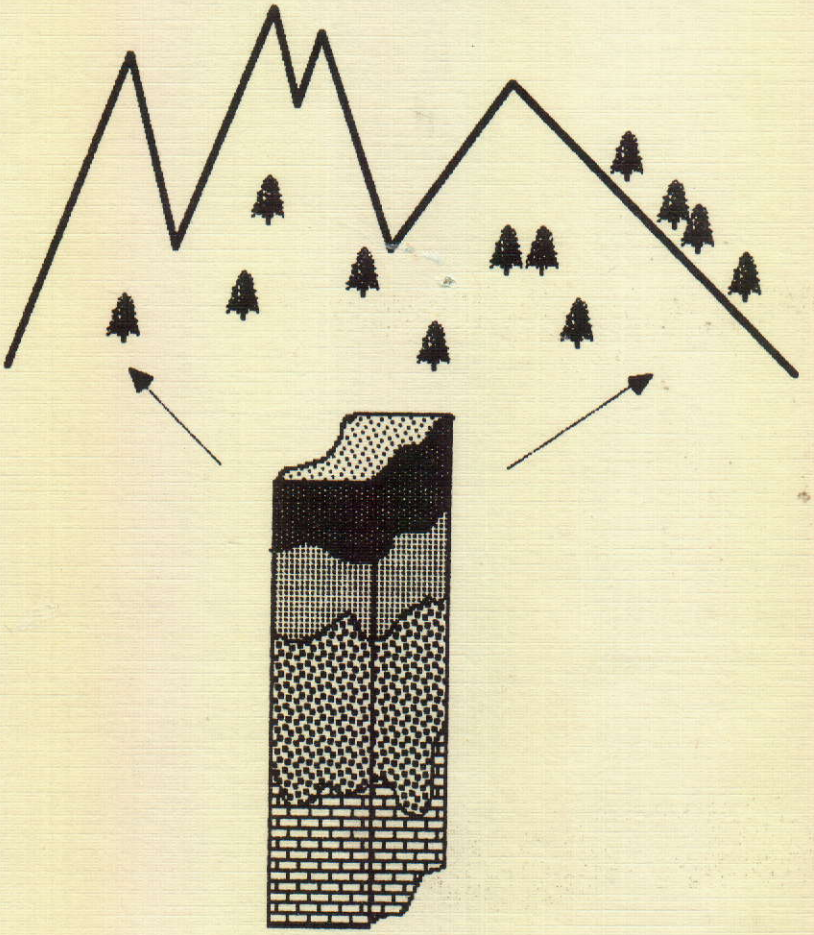
CHARACTERIZATION OF SOILS IN YELLOWSTONE NATIONAL PARK



Project Report
CX-1200-1-B027

Prepared for:

National Park Service
Denver, Colorado

Ford Forestry Center
School of Forestry and Wood Products
Michigan Technological University
Houghton, Michigan
May, 1986

CHARACTERIZATION OF SOILS IN YELLOWSTONE NATIONAL PARK

Final Project Report
(CX-1200-1-B027)

Submitted to:

National Park Service
Denver, Colorado

by

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Preface

This field based project was designed to provide morphological and compositional data for major soil areas in Yellowstone National Park. Vegetation and parent materials were used to identify sampling areas. This report provides basic characterization data for the soils sampled in 1980 and 1981. These data represent a baseline for subsequent ecological range, or forest based research, as well as applied information for Park Management Activities.

Yellowstone National Park provides an extremely unique resource for soil-vegetation research. It's hoped that this project will provide a basis for other research to further our knowledge of soil-plant-animal environments, and to assist in the assessment and development of management guidelines to preserve this and other unique environments.

Acknowledgements

Sincere appreciation is extended to the National Park Service, University of Wyoming - NPS Research Center and Michigan Technological University for their financial support of this project. Dr. D. Despain, Yellowstone National Park, was instrumental in all aspects of this project; and it could not have been realized without his involvement. Dr. K. Pierce, Geological Survey, provided valuable insight into the surficial geology and soil relationships. Mr. J. Good, National Park Service, also provided much appreciated assistance in evaluating the geology of the Park. A special thanks to W. Anzalone and B. Chesler for their assistance in field sampling; to E. Padley and many others who were responsible for the laboratory analysis and to S. Kanniainen for assistance in preparing this report. Finally a very special appreciation to Dr. L.J. Bartelli who originated this project and provided invaluable support and guidance for this research effort.

INTRODUCTION

Soils are a basic natural resource. They provide fundamental information to both land management planning and ecological research. An understanding of the morphology and composition of soil areas is essential to the effective study and management of land resources. In 1980 these needs were identified by the National Park Service - Yellowstone National Park and the University of Wyoming - National Park Service Research Center. Accordingly, a project was initiated to study the major soil areas of Yellowstone National Park.

The specific objectives of this project were:

1) Describe and classify the soils in the major habitat and geological regions of the Park.

2) Sample and analyze the soils within the major habitat and geological regions.

3) Prepare a report containing management interpretations and laboratory analyses.

4) Develop an initial general legend for the major soils in the Park.

5) Develop relationships between the soils, habitats, and geological data for incorporation with the digitized data base of the Park.

The context of this project provides a quantitiative data base for the compositional characteristics of the soils; presents a basis for developing relationsips between the vegetative, geologic and soil features of the Park; and provides reconnaissance level data for input into the Geographical Information System for the Park.

METHODS

Yellowstone National Park is predominantly underlain by two volcanic rock types, the tertiary andesitic rocks and the Quarternary rhyolitic rocks. Soils derived from these two parent materials are compositionally and morphologically different. However, due to the lack of existing soils data for the Park there was little basis for developing a sampling strategy. Accordingly, published data on the bedrock geology (U.S.G.S, 1927a), surficial geology (U.S.G.S. 1972b) and vegetative habitats (Despain, 1980) were used to identify major land areas for sampling purposes. This soils investigation was conducted according to National Cooperative Soil Survey Standards.

Field Sampling

Sample plots were located within habitat/geologic/surficial deposit units to represent major land areas of the Park. Plot locations were determined by evaluating the bedrock geology map, surficial geology map, detailed surficial geology maps (Table 1), the habitat map and by field inspection of the targeted unit. Aerial photographs were also used to evaluate the homogeniety of the unit and determine the extent of the soil area. Potential sampling units were confined to areas within 18 kilometers of a primary road and were excluded from sensitive areas, trails and visitor areas.

Table 1. Detailed surficial geology maps (1:62,500) used for field investigations.

Quadrangle Name	Reference
Abiathur Peak, Wyo.	Pierce (1974)
Canyon Village, Wyo.	Richmond (1977)
Eagle Peak, Wyo.	Richmond and Pierce (1972)
Frank Island, Wyo.	Richmond (1974)
Grassey Lake Reservior, Wyo.	Richmond (1973)
Huckleberry Mountain, Wyo.	Richmond (1973)
Madison Junction, Wyo.	Waldrop and Pierce (1975)
Mammoth, Wyo.	Pierce (1973)
Mount Hancock, Wyo.	Richmond and Pierce (1971)
Mount Holmes, Wyo.	Pierce (1973)
Norris Junction, Wyo.	Richmond and Waldrop (1975)
Old Faithful, Wyo.	Waldrop (1975)
Pelican Cone, Wyo.	Richmond and Waldrop (1972)
Tower Junction, Wyo.	Pierce (1974)
Warm River Butte, Idaho	Richmond (1973)
West Thumb, Wyo.	Richmond (1973)
West Yellowstone, Mont.	Waldrop (1975)

The soils on each plot were sampled and described according to U.S.D.A. Soil Conservation Service standard procedures (Soil Survey Staff, 1972). Field descriptions were taken on the Soil-Woodland Correlation Field Data Sheet (SCS Form 232). The descriptions were subsequently transcribed into stand and profile description format, as presented in this volume. On each plot the parent material was described and the vegetation habitat confirmed. Specific landform and horizon data contained within each soil profile description are presented in Table 2.

Table 2. Landform and horizon data contained on the soil profile description.

Plot and Landform Data	
UTM Coordinate	Parent Material
Pedon Classification	Topography (slope, aspect, shape, elevation)
Vegetative Habitat	Drainage Class
Geological Unit	
Surficial Unit	

Soil Horizon Data	
Horizon Designation	Consistance
Depth	Roots (size and abundance)
Color	Coarse Fragment Content
Texture	pH
Structure	Boundary condition

A soil pit was excavated on each plot for describing and sampling purposes. The sampling depth was to 120 cm or until an impenetrable layer was encountered. Each soil horizon was sampled, except where the horizon was too thin or coarse fragments prevented adequate exposure of the horizon.

Bulk samples were obtained from each of these horizons for chemical and physical soil analysis. Bulk density samples were also obtained from those horizons where the core sampler could be used without interference from coarse fragments or excessive dryness of the soil material. The volume of coarse fragments were estimated from the exposed surfaces in the pit. The bulk soil samples were sent to the Soil Research Laboratory, Ford Forestry Center, Michigan Technological University, for chemical and physical analyses.

Soil Analyses

Standard chemical and physical characteristics analyses were performed on each soil sample in accordance with those described in the Soil Survey Investigations Report No. 1, Soil Conservation Service, U.S.D.A. (1972); special analyses of selected elements, such as P and S were not determined as part of this project due to the special procedures and considerations which are required.

