURFACE LAYER: gleyed stratified silty clay loam and clay
loam

UNDERLYING MATERIAL: stratified materials of sandy loam to clay
texture

OTHER:

SIMILAR INCLUSIONS: Pickford, Histic Humaquepts, Bowers

DISSIMILAR INCLUSIONS: Nunica (<5%), rockland (<5%),

PERMEABILITY: slow

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness)
Campsites: severe (wetness, flooding)
Pit Toilets: severe (wetness, slow perc)
Buildings: severe (wetness, flooding)

FILE NAME: 2L107

MAPPING UNIT: 131B (Champion, shallow variant)

PHASES: B slopes (3-15%)

SLOPES: 7-11% average, 5-15% range

SHAPE: irregular

ACREAGE: 10-50 acres/delineation

LANDFORM: glaciated tilted bedrock

DRAINAGE: MWD and WD

POSITION: ridge tops and side slopes

FLOODING: none

SURFACE LAYER: +/- skeletal sandy loam to silt loam A

SUBSURFACE LAYER: Entic (occasionally typic) spodic sandy loam to silt loam, 15 to 30 inches deep

UNDERLYING MATERIAL: sandy-skeletal fragipan and C, to rock or cobble layer deeper than 35 inches

OTHER: fragipan weakly developed

SIMILAR INCLUSIONS: Michigamme, Pence, Ishpeming

DISSIMILAR INCLUSIONS: Peshekee (<10%, Rockland (<5%))

PERMEABILITY: moderately rapid above fragipan, moderately slow through fragipan

DEPTH TO HIGH WATER TABLE: none; occasionally water may perch on fragipan for a few days

USE LIMITATIONS: Trails: none
Campsites: slight (steepness)
Pit Toilets: moderate (depending on shallowness)
Buildings: slight (steepness, shallowness)

FILE NAME: 2L131

MAPPING UNIT: 131C (Champion, shallow variant)

PHASES: C slopes (15-35%)

SLOPES: 20-25% average, 15-35% range

SHAPE: irregular

ACREAGE: 10-50 acres/delineation

LANDFORM: glaciated tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: +/- skeletal sandy loam to silt loam A

SUBSURFACE LAYER: Entic (occasionally typic) spodic sandy loam to silt loam, 15 to 30 inches deep

UNDERLYING MATERIAL: sandy-skeletal fragipan and C, to rock or cobble layer deeper than 35 inches

OTHER: fragipan weakly developed

SIMILAR INCLUSIONS: Michigamme, Pence, Ishpeming

DISSIMILAR INCLUSIONS: Peshekee (<10%, Rockland (<5%))

PERMEABILITY: moderately rapid above fragipan, moderately slow through fragipan

DEPTH TO HIGH WATER TABLE: none

USE LIMITATIONS: Trails: moderate (steepness)
Campsites: severe (steepness)
Pit Toilets: severe (steepness)
Buildings: severe(steepness, shallowness)

FILE NAME: 2L131

MAPPING UNIT: 140B (Froberg)

PHASES: B slopes (3-15%)

SLOPES: 5-10% ave, 3-15% range

SHAPE: elongated

ACREAGE: 10-20 acres/delineation

LANDFORM: glaciated, tilted bedrock ridges

DRAINAGE: MWD

POSITION: side slopes

FLOODING: Rare

SURFACE LAYER: thick silt loam to clay loam A and E horizons

SUBSURFACE LAYER: thin Bt silty clay loam or clay loam

UNDERLYING MATERIAL: sandy loam or sandy clay loam till

OTHER:

SIMILAR INCLUSIONS:

DISSIMILAR INCLUSIONS: Michigamme (<10%), rockland (<5%)

PERMEABILITY: moderately slow in silt loam, slow in clay

DEPTH TO HIGH WATER TABLE: 1.5 feet perched on clay (?)

USE LIMITATIONS: Trails: none
 Campsites: moderate (steepness)
 Pit Toilets: severe (slow percolation)
 Buildings: moderate (steepness)

FILE NAME: 2L140

MAPPING UNIT: 140C (Froberg)

PHASES: C slopes (15-35%)

SLOPES: 15-20% ave, 15-35% range

SHAPE: elongated

ACREAGE: 10-20 acres/delineation

LANDFORM: glaciated, tilted bedrock ridges

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: thick silt loam to clay loam A and E horizons

SUBSURFACE LAYER: thin Bt silty clay loam or clay loam

UNDERLYING MATERIAL: sandy loam or sandy clay loam till

OTHER:

SIMILAR INCLUSIONS: Manistee

DISSIMILAR INCLUSIONS: Menominee, Michigamme (<10%), rockland (<5%)

PERMEABILITY: moderately slow in silt loam, slow in clay

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (steepness)
Campsites: severe (steepness)
Pit Toilets: severe (steepness, slow perc)
Buildings: severe (steepness)

FILE NAME: 2L140

MAPPING UNIT: 155 (Sayner)

PHASES: none

SLOPES: 20-25% ave; 15-30% range

SHAPE: elongated

ACREAGE: 5-10 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: thin litter layer over loamy sand A

SUBSURFACE LAYER: sandy, entic Bs

UNDERLYING MATERIAL: gravelly sand

OTHER:

SIMILAR INCLUSIONS: Paavola, skeletal Michigamme

DISSIMILAR INCLUSIONS: skeletal Peshekee (<10%) and rockland (5%)

PERMEABILITY: rapid in sand, very rapid in underlying gravel

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (slope)
Campsites: severe (slope)
Pit Toilets: moderate (percs rapidly)
Buildings: severe (steepness)

FILE NAME: 2L155

MAPPING UNIT: 157 (Pickford)

PHASES: none

SLOPES: 0-4%

SHAPE: elongated

ACREAGE: 5-10 acres/delineation

LANDFORM: lacustrine basins

DRAINAGE: PD

POSITION: depressional areas

FLOODING: frequent

SURFACE LAYER: sapric organic layer over gleyed silty clay

SUBSURFACE LAYER: gleyed silty clay, clay

UNDERLYING MATERIAL: heavy red clay

OTHER:

SIMILAR INCLUSIONS: Hettinger, Witbeck (fine variant), Rudyard
Bowers

DISSIMILAR INCLUSIONS: rockland (<5%), Peshekee (<5%),

PERMEABILITY: very slow

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness, clay, flooding)
Campsites: severe (wetness, clay, flooding)
Pit Toilets: severe (wetness, percs slowly)
Buildings: severe (wetness, shrink-swell)

FILE NAME: 2L157

MAPPING UNIT: 159 (Roscommon)

PHASES: none

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 5-10 acres/delineation

LANDFORM: valleys between tilted bedrock ridges

DRAINAGE: PD

POSITION: drainage ways

FLOODING: frequent

SURFACE LAYER: sapric OM over sand

SUBSURFACE LAYER: gleyed sand

UNDERLYING MATERIAL: sand

OTHER:

SIMILAR INCLUSIONS: Sandy Histic Humaquepts, AuGres (<10%)

DISSIMILAR INCLUSIONS: Tawas (<10%)

PERMEABILITY: rapid

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness)
Campsites: severe (wetness, flooding)
Pit Toilets: severe (wetness, precs rapidly)
Buildings: severe (flooding)

FILE NAME: 2L159

MAPPING UNIT: 172S (Witbeck: Histic Humaquepts)

PHASES: S (sandy variant)

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 5-15 acres/delineation

LANDFORM: valleys between tilted bedrock ridges

DRAINAGE: VPD

POSITION: drainage ways

FLOODING: frequent

SURFACE LAYER: sapric OM

SUBSURFACE LAYER: gleyed sand (+/- skeletal)

UNDERLYING MATERIAL: sand (+/- skeletal)

OTHER:

SIMILAR INCLUSIONS: Tawas, Roscommon, Loamy and Fine Histic
Humaquepts

DISSIMILAR INCLUSIONS: rockland (<5%),

PERMEABILITY: moderately rapid through organic cap, rapid
through sand substrata

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness, flooding)
Campsites: severe (wetness, flooding)
Pit Toilets: severe (wetness, flooding)
Buildings: severe (wetness, flooding)

FILE NAME: 2L172

MAPPING UNIT: 172L (Witbeck: Histic Humaquepts)

PHASES: L (Loamy phase)

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 5-15 acres/delineation

LANDFORM: valleys between tilted bedrock ridges

DRAINAGE: VPD

POSITION: drainage ways

FLOODING: frequent

SURFACE LAYER: sapric OM

SUBSURFACE LAYER: gleyed sandy loam to silt loam (+/- skeletal)

UNDERLYING MATERIAL: loamy strata (+/- skeletal)

OTHER:

SIMILAR INCLUSIONS: Tawas (loamy variant), Sandy and Fine Histic
Humaquepts, Gay, Hettinger

DISSIMILAR INCLUSIONS: Rockland (<10%),

PERMEABILITY: moderately rapid through organic, moderate
through loamy substrata

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness, flooding)
Campsites: severe (wetness, flooding)
Pit Toilets: severe (wetness, flooding)
Buildings: severe (wetness, flooding)

FILE NAME: 2L172

MAPPING UNIT: 172C (Witbeck: Histic Humaquepts)

PHASES: C (clayey phase)

SLOPES: 0-2%

SHAPE: elongated

ACREAGE: 5-15 acres/delineation

LANDFORM: valleys between tilted bedrock ridges

DRAINAGE: VPD

POSITION: drainage ways

FLOODING: frequent

SURFACE LAYER: sapric OM

SUBSURFACE LAYER: gleyed sandy clay to silty clay (+/- skeletal)

UNDERLYING MATERIAL: variable

OTHER:

SIMILAR INCLUSIONS: Tawas (Fine variant), sandy and loamy Histic Humaquepts, Pickford, Hettinger

DISSIMILAR INCLUSIONS: Rockland (<10%),

PERMEABILITY: moderately rapid through organic, slow through fine substrata

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness, flooding)
Campsites: severe (wetness, flooding)
Pit Toilets: severe (wetness, flooding)
Buildings: severe (wetness, flooding)

FILE NAME: 2L172

MAPPING UNIT: 183 (Manistee)

PHASES: all B slopes (3-15%)

SLOPES: 8-12% ave; 5-15% range

SHAPE: irregular

ACREAGE: 5-20 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: MWD, WD

POSITION: side slopes, old lake terraces

FLOODING: none

SURFACE LAYER: thin litter over thin sandy A

SUBSURFACE LAYER: sandy, entic Bs

UNDERLYING MATERIAL: clay loam to clay (+/- silty)

OTHER:

SIMILAR INCLUSIONS: Menominee, Ishpeming, Michigamme

DISSIMILAR INCLUSIONS: Rockland (<5%), Peshekee (<10%)

PERMEABILITY: rapid through sand, slow through underlying clay

DEPTH TO HIGH WATER TABLE: >3 feet, occasionally perched on
top of clay for few days at a time

USE LIMITATIONS: Trails: none
Campsites: moderate (slope)
Pit Toilets: moderate (slope)
Buildings: moderate (slope)

FILE NAME: 2L183

MAPPING UNIT: 185 (Allendale)

PHASES: none (all SPD)

SLOPES: 0-6%

SHAPE: irregular

ACREAGE: 5-10 acres/delineation

LANDFORM: lake benches within glaciated, tilted bedrock ridges

DRAINAGE: SPD

POSITION: depressional areas

FLOODING: occasional

SURFACE LAYER: thin A, sand to sandy loam

SUBSURFACE LAYER: mottled, sandy entic Bs

UNDERLYING MATERIAL: sandy to silty clay, clay (20-40 inches deep)

OTHER:

