

# Custom Soil Resource Report for Emmet County, Michigan

## Elmer's Special-Use Permit



# Preface

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Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

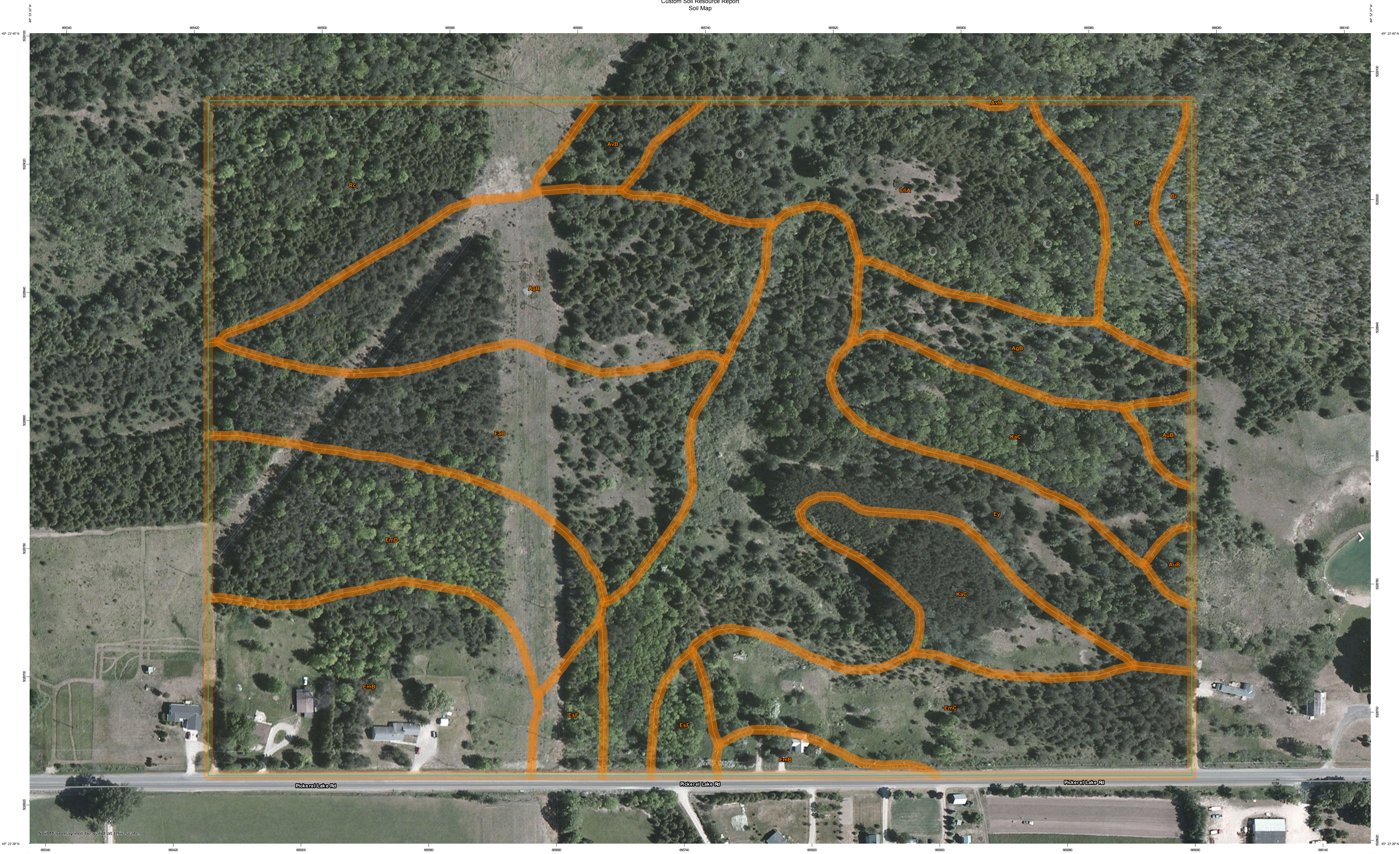
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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

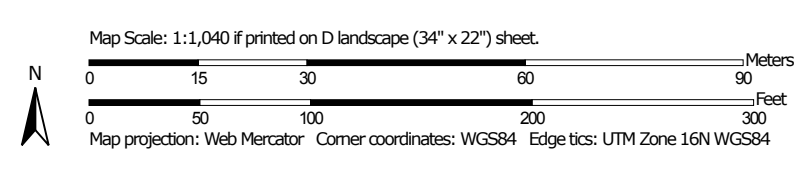
# Soil Map

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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.




Soil Map may not be valid at this scale.