Table 3. Soil characterization analyses and methods

ANALYSIS	METHOD
Particle Size Distribution	Pipette
Bulk Density	Core
Water Retention	0.3, 0.1, 15 bar
Cation Exchange Capacity	NH_4OAc Saturation; Direct Distillation
Extractable Cations (Ca, Mg, K, Na)	NH_4OAc Extractable
Extractable Fe + Al	Dithionite-Citrate Extractable
Al	KCL Extraction
Manganese	Dithionite-Citrate Extraction
pH	1:1 H_2O; 1:2 $CaCl_2$
Extractable Acidity	$BaCl_2$ - Triethanolamine I
Carbon	Acid-Dichromate Digestion
Nitrogen	Kjeldahl Digestion, Ammonia Distillation
Calcium Carbonate	HCl treatment

Particle Size Distribution Analysis

Organic matter was removed from the soil sample by a wet digestion with hydrogen peroxide, and soluble mineral material was removed by vacuum filtration. After being dried and weighed, the sample was dispersed in sodium hexametaphosphate solution. The silt and clay size fractions were separated from the sand by wet sieving, and placed in suspension in a sedimentation cylinder. The size of the silt and clay fractions were determined by pipetting samples of known volume from the suspension at depths and times varying with temperature, and drying and weighing these samples. The sand was dried and divided into five size fractions by dry sieving.

The sizes of particles present in a soil are important in predicting the productivity of vegetative species and also the suitability of the site for use in recreation and construction. Silt and clay size fractions, which have the smallest diameter and the greatest surface area, form micropore spaces in the soil which are responsible for most of the moisture storage capacity. Sand size fractions form macropores in soils, which allow water movement and aeration to occur, so that a sandy soil would have more aeration and more rapid drainage than a clayey soil. Sandy soils have less cohesion between soil particles than do silty and clayey soils. This makes them more easily erodible and less suitable for construction material or recreational uses such as trail and roadway construction.

Moisture Retention Analysis

Soil samples were placed in retaining rings on a porous ceramic plate (for 0.1, 0,33, bar extractions) or on a cellulose membrane over a ceramic drain plate (for 15 bar extractions). The plate was covered with water to wet the samples from below, and allowed to stand until the samples became saturated. The plate was placed in a pressure vessel, and the samples desorbed at the required pressure until equilibrium moisture content was reached (water outflow ceased). The desorbed samples were weighed, oven dried at 105^{0}C, cooled in a dessicator, and weighed again. Moisture content is reported as a percentage of oven dry weight.

The moisture retention capacity of a soil is related to it's texture, so that a sandy soil will store less water than a silty or clayey soil. The analyses performed for moisture retention are designed to determine the amount of water in a soil at field capacity which is approximated by 0.33 bar extractions in silty or clayey soils and by 0.10 bar extractions on sandy soils, and at the permanent wilting point which is approximated by the 15 bar extraction. Water held between these two points is calculated as the Water Retention Difference, a relative value ranging from .02 in a very sandy soil to near .50 in a soil with a large component of silt or clay. Organic material in a soil also retains moisture, so that a surface layer will generally have a higher Water Retention Difference (WRD) than the underlying soil. The capacity for water retention is an important factor in determining the productivity of a soil and the types of vegetation which can grow on it.

Bulk Density

Density sampling was only permitted on those soils where there were few coarse fragments and sufficient moisture to facilitate accurate sampling.

The bulk density of these soils was determined by using a core sampler fitted with compression rings to remove an undisturbed soil core of a standard volume. The soil core was weighed, oven-dried, and reweighed. The resulting weights were compared to the volume to arrive at bulk density values for the two moisture contents. Bulk density values indicate the mass of the soil per unit of volume occupied. A dense soil will be more difficult for roots to penetrate and will have lower rates of water percolation through it. A soil which has a layer of dense material will tend to perch water during wet seasons, resulting in forest equipment operability limitations. These dense layers may also present special problems in construction of sanitary facilities, basements and other structures.

pH Determinations

The water pH of a soil is read in a 1:1 mixture by weight of water and soil The buffer pH is read in a solution of .01 M Ca Cl_2, using Metrohm-Brinkman Model 632 ph-Meter.

The water ph values of these soils have an approximate range of between 4.0 and 8.0 with most soil horizons having values between 5.0 and 7.0. A value of 7.0 is neutral, with lower values indicating acid conditions and higher values indicating alkalinity. The pH of a soil influences the type of vegetation which occurs on it, with acid-tolerant types on soils of low pH and alkali-tolerant types on soils of high pH. Some soils will have an acid surface layer deposited over a more alkaline substratum. In this

situation, deep rooted plant species will be influenced by the nature of the substratum material.

Extractable Acidity Analysis

A 5 g soil sample is leached with a solution of 0.5 N $BaCl_2$ and 0.2 N triethanolamine at pH 8.2, followed by a second leaching with a solution of 0.5 N $BaCl_2$. The resulting solution is titrated to an end point of pH 4.60 with a Metrohm Herisau Titrator E 526. Calculations provide values of extractable acidity in meq/100 g of soil on a less than 2 mm basis.

This procedure removes H^+ and Al^{+3} ions which are held on cation-exchange sites in the soil, and is a more reliable analysis of the acidity component of a soil than is the pH value. It is related to the pH of a soil, so that a high acidity value will correspond to a low soil pH value.

Cation-Exchange Capacity

Cations are extracted from a 5 g soil sample with a solution of 1 N NH_4 OAC at Ph 7.00. The amounts of Ca, Mg, Na, and K in the extract are determined by atomic absorption spectroscopy using an Instrumentation Laboratories Model 251 AA/AE Spectrophotometer. The remaining soil sample, saturated with the ammoniuim ion, is washed with ethanol, made alkaline with 1 N NaOh, and distilled into 4% boric acid, using the Tecator Kjeltec System 1002 Distilling Unit. The distillation liberated the ammonium ions from the exchange sites for a direct measurements of the exchange capacity of the soil. The solution is titrated with 0.1 N HC1 to an end point of pH 4.60 using the Metrohm Herisau Titrator E 526. Calculations from the titration value give cation-exchange capacities in meq/100 g. The cation-exchange capacity was also calculated by the summation method, in which the amounts of exchangeable Ca, Mg, Na, and K are added with exchangeable acidity. The

summation method includes those cations which are 'free' or not attached to exchange sites in the soil. The summation cation-exchange value will frequently be higher than the direct measurement of cation-exchange capacity because of the inclusion of free cations.

The measurements of cation-exchange capacity show the ability of the soil to hold nutrients and release them to plants, which is an important indication of the productivity of the soil. A high cation-exchange capacity would generally indicate a soil of high productivity potential. Factors contributing to a high CEC include a soil texture dominated by silt or clay, the presence of high amounts of organic matter and a mineralogy consisting mostly of layer silicates.

Total Nitrogen

A digestion was performed using 5 g. of sol, 18 ml. H_2SO_4 and a catylist mixture of several salts with heating at 415°C for approximately 1 1/2 hours using the Tecator Digestion System 20. This procedure converted all forms of nitrogen (N) present in the soil to the ammonium ion. The digest is made alkaline with NaOH and distilled into a 4% boric acid solution using the Tecator Kjeltec System 1002 Distillling Unit. Ammomium borate in the distillate was titrated with 0.1 N HCl to an end point of pH 4.60 using the Metrohm Herisau Titrator E526. Calculations give values of total nitrogen as a percentagbe of the less than 2 mm soil.

Nitrogen is one of the three most important plant nutrients, and so this analysis is an indicator of the fertility of the soil. The ratio of organic carbon to nitrogen is also important in predicting soil fertility. At C:N ratios of approximately 10:1 or higher, the nitrogen in the soil becomes unavailable for plants, being used instead in decomposition of the organic matter.

Carbon

Organic forms of carbon in a soil sample are oxidized by 1 N $K_2Cr_2O_7$ with heat generated by addition of concentrated H_2SO_4. The $K_2Cr_2O_7$ remaining following the oxidation is titrated to an end point of 6.30 mV with 1 N $FeSO_4$. Calculations give the percent of organic carbon present in the soil. Organic carbon is that portion of carbon in soils which comes from plant and animal decomposition. It is important to the fertility of a soil because it contributes cation-exchange sites, provides material for soil organisms to live upon and increases water holding capacity.

Spodic Horizon Analyses

Two extractions for Fe and Al are performed to determine whether spodic criteria are met in a soil horizon. In the dithionite-citrate extraction, a 4 g soil sample was shaken overnight in a solution of 0.83% sodium dithionite and 9.6% sodiuim citrate. In the second extraction, 2 g of soil were shaken overnight in a 0.1 M $Na_4P_2O_7$ solution. Amounts of Fe and Al were determined by atomic absorption spectroscopy on the solution extracts, and are reported as percentages.

Spodic pyrophosphate is an extractant which removes organically complexed iron (Fe) and aluminum (Al) from soils, while sodium dithionite-citrate removes both organically complexed and oxide forms of Fe and Al. Comparing values from the two extractions shows what portion of the Fe and Al in the soil is in organically complexed forms. This ratio is one used in soil classification to define the spodic horizon.

RESULTS

A total of 67 plots were sampled. These plots are distributed uniformly throughout the Park, Figure 1. This distribution is intended to give the broadest coverage, representing the dominant soil, geologic and vegetative components.

The 67 sampled plots represent a combination of 23 habitat types, 25 geologic units and 15 surficial units. The grouped geologic units represent the dominent coverage of quarternary rhyolite (37%) and tertiary andesite (27%) groupings within the Park, Figure 2. Representative surficial units are dominated by glacial till (51%) with neoglaciation and bedrock deposits representing an additional 26 percent of the data set, Figure 3. Forested habitat types represent 66 percent of the sampled plots and non-forested types encompass 34 percent. Subalpine fir types dominate the sampled forested types representing 80 percent of this group, Figure 4. The big sagebrush types represent 40 percent of the non-forested types and Idaho fescue types represent 30 percent of this grouping, Figure 5.