SIMILAR INCLUSIONS: Belding, Iosco, Au Gres, Croswell

DISSIMILAR INCLUSIONS: rockland (<5%), Ishpeming (<10%)

PERMEABILITY: rapid through sandy upper story, slow through clay

DEPTH TO HIGH WATER TABLE: 1-2 feet

USE LIMITATIONS: Trails: moderate (wetness)
Campsites: moderate (wetness)
Pit Toilets: severe (wetness, perching on clay)
Buildings: severe (wetness)

FILE NAME: 2L185

MAPPING UNIT: 193 (Menominee)

PHASES: none (all B slopes)

SLOPES: 10-15% ave; 3-15% range

SHAPE: elongated

ACREAGE: 30-100 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: WD, MWD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: thin A, sand and loamy sand

SUBSURFACE LAYER: sandy - loamy sand, entic Bs

UNDERLYING MATERIAL: loamy - clay loamy (+/- skeletal) material
(+/- stratified)

OTHER:

SIMILAR INCLUSIONS: Manistee, Rubicon, Ishpeming

DISSIMILAR INCLUSIONS: Rockland (<5%). Peshekee (<10%)

PERMEABILITY: rapid through sand, moderately slow through
lower story

DEPTH TO HIGH WATER TABLE: >3 feet (occasionally perched on
loamy lower material for a few days at a time)

USE LIMITATIONS: Trails: none
Campsites: moderate (steepness)
Pit Toilets: moderate (steepness, poor filter)
Buildings: moderate (steepness)

FILE NAME: 2L193

MAPPING UNIT: 286B (Peshekee)

PHASES: B slopes

SLOPES: 8-12% ave, 3-15% range

SHAPE: broad

ACREAGE: 10-30 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: MWD

POSITION: side slopes, ridge tops

FLOODING: none

SURFACE LAYER: sandy loam to silt loam A

SUBSURFACE LAYER: sandy loam - silt loam entic Bs

UNDERLYING MATERIAL: unweathered bedrock 10-20 inches

OTHER:

SIMILAR INCLUSIONS: rockland

DISSIMILAR INCLUSIONS: Michigamme (<15%), miscellaneous wet spots (Witbeck variants, SPD Peshekee variant)

PERMEABILITY: moderately rapid to bedrock

DEPTH TO HIGH WATER TABLE: <1.5 feet, occasionally perched on bedrock

USE LIMITATIONS: Trails: none
Campsites: moderate (steepness)
Pit Toilets: severe (shallow)
Buildings: severe (shallow)

FILE NAME: 2L286

MAPPING UNIT: 286C (Peshekee)

PHASES: C slopes

SLOPES: 20-30% ave, 15-35% range

SHAPE: broad

ACREAGE: 30-80 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: sandy loam to silt loam A

SUBSURFACE LAYER: sandy loam - silt loam entic Bs

UNDERLYING MATERIAL: unweathered bedrock 10-20 inches

OTHER:

SIMILAR INCLUSIONS: rockland

DISSIMILAR INCLUSIONS: Michigamme (<15%)

PERMEABILITY: moderately rapid to bedrock

DEPTH TO HIGH WATER TABLE: <1.5 feet, occasionally perched
on bedrock

USE LIMITATIONS: Trails: moderate (steepness)
Campsites: severe (steepness)
Pit Toilets: severe (shallow, steepness)
Buildings: severe (shallow, steepness)

FILE NAME: 2L286

MAPPING UNIT: 286D (Peshekee)

PHASES: D slopes

SLOPES: >35%

SHAPE: elongated

ACREAGE: 30-80 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: sandy loam to silt loam A

SUBSURFACE LAYER: sandy loam - silt loam entic Bs

UNDERLYING MATERIAL: unweathered bedrock 10-20 inches

OTHER:

SIMILAR INCLUSIONS: rockland

DISSIMILAR INCLUSIONS: Michigamme (<15%)

PERMEABILITY: moderately rapid to bedrock

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: severe (steepness)
 Campsites: severe (steepness)
 Pit Toilets: severe (shallow, steepness)
 Buildings: severe (shallow, steepness)

FILE NAME: 2L286

MAPPING UNIT: 286 SPD (Peshekee)

PHASES: none

SLOPES: 1-5%

SHAPE: irregular

ACREAGE: 10-30 acres/delineation

LANDFORM: Abandoned shorelines, ridge tops

DRAINAGE: SPD

POSITION: depressional areas

FLOODING: occasional

SURFACE LAYER: sandy loam to silt loam A

SUBSURFACE LAYER: sandy loam - silt loam entic Bs

UNDERLYING MATERIAL: unweathered bedrock 10-20 inches

OTHER:

SIMILAR INCLUSIONS: Rockland, Waiska SPD, Lithic Histic
Humaquepts, Lithic Haplaquents

DISSIMILAR INCLUSIONS: Michigamme (<5%), Peshekee (<10%)

PERMEABILITY: moderately rapid to bedrock

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: moderate (wetness)
Campsites: severe (wetness)
Pit Toilets: severe (shallow, wetness)
Buildings: severe (shallow, wetness)

FILE NAME: 2L286

MAPPING UNIT: 288B (Ishpeming)

PHASES: B slopes (3-15%)

SLOPES: 5-10% ave, 3-15% range

SHAPE: irregular

ACREAGE: 5-20 acres/delineation

LANDFORM: glaciated, tilted bedrock ridges

DRAINAGE: WD, MWD

POSITION: side slopes, outwash benches

FLOODING: rare

SURFACE LAYER: shallow litter layer over shallow, sand or
loamy sand A

SUBSURFACE LAYER: sand or loamy sand, entic Bs

UNDERLYING MATERIAL: 20-40 inches to bedrock (usually basalt)

OTHER: sandy analog of Michigamme

SIMILAR INCLUSIONS: Michigamme, Ishpeming (shallow variant),
Peshekee, Rubicon

DISSIMILAR INCLUSIONS: Rockland (<10%), miscellaneous wet
areas (Histic Humaquepts, Lithic Haplaquents,
Roscommon) <5%

PERMEABILITY: rapid to bedrock

DEPTH TO HIGH WATER TABLE: >3 feet, occasionally perched on
bedrock for a few days at a time

USE LIMITATIONS: Trails: none
Campsites: moderate (steepness)
Pit Toilets: severe (shallow, percs rapidly)
Buildings: severe (shallow)

FILE NAME: 2L288

MAPPING UNIT: 288C (Ishpeming)

PHASES: C slopes (15-35%)

SLOPES: 20-25% ave, 15-35% range

SHAPE: irregular

ACREAGE: 5-20 acres/delineation

LANDFORM: glaciated, tilted bedrock ridges

DRAINAGE: WD

POSITION: side slopes, outwash benches

FLOODING: none

SURFACE LAYER: shallow litter layer over shallow, sand or
loamy sand A

SUBSURFACE LAYER: sand or loamy sand, entic Bs

UNDERLYING MATERIAL: 20-40 inches to bedrock (usually basalt)

OTHER: sandy analog of Michigamme

SIMILAR INCLUSIONS: Michigamme, Ishpeming (shallow variant),
Peshekee, Rubicon

DISSIMILAR INCLUSIONS: Rockland (<10%)

PERMEABILITY: rapid to bedrock

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (steepness)
Campsites: severe (steepness)
Pit Toilets: severe (shallow, percs rapidly)
Buildings: severe (shallow, steepness)

FILE NAME: 2L288

MAPPING UNIT: 322B (Moquah variant)

PHASES: B slopes

SLOPES: 5-10% ave, 3-15% range

SHAPE: irregular

ACREAGE: 5-15 acres/delineation

LANDFORM: valleys between glaciated bedrock ridges

DRAINAGE: MWD

POSITION: old alluvial terraces, lake benches

FLOODING: rare

SURFACE LAYER: thin sandy loam to silt loam A

SUBSURFACE LAYER: cobbly sandy loam, cambic B

UNDERLYING MATERIAL: stratified loamy sand

OTHER:

SIMILAR INCLUSIONS: Michigamme; Ishpeming, Waiska

DISSIMILAR INCLUSIONS: Rockland (<15%)

PERMEABILITY: moderate through loamy upper story, moderately rapid loamy sand lower story

DEPTH TO HIGH WATER TABLE: >2 feet (?)

USE LIMITATIONS: Trails: none
Campsites: moderate (steepness)
Pit Toilets: moderate (shallow, steepness)
Buildings: moderate (steepness)

FILE NAME: 2L322

MAPPING UNIT: 322C (Moquah variant)

PHASES: C slopes

SLOPES: 20-25% ave, 15-30% range

SHAPE: irregular

ACREAGE: 5-15 acres/delineation

LANDFORM: glaciated bedrock ridges

DRAINAGE: MWD

POSITION: old alluvial terraces, lake benches

FLOODING: none

SURFACE LAYER: thin sandy loam to silt loam A

SUBSURFACE LAYER: cobbly sandy loam, cambic B

UNDERLYING MATERIAL: stratified loamy sand

OTHER:

SIMILAR INCLUSIONS: Ishpeming, Michigamme

DISSIMILAR INCLUSIONS: rockland (<15%)

PERMEABILITY: moderate through loamy upper story, moderately
rapid through loamy sand lower story

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (steepness)
Campsites: severe (steepness)
Pit Toilets: severe (shallow, steepness)
Buildings: severe (steepness)

FILE NAME: 2L322

MAPPING UNIT: 322SPD (Moquah variant, SPD)

PHASES: none

SLOPES: 1-5% ave, 1-8% range

SHAPE: irregular

ACREAGE: 5-15 acres/delineation

LANDFORM: valleys between glaciated bedrock ridges

DRAINAGE: SPD

POSITION: old alluvial terraces, lake benches

FLOODING: Occasional

SURFACE LAYER: thin sandy loam to silt loam A

SUBSURFACE LAYER: mottled, cobbly sandy loam, cambic

UNDERLYING MATERIAL: stratified loamy sand

OTHER:

SIMILAR INCLUSIONS: Ishpeming, Waiska SPD

DISSIMILAR INCLUSIONS: Rockland (<15%)

PERMEABILITY: moderate through loamy upper story, moderately
rapid through loamy sand lower story

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: moderate (wetness)
Campsites: severe (wetness)
Pit Toilets: severe (wetness)
Buildings: severe (wetness)

FILE NAME: 2L322

MAPPING UNIT: 358B (Waiska)

PHASES: B slopes

SLOPES: 3-8% ave, 1-15% range

SHAPE: elongated

ACREAGE: 10-50 acres/delineation

LANDFORM: abandoned rocky beaches

DRAINAGE: MWD

POSITION: beach terraces

FLOODING: rare

SURFACE LAYER: thin litter layer on very gravelly, cobbly sand

SUBSURFACE LAYER: very gravelly, cobbly sand, typic Bhs

UNDERLYING MATERIAL: gravels, cobbles, bedrock at variable depth

OTHER:

SIMILAR INCLUSIONS: Waiska SPD

DISSIMILAR INCLUSIONS: Rockland (<10%), Ishpeming (<5%)

PERMEABILITY: very rapid

DEPTH TO HIGH WATER TABLE: >1 foot, water table rare

USE LIMITATIONS: Trails: slight (stoniness)
Campsites: severe (coarse fragments, slope)
Pit Toilets: severe (poor filter, shallow)
Buildings: moderate (coarse fragments, slope)

FILE NAME: 2L358

MAPPING UNIT: 358C (Waiska)

PHASES: C slopes

SLOPES: 15-12% ave, 15-35% range

SHAPE: elongated

ACREAGE: 10-50 acres/delineation

LANDFORM: abandoned rocky beaches

DRAINAGE: MWD

POSITION: beach terraces

FLOODING: never

SURFACE LAYER: thin litter layer on very gravelly, cobbly sand

SUBSURFACE LAYER: very gravelly, cobbly sand, typic Bhs

UNDERLYING MATERIAL: gravels, cobbles, bedrock at variable depth

OTHER:

SIMILAR INCLUSIONS: Waiska SPD

DISSIMILAR INCLUSIONS: Rockland (<10%), Ishpeming (<5%)

PERMEABILITY: very rapid

DEPTH TO HIGH WATER TABLE: >1 foot, water table rare

USE LIMITATIONS: Trails: slight (stoniness)
Campsites: severe (coarse fragments, slope)
Pit Toilets: severe (poor filter, shallow)
Buildings: severe (coarse fragments, slope)

FILE NAME: 2L358

MAPPING UNIT: 358WV (Waiska, wet variant)

PHASES: none

SLOPES: 0-4%

SHAPE: elongated

ACREAGE: 5-20 acres/delineation

LANDFORM: abandoned rocky beaches

DRAINAGE: SPD, PD

POSITION: beach terraces

FLOODING: Frequent

SURFACE LAYER: sapric OM on very gravelly, cobbly sand

SUBSURFACE LAYER: very gravelly, cobbly sand

UNDERLYING MATERIAL: gravels, cobbles, bedrock at variable depth

OTHER:

SIMILAR INCLUSIONS: Waiska, Sandy Histic Humaquepts

DISSIMILAR INCLUSIONS: Rockland (<10%), Tawas (<5%)

PERMEABILITY: very rapid

DEPTH TO HIGH WATER TABLE: surface

USE LIMITATIONS: Trails: severe (wetness)
Campsites: severe (coarse fragments, wetness)
Pit Toilets: severe (poor filter, wetness)
Buildings: moderate (coarse fragments, wetness)

FILE NAME: 2L358

MAPPING UNIT: 400 (Paavola taxadjunct)

PHASES: none

SLOPES: 20-25%

SHAPE: elongated

ACREAGE: 5-10 acres/delineation

LANDFORM: glaciated, tilted bedrock ridges

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: thin, gravelly sand - loamy sand A

SUBSURFACE LAYER: very gravelly sand, entic Bs, fragipan

UNDERLYING MATERIAL: very gravelly fine sand/sand strata

OTHER: very gravelly sands, variously stratified, with fragipan

SIMILAR INCLUSIONS: Sayner, Champion

DISSIMILAR INCLUSIONS: Rockland (<5%), Peshekee and Michigamme
(<10%)

PERMEABILITY: very rapid to fragipan, slow through fragipan

DEPTH TO HIGH WATER TABLE: no water table

USE LIMITATIONS: Trails: moderate (slope)
Campsites: severe (slope)
Pit Toilets: severe (slope, poor filter)
Buildings: severe (slope)

FILE NAME: 2L400

MAPPING UNIT: 401 (Rockland-Witbeck Association)

PHASES: none

SLOPES: 5-20% on rock knobs, 0-5% in joints between knobs

SHAPE: broad

ACREAGE: 80-200 acres/delineation

LANDFORM: glaciated, jointed, bedrock ridges

DRAINAGE: WD on knobs; PD and SPD in joints between knobs

POSITION: rock knobs and closed depressions

FLOODING: never on rock knobs, frequent in joints between knobs

SURFACE LAYER: rock and silt loam on knobs, sapric OM in joints
between knobs (+/- Histic epipedon)

SUBSURFACE LAYER: silt loam on knobs, sand and loam
in joints between knobs

UNDERLYING MATERIAL: bedrock

OTHER: PD units too small to map separately from rockland

SIMILAR INCLUSIONS: Rockland (60-90%), Witbeck (10-40%)
Peshekee and Ishpeming (shallow) on knobs;
Lithic and shallow Haplaquents and Haplaquods in joints
between knobs

DISSIMILAR INCLUSIONS: Crosswell and Iosco (<10%); Menominee and
Ishpeming (<5%)

PERMEABILITY: moderately rapid in sandy materials to bedrock or
loamy and clayey substrata

DEPTH TO HIGH WATER TABLE: no water table on knobs, frequently at
surface in joints between knobs

USE LIMITATIONS: Trails: moderate (wetness between knobs)
Campsites: severe (too shallow on knobs, too
wet between knobs)
Pit Toilets: severe (too shallow on knobs, too
wet between knobs)
Buildings: severe (too shallow on knobs, too
wet between knobs)

FILE NAME: 2L401

MAPPING UNIT: 731B (Michigamme-Pence Complex)

PHASES: B slopes (3-15%)

SLOPES: 10-15% ave, 8-15% range

SHAPE: broad

ACREAGE: 10-30 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: MWD, WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: thin litter layer over thin sandy loam to loam A

SUBSURFACE LAYER: gravelly, sandy loam Entic Bs

UNDERLYING MATERIAL: gravelly sand or bedrock between 20-40 inches (generally deeper than 30 inches)

OTHER: soils so intricately intermingled in landscape that it is impractical to map them separately.

SIMILAR INCLUSIONS: Michigamme 40-70%, Pence 20-50%; Champion and Peshekee unnamed inclusions

DISSIMILAR INCLUSIONS: Rockland (<10%)

PERMEABILITY: moderately rapid

DEPTH TO HIGH WATER TABLE: >3 feet

USE LIMITATIONS: Trails: none
Campsites: moderate (slope)
Pit Toilets: moderate (slope)
Buildings: moderate (slope)

FILE NAME: 2L731

MAPPING UNIT: 731C (Michigamme-Pence Complex)

PHASES: C slopes (15-35%)

SLOPES: 20-25% ave, 15-30% range

SHAPE: broad

ACREAGE: 10-30 acres/delineation

LANDFORM: glaciated, tilted bedrock

DRAINAGE: WD

POSITION: side slopes

FLOODING: none

SURFACE LAYER: thin litter layer over thin sandy loam to loam A

SUBSURFACE LAYER: gravelly, sandy loam Entic Bs

UNDERLYING MATERIAL: gravelly sand or bedrock between 20-40 inches (generally deeper than 30 inches)

OTHER: soils so intricately intermingled in landscape that it is impractical to map them separately.

SIMILAR INCLUSIONS: Michigamme 40-70%, Pence 20-50%; Champion and Peshekee unnamed inclusions

DISSIMILAR INCLUSIONS: Rockland (<15%)

PERMEABILITY: moderately rapid

DEPTH TO HIGH WATER TABLE: >3 feet

USE LIMITATIONS: Trails: moderate (slope)
Campsites: severe (slope)
Pit Toilets: severe (slope)
Buildings: severe (slope)

FILE NAME: 2L731

**INDEX FOR LEVEL FOUR MAPPING LEGEND
ISLE ROYALE SOIL SURVEY**

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MAPPING UNIT: BFR

COMPONENTS: Bowers, Froberg, Rudyard

SLOPES: 0-35%

DRAINAGE: SPD, MWD

PM TEXT: SCL, CL, SiC, C

LANDSCAPE: Old lake basins and backwater areas; side slopes with clayey ablation till or clay over till

GEOMORPHIC RELATIONS: Undifferentiated group: Bowers and Rudyard are adjacent to depressional areas, generally of low elevation (<650 feet GMsl); Froberg on side slopes at any elevation.

UNIT COMPOSITION: Undifferentiated Group: Froberg 50%, Bowers and Rudyard <10%; or Bowers 30%, Rudyard 15%, Froberg <10%.

MINOR SOILS: Rockland in both members of group; Michigamme and Manistee with Froberg; Hettinger, Nunica, Pickford, and Moquah variants with Bowers and Rudyard.

USE LIMITATIONS:

TRAILS: Moderate (clayey)
CAMPSITES: Moderate (clayey)
PIT TOILETS: Severe (percs slowly)
BUILDINGS: Moderate (shrink swell)

REFER TO SERIES DESCRIPTIONS: Bowers
Froberg
Rudyard

COMMENTS: This undifferentiated group includes the major soils of the island that have Fine-loamy, Fine, or Very Fine partical size class. Such soils are of minor extent but locally important. The two parts of the group (Froberg on the one hand and Bowers and Rudyard on the other) probably do not occur together.

FILE NAME: BFR

MAPPING UNIT: BRP

COMPONENTS: Borofolists, Rockland, Peshekee

SLOPES: 0-35%

DRAINAGE: WD, EWD

PM TEXT: Sapric and hemic OM, SL, L, SiL

LANDSCAPE: Rock ridges and rock knolls; igneous and sedimentary

GEOMORPHIC RELATIONS: Borofolists on rock faces w/o mineral;
Rockland where mineral is 1-10 inches thick or bare
bedrock; Peshekee where mineral is 10-20 inches thick.

UNIT COMPOSITION: Borofolists 40%; Rockland 20%; Peshekee 20%
soils of minor extent 20%

MINOR SOILS: Lithic and Terric Borosaprists in drainageways
and depressions; Waiska on old shorelines.

USE LIMITATIONS:

TRAILS: Moderate (fragile)
CAMPSITES: Severe (fragile, shallow)
PIT TOILETS: Severe (shallow)
BUILDINGS: Severe (shallow)

REFER TO SERIES DESCRIPTIONS: Ricker
Typic Borofolists
Rockland
Peshekee

FILE NAME: BRP

BRF

BOROFOLISTS/ROCKLAND/PESHEKEE ASSOCIATION

Strongly and gently sloping, well drained and excessively well drained soils formed in organic material and mineral material shallow to bedrock; on rock ridges and knolls on the NE 1/6 of the island and on the NE end of the Saginaw Peninsula.

These soils are found on rock slopes and ridges where less than 20" of mineral matter has accumulated. On rock faces with no mineral matter well drained organic matter has accumulated, forming the parent material for the Borofolists. Peshekee soils form where mineral soil is between 10 and 20 inches thick, and Rockland where the soil is less than 10 inches thick. Slopes range from 0 to 35%.

This association makes up about 10% of the area mapped. It is about 40% Borofolist, 20% Rockland, 20% Peshekee, and 20% soils of minor extent.

Borofolists are well drained organic soils shallow to rock or rubble. Surface layer is undecomposed litter and subsurface layer is well decomposed organic matter. Where mineral soil covers bedrock it is dark brown and dark yellowish brown sandy loam and loam less than inches thick. Peshekee soils are well drained and moderately well drained soils 10-20 inches thick. Surface layer is 1 to 3 inches thick very dark gray sandy loam and silt loam; subsurface layer is dark reddish brown sandy loam and loam to bedrock. Bedrock is mostly basalt, but occasionally sandstone is present.

Some of the minor soils in this association include shallow organic soils (Lithic and Terric Borosaprists) and Waiska. Terric Borosaprists are located in drainage ways; Lithic Borosaprists are in closed depressions on rock ridges; and Waiska is located on gravelly beach deposits near the contemporary Lake Superior shoreline.

The soils in this association are generally too shallow and too fragile for use as trails, campsites, buildings, and pit toilets.

MAPPING UNIT: IMP

COMPONENTS: Ishpeming, Menominee, Rubicon, Rockland

SLOPES: 0-30

DRAINAGE: MWD, WD, EWD

PM TEXT: S, LS over rock and loamy till

LANDSCAPE: Sandy ground moraine and outwash on rock ridges
and side slopes

GEOMORPHIC RELATIONS: Ishpeming and Rubicon on rock slopes and
terraces, +/- 40" deep; Menominee over sand over loamy
till on same slopes, Rockland where rock exposed on
those slopes and ridges

UNIT COMPOSITION: Ishpeming 30%, Rubicon 15%, Menominee and
similar soils 20%, Rockland 15%, minor inclusions 20%

MINOR SOILS: Michigamme and Peshekee on loamy areas; Saynor,
Paavola, Champion where more gravelly; SPD analogs of
all of above on level areas.