### MAP LEGEND

**Area of Interest (AOI)**

 Area of Interest (AOI)


**Soils**


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points

**Special Point Features**

 Blowout

 Borrow Pit


 Clay Spot


 Closed Depression

 Gravel Pit


 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop


 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole

 Slide or Slip


 Sodic Spot


 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

**Water Features**

 Streams and Canals


**Transportation**

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

**Background**

 Aerial Photography

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL:  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Emmet County, Michigan  
 Survey Area Data: Version 12, Sep 21, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 23, 2010—May 16, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Emmet County, Michigan (MI047)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AgB	Alpena gravelly loamy sand, sandy variant, 0 to 6 percent slopes	8.9	13.8%
AuB	Au Gres loamy sand, loamy substratum, 0 to 6 percent slopes	0.6	0.9%
AvB	Au Gres loamy sand, gravelly subsoil variant, 0 to 6 percent slopes	0.8	1.3%
Br	Brevort mucky loamy sand	0.4	0.6%
ChA	Charlevoix sandy loam, 0 to 4 percent slopes	6.4	10.0%
EaB	East Lake loamy sand, 0 to 6 percent slopes	6.1	9.5%
EmB	Emmet sandy loam, 2 to 6 percent slopes	6.1	9.5%
EmC	Emmet sandy loam, 6 to 12 percent slopes	4.8	7.4%
EmD	Emmet sandy loam, 12 to 18 percent slopes	5.2	8.1%
EsF	Emmet soils, 25 to 45 percent slopes	1.4	2.1%
Ey	Ensley sandy loam	10.4	16.2%
KaC	Kalkaska sand, 6 to 12 percent slopes	5.7	8.9%
Rc	Roscommon mucky sand	7.4	11.5%
<b>Totals for Area of Interest</b>		<b>64.2</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made

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up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

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An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## Emmet County, Michigan

### AgB—Alpena gravelly loamy sand, sandy variant, 0 to 6 percent slopes

#### Map Unit Setting

*National map unit symbol:* 6bzm  
*Elevation:* 600 to 1,500 feet  
*Mean annual precipitation:* 22 to 34 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 70 to 150 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Alpena and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Alpena

##### Setting

*Landform:* Kames, lake terraces, eskers  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* 4 to 10 inches of sandy and loamy material over calcareous sandy and gravelly glaciofluvial deposits

##### Typical profile

*H1 - 0 to 7 inches:* gravelly loamy sand  
*H2 - 7 to 9 inches:* gravelly loamy sand  
*H3 - 9 to 60 inches:* very gravelly sand

##### Properties and qualities

*Slope:* 0 to 6 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Excessively drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 20 percent  
*Available water storage in profile:* Very low (about 3.0 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6s  
*Hydrologic Soil Group:* A  
*Hydric soil rating:* No

#### Minor Components

##### Roscommon

*Percent of map unit:* 5 percent

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*Landform:* Depressions on outwash plains, depressions on drainageways, depressions on lake plains

*Landform position (three-dimensional):* Talf

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* Yes

### **East lake**

*Percent of map unit:* 5 percent

*Landform:* Outwash plains, beach ridges

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

## **AuB—Au Gres loamy sand, loamy substratum, 0 to 6 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 6bzp

*Elevation:* 600 to 1,800 feet

*Mean annual precipitation:* 27 to 45 inches

*Mean annual air temperature:* 39 to 46 degrees F

*Frost-free period:* 90 to 140 days

*Farmland classification:* Farmland of local importance

### **Map Unit Composition**

*Au gres, loamy substratum, and similar soils:* 90 percent

*Minor components:* 10 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Au Gres, Loamy Substratum**

#### **Setting**

*Landform:* Outwash plains, till plains

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy glaciofluvial deposits

#### **Typical profile**

*H1 - 0 to 15 inches:* loamy sand

*H2 - 15 to 30 inches:* sand

*H3 - 30 to 42 inches:* sand

*H4 - 42 to 60 inches:* stratified very fine sand to silt loam

#### **Properties and qualities**

*Slope:* 0 to 6 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Somewhat poorly drained

*Runoff class:* Very low

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*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)

*Depth to water table:* About 12 to 24 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water storage in profile:* Low (about 5.5 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4w

*Hydrologic Soil Group:* A/D

*Hydric soil rating:* No

### Minor Components

#### Au gres

*Percent of map unit:* 4 percent

*Landform:* Outwash plains, till plains

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

#### Menominee

*Percent of map unit:* 3 percent

*Landform:* Outwash plains, lake plains

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

#### Brevort

*Percent of map unit:* 3 percent

*Landform:* Depressions on lake plains, depressions on till plains

*Landform position (three-dimensional):* Talf

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* Yes

## **AvB—Au Gres loamy sand, gravelly subsoil variant, 0 to 6 percent slopes**

### Map Unit Setting

*National map unit symbol:* 6bzq

*Elevation:* 600 to 1,200 feet

*Mean annual precipitation:* 27 to 33 inches

*Mean annual air temperature:* 41 to 46 degrees F

*Frost-free period:* 80 to 150 days

*Farmland classification:* Farmland of local importance

**Map Unit Composition**

*Au gres and similar soils:* 90 percent

*Minor components:* 10 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Au Gres**

**Setting**

*Landform:* Outwash plains

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy and gravelly glaciofluvial deposits