The sampled soil areas necessarily represent a complex combination of groupings, due to the diversity of ecosystems in the Park, and the limited scope of this project. The data contained in Appendix II represents the basic resource data which characterizes the sampled land area. It s utility is two-fold: 1) provide information for specific locations, and 2) to provide data to develop relationships of general characterizations of broad park ecosystems. A plot listing is also provided in Appendix II which may be used to cross reference plot number with the habitat type, geologic unit and surficial unit. The following sections on soil classification, interpretations and soil-habitat relations provide the balance of the soil resource data.

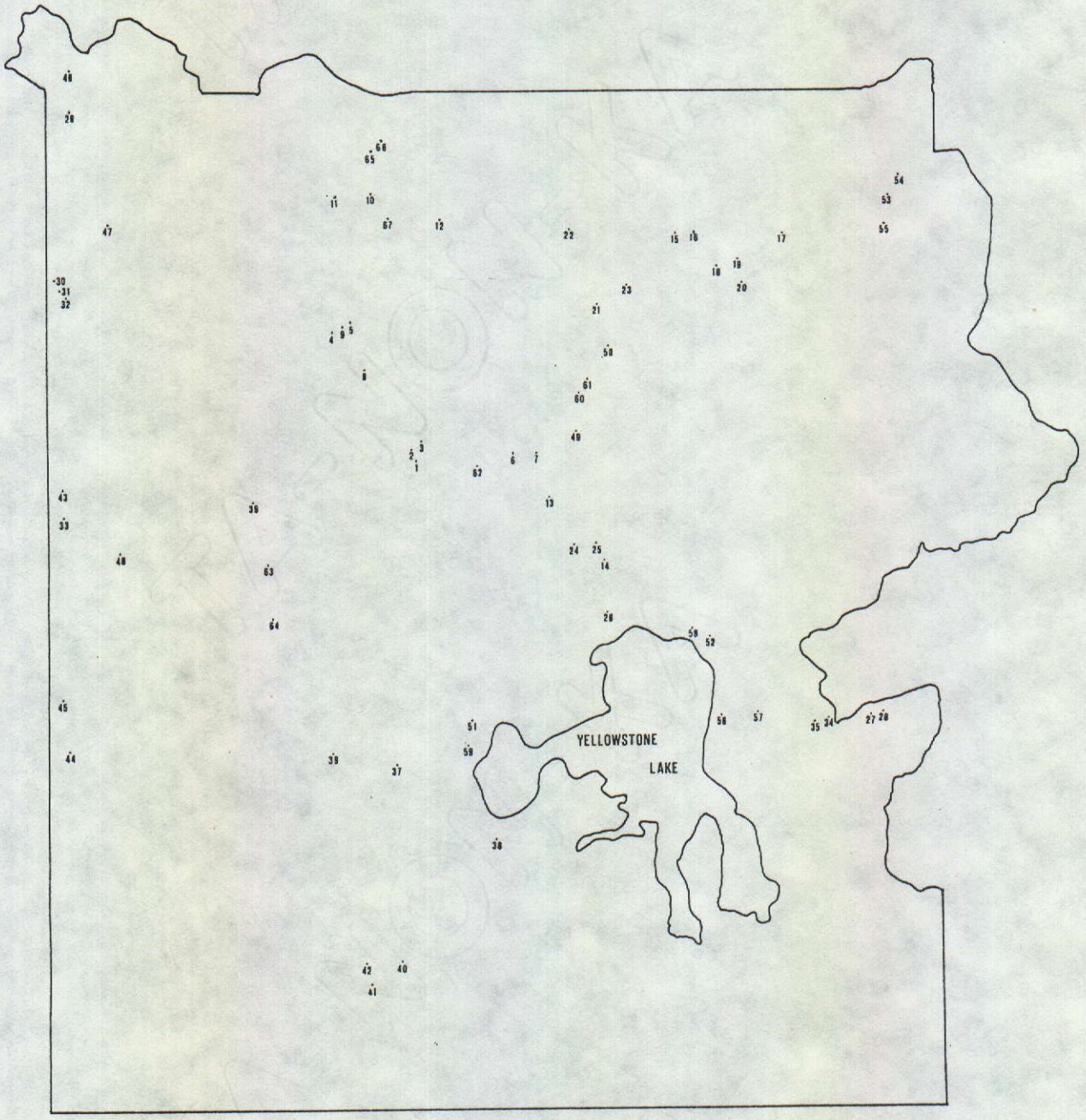


Figure 1. Location of soil sampling plots in Yellowstone National Park.

Fig. 2 FREQ DIST COMB. GEO. GRPS.