USE LIMITATIONS:

TRAILS: None
CAMPSITES: None
PIT TOILETS: Moderate (poor filter)
BUILDINGS: None

On site investigations needed to determine suitability
for use and management at specific locations.

REFER TO SERIES DESCRIPTIONS: Ishpeming
Menominee
Rubicon
Rockland

FILE NAME: IMP

MAPPING UNIT: IST

COMPONENTS: Carbondale, Tawas and Tawas variants, Histic Hum-
aquepts, Roscommon, Hettinger

SLOPES: 0-2%

DRAINAGE: PD, VPD

PM TEXT: Sapric OM over mineral

LANDSCAPE: Drainage ways, depressional areas, beaver ponds

GEOMORPHIC RELATIONS: Carbondale over most of marsh and bog,
Tawas and variants at bog margins, Histic Humaquepts
and Roscommon and Hettinger in PD lowlying adjacent
areas

UNIT COMPOSITION: Carbondale 60%; Tawas and variants 10%;
Histic Humaquepts 15%; Roscommon and Hettinger 5%;
minor inclusions 10%

MINOR SOILS: Rockland, Pickford,

USE LIMITATIONS:

TRAILS: Severe (wet)

CAMPSITES: Severe (wet)

PIT TOILETS: Severe (wet)

BUILDINGS: Severe (wet)

REFER TO SERIES DESCRIPTIONS: Carbondale
Tawas
Tawas (clayey variant)
Tawas (loamy variant)
Witbeck (clayey variant)
Witbeck (loamy variant)
Witbeck (sandy variant)
Roscommon
Hettinger

FILE NAME: IST

MAPPING UNIT: MPR

COMPONENTS: Michigamme, Peshekee, Rockland

SLOPES: 5-80%

DRAINAGE: MWD, WD, EWD

PM TEXT: SL, L, SiL

LANDSCAPE: Rock ridges and rock slopes

GEOMORPHIC RELATIONS: Michigamme on gentle slopes and shoulder slopes 20-40" to bedrock; Peshekee on back slopes and terraces 10-20" to bedrock; Rockland on steeper slopes and erosional surfaces 0-10" to bedrock.

UNIT COMPOSITION: Michigamme 40%, Peshekee 15%, Rockland 30%, soils of minor extent 30%

MINOR SOILS: Champion and Pence on back slopes and ridge tops in deeper soil; Ishpeming in sandy spots shallow to bedrock; Waiska along shorelines.

USE LIMITATIONS:

TRAILS: None

CAMPSITES: None to slight (shallow)

PIT TOILETS: Moderate to severe (shallow)

BUILDINGS: None to severe (shallow)

On site investigations needed to determine suitability for use and management at specific locations.

REFER TO SERIES DESCRIPTIONS: Michigamme
Peshekee
Rockland

FILE NAME: MPR

MAPPING UNIT: RHP

COMPONENTS: Rockland, Histic Humaquepts, Peshekee,

SLOPES: 0-30%

DRAINAGE: PD, SPD, WD

PM TEXT: Bedrock, SL, L, sapric OM

LANDSCAPE: Rock face in Saginaw Peninsula characterized by diagonal joint lines between rock knobs.

GEOMORPHIC RELATIONS: Rockland and Peshekee on rock knobs; Histic Humaquepts and Peshekee (SPD variant) in jointed depressional areas between knobs.

UNIT COMPOSITION: Rockland 40%; Peshekee 10%; Histic Humaquepts 15%; Peshekee (SPD variant) 15%; minor inclusions 20%

MINOR SOILS: Ishpeming, Iosco, Hettinger, Tawas and Tawas variants

USE LIMITATIONS:

TRAILS: Slight (wet)
CAMPSITES: Severe (shallow, wet)
PIT TOILETS: Severe (shallow, wet)
BUILDINGS: Severe (shallow, wet)

On site investigations needed to determine suitability for use and management at specific locations.

REFER TO SERIES DESCRIPTIONS: Rockland
Peshekee
Peshekee (SPD variant)
Witbeck (clayey variant)
Witbeck (loamy variant)
Witbeck (sandy variant)

FILE NAME: RHP

MAPPING UNIT: WBR

COMPONENTS: Waiska, Borofolists, Rockland

SLOPES: 0-20

DRAINAGE: MWD, WD

PM TEXT: Gr S, sapric OM, SL-SiL, rock

LANDSCAPE: Outlying islands, with little soil other than
Nippising beach gravels and sands

GEOMORPHIC RELATIONS: Waiska on beach gravels; Rockland on rock
exposures; Borofolists in OM mat over bedrock and
gravel deposits

UNIT COMPOSITION: Waiska 30%; Borofolists 40%; Rockland 15%;
soils of minor extent 15%

MINOR SOILS: Peshekee and Michigamme on deeper mineral deposits;
Borosaprists in depressions and drains

USE LIMITATIONS:

TRAILS: None
CAMPSITES: Moderate (shallow, gravelly)
PIT TOILETS: Severe (poor filter, shallow)
BUILDINGS: Severe (shallow)

On site investigations needed to determine suitability
for use and management at specific locations.

REFER TO SERIES DESCRIPTIONS: Waiska
Ricker
Typic Borofolists
Rockland

FILE NAME: WBR

MAPPING UNIT: WPM

COMPONENTS: Waiska, Peshekee, Michigamme

SLOPES: 0-20

DRAINAGE: SPD, MWD, WD

PM TEXT: Gr S, SL-SiL

LANDSCAPE: Shore areas of main island dropping gradually into Lake Superior

GEOMORPHIC RELATIONS: Waiska on beach gravels; Peshekee and Michigamme on adjacent side slopes and in loamy-skeletal beach deposits

UNIT COMPOSITION: Waiska 35%; Peshekee 20%; Michigamme 15%; soils of minor extent 30%

MINOR SOILS: Rockland; Bowers and Rudyard on lacustrine inclusions

USE LIMITATIONS:

TRAILS: Slight (cobbly)
CAMPSITES: Moderate (shallow, gravelly)
PIT TOILETS: Severe (poor filter, shallow)
BUILDINGS: Severe (shallow)

On site investigations needed to determine suitability for use and management at specific locations.

REFER TO SERIES DESCRIPTIONS: Waiska
Waiska wet variant
Peshekee
Peshekee SPD variant
Michigamme

FILE NAME: WBR

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LIST OF SOILS SERIES
ISLE ROYALE NATIONAL PARK

SUMMER, 1987

Enclosed are descriptions of the series used in mapping the NE 1/3 of the Isle Royale during the summer of 1987. Each series we used is tentatively identified with an established series defined by the USDA National Cooperative Soil Survey for the State of Michigan. There was not perfect agreement between the soil series we defined as found on the island and the series as defined for the rest of the State of Michigan. Therefore, we have included in our descriptions comparisons between the series we used and the series as established by NCSS.

The following is a guide to our series descriptions.

The title is the name of the series followed by a number in parentheses. This number is the mapping unit code we used on our map sheets to identify delineations in the field. This code is the same one used by SCS Michigan Office in East Lansing for the established series of that name. Occasionally we had to create a new code for an association or for a series for which we did not know the SCS code.

The body of the description is divided into two columns. On the left is the series as we defined it for Isle Royale, and on the right is the series as established by NCSS for Michigan.

The first items listed provide an overview of the series, including: parent material (PM), soil drainage class, range of slopes in percentage, the soil classification including particle size class for the family, and landscapes on which the series is found. All terms, descriptions, and taxonomic classification conform to standard NCSS standards, as defined in the National Soils Handbook (1983), Soil Survey Manual (1981), and Soil Taxonomy (1975).

Following is a description of the defining morphological components of the soil series, emphasizing diagnostic horizons and their texture, color, depth in inches, and coarse fragment content (C Frags). The profile is arbitrarily broken up into Surface horizons (O and A horizons where organic matter (OM) accumulates); sub-surface horizons where there are accumulations of Fe₂O₃ and Al₂O₃ (B_{hs} and B_s horizons), clay (B_t horizons), reduced iron (B_g horizons); and substrata of unweathered soil parent material (PM) in the C horizons.

At the end of the description are comments about the series to aid future soil mapping parties on the island.

The last item of the description is the computer file name where the description is stored. All files are stored on a floppy disk labeled "ISLE ROYALE SOILS: 2ND ORDER LEGEND." These files were written with "WORDSTAR," and are stored with Professor Stephen Shetron at Michigan Technological University, School of Forestry.

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2. Soil Conservation Service. 1981+. Soil survey manual, revisions. U. S. Dept. of Agriculture.
3. Soil Conservation Service. 1983. National soils handbook. U.S. Govt. Printing Office, Washington, DC.

ALLENDALE (185)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Outwash over till or over lacustrine	Sand over clay
Drainage	SPD	SPD
Slope	0-6%	0-6%
Taxonomy	Alfic Haplaquods	Alfic Haplaquods
Family	Sandy over clayey	Sandy over clayey
Landscape	Foot and toe slopes	Foot and toe slopes
Surface		
Texture	S, LS	S, LS
C Frags	0-15%	0-5%
Subsurface		
Horizons	Bs	+/-Bhs Bs
Color	5-10YR 3-4/3-4, not 3/3	5-10YR 3-4/3-4
Texture	S, LS	S, LS
C Frags	0-15%	0-5%
Mottling	<2 chroma mottles	+/- <2 chroma mottles
Substratum		
Horizons	2Bt, 2C	2Bt, 2C
Text	CL, C	CL, SiCL, C, SiC
Depth to	25-40"	20-40"
CaCO ₃	None	Strong
Comments	Allendale is of minor extent, but will probably become more significant in the SW 2/3 of the island.	
File Name	ALLEND.ALE	

	BOWERS taxadjunct	(106)
	ISLE ROYALE	ESTABLISHED SERIES
PM	Glacial-fluvial deposits	Stratified lacustrine
Drainage	SPD	SPD
Slope	0-6%	0-6%
Taxonomy	Aquic Eutroboralfs Aquic Eutrochrepts Aquic Haploborolls	Aquic Eutroboralfs
Family	Fine, Fine-loamy	Fine
Landscape	Old lake basins	Lake plains
Surface		
Texture	SL-SiCL	SL-SiCL
C frags	0-5% ave, 0-90% range	?
Subsoil		
Horizons	variously BE, Bw, Bt	BE, Bt
Color	5-7.5YR 3-4/3-6 mottled	2.5-10YR 4-5/3-4 mottled
Texture	SiCL, CL, C stratified in lower B horizons with SCL, VFSL, SiL	SiCL, CL
C Frags	0-15% ave, 0-35% range	?
C Horizon		
Depth to	15-25"	18-36"
Texture	28-35% clay overall	28-35% clay overall
Strata	Stratified with any of S, SCL, SL, VFSL, SiL, CL, C	CL, SiCL, SiL, SiC
C Frags	0-15% ave, 0-35% range	?
Bedrock		
Depth to	>40" ave, >30" range	>40"
Comments	We used Bowers Taxadjunct for soils that are coarser in texture than Rudyard and Pickford but finer than loam. Stratification is also necessary, and in the soils of NE Isle Royale stratification was varied and extensive. The island does not have many soils with a fine partical size class, so it wa necessary to combine those that are present. The soils may be shallow to bedrock and may have many pebbles and cobbles.	
File Name	BOWERS	

CARBONDALE

	ISLE ROYALE	ESTABLISHED SERIES
PM	Herbaceous and woody OM	Herbaceous and woody OM
Taxonomy	Borosaprists (Typic Fibric, and Hemic subgroups)	Hemic Borosaprists
Family	Euic	Euic
Landscapes	Major drainages, beaver ponds	Bogs
pH	6.5-7 below surface tier occasional Oi horizons have pH<4.5	5.5-7.8
Horizons	Dominantly Oa, sometimes >10" of Oi, Oe	Dominantly Oa with >10" Oe
Mineral soil		
layers in OM	None	None
Depth to mineral	>51"	>51"

Comments Most of the beaver ponds fit the Carbondale we describe above. The bog on Raspberry Island is the only one we found to be dysic, and it is in a closed depression.