**Typical profile**

*H1 - 0 to 5 inches:* loamy sand

*H2 - 5 to 19 inches:* loamy sand

*H3 - 19 to 29 inches:* loamy sand

*H4 - 29 to 60 inches:* gravelly sand

**Properties and qualities**

*Slope:* 0 to 6 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Somewhat poorly drained

*Runoff class:* Very low

*Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)

*Depth to water table:* About 6 to 18 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 20 percent

*Available water storage in profile:* Low (about 3.5 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3w

*Hydrologic Soil Group:* A/D

*Hydric soil rating:* No

**Minor Components**

**Wheatley**

*Percent of map unit:* 5 percent

*Landform:* Depressions on outwash plains

*Landform position (three-dimensional):* Talf

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* Yes

**East lake**

*Percent of map unit:* 5 percent

*Landform:* Outwash plains, beach ridges

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

## **Br—Brevort mucky loamy sand**

### **Map Unit Setting**

*National map unit symbol:* 6bzy  
*Elevation:* 600 to 2,000 feet  
*Mean annual precipitation:* 27 to 44 inches  
*Mean annual air temperature:* 39 to 45 degrees F  
*Frost-free period:* 60 to 140 days  
*Farmland classification:* Prime farmland if drained

### **Map Unit Composition**

*Brevort and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Brevort**

#### **Setting**

*Landform:* Depressions on lake plains, depressions on till plains  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* 20 to 40 inches of sandy glaciofluvial deposits over loamy till

#### **Typical profile**

*H1 - 0 to 6 inches:* mucky loamy sand  
*H2 - 6 to 20 inches:* loamy sand  
*H3 - 20 to 60 inches:* loam

#### **Properties and qualities**

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Poorly drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)  
*Depth to water table:* About 0 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* Frequent  
*Calcium carbonate, maximum in profile:* 30 percent  
*Available water storage in profile:* Moderate (about 8.9 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 5w  
*Hydrologic Soil Group:* C/D  
*Hydric soil rating:* Yes

## Minor Components

### Carbondale

*Percent of map unit:* 5 percent

*Landform:* Depressions on outwash plains, depressions on till plains

*Landform position (three-dimensional):* Dip

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* Yes

### Iosco

*Percent of map unit:* 5 percent

*Landform:* Lake plains, outwash plains

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

## ChA—Charlevoix sandy loam, 0 to 4 percent slopes

### Map Unit Setting

*National map unit symbol:* 6c02

*Elevation:* 600 to 1,200 feet

*Mean annual precipitation:* 27 to 33 inches

*Mean annual air temperature:* 41 to 46 degrees F

*Frost-free period:* 100 to 140 days

*Farmland classification:* Prime farmland if drained

### Map Unit Composition

*Charlevoix and similar soils:* 90 percent

*Minor components:* 10 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Charlevoix

#### Setting

*Landform:* Till plains, moraines

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Loamy till

#### Typical profile

*H1 - 0 to 6 inches:* sandy loam

*H2 - 6 to 14 inches:* sandy loam

*H3 - 14 to 22 inches:* loam

*H4 - 22 to 60 inches:* sandy loam

#### Properties and qualities

*Slope:* 0 to 4 percent

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*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat poorly drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 5.95 in/hr)  
*Depth to water table:* About 12 to 24 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 30 percent  
*Available water storage in profile:* Moderate (about 6.6 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* A/D  
*Hydric soil rating:* No

### Minor Components

#### Ensley

*Percent of map unit:* 5 percent  
*Landform:* Depressions on moraines  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* Yes

#### Emmet

*Percent of map unit:* 5 percent  
*Landform:* Moraines  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

## EaB—East Lake loamy sand, 0 to 6 percent slopes

### Map Unit Setting

*National map unit symbol:* 6c09  
*Elevation:* 600 to 1,900 feet  
*Mean annual precipitation:* 27 to 34 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 70 to 150 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*East lake and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Description of East Lake

### Setting

*Landform:* Outwash plains, beach ridges  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* 20 to 40 inches of sandy material over calcareous, sandy and gravelly glaciofluvial deposits

### Typical profile

*H1 - 0 to 9 inches:* loamy sand  
*H2 - 9 to 30 inches:* loamy sand  
*H3 - 30 to 60 inches:* gravelly sand

### Properties and qualities

*Slope:* 0 to 6 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 25 percent  
*Available water storage in profile:* Low (about 4.1 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4s  
*Hydrologic Soil Group:* A  
*Hydric soil rating:* No

## Minor Components

### Mancelona

*Percent of map unit:* 4 percent  
*Landform:* Beach ridges, deltas, outwash plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

### Au gres

*Percent of map unit:* 3 percent  
*Landform:* Outwash plains, till plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

### Kalkaska

*Percent of map unit:* 3 percent  
*Landform:* Outwash plains, till plains, moraines  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear