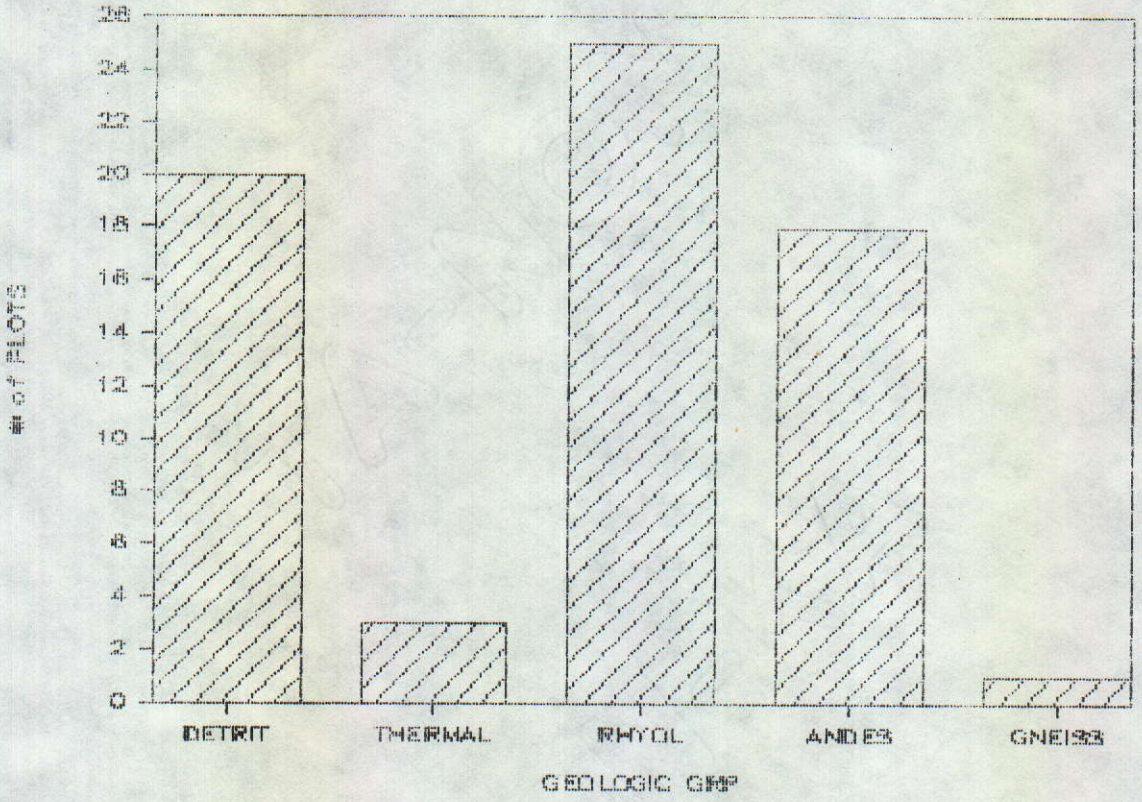


Fig. 3 FREQ DIST SURFICIAL GEO GROUPS

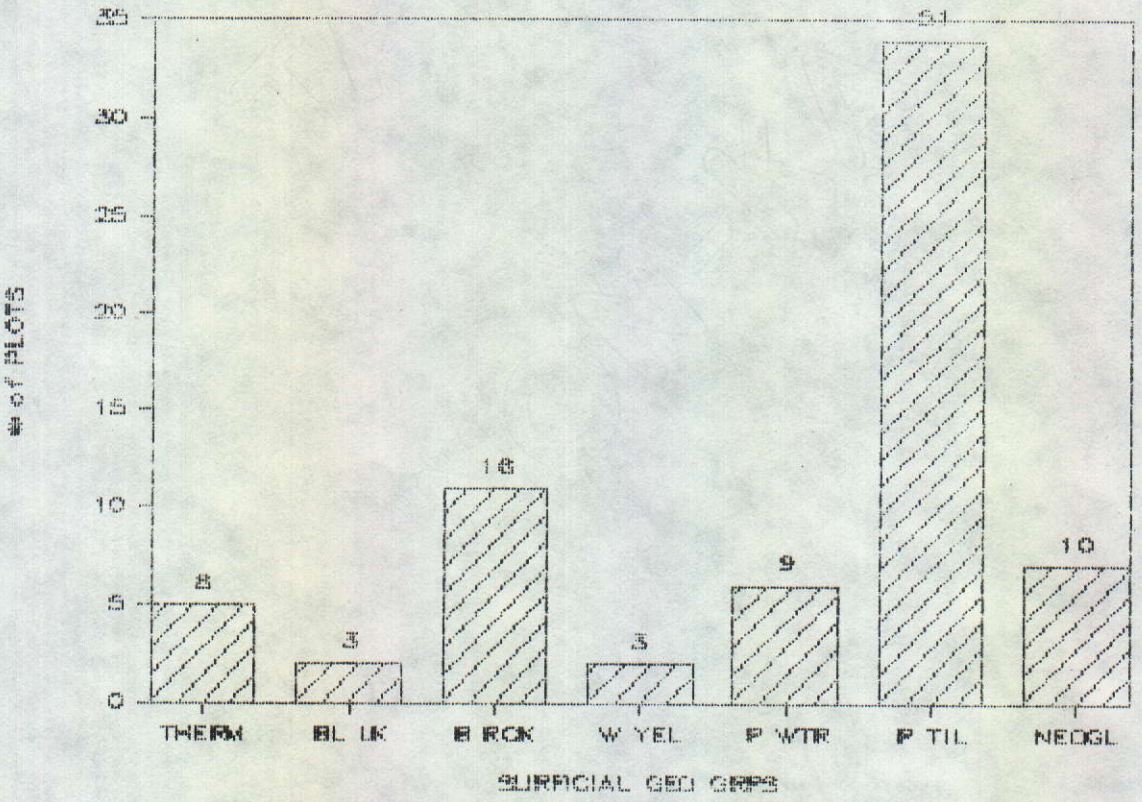


Fig. 4 FREQ DIST — FORESTED HABITAT TYPES

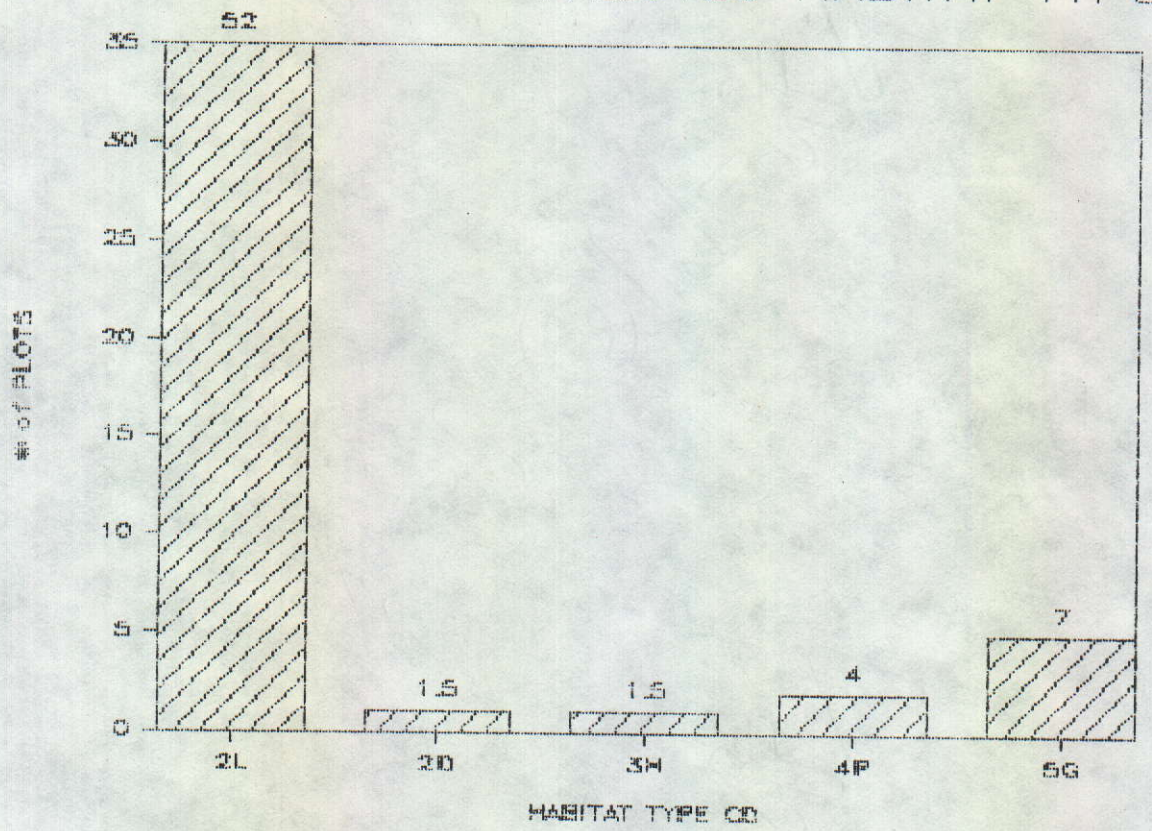
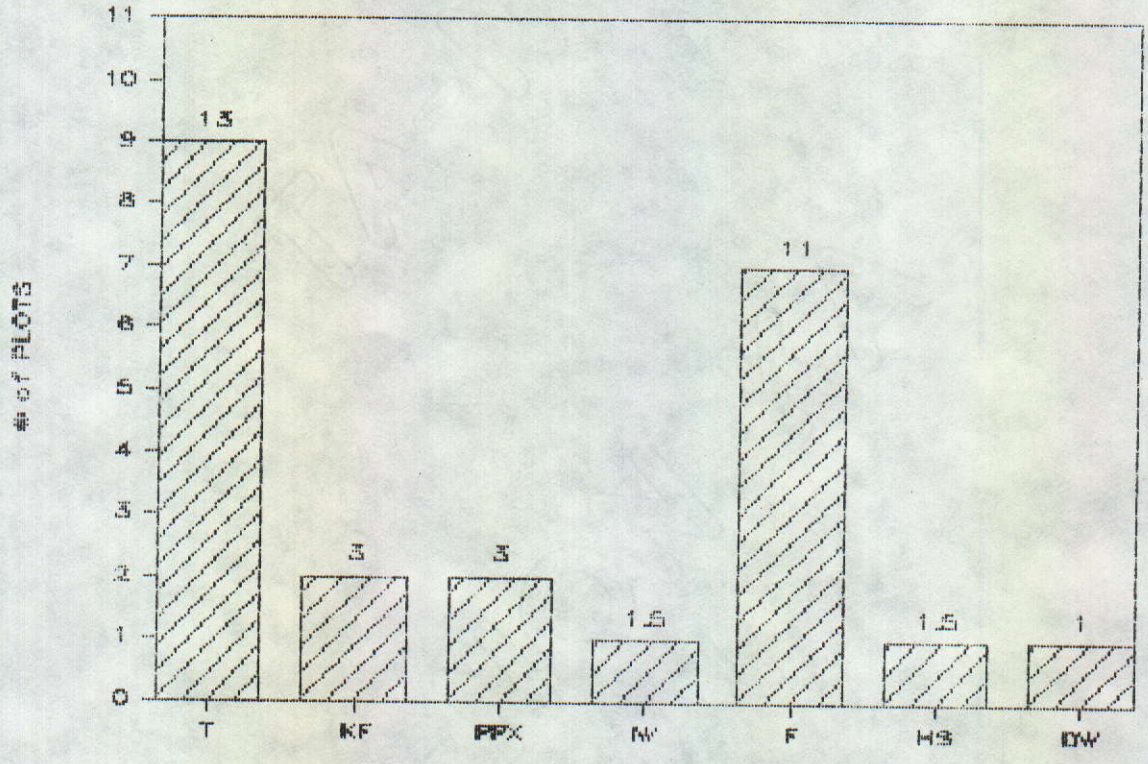


Fig. 5 FREQ DIST — NONFORESTED HABITAT TYPES



SOIL CLASSIFICATION

Soil Taxonomy (1975) provides the nationally recognized classification system for soils in the United States. The system recognizes seven levels, with the first five being based on entirely soil properties. Levels 6 and 7 (series and phase) are derived from both properties, and use and management criteria. Accordingly, the soils for this project were classified through the family level (level 5). Six of the 10 recognized soil orders are found in the Park. These orders represent diverse properties ranging from poorly drained organic soils to well drained grassland and forested soils. The following summary presents a general description of the taxa recognized in this project. Soil Taxonomy (1975) should be selected for more detailed discussion on the characteristics of the taxa. Table 4 presents the classification list of the sampled soils on each plot. Those plots which are representative of the taxa are noted as model and the characterization data should be referred to for compositional data.

Cryohrepts

These soils represent the "cold" Ochrept suborder, which typically occur in mountains and high latitudes. The vegetation usually consists of conifers, mixed conifers or shrub vegetation. The soils may be formed in loess, drift, alluvium, or in solifluction deposits, mostly of the late Pleistocene or Holocene age. The soils generally have a thin, brownish surface layer and a light brown sub-surface horizon. Many have rock fragments within 1 m of the surface.

The 'Typic'subgroup represents soils which are greater than 50 cm thick and have a moderate to high base saturation. In contrast, the 'Dystic' subgroup has a lower base saturation (<60%), but is otherwise similar.

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Table 4. Soil classification of sampled plots.