The beaver ponds are deeper than 51 inches. Very little of the area is Tawas, except around the pond margins.

Although beavers periodically abandon the ponds, organic accumulation in most ponds indicates long and repeated habitation. Dr. Phil Shelton has studied 100 years of map data and 50 years of aerial photo data and has concluded that beavers will re-inhabit old ponds frequently enough that current ponds will retain their bog characteristics throughout the life of this soil survey.

File Name CARBOND.ALE

CHAMPION (131)

	ISLE ROYALE	ESTABLISHED SERIES
FM	Glacial till	Glacial till
Drainage	MWD, WD	MWD, WD
Slope	10-25%	0-70%
Taxonomy	Entic Fragiorthods Typic Fragiorthods	Typic Fragiorthods
Family	Coarse loamy or sandy	Coarse loamy
Landscape	Side slopes and ridge tops, terraces	Ground moraines and end moraines
Surface		
Texture	FSL-SiL	FSL-SiL
C Frags	0-10% gr, 0-10% cb	0-10% gr, 0-35% cb
Subsurface		
Texture	LFS, SL, to L & SiL	LS-SiL
Horizons	+/- Bhs, + Bs	+Bhs, +Bs
Color	5-7.5YR 3-4/3-4	2.5-10YR 3-4/3-4 +3/3
C Frags	10-30% gr, 0-30% cb	15-35% gr, 0-35% cb
Fragipan		
Depth to	12-33"	12-33"
Horizons	2Bx, +/- 2Ex weakly developed	2Bx
Texture	GrLS, SL, L generally coarser than higher horizons	GrLFS, LS, SL
C Frags	10-30% gr, 0-20% cb	15-35% gr, 0-15% cb
C Horizon		
Depth to	23-35"	30-70"
Texture	GrLS, SL, L	GrLS, SL, L
c frags	10-40% gr, 0->20% cb	15-35% gr, 0-15% cb
Bedrock		
Depth to	>35 inches	>40 inches
Comments	Champion generally has a FSL-LS cap over a somewhat coarser fragipan. Fragipans are weakly developed. Cobble content in C may be high enough to prevent penetration with an auger past 32". This makes it difficult to distinguish from a shallow variant (35-40") of the established series. Because of practical difficulties in breaking out a shallow variant and because the difference in depth is so small, we decided to amend the definition of Champion to include soils >35" to bedrock. Hue of the solum is usually 7.5YR.	

File Name CHAMPION

FROBERG (140)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Clay loam and clay over loam till	Clayey over loamy
Drainage	MWD	WD, MWD
Slopes	5-20%	0-25%
Taxonomy	Typic Eutroboralfs Typic Glossoboralfs	Typic Eutroboralfs
Family	Clayey over loamy	Clayey over loamy
Landscape	Lower side slopes near lake basins	Lake plains
Surface		
Texture	SiL, CL, SL	SiL, SiCL
C Frags	0-50% gr, cb	0%
Argillic		
Texture	SiC, CL	SiC, C
C Frags	0-50%	0%
Color	2.5YR 4/4	10R-2.5YR 3-4/4-6
2C		
Text	SL-SCL	SL-SCL
C Frags	20-40%	0%
Depth to	25-30"	15-36"
Bedrock	>40"	none
Comments	Of minor extent on the NE 1/3 of the island. Froberg is less stratified than Bowers.	
File Name	FROBERG	

HETTINGER taxadjunct (107)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Glacial-fluvial deposits	Stratified lacustrine
Drainage	PD	PD
Slope	0-2%	0-2%
Taxonomy	Mollic Haplaquepts Aeric Haplaquepts	Mollic Haplaquepts
Family	Fine, Fine-loamy	Fine-loamy
Landscape	Old lake basins	Lake plains
Surface		
Texture	SL-SiCL	SL-SiCL
C frags	0-5% ave, 0-90% range	?
Subsurface		
Horizons	Bg, +/- Bw	Bg
Color	7.5YR <2 chroma mottles	7.5-10YR, 2.5Y <2 chroma mottles
Texture	SiCL, CL, C stratified in lower B horizons with SCL, vfSL, SiL	SiCL, CL +/- strata of SiC, C, Si, SiL
C Frags	0-15% ave, 0-35% range	?
C horizon		
Depth to	18-28"	18-28"
Texture	28-35% clay overall	28-35% clay overall
Strata	Stratified with any of S, SCL, SL, VFSL, SiL, CL, C	CL, SiCL, SiL, SiC
C Frags	0-15% ave, 0-35% range	?
Comments	We used Hettinger Taxadjunct for soils that are coarser in texture than Rudyard and Pickford but finer than loam. Stratification is also necessary, and in the soils of NE Isle Royale stratification was varied and extensive. The island does not have many soils with a fine partical size class, so it was necessary to combine those that are present. The soils may be shallow to bedrock and may have many pebbles and cobbles.	
File Name	HETTIN.GER	

IOSCO (96)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Outwash over till	Outwash over till
Drainage	SPD	SPD
Slope	0-6%	0-6%
Taxonomy	Alfic Haplaquods	Alfic Haplaquods
Family	Sandy over loamy	Sandy over loamy
Landscape	Level terraces, toe slopes	Outwash plains
Surface		
Texture	S, LS, FS, LFS	S, LS, FS, LFS
C Frags	0-15% gr	?
Subsurface		
Horizons	Bs	Bs, +/- Bhs
Color	5-7.5YR 3-4/3-4, not 3/3	5-10YR 3-4/3-4
Texture	S, LS, FS, LFS	S, LS, FS, LFS
C Frags	0-15% gr	?
Mottles	Upper spodic +/- mottled	Upper spodic mottled
E'	Absent	Optional
2Bt		
Texture	SCL	SiCL, CL, SCL
Depth	20-30"	21-36"
C Frags	15-45%	?
Color	5YR-10YR 4-5/3-6	5YR-10YR 4-5/3-6
2C		
Texture	SCL	SCL, CL, SiCL
Color	5YR-10YR 4-6/1-4	5YR-10YR 4-6/1-4
Comments	Of minor extent. We identified it as a SPD analog of Menominee. Mottles were not always present in the upper spodic horizon but landscape position, vegetation, and relative wetness indicated an aquic moisture regime.	
File Name	IOSCO	

MANISTEE (183)

	ISLE ROYALE	ESTABLISHED SERIES
FM	Outwash over till or over lacustrine	Sand over clay
Drainage	WD, MWD	WD, MWD
Slope	5-30%	0-50%
Taxonomy	Alfic Haplorthods	Alfic Haplorthods
Family	Sandy over clayey	Sandy over clayey
Landscape	Side slopes	Various
Surface		
Texture	S, LS	S, LS
C Frags	0-15%	0-5%
Subsurface		
Horizons	Bs	Bs, +/- E'
Color	5-10YR 3-4/3-4, not 3/3	5-10YR 3-4/3-4, not 3/3
Texture	S, LS	S, LS
C Frags	0-15%	0-5%
Understory		
Horizons	2Bt, 2C	2Bt, 2C
Text	CL, C	CL, SiCL, C, SiC
Depth to CaCO ₃	25-40" None	20-40" Strong
Comments	The soil is of minor extent, but will probably become more significant in the SW 2/3 of the island.	
File Name	MANISTEE	

ISHPEMING (288)

	ISLE ROYALE	ESTABLISHED SERIES
FM	Outwash over bedrock	Sandy over rock
Drainage	EWD, WD	EWD
Slope	5-35%	8-60%
Taxonomy	Entic Haplorthods	Entic Haplorthods
	Typic Haplorthods	
Family	Sandy	Sandy
Landscape	Side slopes	Various
Surface		
Texture	S, LS, SL	S, LS
C Frags	0-15%	0-10%
Subsurface		
Texture	S, LS	S, LS
Horizons	Bs (+/- Bhs)	Bhs, Bs
Colors	5-7.5YR 3-4/3-4	2.5-7.5YR 3-4/3-4 +3/3
C Frags	5-15% ave, 0-35% range	0-10%
Bedrock		
Depth to	20-40"	20-40"
Kind	Any (not source material for sands of solum)	Igneous
Comments	We used Ishpeming for soils that are 20-40" to bedrock and have a texture sandier than allowed for Michigamme. Most of them lack a Bhs, though Typic Haploorthods are allowed in the NCSS soil series description for Michigan. We did not find either fragipans or ortstein in these soils.	
File Name	ISHPEM.ING	

MENOMINEE (193)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Outwash over till	Sand over loam
Drainage	WD, MWD	WD, MWD
Slope	5-30%	0-45%
Taxonomy	Alfic Haplorthods	Alfic Haplorthods
Family	Sandy over loamy	Sandy over loamy
Landscape	Side slopes	Various
Surface		
Texture	S, LS	S, LS
C Frags	0-15%	None
Subsurface		
Horizons	Bs, +/- E'	Bs, +/- E'
Color	5-10YR 3-4/3-4, not 3/3	5-10YR 3-4/3-4, not 3/3
Texture	S, LS	S, LS
C Frags	0-15%	none
Substratum		
Horizons	2Bt, 2C	2Bt, 2C
Texture	Heavy SL, L, SCL, SiL	CL, SCL, L, SiL, SiCL
Depth to	25-40"	20-40"
CaCO3	None	+/-
Comments	Menominee is of minor extent in the NE 1/4 of the island but becomes more significant in the Indian Portage fault. We identified it as an analog of Manistee with a loamy rather than clayey substratum.	
File Name	MENOMI.NEE	

MICHIGAMME (73)

ISLE ROYALE		ESTABLISHED SERIES
PM	Till, +/- eolian cap	Ground moraine
Drainage	MWD, WD	MWD, WD
Slope	5-50%+	1-70%
Taxonomy	Entic Haplorthod & Typic Haplorthod	Typic Haplorthod
Family	Coarse loamy and loamy skeletal	Coarse loamy and loamy skeletal
Surface		
Texture	SL-SiL	SL-SiL
C frags	0-70% (+/- skeletal phases)	0-50%
Subsoil		
Texture	SL-SiL	Sl-SiL
Horizons	Bs (+/- Bhs)	Bhs, Bs
Colors	5-7.5YR 3-4/3-4	2.5-7.5YR 3-4/3-4 +3/3
C Frags	0-70%	0-50%
Bedrock		
Depth to	20-40"	20-40"
Kind	Any	Igneous
Comments	Michigamme soils on the island are almost any MWD or WD soils 20-40" to bedrock that have textures falling in the SL, L, or SiL regions of the texture triangle. They do not have a pronounced fragipan, though a thin weak Ex lying on top of the rock surface is permitted. We did not test the Bs and Bhs horizons for extractable Fe and Al, so the series may include some Dystric Eutrochrepts. E horizons are not common; this may be due to earthworm activity.	