## Custom Soil Resource Report

*Across-slope shape:* Linear  
*Hydric soil rating:* No

### **EmB—Emmet sandy loam, 2 to 6 percent slopes**

#### **Map Unit Setting**

*National map unit symbol:* 6c0k  
*Elevation:* 600 to 1,500 feet  
*Mean annual precipitation:* 27 to 34 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 90 to 150 days  
*Farmland classification:* All areas are prime farmland

#### **Map Unit Composition**

*Emmet and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### **Description of Emmet**

##### **Setting**

*Landform:* Moraines  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* 24 to 50 inches of loamy material over calcareous loamy till

##### **Typical profile**

*H1 - 0 to 6 inches:* sandy loam  
*H2 - 6 to 22 inches:* sandy loam  
*H3 - 22 to 32 inches:* loam  
*H4 - 32 to 60 inches:* sandy loam

##### **Properties and qualities**

*Slope:* 2 to 6 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 30 percent  
*Available water storage in profile:* Moderate (about 7.5 inches)

##### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* B  
*Hydric soil rating:* No

**Minor Components**

**Charlevoix**

*Percent of map unit:* 4 percent  
*Landform:* Till plains, moraines  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

**Blue lake**

*Percent of map unit:* 3 percent  
*Landform:* Moraines, till plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

**Leelanau**

*Percent of map unit:* 3 percent  
*Landform:* Till plains, moraines  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

**EmC—Emmet sandy loam, 6 to 12 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 6c0l  
*Elevation:* 600 to 1,500 feet  
*Mean annual precipitation:* 27 to 34 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 90 to 150 days  
*Farmland classification:* Farmland of local importance

**Map Unit Composition**

*Emmet and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Emmet**

**Setting**

*Landform:* Moraines  
*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Interfluve, head slope, nose slope, side slope, base slope, crest  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear, convex

## Custom Soil Resource Report

*Parent material:* 24 to 50 inches of loamy material over calcareous loamy till

### Typical profile

*H1 - 0 to 6 inches:* sandy loam

*H2 - 6 to 22 inches:* sandy loam

*H3 - 22 to 32 inches:* loam

*H4 - 32 to 60 inches:* sandy loam

### Properties and qualities

*Slope:* 6 to 12 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 30 percent

*Available water storage in profile:* Moderate (about 7.5 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* B

*Hydric soil rating:* No

### Minor Components

#### Blue lake

*Percent of map unit:* 5 percent

*Landform:* Till plains, moraines

*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope

*Landform position (three-dimensional):* Crest, base slope, side slope, nose slope, head slope, interfluvium

*Down-slope shape:* Linear

*Across-slope shape:* Convex, linear

*Hydric soil rating:* No

#### Leelanau

*Percent of map unit:* 5 percent

*Landform:* Till plains, moraines

*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope

*Landform position (three-dimensional):* Interfluvium, head slope, nose slope, side slope, base slope, crest

*Down-slope shape:* Linear

*Across-slope shape:* Convex, linear

*Hydric soil rating:* No

## **EmD—Emmet sandy loam, 12 to 18 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 6c0m  
*Elevation:* 600 to 1,900 feet  
*Mean annual precipitation:* 27 to 34 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 70 to 150 days  
*Farmland classification:* Farmland of local importance

### **Map Unit Composition**

*Emmet and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Emmet**

#### **Setting**

*Landform:* Moraines  
*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Interfluve, head slope, nose slope, side slope, base slope, crest  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Concave, convex  
*Parent material:* 24 to 50 inches of loamy material over calcareous loamy till

#### **Typical profile**

*H1 - 0 to 6 inches:* sandy loam  
*H2 - 6 to 22 inches:* sandy loam  
*H3 - 22 to 32 inches:* loam  
*H4 - 32 to 60 inches:* sandy loam

#### **Properties and qualities**

*Slope:* 12 to 18 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 30 percent  
*Available water storage in profile:* Moderate (about 7.5 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* B

## Custom Soil Resource Report

*Hydric soil rating:* No

### Minor Components

#### Kalkaska

*Percent of map unit:* 5 percent

*Landform:* Moraines, outwash plains, till plains

*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope

*Landform position (three-dimensional):* Interfluve, head slope, nose slope, side slope, base slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Concave, convex

*Hydric soil rating:* No

#### Leelanau

*Percent of map unit:* 5 percent

*Landform:* Till plains, moraines

*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope

*Landform position (three-dimensional):* Head slope, nose slope, interfluve, side slope, base slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Concave, convex

*Hydric soil rating:* No

## EsF—Emmet soils, 25 to 45 percent slopes

### Map Unit Setting

*National map unit symbol:* 6c0p

*Elevation:* 600 to 1,500 feet

*Mean annual precipitation:* 27 to 34 inches

*Mean annual air temperature:* 39 to 46 degrees F

*Frost-free period:* 90 to 150 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Emmet and similar soils:* 90 percent

*Minor components:* 10 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Emmet