Plot No.	Classification
1	Dystric Cryochrept, coarse-loamy, mixed
2	Dystric Cryochrept, sandy, mixed
3	Typic Cryosaprist, euic
4	Dystric Cryochrept, loamy-skeletal,mixed
5	Typic Cryoboroll, coarse-loamy,mixed
6	Dystric Crochrept, sandy-skeletal, mixed
7	Dystric Crochrept, sandy-skeletal, mixed
8	Typic Cryorthent, fine-loamy, mixed
9	Typic Cryochrept, coarse-loamy, mixed
10	Lithic Cryoboroll, fine-loamy,mixed
11	Typic Cryoboroll, loamy-skeletal, mixed
12	Typic Cryoboroll, coarse-loamy, mixed
13	Typic Cryochrept, coarse-loamy,mixed
14	Pachic Cryoboroll, coarse-loamy, mixed
15	Typic Cryorthent, sandy-skeletal, mixed
16	Terric Cryohemist, euic
17	Typic Cryoboroll, loamy-skeletal, mixed
18	Argic Cryoboroll, loamy-skeletal, mixed
19	Pachic Cryoboroll, coarse-loamy, mixed
20	Typic Cryoboroll, loamy-skeletal, mixed
21	Pachic Cryoboroll, Loamy-skeletal, mixed
22	Typic Cryoboroll, coarse-loamy,mixed
23	Typic Cryoboroll, loamy-skeletal, mixed
24	Typic Cryoboroll, coarse-loamy, mixed
25	Typic Cryoboroll, coarse-loamy, mixed
26	Typic Cryochrept, coarse-loamy, mixed
27	Lithic Cryumbrept, loamy-skeletal, mixed
28	Pachic Cryoboroll, loamy-skeletal, mixed
29	Pachic Cryoboroll, loamy-skeletal over fragmental, mixed
30	Lithic Cryochrept, loamy-skeletal, mixed
31	Typic Cryoboroll, loamy-skeletal, mixed
32	Typic Cryochrept, loamy-skeletal, mixed
33	Typic Cryorthent, sandy-skeletal, mixed
34	Aquic Cryoboroll, loamy-skeletal, mixed

Table 4. continued.

Plot No.	Classification
35	Dystric Cryochrept, sandy, mixed
36	Dystric Cryochrept, coarse-loamy, mixed
38	Typic Cryochrept, coarse-loamy, mixed
39	Lithic Cryochrept, coarse-loamy, mixed
40	Typic Cryumbrept, coarse-loamy, mixed
41	Lithic Cryorthent, sandy-skeletal, mixed
42	Typic Cryorthent, coarse-loamy , mixed
43	Typic Cryochrept, sandy, mixed
44	Dystric Cryochrept, coarse-loamy, mixed
45	Dystric Cryochrept, sandy, mixed
46	Lithic Cryoboralf, loamy-skeletal, mixed
47	Typic Cryochrept, fine-loamy, mixed
48	Lithic Cryochrept, loamy-skeletal, mixed
49	Dystric Cryochrept, sandy, mixed
50	Typic Cryoboroll, loamy-skeletal, mixed
51	Typic Cryochrept, sandy, mixed
52	Typic Cryochrept, fine-loamy, mixed
53	Entic Cryumbrept, loamy-skeletal over fragmental, mixed
54	Lithic Cryorthent, coarse-loamy, mixed
55	Typic Cryoboroll, loamy-skeletal, mixed
56	Typic Cryorthent, coarse-loamy, mixed
57	Typic Cryochrept, coarse-loamy, mixed
58	Typic Cryumbrept, fine-loamy, mixed
59	Typic Cryochrept, sandy, mixed
60	Lithic Cryochrept, loamy-skeletal over fragmental, mixed
61	Typic Cryochrept, coarse-loamy, mixed
62	Dystric Cryochrept, coarse-loamy, mixed
63	Typic Cryochrept, coarse-loamy, mixed
64	Lithic Udorthent, fine-loamy, mixed, frigid
65	Typic Cryochrept, coarse-loamy, mixed
66	Cryic Eutroboralf, loamy-skeletal, mixed
67	Typic Cryumbrept, fine-loamy, mixed

Accordingly, the inherent fertility of 'Dystic' soils is less than those classified as 'Typic'. The 'Lithic' subgroup represents soils which are less than 50 cm thick before impenetrable rock is reached.

Cryumbrepts

The soils represented by the 'Cryumbrepts' are dark reddish or brownish, well drained and have accumulated organic matter. They are similar to the 'Cryoborolls' except they do not have as high a base saturation. These soils typically form under coniferous forests or under shrubs and grasses, in mountainous areas. These soils usually form in acid parent materials.

The 'Typic' subgroup is characterized by well drained soils that have a thick surface horizon and a moderately well dveloped subsurface layer. The 'Entic' subgroup is coarser textured and does not have as well developed subsurface horizon which results in a lower water holding capacity. The 'Lithic' subgroup has a rock contact within 50 cm of the surface.

Cryoborolls

This taxa represents the "cold" Boroll suborder, which occurs in the mountains of the Western U.S. These soils have a distinctive and very thick, dark surface horizon. This layer is typically 25 to 75 cm thick. The unique characteristic of this horizon is it's high fertility, accumulations of organic matter and relatively high moisture retention. The surface horizon typically overlies other diagnostic subsurface horizons. These soils were mainly formed in late Pleistocene or Holocene deposits or on similarly dated surfaces. The vegetation on these sites were grasses with scattered conifers on grasslands.

The Typic subgroup represents soils which are freely drained and have a moderately well developed subsurface horizon. The Argic subgroup represents those soils in which the subsurface horizon has an accumulation of clay; which results in a higher moisture retention and nutrient availability. Soils of the "Aquic subgroup are influenced by shallow water tables, during part of the year. The Lithic subgroup represents those soils which are shallow to bedrock. The Pachic subgroup represents soils with a surface horizon greater than 40 cm thick; which indicates greater accumulations of organic matter and nutrients.

Cryorthents

These soils are the Orthents from high mountainous areas. Typically these soils are on recent erosional surfaces, on steep slopes where rock is shallow or are in recent solifluction deposits. The vegetation can range from coniferous forests to scattered shrubs. Soils in the Typic subgroup are greater than 50 cm thick and are well drained. These soils are very weakly developed.

Cryoboralfs

The Cryoboralfs are soils which have an accumulation of clay in a subsurface layer within 60 cm of the surface. These soils are well drained and typically occur on steep lands. The sites are usually forested and may be mixed with shrubs and grasses. The clay layer in these soils provides improved water holding capacity and availability of nutrients. The Typic subgroup has a well developed clay layer and has a loamy texture. The Lithic subgroups are similar except that they have bedrock within 50 cm of the surface.

Cryosaprists

These soils are the cold 'Saprists', which are the well decomposed, poorly drained, organic soils. The botanic origin of the material cannot be directly observed. These soils are usually black and saturated, but the water table will tend to fluctuate. The 'Typic' subgroup represents the central concept of these soils.

Cryohemists

These soils are the cold 'Hemists', which are the moderately well decomposed, poorly drained organic soils. The ground water does not fluctuate very much on these soils. The 'Terric' subgroup represents these soils which have depth of 1 to 1.5 meters.

SOIL-HABITAT-GEOLOGIC TYPES

The sampled plots were selected to represent the dominant geologic material and habitat types. Resultantly, not all possible combinations of soil-habitat-geologic types were documented. Those which are presented are adequate to represent the composition of those sampled sites and provide a usable basis for interpreting other sites. The tables presented in this section may be used to determine the probable soil type for combination of habitat types and geologic type. However, due to level of sampling there was insufficent resolution in the data set to develop quantitative models. The tables are based on the sampled plots, and have not been extrapolated to include all possible combinations of vegetation and geology. The tables are representative of the Park and will provide accurate coverage to the soil classification levels which are indicated. Table 5 presents the soil reference for forested types and Table 6 presents the non-forested types.

Table 5. Soil Types by Forested Habitat Type and Geologic Type.

Habitat Types	Geologic Types: Detritus	Quartennary Rhyolite	Tertiary Andesite	Thermal Deposits
2LL	Cryochrepts	Cryochrepts Cryumbrepts	Cryochrepts	Cryorthents
2FO	Cryochrepts	Cryoborolls	Cryoborolls Cryorthents	
2L3	Cryochrepts	Cryochepts	Cryochrepts Cryoborolls	
2LG		Cryochrepts		
2CL			Cryoborolls	
2EE			Cryumbrepts Cryoborolls	
2GO		Cryoborolls		
2DD		Cryochrepts		
3HO		Cryochrepts		
4PO	Cryorthents Cryochrepts			
5NO		Cryumbrepts	Cryumbrepts Cryoborolls	
5GO		Cryoborolls		

Table 6. Soil Types by Non-Forested Habitat Type and Geologic Type.

Habitat Types	Geologic Types: Detritus	Quartennary Rhyolite	Tertiary Andesite	Thermal Deposits
TFG	Cryoborolls Cryumbrepts Cryorthents		Cryoborolls	
KF	Cryoborolls			
TF3	Cryoboralfs			
PPX		Cryorthents		
DW	Cryosaprists			
IW	Cryoborolls			
FD	Cryohemist	Cryochepts		
FN			Cryoborolls	
FNG	Cryochrept		Cryoborolls Cryochrepts Cryorthents	
HS				Udorthents

SOIL INTERPRETATIONS

The National Cooperative Soil Survey provides standard evaluation procedures to develop use interpretations based on soil properties. These procedural guides were used to assign interpretations to each of the sampled plots. Interpretations were developed for the following uses: Septic Tank Absorption Fields, Sewage Lagoons, Camp Areas, Picnic Areas, Playgrounds and Paths and Trails.

Table 7 presents the interpretations for the sampled plots. For each plot the interpretation is rated according to a 3 point scale. The 'slight' rating indicates that there is little or no problems with the soil for the particular use. The 'moderate' ratings suggests that special design or application may be required for the intended use. The 'severe' rating indicates that the intended use is generally prohibitive without major design changes or site modification. The limiting soil factor is also presented for the moderate and severe ratings.

The most common limiting factors for recreational use are the steep slopes, rock content and wetness in selected areas. The slope factor is a site parameter; accordingly a similar soil located on a more gentle slope would have a rating of one unit less. The rock content and wetness limitations are a function of the soil type and therefore could be expected to occur wherever the soils is found. The "guides" used to develop these interpretations are presented in Appendix III.