File Name MICHIGAM.ME

MOQUAH VARIANT (322)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Cobbly SL over LS	Alluvium
Drainage	MWD	MWD
Slope	5-30%	0-3%
Taxonomy	Dystic Eutrochepts	Typic Udifluvents
Family	Coarse-loamy	Coarse-loamy
Landscape	Back & foot slopes to lake basins	Flood plains
Surface		
Texture	SL	SL-SiL
C Frags	15-35% cb	?
Subsurface		
Horizons	Bw	no Bw
Texture	SL, L	
Colors	7.5-10YR 4-5/3-4	
C Frags	15-35% cb.	
2C Horizon		
Texture	LS	SL, L, SiL, VFSL, FSL, bands of S, FS
Colors	7.5-10YR 4-5/4	2.5-10YR 3-5/3-6
Strata	+/-	++
C Frags	0-10%	0-10%
Depth to	18-20"	3-16
Bedrock		
Depth to	35-42"	
Comments	We assigned the designation "Moquah" to a group of soils on the N. shore of Moskey Basin that have a cobbly sandy loam upper story over +/- stratified loamy sands. They do not have spodic colors but do seem to have enough structure and color development to be Inceptisols rather than Entisols. They are 35-42 inches deep to bedrock.	
File Name	MOQUAH	

MOQUAH SPD VARIANT (322SPD)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Cobbly SL over LS	Alluvium
Drainage	SPD	MWD
Slope	2-6%	0-3%
Taxonomy	Aeric Haplaquepts	Typic Udifluvents
Family	Coarse-loamy	Coarse-loamy
Landscape	Foot and toe slopes to lake basins	Flood plains
Surface		
Texture	SL	SL-SiL
C Frags	15-35% cb	?
Subsurface		
Horizons	Bw	no Bw
Texture	SL, L	
Colors	7.5-10YR 3-4/2-3	
C Frags	15-35% cb.	
2C Horizon		
Texture	LS	SL, L, SiL, VFSL, FSL, bands of S, FS
Strata	+/-	++
C Frags	0-10%	0-10%
Depth to	18-20"	3-16
Bedrock		
Depth to	35-42"	
Comments	We assigned the designation "Moquah SPD" to SPD soils on the N. shore of Moskey Basin that have a cobbly sandy loam upper story over +/- stratified loamy sands. They do not have spodic colors but do seem to have enough structure and color development to be Inceptisols rather than Entisols. They are 35-42 inches deep to bedrock.	
File Name	MOQUAH	

PAAVOLA (400)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Gr S over grS till	Gr S over grS till
Drainage	WD	WD, MWD
Slope	15-30%	0-70%
Taxonomy	Entic Fragiorthods	Typic Fragiorthods
Family	Sandy-skeletal	Sandy-skeletal
Landscape	Side slopes to drains	Ground moraines
Surface		
Texture	S	S, LS, SL, L
C Frags	15-35% gr	0-30%
Subsurface		
Horizons	Bs	Bhs, Bs
Color	5-7.5YR 3-4/3-4, not 3/3	5-7.5YR 3-4/3-4 +3/3
Texture	S	S, LS
C Frags	15-50% gr, 10-20% cb	0-20% gr, 0-30% cb
Fragipan		
Texture	FS	S, LS, FS, LFS
C Frags	15-50% gr, 10-20% cb	3-60% gr, 5-40% cb
Thickness	10-20"	15-40"
Depth to	25-35"	30-40"
C Horizons		
Texture	stratified sands	S, SL, LS
C Frags	>35%	3-60% gr, 5-40% cb
Comments	Paavola soils are very gravelly sands, variously stratified, with a fragipan. They are of minor extent in the NE 1/3 of the island. If the series is discarded the single delineation on photo 275-3-134 should be changed. See Sayner description (unit 155)	
File Name	Paavola	

PENCE (731)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Loamy over sandy outwash	Loamy over sandy outwash
Drainage	WD	WD
Slope	3-35%	0-45%
Taxonomy	Entic Haploorthods	Entic Haploorthods
Family	Sandy	Sandy
Landscapes	Side slopes	Outwash plains
Surface		
Texture	SL, FSL	SL, L, FSL
C Frags	0-35%	0-15%
Subsurface		
Horizons	Bs	Bs
Color	5-10YR 3-4/3-4, not 3/3	5-10YR 3-4/3-4, not 3/3
Texture	SL, FSL	SL, FSL, L
C Frags	0-35%	
Substratum		
Horizons	2BC, 2C (+/-2Bs)	2BC, 2C
Text	LS, LFS, S	S, LS
C Frags	5-35%	15-55%
Color	7.5-10YR 4-5/3-6	5-10YR 4-5/3-6
Depth to	15-30"	10-20"
Bedrock	>32"	>40"
Comments	We mapped Pence in a complex with Michigamme. Bedrock is generally deeper than 40", but may be as shallow as 35". The major difference between Pence and Champion is absence of a fragipan. Upper stratum in Pence, Champion, and Michigamme soils is all about the same.	
File Name	PENCE	

PESHEKEE (286)

ISLE ROYALE		ESTABLISHED SERIES
FM	Till, +/- eolian cap	Ground moraine
Drainage	MWD, WD	MWD, WD
Slope	5-50%	3-70%
Taxonomy	Lithic Haplorthod	Lithic Haplorthod
	Entic Lithic Haplorthod	
Family	Coarse-loamy and Loamy-skeletal	Coarse-loamy and Loamy-skeletal
Surface		
Texture	SL-SiL	SL-SiL
C frags	0-70%	0-50%
Spodic		
Texture	SL-SiL	SL-SiL
Horizons	Bs (+/- Bhs)	Bhs, Bs
Colors	5-7.5YR 3-4/3-4	2.5-7.5YR 3-4/3-4 +3/3
C Frags	0-70%	0-50%
Bedrock		
Septh	10-20"	10-20"
Kind	Any	Igneous or metamorphic
Comments	Peshekee soils on the island are almost any MWD or WD soils 10-20" to bedrock that have textures falling in the SL, L, or SiL areas of the textural triangle. We did not test the Bs and Bhs horizons for extractable Fe and Al, so Peshekee may include some Lithic Eutrochrepts. E horizons are not common; this may be due to earthworm activity.	
File Name	PESHEKEE	

FESHEKEE (286SPD)

	ISLE ROYALE	ESTABLISHED SERIES
FM	Ground moraine	Ground moraine
Drainage	SPD	MWD, WD
Slope	1-5%	3-70%
Taxonomy	Lithic Haplaquod	Lithic Haplorthod
Family	Coarse-loamy and Loamy-skeletal	Coarse-loamy and Loamy-skeletal
Surface		
Texture	SL-SiL	SL-SiL
C Frags	0-70%	0-50%
Subsurface		
Texture	SL-SiL	SL-SiL
Horizons	Bs	Bhs, Bs
Color	5-7.5YR 3-4/3-4, not 3/3	2.5-7.5YR 3-4/3-4 +3/3
C Frags	0-70%	0-50%
Mottles	+/- <2 chroma mottles	- <2 chroma mottles
Bedrock		
Depth	10-20"	10-20"
Kind	Any	Igneous or metamorphic
Comments	Peshekee (somewhat poorly drained variant) soils are soils 10-20" to bedrock that are SPD and have less sand than Waiska. Most of them are formed on old shore lines; thus coarse fragment content is usually >35%. They are of minor extent.	
File Name	FESHEKEE	

PICKFORD (157)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Lacustrine clays	Lacustrine clays
Drainage	PD	PD
Slope	0-4%	0-4%
Taxonomy	Typic Haplaquepts	Typic Haplaquepts
Family	Fine	Fine
Landscape	Lake basin	Lake plains
Surface		
Texture	SiL, SiCL, SiC, C	C, SiL, SiCL, SiC
C Frags	None	None
Subsurface		
Horizons	Bg	Bg
Texture	C, SiC	C, SiC
Color	2.5-5YR 4-5/1-2	2.5-5YR 4-5/2-4
	<2 chroma mottles	<2 chroma mottles
C Frags	0	0
C Horizon		
Texture	SiC, C	SiC, C
Color	2.5-5YR, 4-5/3-4	2.5-7.5YR, 4-6/2-4
Depth	20-30"	14-30"
CaCO ₃	None	Present
strati- fication	None	None
Comments	We mapped as Pickford fine, PD soils that showed no stratification and had more clay than allowed in the Nunica, Bowers, Hettinger sequence. They are of minor extent in the NE 1/3 of the island and could be included in a Pickford/Hettinger Group if they are no more extensive on the rest of the island. All representatives found so far lack carbonates, but otherwise fit established criteria for Pickford. We would normally map these soils as Witbeck (fine variant) if more sapric OM had accumulated on the surface.	
File Name	PICKFORD	

RICKER (001)

	ISLE ROYALE	ESTABLISHED SERIES
FM	Drained organic deposits	Drained organic deposits
Drainage	WD, EWD	WD, EWD
Slopes	5-40%	3-80%
Taxonomy	Lithic Borofolists	Lithic Borofolists
Family	Euic	Dysic
Landscape	Rock slopes, rock faces on outer islands	Rock faces on mountains
Surface		
Texture	Fibric or sapric	Fibric
pH	5-7	<4.5
Thickness	0-5"	0-2"
Subsurface		
Horizons	Oa (occasionally Oi)	Oe or Oa
Thickness	5-10" ave, 1-20" range	1-26 inches
pH	5-6	<4.5
Mineral		
Texture	LS-SiL, +/- channery	CS-SiL, very channery
Thickness	0-2 inches	0-4 inches
Bedrock		
Depth to	2-20 inches	2-26 inches
Comments	Ricker occurs on the NE 1/6 of the island on most rock faces and further southwest on faces near the lake shore. It also occurs on outlying islands. It is the organic analog of Rockland, a mineral soil less than 10 inches thick.	
File Name	RICKER	

ROCKLAND (000)

PM	Bedrock, Eolian, Till
Drainage	WD, MWD
Slopes	10-80%
Taxonomy	No soil, Lithic Udorthents, Entic Lithic Haplorthods
Family	Loamy and loamy-skeletal
Landscape	Bedrock slopes
Surface	
Texture	LS, LfS, FSL, SiL
C frags	0-70% (mostly shattered bedrock flags and gravels)
Thickness	0-10 inches
Other horizons Bs, C possible, both <10" to bedrock	
Bedrock	
Depth to	0-10"
Kind	Any
Comments	Rockland consists of any land area covered with less than 10 inches of any mineral soil, including bare bedrock. Depth of soil is sometimes difficult to predict in the field because bedrock surfaces are irregular. This series stands in contrast to Ricker (Lithic Borofolist). Mineral deposits on the Greenstone Ridge dominate southwest of Mount Franklin.
File Name	ROCKLAND

ROSCOMMON (159)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Outwash	Outwash
Drainage	PD, VPD	PD, VPD
Slope	0-2% <i>Humasupis</i>	0-2%
Taxonomy	<i>None</i> ~~Mollie~~ Psammaquents	Mollic Psammaquents
Landscape	Drainageways	Drainageways
Surface		
Texture	Sapric OM (<8") over S,LS	S, LS
C Frags	None	0-10%
C Horizons		
Horizons	Cg, C	Cg, C
Texture	S	S, LS
Color	7.5-10YR 4-6/1-3	7.5YR-5Y 4-6/1-3
C Frags	None	0-10%
Depth to	1/2 foot	4-7"
Comments	We called a soil Roscommon if it was a PD or VPD medium or coarse sand that showed no pedogenic development in two or three auger depths and if it had less than 8" of OM on top. The soils are more extensive than expected because the organic cap seems to be less thick on top of PD sands than over PD loams or clays.	
File Name	ROSCOM.MON	

RUBICON (50)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Outwash	Outwash & sandy till
Drainage	EWD	EWD
Slope	10-25%	0-60%
Taxonomy	Entic Haplorthods	Entic Haplorthods
Family	Sandy	Sandy
Landscape	Side slopes, terraces	Variable
Surface		
Texture	S, LS, SL	S, LS
C Frags	0-20% gravel	0-15%
Subsurface		
Texture	S, LS	S, LS
Horizons	Bs (no Bhs)	Bs (no Bhs)
Colors	5-10YR 3-4/3-4, not 3/3	2.5-10YR 3-4/3-4 not 3/3
C Frags	0-20%	0-15%
C Horizon		
Texture	S, LS	S, LS
Depth	25"+	20-45"
Bedrock	>40"	none
Comments	We mapped as Rubicon any WD sandy soil that is >40" deep, has no major textural discontinuities, has Entic Spodic colors, and no other diagnostic horizons.	
File Name	RUBICON	