#### Setting

*Landform:* Moraines

*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope

*Landform position (three-dimensional):* Interfluve, head slope, nose slope, side slope, base slope, crest

*Down-slope shape:* Convex, linear

## Custom Soil Resource Report

*Across-slope shape:* Concave, convex

*Parent material:* 24 to 50 inches of loamy material over calcareous loamy till

### Typical profile

*H1 - 0 to 6 inches:* sandy loam

*H2 - 6 to 22 inches:* sandy loam

*H3 - 22 to 32 inches:* loam

*H4 - 32 to 60 inches:* sandy loam

### Properties and qualities

*Slope:* 25 to 45 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 30 percent

*Available water storage in profile:* Moderate (about 7.5 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 7e

*Hydrologic Soil Group:* B

*Hydric soil rating:* No

### Minor Components

#### Blue lake

*Percent of map unit:* 5 percent

*Landform:* Moraines, till plains

*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope

*Landform position (three-dimensional):* Interfluvium, head slope, nose slope, side slope, base slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Concave, convex

*Hydric soil rating:* No

#### Leelanau

*Percent of map unit:* 5 percent

*Landform:* Till plains, moraines

*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope

*Landform position (three-dimensional):* Interfluvium, head slope, nose slope, side slope, base slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Concave, convex

*Hydric soil rating:* No

## **Ey—Ensley sandy loam**

### **Map Unit Setting**

*National map unit symbol:* 6c0q  
*Elevation:* 600 to 1,200 feet  
*Mean annual precipitation:* 27 to 33 inches  
*Mean annual air temperature:* 41 to 46 degrees F  
*Frost-free period:* 100 to 140 days  
*Farmland classification:* Prime farmland if drained

### **Map Unit Composition**

*Ensley and similar soils:* 95 percent  
*Minor components:* 5 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Ensley**

#### **Setting**

*Landform:* Depressions on moraines  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* 15 to 35 inches of loamy material over calcareous loamy till

#### **Typical profile**

*H1 - 0 to 10 inches:* sandy loam  
*H2 - 10 to 18 inches:* sandy clay loam  
*H3 - 18 to 60 inches:* sandy loam

#### **Properties and qualities**

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Poorly drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)  
*Depth to water table:* About 0 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* Frequent  
*Calcium carbonate, maximum in profile:* 20 percent  
*Available water storage in profile:* Moderate (about 7.5 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 5w  
*Hydrologic Soil Group:* B/D  
*Hydric soil rating:* Yes

**Minor Components**

**Charlevoix**

*Percent of map unit:* 5 percent  
*Landform:* Till plains, moraines  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

**KaC—Kalkaska sand, 6 to 12 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 6c0w  
*Elevation:* 600 to 1,900 feet  
*Mean annual precipitation:* 27 to 34 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 70 to 150 days  
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Kalkaska and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Kalkaska**

**Setting**

*Landform:* Outwash plains, till plains, moraines  
*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Interfluve, head slope, nose slope, side slope, base slope, crest  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex, linear  
*Parent material:* Sandy glaciofluvial deposits

**Typical profile**

*H1 - 0 to 4 inches:* sand  
*H2 - 4 to 9 inches:* sand  
*H3 - 9 to 48 inches:* sand  
*H4 - 48 to 60 inches:* sand

**Properties and qualities**

*Slope:* 6 to 12 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)

## Custom Soil Resource Report

*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water storage in profile:* Low (about 4.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6s  
*Hydrologic Soil Group:* A  
*Hydric soil rating:* No

### Minor Components

#### Blue lake

*Percent of map unit:* 5 percent  
*Landform:* Moraines, till plains  
*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Crest, base slope, side slope, nose slope, head slope, interfluvium  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex, linear  
*Hydric soil rating:* No

#### East lake

*Percent of map unit:* 5 percent  
*Landform:* Outwash plains, beach ridges  
*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Interfluvium, head slope, nose slope, side slope, base slope, crest  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex, linear  
*Hydric soil rating:* No

## Rc—Roscommon mucky sand

### Map Unit Setting

*National map unit symbol:* 6c1k  
*Elevation:* 600 to 2,000 feet  
*Mean annual precipitation:* 22 to 44 inches  
*Mean annual air temperature:* 39 to 46 degrees F  
*Frost-free period:* 60 to 140 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Roscommon and similar soils:* 90 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Description of Roscommon

### Setting

*Landform:* Depressions on drainageways, depressions on lake plains, depressions on outwash plains

*Landform position (three-dimensional):* Talf

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy glaciofluvial deposits

### Typical profile

*H1 - 0 to 6 inches:* mucky sand

*H2 - 6 to 60 inches:* sand

### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Poorly drained

*Runoff class:* Negligible

*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)

*Depth to water table:* About 0 inches

*Frequency of flooding:* None

*Frequency of ponding:* Frequent

*Calcium carbonate, maximum in profile:* 10 percent

*Available water storage in profile:* Low (about 4.5 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 6w