Table 7. Soil interpretations for selected uses for each sampled plot.

	Septic Tank Absorption Fields	Sewage Lagoons	Camp Areas	Picnic Areas	Playgrounds	Paths and Trails
Plot 1	Severe - Depth to rock	Severe - Depth to rock	Severe- Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Slight
Plot 2	Moderate - Depth to rock	Moderate - Depth to rock	Moderate - Small stones	Moderate - Small stones	Severe - Small stones	Slight
Plot 3	Severe - Wetness	Severe - Wetness	Severe - Wetness	Severe - Wetness	Severe - wetness	Severe - wetness
Plot 4	Moderate - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 5	Slight	Slight	Moderate - Small stones	Moderate - Small stones	Slight	Slight
Plot 6	Moderate - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 7	Slight	Severe - Seepage	Moderate - Small stones	Moderate - Small stones	Severe - Small stones	Slight
Plot 8	Moderate - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 9	Moderate - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - slope	Slight
Plot 10	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Slight
Plot 11	Severe - Large stones	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 12	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight

Table 7 - Continued

	Septic Tank Absorption Fields	Sewage Lagoons	Camp Areas	Picnic Areas	Playgrounds	Paths and Trails
Plot 13	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight
Plot 14	Slight	Moderate - Seepage	Slight	Slight	Moderate - Small stones	Slight
Plot 15	Moderate - Large stones	Severe - Large stones	Moderate - Small stones	Moderate - Small stones	Severe - Small stones	Slight
Plot 16	Severe - Wetness	Severe - Wetness	Severe- Wetness	Severe - Wetness	Severe - Wetness	Severe - Wetness
Plot 17	Moderate - Large stones	Moderate - Slope	Moderate - Small stones	Moderate - Small stones	Severe - Small stones	Slight
Plot 18	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - wetness	Severe - Slope
Plot 19	Severe- Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 20	Moderate - Large stones	Severe - Large stones	Moderate - Small stones	Moderate Small stones	Severe - Small stones	Slight
Plot 21	Moderate - Large stones	Severe - Large stones	Slight	Slight	Severe - Slope	Slight
Plot 22	Severe - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 23	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 24	Moderate - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 25	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight

Table 7 - Continued

	Septic Tank Absorption Fields	Sewage Lagoons	Camp Areas	Picnic Areas	Playgrounds	Paths and Trails
Plot 26	Moderate - Slope	Severe - Slope	Moderate - Slope	Moderate Slope	Severe - Slope	Moderate - Slope
Plot 27	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Slight
Plot 28	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 29	Severe - Slope	Severe - Slope	Severe- Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 30	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Slight
Plot 31	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 32	Severe- Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 33	Severe - Poor Filter	Severe - Seepage	Moderate - Small stones	Moderate Small stones	Severe - Small stones	Slight
Plot 34	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 35	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight
Plot 36	Moderate - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe Slope	Slight
Plot 37	Severe - Poor Filter	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 38	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight

Table 7 - Continued

	Septic Tank Absorption Fields	Sewage Lagoons	Camp Areas	Picnic Areas	Playgrounds	Paths and Trails
Plot 39	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Slight
Plot 40	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight
Plot 41	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Slight
Plot 42	Severe - Depth to rock	Severe - Depth to rock	Slight	Slight	Moderate - Slope	Slight
Plot 43	Severe - Poor Filter	Severe - Seepage	Moderate - Too Sandy	Moderate - Too Sandy	Moderate - Too Sandy	Slight
Plot 44	Slight	Slight	Slight	Slight	Moderate - Small Stones	Slight
Plot 45	Slight	Moderate - Slope	Slight	Slight	Severe - Slope	Slight
Plot 46	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Moderate - Slope
Plot 47	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 48	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Slight
Plot 49	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight
Plot 50	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope

Table 7 - Continued

	Septic Tank Absorption Fields	Sewage Lagoons	Camp Areas	Picnic Areas	Playgrounds	Paths and Trails
Plot 51	Severe - Poor Filter	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 52	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight
Plot 53	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 54	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Slight
Plot 55	Severe- Large Stones	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 56	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Moderate - Slope
Plot 57	Slight	Slight	Slight	Slight	Moderate - Small Stones	Slight
Plot 58	Slight	Moderate - Slope	Slight	Slight	Moderate - Slope	Slight
Plot 59	Slight	Moderate Slope	Slight	Slight	Moderate - Slope	Slight
Plot 60	Severe - Slope	Severe - Slope	Severe- Slope	Severe - Slope	Severe - Slope	Severe - Slope
Plot 61	Severe - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Moderate - Slope
Plot 62	Moderate - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Slight
Plot 63	Slight	Slight	Moderate - Small stones	Moderate Small stones	Severe - Small stones	Slight

Table 7 - Continued

	Septic Tank Absorption Fields	Sewage Lagoons	Camp Areas	Picnic Areas	Playgrounds	Paths and Trails
Plot 64	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to rock	Severe - Depth to Rock
Plot 65	Severe - Slope	Severe - Slope	Severe - Slope	Severe - Slope	Severe Slope	Moderate - Slope
Plot 66	Severe - Slope	Severe - Slope	Moderate - Slope	Moderate - Slope	Severe - Slope	Moderate - Slope
Plot 67	Slight	Slight	Moderate Small stones	Moderate Small stones	Severe - Small stones	Slight

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APPENDIX I

Key to Geologic Units
Key to Surficial Geology Units
Key to Habitat Types

KEY TO GEOLOGIC UNITS

Surficial Deposits

Qs - detritial deposits

Qh - hot springs deposits

Qhe - hydrothermal explosion deposits

Quaternary Period

Qyh - Huckleberry Ridge Tuff of Yellowstone Group
(welded ash flows)

Quf - Undine Falls Basalt
(includes some gravel)

Qyl - Lava Creek Tuff of Yellowstone Group
(welded ash flows)

Qpm - Mallard Lake Member

Qf - Falls River Basalt

Qsl - Swan Lake Flat Basalt

Qpu - Upper Basin Member

Qpcd - Dry Creek Flow

Qpce - Elephant Back Flow

Qpcl - Summit Lake Flow

Qpcp - Pitchstone Plateau Flow

Qpcn - Nez Perce Creek Flow

Qpcf - Solfatara Plateau Flow

Qpcy - West Yellowstone Flow

Tertiary Period

Ts - Sepulchur Formation
(undivided dominantly light-colored andesitic rocks)

Tsd - Sepulchur Formation, Daly Creek Member
(light-colored alluvial and vent facies)

Tertiary Period continued

Ti - Absaroka Volcanic Supergroup
(rhyodacite, quartz latite, quartz monzonite, and grandodiorite in the Gallatin Range)

Tt - Trout Creek Trachyandesite
(lava flows, breccia, and conglomerate)

Tl - Langford Formation
(undivided dominantly light-colored andesitic volcaniclastic rocks and andesite lava flows)

Tlr - Lamar River Formation
(dominantly dark-colored andesitic volcaniclastic rocks)

Tlrf - Lamar River Formation
(dominantly dark-colored andesite flows)

Mississippian Period

Mm - Madison Limestone
(limestone and dolomite)

Precambrian

pCg - gneiss and schist

KEY TO SURFICIAL GEOLOGY UNITS

Neoglaciation and Pinedale Glaciation

co - colluvium

tr - travertine

ls - landslide deposits

fa - fine grain humic alluvium

Pinedale Glaciation

Late Stade

pl - lake deposits

Middle and Early Stades

pt - till

pk - kame sand and gravel

pkl - ice-dammed lake deposits

pg - sand and gravel

phe - hydrothermal explosion deposits

Bull Lake/Pinedale Interval

ws - sediments of West Yellowstone Basin

Bull Lake/Pinedale Interval and Bull Lake Glaciation

bu - lake deposits

Bull Lake Glaciation

bt - till

Bedrock

R - rhyolite flows, basalt flows, ash-flow tuffs, and pre-Quaternary rocks

yr - Plateau Rhyolite - West Yellowstone Flow

KEY TO HABITAT TYPES

Nonforested

TFG - The most common phase of sagebrush dominated types. Different from TF (Big sagebrush/Idaho fescue HT) by being more moist thus having a greater standing crop of grasses and forbs.

KF - Silver sage/Idaho fescue HT
Artemesia cana/Festuca idahoensis

TF - Big sagebrush/Idaho fescue HT
Artemesia tridentata/Festuca idahoensis

PPX - Pitchstone Plateau Complex

DW - Tufted hairgrass/sedge HT
Deschampsia caespitosa/Carex spp.

IW - Willow/sedge HT

FD - Idaho fescue/tufted hairgrass HT
Festuca idahoensis/Deschampsia caespitosa/

FN - Idaho fescue/bearded wheatgrass HT
Festuca idahoensis/Agropyron caninum

FNG - Moist phase of the FN type with sticky goranium (*Geranium viscosissimum*) and graceful cinquefoil (*Potentilla gracilis*).

HS - Hot spring deposits and warm ground with a much modified vegetation, usually stunted.