RUDYARD (78)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Lacustrine clays	Lacustrine clays
Drainage	SPD	SPD
Slope	0-4%	0-4%
Taxonomy	Aquic Eutroboralfs	Aquic Eutroboralfs
Family	Very-fine	Very-fine
Landscape	Lake basin	Lake plains
Surface		
Texture	SiL, SiCL, SiC	SiL, SiCL, SiC
C Frags	None	None
Subsurface		
Horizon	Argillic	Argillic
Texture	C, SiC	C, SiC
Color	2.5-5YR 3-4/4	2.5-5YR 3-4/4
C Frags	0	0
C Horizon		
Texture	SiC, C	SiC, C
Color	2.5-5YR, 4-5/3-4	2.5-5YR, 4-5/3-4
Depth	16-40"	16-40"
CaCO ₃	+/-	present
Strati- fication	None	None
Comments	We used Rudyard to map very fine, SPD soils that showed no stratification and had more clay than allowed in the Nunica/Bowers/Hettinger sequence. They are of minor extent in the NE 1/3 of the island and could be included in an Bowers/Rudyard group if they are no more extensive on the rest of the island. All representatives found so far lack carbonates, but otherwise fit established criteria for Rudyard.	
File Name	RUDYARD	

SAYNER (155)

ISLE ROYALE		ESTABLISHED SERIES
FM	Outwash	Outwash
Drainage	WD	WD
Slope	20-25%	?
Taxonomy	Entic Haplorthods	Entic Haplorthods
Family	Sandy	Sandy
Landscape	Side slopes	?
Surface		
Texture	LS, S	?, S
C frags	<35%	?
Subsurface		
Texture	S, LS	S, ?
Horizons	Bs	Bs
Color	5YR 3-4/3-4, not 3/3	5YR 3-4/3-4, not 3/3
C frags	<35%	?
C horizon		
Depth	20"	12-36
C Frags	>35%	>15% ???
Comments	We have no documentation for either the established series of Sayner or for the single delineation tentatively identified as Sayner in the field. The soils had enough of an increase in gravels to indicate a lithologic discontinuity. We expect there to be more of it further SW on the island so have left the delineation stand. If the series is discarded, the delineation on photo 275-3-134 should be changed. The definition of "Rubicon" could be amended to allow for more coarse fragments.	
File Name	SAYNER	

TYPIC BOROFOLISTS (002)

PM Organic material
Drainage WD, EWD
Slopes 5-80%
Taxonomy Typic Borofolists
Family Euic
Landscapes Rubble fields, Escarpments, Abandoned beaches

Surface
Texture Fibric
pH 5-7
Depth 0-5 inches

Subsurface
Texture Fibric, hemic, sapric
C frags Extremely cobbly, stoney
Thickness Usually unknown; >10 inches

Comments This series consists of organic soil on top of and intermingled among rock rubble. Rubble fields are found on old shore lines and particularly down the steep escarpment faces of the NW side of the Greenstone Ridge. The series is found mainly on the NE 1/6 of the main island and on outlying islands.

File name TYPBORFL.IST

TAWAS clayey variant

	ISLE ROYALE	ESTABLISHED SERIES
FM	Sapric OM over clay, woody & herbaceous	Sapric OM over sand, woody & herbaceous
Drainage	VPD	VPD
Taxonomy	Terric Borosapristis	Terric Borosapristis
Family	Euic, clayey	Euic sandy or S-skel
Landscapes	Bog edges, depressions	Bog edges, dpressns.
Horizons	Variable, dominantly Oa	Dominantly Oa, with some Oe
pH	6.5+	5.5-7.8
Mineral soil		
Depth	16-51 inches	16-51 inches
Texture	CL, SCL, C	Sand or gr sand
Comments	Tawas (clayey variant) is mapped only as part of an association with Carbondale. It is of minor extent. Most bogs and beaver ponds are deeper than 51", and the surrounding mineral soils rise abruptly out of the drainages on rock ridges. Sapric OM dominates the shallower organic soils. pH is generally above 5. We did not closely characterize these soils and labled as Tawas (clayey variant) almost any organic soil of the right depth, texture, and pH. Texture of material underlying beaver ponds is quite variable. Inspections of drained ponds whose dams had recently broken revealed materials ranging from gravelly sands to clays, sometimes within feet of each other. These materials are also variably stratified.	
File Name	TAWAS	

TAWAS (060)

	ISLE ROYALE	ESTABLISHED SERIES
FM	Sapric OM over sand, woody & herbaceous	Sapric OM over sand, woody & herbaceous
Drainage	VPD	VPD
Taxonomy	Terric Borosaprists	Terric Borosaprists
Family	Euic, sandy or sandy skel	Euic sandy or S-Skel
Landscapes	Bog edges, depressions	Bog edges, depressns.
Horizons	Variable, dominantly Oa	Dominantly Oa, with some Oe
pH	6.5+	5.5-7.8
Mineral soil		
Depth	16-51 inches	16-51 inches
Texture	Sand or gravelly sand	Sand or gravelly sand
Comments	On Isle Royale Tawas is of minor extent. Most of the bogs and beaver ponds are deeper than 51", and the surrounding mineral soils rise abruptly out of the drainages on rock ridges. Sapric OM dominates the shallower organic soils. pH is generally above 5. We did not closely characterize these soils and labled as Tawas almost any organic soil of the right depth, texture, and pH. Texture of material underlying beaver ponds is quite variable. Inspectionsa of drained ponds whose dams had recently broken revealed materials ranging from gravelly sands to clays, sometimes within feet of each other. These materials are also variably stratified.	
File Name	TAWAS	

TAWAS loamy variant

	ISLE ROYALE	ESTABLISHED SERIES
FM	Sapric OM over loam, woody & herbaceous	Sapric Om over sand, woody & herbaceous
Drainage	VPD	VPD
Taxonomy	Terric Borosaprists	Terric Borosaprists
Family	Euic, loamy	Euic sandy or S-skel
Landscapes	Bog edges, depressions	Bog edges, depressns.
Horizons	Variable, dominantly Oa	Dominantly Oa, with some Oe
pH	6.5+	5.5-7.8
Mineral soil		
Depth	16-51 inches	16-51 inches
Texture	SL, L, SiL,	Sand or gr sand
Comments	Tawas (loamy variant) is mapped only as part of an association with Carbondale. It is of minor extent. Most bogs and beaver ponds are deeper than 51", and the surrounding mineral soils rise abruptly out of the drainages on rock ridges. Sapric OM dominates the shallower organic soils. pH is generally above 5. We did not closely characterize these soils and labled as Tawas (Loamy Variant) almost any organic soil of the right depth, texture, and pH. Texture of material underlying beaver ponds is quite variable. Inspections of drained ponds whose dams had recently broken revealed materials ranging from gravelly sands to clays, sometimes within feet of each other. These materials are also variably stratified.	
File Name	TAWAS	

WAISKA (358)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Very gravelly beach deposits	Gravelly lake benches
Drainage	EWD, WD, MWD	EWD
Slope	3-8%	0-15%
Taxonomy	Entic Haplorthods Typic Haplorthods	Typic Haplorthods
Family	Sandy skeletal and Fragmental	Sandy Skeletal
Landscape	Old lake beaches	Lake benches
Surface		
Texture	S, LS, SL, L	S, LS, SL, L
C Frags	>35% gr & cb	5-60%
Subsurface		
Horizons	Bs, +/- Bhs	Bhs, Bs
Color	5-7.5YR 3-4/3-4	5-7.5YR 3-4/3-4 +3/3
Texture	S, LS	S, LS
C Frags	35-90% gr, cb	35-60%
C Horizon		
Texture	S, LS, bedrock	S, LS
C Frags	35-90% gr, cb	35-60%
Depth to	20-30"	30-50"
Comments	Waiska soils are on gravelly and cobbly beach deposits that range in depth to bedrock. Presence or absence of bedrock is not central to the series concept but rather skeletal or fragmental partical-size class. Bedrock is as shallow as 20 inches in some pedons. Because of difficulty of excavation the mapper will not know how deep it is to bedrock. The fine earth fraction should be checked for organic carbon content. Waiska intergrades to Typic Borofolists (002) in some places.	
File Name	Waiska	

WAISKA Wet Variant (358WV)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Very gravelly beach deposits	Gravelly lake benches
Drainage	SPD	EWD
Slope	0-4%	0-15%
Taxonomy	Entic Haplaquods	Typic Haplorthods
Family	Aeric Haplaquods	
	Sandy-skeletal and Fragmental	Sandy-skeletal
Landscape	Old lake beaches	Lake benches
Surface		
Texture	S, LS, SL, L	S, LS, SL, L
C Frags	>35% gr & cb	5-60%
Subsurface		
Horizons	Bs, +/- Bhs	Bhs, Bs
Color	5-7.5YR 3-4/3-4	5-7.5YR 3-4/3-4 +3/3
Texture	S, LS	S, LS
C Frags	35-90% gr, cb	35-60%
Mottles	+/- <2 chroma mottles	
C Horizon		
Texture	S, LS, bedrock	S, LS
C Frags	35-90% gr, cb	35-60%
Depth to	20-30"	30-50"
Comments	Waiska SPD soils are on gravelly and cobbly beach deposits that range in depth to bedrock. Presence or absence of bedrock is not central to the series concept but rather skeletal or fragmental partical-size class. Bedrock is as shallow as 20 inches in some pedons. Because of difficulty of excavation the mapper will not know how deep it is to bedrock. The fine earth fraction should be checked for organic carbon content. The soils have an aquic moisture regime, as determined from landscape position and vegetation, but may lack <2 chroma mottles. A sapric organic cap is usually present, but is not deep enough to meet the criteria for a histic epipedon.	
File Name	WAISKA	

	WITBECK (sandy variant)	(172S)
	ISLE ROYALE	ESTABLISHED SERIES
PM	Sandy outwash, till	Ground moraines
Drainage	VPD	VPD
Slope	0-2%	0-2%
Taxonomy	Histic Humaquepts	Histic Humaquepts
Family	Sandy	Coarse-loamy
Landscape	Drainage ways, depressional areas	Drainage ways, depressional areas
Histic		
Texture	Sapric	Muck
C Frags	None	0-10% gr, 35-60% cb
Thickness	8-16"	5-7"
B Horizons	+/- Bg	Bg
Texture	S, LS	SL, L, FSL, LFS
Color	5-7.5YR 3-5/1-4	10YR-5Y 3-5/1-4
C Frags	0-15%	5-35 gr, 0-15 cb
C Horizons		
Depth to	5-15" below mineral surface	8-16" below mineral surface
Comments	We used the classification Witbeck (sandy variant) for any Sandy Histic Humaquept. In practice this means they are like Roscommon but with an 8-16" organic cap. Our sandy soils did not have the coarse fragment content defined by the established series.	
File Name	WITBECK	

WITBECK (clayey variant) (172C)