*Hydrologic Soil Group:* A/D

*Hydric soil rating:* Yes

## Minor Components

### Au gres

*Percent of map unit:* 4 percent

*Landform:* Outwash plains, till plains

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

### Carbondale

*Percent of map unit:* 3 percent

*Landform:* Depressions on outwash plains, depressions on till plains

*Landform position (three-dimensional):* Dip

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* Yes

### Tawas

*Percent of map unit:* 3 percent

*Landform:* Depressions on lake plains, depressions on moraines, depressions on outwash plains

*Landform position (three-dimensional):* Dip

*Down-slope shape:* Linear

## Custom Soil Resource Report

*Across-slope shape:* Linear  
*Hydric soil rating:* Yes

# Soil Information for All Uses

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## Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

## Construction Materials

This folder contains a collection of tabular reports that present soil interpretations related to sources of construction materials. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Construction materials interpretations are tools designed to provide guidance to users in selecting a site for potential source of various materials. Individual soils or groups of soils may be selected as a potential source because they are close at hand, are the only source available, or they meets some or all of the physical or chemical properties required for the intended application. Example interpretations include roadfill, sand and gravel, topsoil and reclamation material.

## Source of Reclamation Material, Roadfill, and Topsoil

This table gives information about the soils as potential sources of reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

The soils are rated *good*, *fair*, or *poor* as potential sources of reclamation material, roadfill, and topsoil. The features that limit the soils as sources of these materials are specified in the table. Numerical ratings between 0.00 and 0.99 are given after the specified features. These numbers indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

*Reclamation material* is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do

## Custom Soil Resource Report

not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments. The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

**Report—Source of Reclamation Material, Roadfill, and Topsoil**

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the limitation]

Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AgB—Alpena gravelly loamy sand, sandy variant, 0 to 6 percent slopes							
Alpena	90	Poor		Good		Poor	
		Wind erosion	0.00			Rock fragments	0.00
		Droughty	0.00			Too sandy	0.00
		Too sandy	0.00			Hard to reclaim (rock fragments)	0.32
		Low content of organic matter	0.13			Exchange capacity	0.67
East lake	5	Poor		Good		Fair	
		Wind erosion	0.00			Hard to reclaim (rock fragments)	0.02
		Too sandy	0.05			Too sandy	0.05
		Low content of organic matter	0.13			Exchange capacity	0.44
		Droughty	0.29			Rock fragments	0.53
		Carbonate content	0.97				
Roscommon	5	Poor		Poor		Poor	
		Too sandy	0.00	Wetness	0.00	Wetness	0.00
		Wind erosion	0.00			Too sandy	0.00
		Low content of organic matter	0.13			Exchange capacity	0.56
		Droughty	0.58				

Custom Soil Resource Report

Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AuB—Au Gres loamy sand, loamy substratum, 0 to 6 percent slopes							
Au gres, loamy substratum	90	Poor		Fair		Poor	
		Too sandy	0.00	Wetness	0.14	Too sandy	0.00
		Wind erosion	0.00			Wetness	0.14
		Low content of organic matter	0.13			Exchange capacity	0.39
		Too acid	0.95				
		Droughty	0.95				
Au gres	4	Poor		Fair		Poor	
		Wind erosion	0.00	Wetness	0.01	Too sandy	0.00
		Too sandy	0.00			Wetness	0.01
		Low content of organic matter	0.13			Exchange capacity	0.54
		Droughty	0.44			Rock fragments	0.97
		Too acid	0.95				
Brevort	3	Poor		Poor		Poor	
		Wind erosion	0.00	Wetness	0.00	Wetness	0.00
		Low content of organic matter	0.13	Low strength	0.78	Exchange capacity	0.86
		Carbonate content	0.80	Shrink-swell	0.96	Rock fragments	0.99
		Too acid	0.99				
		Water erosion	0.99				
Menominee	3	Poor		Fair		Fair	
		Wind erosion	0.00	Shrink-swell	0.96	Exchange capacity	0.90
		Low content of organic matter	0.13			Rock fragments	0.97
		Carbonate content	0.68				
		Too acid	0.68				
		Water erosion	0.99				

Custom Soil Resource Report

Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AvB—Au Gres loamy sand, gravelly subsoil variant, 0 to 6 percent slopes							
Au gres	90	Poor		Fair		Poor	
		Wind erosion	0.00	Wetness	0.01	Too sandy	0.00
		Too sandy	0.00			Wetness	0.01
		Droughty	0.06			Hard to reclaim (rock fragments)	0.02
		Low content of organic matter	0.13			Rock fragments	0.11
						Exchange capacity	0.58
East lake	5	Poor		Good		Fair	
		Wind erosion	0.00			Hard to reclaim (rock fragments)	0.02
		Too sandy	0.05			Too sandy	0.05
		Low content of organic matter	0.13			Exchange capacity	0.44
		Droughty	0.29			Rock fragments	0.53
		Carbonate content	0.97				
Wheatley	5	Poor		Poor		Poor	
		Wind erosion	0.00	Wetness	0.00	Wetness	0.00
		Too sandy	0.00			Too sandy	0.00
		Droughty	0.01			Hard to reclaim (rock fragments)	0.00
		Low content of organic matter	0.13			Rock fragments	0.07
		Carbonate content	0.68			Exchange capacity	0.58