Forested

2LL - Subalpine fir/grouse whortleberry HT grouse whortleberry phase
Abies lasiocarpa/Vaccinium scoparium - V. scoparium

2FC - Subalpine fir/meadowrue HT
Abies lasiocarpa/Thalictrum occidentale

2L3 - Subalpine fir/grouse whortleberry HT whitebarked pine phase
Abies lasiocarpa/Vaccinium scoparium - Pinus albicaulis

2LG - Subalpine fir/grouse whortleberry HT pinegrass phase
Abies lasiocarpa/Vaccinium scoparium - Calamagrostis rubescens

2CL - Sublapine fir/twinflower HT grouse whortleberry phase
Abies lasiocarpa/Linnaea borealis - Vaccinium scoparium

2EE - Subalpine fir/globe huckleberry HT globe huckleberry phase
Abies lasiocarpa/Vaccinium globulare - V. globulare

2GO - Subalpine fir/pinegrass HT
Abies lasiocarpa/Calamagrostis rubescens

2DO - Wet forests - Complex of habitat types

3HO - Whitebarked pine/elk sedge HT
Pinus albicaulis/Carex geyrii

4PO - Lodgepole pine/bitterbrush HT
Pinus contorta/Purshia tridentata

5NO - Douglas-fir/snowberry HT
Pseudotsuga menziesii/Symphoricarpos albus

5GO - Douglas-fir/pinegrass HT
Pseudotsuga menziesii/Calamagrostis rubescens

APPENDIX II

Plot listing
Soil characterization data for
each sampled plot

PLOT NO.	UTM COORDINATE	HABITAT TYPE	GEOLOGIC TYPE	SURFICIAL TYPE	DETAILED SURF TYPE
1	49-37.8N 52-20E	2LL	QYL	PT	PT
2	49-32.6N 52-33E	2LL	QYL	PT	PT
3	49-52.6N 52-54E	DW	QS	FA	FA
4	49-34.2N 51-99E	2LL	QYL	PT	PR
5	49-69.0N 52-10E	IW	QS	FA	PFG
6	49-59.8N 53-58E	2LL	QPCF	PT	PT
7	49-51.8N 53-65E	ED	QF	SS	PS
8	49-69.4N 52-00E	2LL	QHE	MS	HA
9	49-54.8N 52-[illegible]	2LL	QUF	PT	PKS
10	49-77.6N 52-10E	TF	QH	TR	TRO
11	49-78.[illegible]	TFG	SC	PT	PT
12	49-7[illegible]	EGO	QBL	PT	PT
13	49-46.1N 53-03E	2LL	QPCF	PT	PT
14	49-40.8N 54-06E	MF	QS	SS	PGS
15	49-73.0N 55-13E	TFG	QS	PK	PKG
16	49-73.0N 56-25E	FG	QS	FA	FA
17	49-70.[illegible]	TFG	QS	PT	PT
18	49-76.[illegible]	5NO	TLR	PT	PT
19	49-70.1N 55-54E	FN	TLR	R	PR
20	49-80.0N 55-50E	TFG	TLR	R	PR
21	49-67.[illegible]	TFG	TL	PT	PT
22	49-75.[illegible]	5NO	TS	PT	PT
23	49-[illegible]	2GO	QYL	PT	PT
24	49-[illegible]	TFG	QS	DU	BL
25	49-44.[illegible]	RF	QS	PT	PKSG
26	49-47.[illegible]	2LL	QPCB	PT	PR
27	49-54.[illegible]	3EE	TT	R	R
28	49-[illegible]	3EE	TT	R	PTP
29	49-[illegible]	2CL	YM	CO	PTC
30	49-[illegible]	3FO	PCO	R	PCO
31	49-[illegible]	3KO	QYH	CO	PCO
32	49-[illegible]	2LG	QYH	CO	PCO
33	49-[illegible]	4PO	QS	WS	WGS
34	49-[illegible]	2L3	TT	PT	PT
35	49-[illegible]	3L3	QS	PK	PKSG
36	49-[illegible]	3L3	QPY	PT	PT

PLOT NO.	UTM COORDINATE	HABITAT TYPE	GEOLOGIC TYPE	SURFICIAL TYPE	DETAILED SURF TYPE
37	49-50.8N 52-57E	3HO	QPCD	PT	PT
38	49-14.3N 53-50E	2LL	QS	PKL	PKL
39	49-45.4N 51-10E	2LG	QYL	CO	PCO
40	48-99.0N 52-56E	2LL	QPCP	PT	PT
41	48-98.7N 52-[illegible]E	PPX	QPCP	R	PR
42	49-99.6N 52-[illegible]E	PPX	QPCP	R	PR
43	49-46.7N 49-31E	4PO	QS	WS	WGS
44	49-22.5N 49-31E	2LL	QPCL	ST	
45	49-27.5N 49-33E	2LL	QPCY	YR	RY
46	49-57.2N 49-36E	2FO	TSO	CO	PCO
47	49-73.5N 49-58E	2FO	QS	PT	PT
48	49-41.0N 50-[illegible]E	2L3	QYL	PT	PT
49	49-34.4N 49-35E	2LL	QPU	PT	PT
50	49-61.7N 5[illegible]-43E	PNG	TLR	R	PR
51	49-24.7N 53-54E	2LL	QS	PL	PS
52	49-34.1N 55-69E	2FO	QS	PT	PKS
53	49-75.8N 57-10E	5NO	TLR	PT	PR
54	49-78.0N 57-18E	PNG	TLR	R	R
55	49-74.6N 57-[illegible]E	2CL	TLR	PT	PKLU
56	49-28.4N 58-90E	2FO	TL	PT	PT
57	49-27.5N 58-40E	2DO	QYL	PT	PT
58	49-34.4N 55-47E	TFB	QS	PL	PLSG
59	49-23.7N 53-32E	3LL	QS	PT	PT
60	49-57.2N 54-25E	PNG	TS	R	PR
61	49-57.9N 54-35E	2L3	TLRF	PT	PT
62	49-50.6N 53-23E	2LL	QPCF	PT	PT
63	49-40.3N 51-39E	3LL	QPCN	PT	PT
64	49-34.4N 51-33E	HS	QH	PKS	PS
65	49-80.9N 53-32E	PNG	QS	PT	PT
66	49-81.7N 52-29E	TF	QS	LS	LS
67	49-74.3N 52-48E	5NO	QBL	PT	PT

Plot No.: 1
UTM Coordinate: 49-57.2N/5-22E
Pedon Classification: Dystric Cryochrept, coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qyl
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Nearly level. Gradient is 2 percent. West aspect. Convex. Slope length is 300 meters. Elevation is 2290 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oi 2 to 0.5 cm. Lodgepole pine needles and twig debris. Abrupt smooth boundary.

Oe 0.5 to 0 cm. Decomposed pine needles. Moderately acid; abrupt smooth boundary.

A 0 to 7 cm. Brown (10YR 5/3) dry, fine sandy loam; weak fine granular structure; friable; common fine and common medium roots; 5 percent pebbles; strongly acid; clear smooth boundary.

Bw 7 to 19 cm. Yellowish brown (10YR 5/4) dry, fine sandy loam; weak fine granular structure; friable; common fine and few medium roots; 15 percent pebbles; very strongly acid; clear smooth boundary.

C 19 to 31 cm. Light yellowish brown (10YR 6/4) dry, gravelly fine sandy loam; single grained;friable; few fine roots; 30 percent pebbles; medium acid.

Note: Soil profile of plot 1 was not sampled.

Plot No.: 2
UTM Coordinate: 49-52.5N/5-26.4E
Pedon Classification: Dystric Cryochrept; sandy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qyl
Surficial Unit: pt
Parent Material: Rhyolitic till
Topography: Nearly level. Gradient is 3 percent. East aspect. Convex. Slope length is 500 meters. Elevation is 2300 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oi 1 to 0.5 cm. Lodgepole pine needles and twig debris.

Oa 0.5 to 0 cm. Decomposed pine needles.

A 490 0 to 11 cm. Brown (10YR 5/3) dry; gravelly coarse sandy loam; weak fine granular structure; friable; common fine, common medium and few coarse roots; 20 percent pebbles; strongly acid; clear smooth boundary.

Bw1 491 11 to 24 cm. Dark yellowish brown (10YR 4/4) dry; gravelly coarse sandy loam; weak fine subangular blocky structure; friable; common fine and common medium roots; 16 percent pebbles; strongly acid; clear smooth boundary.

Bw2 492 24 to 49 cm. Yellowish brown (10YR 5/4) dry; gravelly loamy coarse sand; weak fine subangular blocky structure; friable; common fine roots; 25 percent pebbles; strongly acid; abrupt smooth boundary.

C 493 49 to 85 cm. Light brownish gray (10YR 6/2) dry, gravelly loamy coarse sand; single grained; firm; few fine roots; 26 percent pebbles; medium acid.