	ISLE ROYALE	ESTABLISHED SERIES
PM	Lacustrine	Ground moraines
Drainage	VPD	VPD
Slope	0-2%	0-2%
Taxonomy	Histic Humaquepts	Histic Humaquepts
Family	Fine-loamy, Fine	Coarse-loamy
Landscape	Drainage ways, Depressional areas	Drainage ays Depressional areas
Histic		
Texture	Sapric	Muck
C Frags	None	0-10% gr, 35-60% cb
Thickness	8-16"	5-7"
B Horizons	+/- Bg	Bg
Texture	CL, SCL, SiCL, C	SL, L, FSL, LFS
Color	5-10YR 2-4/1-2	10YR-5Y 2-4/1-2
C frags	0-35%	5-35 gr, 0-15 cb
C horizons		
Depth to	5-20" below mineral surface	8-16" below mineral surface
Comments	We used the classification Witbeck (clayey variant) for any Fine-loamy or Fine Histic Humaquept. In practice this means they are like Hettinger or Pickford but with 8-16" organic cap. Coarse fragment content is not important to the definition of the series.	
File Name	WITBECK	

**Tabulation of pH data by soils sampled in hard-
wood sites.**

SOIL	HORIZON	DEPTH IN	PH	SOIL	HORIZON	DEPTH IN	PH
ISHPEMING 082	A	0-6	6.2	CHAMPION 085	Oi/A	1-0	4.5
MALONE	BE	6-10	6.2		E	0-2	4.7
BAY	Bs1	10-30	6.4	SUGAR MT.	Bhs	2-4	5.0
	Ex	30-40	6.7		Bs	4-11	5.4
	2R	40 -			Bsh	11-32	5.7
CHAMPION 084	Oi/A	2-0	5.4	ELO	A	0-3	4.9
	Oa	1-0	5.4	089	EB	3-6	5.1
SUGAR MT.	AB	0-1	5.4	SISKIWIT	Bs1	6-15	5.4
	Bs1	1-12	5.7		Bsh	15-22	5.6
	Ex	12-23	6.4		Bth	22-26	5.6
	C	23- +	6.5		2C	26- +	6.0
SUPERIOR 088	AB	0-8	5.0	NUNICA	A	0-5	5.6
	Bt	8-13	5.5	051	EA	5-8	6.1
GRACE	Bx	13-15	5.7	MOSKEY	Bt1	8-11	6.2
CREEK	Ex	15-21	5.7	CAMPGROUND	Bt2	11-16	6.5
	Bth	21-25	6.1		BC	16-23	7.1
	BC	25-30	6.3		C	23- +	8.0
	C	30-39	6.4				
BRUCE 050	Oa	7-0	6.6	YALMER	A	0-4	6.1
	A	0-5	6.8	083	EB	4-7	5.7
MOSKEY	EA	5-9	6.8	GREENSTONE	Bs	7-23	5.8
	Bg	9-17	6.5	to DESOR	Bsh	23-25	5.6
	BC	17-20	7.7		EBh	25-36	6.0
					C	36-40	6.7
					2C	40-60	7.4
MICHIGAMME ENTIC VAR. 097	Oa	4-0	6.4	FROBERG 128	Oa	0-2	4.8
	Bs1	1-8	5.6		E	2-8	4.8
	Bs2	8-17	6.0	WALLACE	Bt	8-20	6.3
GREENSTONE	Bh	17-20	6.2	LAKE	C1	20-27	7.5
EAST OF MT	Ex	20-28	6.2		C2	27-45	7.5
FRANKLIN	C	28-35	6.0				
	2R	35-					

(Hardwood con.)

WAISKA	A	0-3	5.7	FROBERG	A	0-4	5.6
134	Bw1	3-8	6.1	136	AE	4-8	5.7
McCARGOE	Bw2	8-15	6.1	McCARGOE	EB	8-11	5.3
CODE	2C	15-26	5.8	CODE	BE	11-16	5.4
					Bt	16-25	5.2
					2C	25-60	6.5

NOTE: NUMBER BELOW SOIL NAME REFERS TO PROJECT COMPUTER CODE FOR
SOIL NOTE CARDS AND PEDON CODING.

Tabulation of pH data for soils sampled in conifer sites.

SOIL	HORIZON	DEPTH	PH	SOIL	HORIZON	DEPTH	PH
		IN				IN	
PENCE	0e	5-3	4.5	ISHPEMING	A	0-4	6.1
135	0a	0-3	4.6	138	AB	4-9	5.8
McCARGOE	E	0-2	5.1	DAISY FARM	Bs1	9-15	5.7
COVE	Bs1	2-6	5.5	TO OJIBWAY	Bs2	15-20	5.8
	Bs2	6-14	6.1		Bs3	20-25	5.7
	Bs3	14-17	6.2		2R	25 +	
	2C	17-60	6.3				
WITBECK	0a	0-9	6.0	MICHIGAMME	0e	2-1	5.1
FINE VAR.	Bg	9-17	6.2	133	0a	1-0	3.8
086	Bw	17-23	6.2	SAGINAW MT	Bhs	0-3	5.0
Washington	2C	23-60	6.3		Bs1	3-6	5.2
CREEK					Bs2	6-14	5.4
					EB	14-21	5.7
					2R	21 +	
MICHIGAMME	A	0-4	5.7	ONOTA VAR.	A	0-2	4.6
018	E	4-7	5.9	091	E	2-4	4.4
RANSOM	Bs1	7-12	5.5	SISKIWIT	Bw	4-13	4.8
HILL	BC	12-	5.6	CAMPGROUND	CR	13-20	5.6
					2R	20 +	
RICKER	Oi	0-3	5.1	RICKER	0e	0-2	3.8
VAR.	Bs	3-8	5.1	140	0a	2-5	4.0
042				OUTER HILL	E	5-6	3.7
RED ROCK				ISLAND	CR	6-7	3.9
POINT					2R	7 +	
PESHEEKEE	A	0-2	4.8	PESHEEKEE	A	0-2	5.0
002	Bhs	2-12	5.0	039	Bs1	2-8	5.1
TOOKER	2R	12- +		BLAKES	Bs2	8-12	5.0
ISLAND				POINT	2R	12- +	

186 (Conifer con.)

ISHPEMING	Oi	5-4	3.9	CHAMPION	0a	2-0	5.1
093	0a	2-5	3.6	132	A	0-3	4.8
MOOSE	E	5-9	3.8	DAISY	BA	3-9	5.4
PORTAGE	Bs1	9-15	4.7	TO OJIBWAY	Bs1	9-17	5.4
MT. FRANKLIN	Bs2	15-19	5.0	TRAIL	Bs2	17-21	5.6
	CA	19-25	5.0		E	21-25	6.0
	2A	25 - +					
RICKER	Oi	0-2	4.9	WAISKA	Oi	3-2	4.9
130	0a	2-3	4.9	138A	0a	2-0	3.8
SW Wallace	C	3-5	5.1	Raspberry	E	0-1	4.7
LAKE in Jack	2A	5 - +		Isalnd	Bhs	1-17	5.5
PINE					Bs1	17-26	5.7
					BC	STONE	

NOTE: NUMBERS BELOW EACH SOIL REFERS TO PROJECT COMPUTER CODE FOR SOIL NOTE CARDS AND PEDON CODING.

TABLE Summary of Soil, Number of Observations and Recorded Tree Species Adjacent Soil Profile Observation Point. Isle Royale Soil Survey.

Soil	No. of Observ.	Tree Species
Allendale	1	W. Birch, Alder, Mt. Ash
Bowers	4	W. Spruce, B. fir, Alder, G. Ash
Brevort		W. Birch, W. Spruce, B. Fir, Alder
Bruce	1	W. Spruce, G. Ash, Alder
Carbondale	3	N. W. Cedar, B. Fir, Bl. Spruce.
Champion	8	W. Spruce, W. Birch, N. W. Cedar, S. Maple, Y. Birch, Q. Aspen
Dawson	1	Bl. Spruce, Alder, G. Ash
Fence	1	B. Fir, Q. Aspen
Freda	2	W. Birch, W. Spruce, N. W. Cedar
Fragiboralf	1	W. Birch, W. Spruce, Y. Birch
Froberg	4	W. Birch, W. Pine, W. Spruce, Q. Aspen, Alder
Greenwood	1	Bl. Spruce
Ishpeming	10	W. birch, W. Spruce, N. W. Cedar, Mt. Ash, Q. Aspen, B. Fir.
Iosco	2	W. Birch, W. Spruce, B. fir, Alder, Q. Aspen
Hettinger	1	W. birch, W. speuce, B. fir, Alder
Manistee	1	W. Birch, W. Pine, W. Spruce, Q. Aspen
Menominee	2	W. Birch, W. Spruce, B. fir,
Michigamme	18	W. Birch, W. Spruce, Q Aspen, R. Maple, Alder, N. W. Cedar, B. Fir, W. Pine
Moquah	1	W. Birch, W. Spruce, Q. Aspen, Alder
Nunica	2	Q. Aspen, B. Fir, Gr. Ash,
Ocqueoc	1	W. Birch, W. Spruce, B. fir, N. W. Cedar, Q. Aspen
Pelkie	1	W. Birch, Gr. Ash, Alder
Pence	3	W. Birch, W. Spruce, W. Pine
Pesheek	16	W. Birch, W. Spruce, B. fir, Q. Aspen, N. W. Cedar, R. Maple
Pickford	1	Alder

Table (Con.)

Pinconning	1	W. Spruce, Q. Aspen
Rockland	9	W. Spruce, W. Birch, B. Fir, R. Maple, Q. Aspen, R. Maple
Roscommon	1	W. Spruce, Alder
Ricker	13	W. Birch, B. fir, W. Spruce, Q. Aspen
Saynor	1	W. Spruce, B. Fir, Q. Aspen
Tacoosh	3	W. Birch, Bl. & W. Spruce, Alder, N. W. Cedar
Tawas	2	B. fir, Bl. Spruce
Typic Haplaquod	1	Grass
Waiska	17	W. Birch, W. Spruce, Q. Aspen, N. W. Cedar, B. Fir
Witbeck	3	W. Birch, W. Spruce, Q. Aspen, N. W. Cedar, G. Ash

EXAMPLE OF SOIL MAP FIELD SHEET AND SOIL MAP UNIT DISCUSSION

The xerox copy of the soil survey field sheet shows two levels of soil mapping; level two and level four. Level two is that area bounded by the black line and appears as a corridor on the map. This is an example of the 300 meter wide strip with a hiker trail at the center. Level four mapping is that area in the lower portion of the soil map below the level two mapping. Note that only a portion of the photo has soil mapping on it. This is because photos joining this map have this portion on them.

The campground symbol, northern shoreline of Lake Ritchie, is the Lake Ritchie campground. On page 56 is the level one map of the camp site. Note the differences in detail between the two maps (level one is the NPS schematic map and the photo is 4"/mile scale map). On the aerial photo the campground is shown as one soil map unit, 000B, whereas the campground map shows five soil map unit delineations. Page 67 lists the individual soil map units used for both levels of soil mapping. For example 0036B, Rockland-Pesheek Complex, for the campground map is discussed on page 74. The soil map unit descriptions discuss the kinds of landforms it will occur on, drainage, other soils that may occur in the soil map unit, and, potential use limitations for trails, campgrounds, pit toilets and buildings. Because of the scale of the aerial photo the level two map shows only the dominant soils, 000B or Rockland, which is discussed on page 69. From an interpretative viewpoint the level two mapping would indicate that the campground has little potential for expansion. However, the level one map does show soil map units, for example 73B, which may have a potential for further expansion of the campground. Also, soil map unit 172C,A (Witbeck) is a wet soil and has severe limitations for intensive use.

For the level four map, page 119 is the index for these soil map units. For example the RHP soil mapping unit below the level two mapped area. The use of letters for level four vs numbers for level two is standard convention for these two levels of mapping (Soil Survey Staff 1981). The discussion for RHP is presented on page 126 and follows the same format used for the level two descriptions. Level four mapping is not as specific for soil management interpretations and on site inspection is recommended for any intensive soil use.

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