Custom Soil Resource Report

Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
Br—Brevort mucky loamy sand							
Brevort	90	Poor		Poor		Poor	
		Wind erosion	0.00	Wetness	0.00	Wetness	0.00
		Low content of organic matter	0.13	Low strength	0.78	Exchange capacity	0.86
		Carbonate content	0.80	Shrink-swell	0.96	Rock fragments	0.99
		Too acid	0.99				
		Water erosion	0.99				
Carbondale	5	Poor		Poor		Poor	
		Wind erosion	0.00	Wetness	0.00	Wetness	0.00
		Too acid	0.84	Low strength	0.00	Organic matter content high	0.00
				Dusty	0.80		
Iosco	5	Poor		Poor		Fair	
		Wind erosion	0.00	Low strength	0.00	Wetness	0.01
		Low content of organic matter	0.13	Wetness	0.01	Exchange capacity	0.88
		Carbonate content	0.80	Shrink-swell	0.96		
		Too acid	0.84				
		Water erosion	0.99				
ChA—Charlevoix sandy loam, 0 to 4 percent slopes							
Charlevoix	90	Fair		Fair		Fair	
		Low content of organic matter	0.13	Wetness	0.14	Wetness	0.14
		Carbonate content	0.92			Exchange capacity	0.69
		Too acid	0.99			Rock fragments	0.94
Emmet	5	Fair		Good		Fair	
		Low content of organic matter	0.13			Exchange capacity	0.66
		Water erosion	0.90			Rock fragments	0.90
		Carbonate content	0.92				
		Too acid	0.95				
Ensley	5	Fair		Poor		Poor	
		Low content of organic matter	0.13	Wetness	0.00	Wetness	0.00
						Rock fragments	0.79
						Exchange capacity	0.82

Custom Soil Resource Report

Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
EaB—East Lake loamy sand, 0 to 6 percent slopes							
East lake	90	Poor		Good		Fair	
		Wind erosion	0.00			Hard to reclaim (rock fragments)	0.02
		Too sandy	0.05			Too sandy	0.05
		Low content of organic matter	0.13			Exchange capacity	0.44
		Droughty	0.29			Rock fragments	0.53
		Carbonate content	0.97				
Mancelona	4	Poor		Good		Fair	
		Wind erosion	0.00			Rock fragments	0.17
		Low content of organic matter	0.13			Hard to reclaim (rock fragments)	0.18
		Too sandy	0.31			Too sandy	0.31
		Droughty	0.40			Exchange capacity	0.66
		Carbonate content	0.97				
Au gres	3	Poor		Fair		Poor	
		Wind erosion	0.00	Wetness	0.01	Too sandy	0.00
		Too sandy	0.00			Wetness	0.01
		Low content of organic matter	0.13			Exchange capacity	0.54
		Droughty	0.44			Rock fragments	0.97
		Too acid	0.95				
Kalkaska	3	Poor		Good		Poor	
		Wind erosion	0.00			Too sandy	0.00
		Too sandy	0.00			Exchange capacity	0.73
		Droughty	0.23				
		Too acid	0.74				

Custom Soil Resource Report

Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
EmB—Emmet sandy loam, 2 to 6 percent slopes							
Emmet	90	Fair		Good		Fair	
		Low content of organic matter	0.13			Exchange capacity	0.66
		Water erosion	0.90			Rock fragments	0.90
		Carbonate content	0.92				
		Too acid	0.95				
Charlevoix	4	Fair		Fair		Fair	
		Low content of organic matter	0.13	Wetness	0.14	Wetness	0.14
		Carbonate content	0.92			Exchange capacity	0.69
		Too acid	0.99			Rock fragments	0.94
Blue lake	3	Poor		Good		Fair	
		Wind erosion	0.00			Too sandy	0.02
		Too sandy	0.02			Exchange capacity	0.70
		Low content of organic matter	0.13				
		Too acid	0.74				
		Droughty	0.96				
Leelanau	3	Poor		Good		Fair	
		Wind erosion	0.00			Too sandy	0.04
		Too sandy	0.04			Exchange capacity	0.66
		Low content of organic matter	0.50			Rock fragments	0.95
		Droughty	0.88				
		Too acid	0.95				

Custom Soil Resource Report

Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
EmC—Emmet sandy loam, 6 to 12 percent slopes							
Emmet	90	Fair		Good		Fair	
		Low content of organic matter	0.13			Exchange capacity	0.66
		Water erosion	0.90			Rock fragments	0.90
		Carbonate content	0.92			Slope	0.96
		Too acid	0.95				
Blue lake	5	Poor		Good		Fair	
		Wind erosion	0.00			Too sandy	0.02
		Too sandy	0.02			Exchange capacity	0.70
		Low content of organic matter	0.13			Slope	0.96
		Too acid	0.74				
		Droughty	0.96				
Leelanau	5	Poor		Good		Fair	
		Wind erosion	0.00			Too sandy	0.04
		Too sandy	0.04			Exchange capacity	0.66
		Low content of organic matter	0.50			Rock fragments	0.95
		Droughty	0.88			Slope	0.96
		Too acid	0.95				

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Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
EmD—Emmet sandy loam, 12 to 18 percent slopes							
Emmet	90	Fair		Good		Poor	
		Low content of organic matter	0.13			Slope	0.00
		Water erosion	0.90			Exchange capacity	0.66
		Carbonate content	0.92			Rock fragments	0.90
		Too acid	0.95				
Kalkaska	5	Poor		Good		Poor	
		Wind erosion	0.00			Too sandy	0.00
		Too sandy	0.00			Slope	0.00
		Droughty	0.23			Exchange capacity	0.73
		Too acid	0.74				
Leelanau	5	Poor		Good		Poor	
		Wind erosion	0.00			Slope	0.00
		Too sandy	0.04			Too sandy	0.04
		Low content of organic matter	0.50			Exchange capacity	0.66
		Droughty	0.88			Rock fragments	0.95
		Too acid	0.95				

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Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
EsF—Emmet soils, 25 to 45 percent slopes							
Emmet	90	Fair		Poor		Poor	
		Low content of organic matter	0.13	Slope	0.00	Slope	0.00
		Water erosion	0.90			Exchange capacity	0.66
		Carbonate content	0.92			Rock fragments	0.90
		Too acid	0.95				
Blue lake	5	Poor		Poor		Poor	
		Wind erosion	0.00	Slope	0.00	Slope	0.00
		Too sandy	0.02			Too sandy	0.02
		Low content of organic matter	0.13			Exchange capacity	0.70
		Too acid	0.74				
		Droughty	0.96				
Leelanau	5	Poor		Poor		Poor	
		Wind erosion	0.00	Slope	0.00	Slope	0.00
		Too sandy	0.04			Too sandy	0.04
		Low content of organic matter	0.50			Exchange capacity	0.66
		Droughty	0.88			Rock fragments	0.95
		Too acid	0.95				
Ey—Ensley sandy loam							
Ensley	95	Fair		Poor		Poor	
		Low content of organic matter	0.13	Wetness	0.00	Wetness	0.00
						Rock fragments	0.79
						Exchange capacity	0.82
Charlevoix	5	Fair		Fair		Fair	
		Low content of organic matter	0.13	Wetness	0.14	Wetness	0.14
		Carbonate content	0.92			Exchange capacity	0.69
		Too acid	0.99			Rock fragments	0.94

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Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
KaC—Kalkaska sand, 6 to 12 percent slopes							
Kalkaska	90	Poor		Good		Poor	
		Wind erosion	0.00			Too sandy	0.00
		Too sandy	0.00			Exchange capacity	0.73
		Droughty	0.23			Slope	0.96
		Too acid	0.74				
Blue lake	5	Poor		Good		Fair	
		Wind erosion	0.00			Too sandy	0.02
		Too sandy	0.02			Exchange capacity	0.70
		Low content of organic matter	0.13			Slope	0.96
		Too acid	0.74				
		Droughty	0.96				
East lake	5	Poor		Good		Fair	
		Wind erosion	0.00			Hard to reclaim (rock fragments)	0.02
		Too sandy	0.05			Too sandy	0.05
		Low content of organic matter	0.13			Exchange capacity	0.44
		Droughty	0.29			Rock fragments	0.53
		Carbonate content	0.97			Slope	0.96

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Source of Reclamation Material, Roadfill, and Topsoil—Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Potential as a source of reclamation material		Potential as a source of roadfill		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
Rc—Roscommon mucky sand							
Roscommon	90	Poor		Poor		Poor	
		Too sandy	0.00	Wetness	0.00	Wetness	0.00
		Wind erosion	0.00			Too sandy	0.00
		Low content of organic matter	0.13			Exchange capacity	0.56
		Droughty	0.58				
Au gres	4	Poor		Fair		Poor	
		Wind erosion	0.00	Wetness	0.01	Too sandy	0.00
		Too sandy	0.00			Wetness	0.01
		Low content of organic matter	0.13			Exchange capacity	0.54
		Droughty	0.44			Rock fragments	0.97
		Too acid	0.95				
Carbondale	3	Poor		Poor		Poor	
		Wind erosion	0.00	Wetness	0.00	Wetness	0.00
		Too acid	0.84	Low strength	0.00	Organic matter content high	0.00
				Dusty	0.80		
Tawas	3	Poor		Poor		Poor	
		Wind erosion	0.00	Wetness	0.00	Wetness	0.00
		Low content of organic matter	0.13	Dusty	0.80	Organic matter content high	0.00
		Too acid	0.84				

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