PLOT-2

CLASSIFICATION: Dystric Cryochrept, sandy, mixed

R 80WY-029 - 01 SAMPLE NOS. 80P 490 - 493 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - - -SAND- - - - - -)(-COARSE FRACTIONS(MM)-)(>2MM) WT																
				CLAY LT .002	SILT .002 -.05	SAND .05 -2	FINE LT .0002	CO3 LT .002	FINE .002 -.02	COARSE .02 -.05	VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2	2 -5	5 -20	20 -75	.1- 75	PCT OF WHOLE SOIL
				<- - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->		
80 490	1S	0- 11	A	8.8	25.9	65.3			13.5	12.4	9.8	12.4	13.5	16.6	16.1	14	8	8V	71	30
80 491	2S	11- 24	Bw1	8.3	29.2	62.5			15.2	14.0	9.5	15.1	12.3	16.4	14.2	14	5	8V	65	25
80 492	3S	24- 49	Bw2	4.9	16.0	79.4			6.9	9.1	7.8	15.8	17.1	20.1	13.6	15	8	15V	82	38
80 493	4S	49- 85	C	5.5	17.5	77.0			11.8	5.7	6.7	14.2	22.6	22.9	10.6	5	4	30V	82	39

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - - ->				CM/CM
80 490	1	.84	.114						.91	.61						--					
80 491	2	.46	.040			.6	.2	.4	.87	.60						--			15.3	5.4	.12
80 492	3	.20	.030			.3	.1	.1	.65	.70						--			15.7	5.0	.13
80 493	4	.56	.019			.2	TR	.1	.29	.40						--			9.6	3.2	.07
																			9.7	2.2	.08

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID- ITY	EXTR AL	CEC SUM CATS	CEC NH4- OAC	AL SAT BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - - -) CACL2 .01M	H2O
		<- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 490	1	1.1	.5	.0	.2	1.8	10.1	2.6	11.9	3.0	4.4	59	15	2			4.3	5.6
80 491	2	.9	.4	TR	.2	1.5	9.0	2.3	10.5	3.6	3.6	61	14	2			4.4	5.5
80 492	3	.7	.4	TR	.1	1.2	3.7	1.3	4.9	2.0	2.5	52	24	4			4.4	5.5
80 493	4	.4	.4	TR	.1	.9	2.4	.6	3.3	1.6	1.5	40	27	5			4.2	5.6

FAMILY CONTROL SECTION: DEPTH 25- 35 PCT CLAY 5.1 PCT .1-75MM 82.0

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 3
UTM Coordinate: 49-52.5N/5-26.4E
Pedon Classification: Typic Cryosaprist; euic.
Vegetative Habitat: Dw
Geological Unit: Qs
Surficial Unit: fa
Parent Material: Alluvium.
Topography: Nearly level. Gradient is 1 percent. North aspect. Slightly convex. Elevation is 2290 meters.
Drainage: Very poorly drained.

(All colors are for moist condition unless otherwise stated.)

Oa1 494 0 to 12 cm. Very dark brown (10YR 2/2) sapric material; about 60 percent fibers, 5 percent rubbed: massive; strongly acid.

Oa2 495 12 to 55 cm. Dusky red (2.5YR 3/2) sapric material; about 10 percent fibers, less than 1 percent rubbed: massive; many fine and many medium roots; strongly acid.

Oa3 496 55 to 75 cm. Dark grayish brown (10YR 4/2) sapric material; about 5 percent fibers, less than 1 percent rubbed: massive; medium acid.

Oa4 497 75 to 100 cm. Very dark gray (10YR 3/1) sapric material; about 5 percent fibers, less than 1 percent rubbed; massive: firm; strongly acid.

2C 498 100 to 115 cm. Grayish brown (10YR 5/2) very gravelly coarse loamy sand; single grained: loose; few fine roots; 39 percent pebbles: medium acid.

Note: Water table at 25 cm.

PLOT-3

CLASSIFICATION: Typic Cryosaprist, euic

R 8CWY-029 - 02 SAMPLE NOS. 8OP 494 - 498 DATE 05/07/86

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L ANSE, MICHIGAN

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
				(- - -TOTAL - - -)			(- -CLAY- -)		(- -SILT- -)		(- - - - - -SAND- - - - - -)					(-COARSE FRACTIONS(MM)-)				(>2MM)
				CLAY	SILT	SAND	FINE	CO3	FINE	COARSE	VF	F	M	C	VC	- - - - WEIGHT - - - -				WT
SAMPLE	HZN	DEPTH	HORIZON	LT	.002	.05	-2	LT	.002	.02	.05	.10	.25	.50	1	2	5	20	.1-	PCT OF
NO.	NO.	(CM)		.002	-.05	-2	.0002	.002	-.02	-.05	-.10	-.25	-.50	-1	-2	-5	-20	-75	75	WHOLE
				<- - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - ->												<- PCT OF <75MM(3B1) ->				SOIL
80 494	1S	0- 12	Oa1													--	--	--	--	--
80 495	2S	12- 55	Oa2													--	--	--	--	--
80 496	3S	55- 75	Oa3													--	--	--	--	--
80 497	4S	75-100	Oa4													--	--	--	--	--
80 498	5S	100-115	2C	2.8	17.0	80.2			9.2	7.8	6.8	15.6	16.6	20.8	20.5	25	14	20V	89	59

		ORGN	TOTAL	EXTR	TOTAL	(- - DITH-CIT - -)			(RATIO/CLAY)		(ATTERBERG)		(- BULK DENSITY -)			COLE	(- - -WATER CONTENT - - -)				WRD
		C	N	P	S	EXTRACTABLE FE	AL	MN	CEC	15 BAR	LIMITS - LL	PI	FIELD MOIST	1/3 BAR	OVEN DRY	WHOLE SOIL	FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WHOLE SOIL
SAMPLE NO.	HZN NO.	<- - - - - - -PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 494	1	25.3	1.71																	50.4	
80 495	2	12.3	.838																	35.1	
80 496	3	5.35	.337																	21.1	
80 497	4	1.77	.095																	9.0	
80 498	5	.04				.1		.1	1.14	1.07						--		18.7		3.0	.13

		(- NH4OAC EXTRACTABLE BASES -)					ACID-	EXTR	(- - - -CEC - - -)			AL	-BASE	SAT-	CO3 AS	RES.		(- - - -PH - - -)	
		CA	MG	NA	K	SUM BASES	ITY	AL	SUM CATS	NH4- OAC	BASES + AL	SAT	SUM	NH4 OAC	CACO3 <2MM	OHMS /CM		CACL2 .01M	H2O
SAMPLE NO.	HZN NO.	<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->										<- - - - -PCT - - - ->						1:2	1:1
80 494	1	24.8	5.7	.7	3.3	34.5	50.6		84.1	59.0			40	49				4.9	5.3
80 495	2	6.8	3.3	.4	1.0	11.4	41.7		53.1	65.5			26	22				4.6	5.1
80 496	3	7.9	1.7	.3	.4	10.4	21.0		31.4	44.9			33	23				4.8	5.7
80 497	4	3.9	1.1	.2	.3	5.5	15.6		20.2	15.4			41	53				4.4	5.2
80 498	5	1.3	.5	.1	.1	1.9	2.0	.2	3.9	3.2	2.1	10	49	59				4.9	5.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 4
UTM Coordinate: 49-64.3/5-19.9E
Pedon Classification: Dystric Cryochrept: loamy-skeletal, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qyl
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Moderately steep. Gradient is 13 percent. East aspect. Convex. Slope length is 200 meters. Elevation is 2410 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 499 0 to 11 cm. Brown (10YR 5/3) dry, gravelly sandy loam; weak fine granular structure; friable; common fine, common medium and few coarse roots; 32 percent pebbles; very strongly acid; clear smooth boundary.

Bw 500 11 to 24 cm. Yellowish brown (10YR 5/4) dry, gravelly coarse sandy loam; moderate medium granular structure; friable; common fine and common medium roots; 29 percent pebbles, 2 percent cobbles; medium acid; gradual smooth boundary.

BC 501 24 to 40 cm. Pale brown (10YR 6/3) dry, gravelly coarse sandy loam; weak fine granular structure; friable; common fine and few medium roots; 24 percent pebbles, 5 percent cobbles; medium acid; gradual wavy boundary.

C 502 40 to 65 cm. Light brownish gray (10YR 6/2) dry, gravelly sandy loam; structureless; firm; few fine roots; 29 percent pebbles, 10 percent cobbles; medium acid.

PLOT-4

CLASSIFICATION: Dystric Cryochrept, loamy-skeletal, mixed

R E04Y-029 - 03 SAMPLE NOS. 80P 499 - 502 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 23

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SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-5- TOTAL CLAY LT .002	-6- TOTAL SILT .002-.05	-7- TOTAL SAND .05-2	-8- CLAY FINE LT .0002	-9- CLAY CO3 LT .002	-10- SILT FINE .002-.02	-11- SILT COARSE .02-.05	-12- SAND VF .05-.10	-13- SAND F .10-.25	-14- SAND M .25-.50	-15- SAND C .5-1	-16- SAND VC 1-2	-17- COARSE FRACTIONS (MM) WEIGHT 2-5	-18- 5-20	-19- 20-75	-20- .1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- - PCT OF <2MM (3A1)											->	<- PCT OF <75MM(3B1)			->	
80 499	1S	0- 11	A	9.9	35.9	54.2			19.9	16.0	8.4	10.9	11.0	13.7	10.0	14	13	21V	72	48
80 500	2S	11- 24	Bw	8.8	33.7	57.5			17.6	16.1	8.2	11.2	12.0	15.0	11.1	17	9	19V	72	47
80 501	3S	24- 40	BC	7.8	29.6	62.6			17.0	12.6	8.4	13.6	14.8	15.3	10.6	15	9	16V	73	44
80 502	4S	40- 65	C	6.4	26.4	67.2			13.3	13.1	11.6	16.9	14.1	14.1	10.6	12	8	31V	78	58

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM						->			PCT <0.4MM		<- G/CC		->	CM/CM	<- PCT OF <2MM			->	CM/CM
80 499	1	1.33	.061			.5	.2	.3	.96	.50						--			16.3	4.9	.11
80 500	2	.63	.044			.5	.2	.2	.77	.56						--			16.3	4.9	.12
80 501	3	.53	.039			.5	.2	.2	.74	.65						--			15.3	5.1	.10
80 502	4	.22				.4	.1	.1	.56	.59						--			12.2	3.8	.07

SAMPLE NO.	HZN NO.	(NH4OAC EXTRACTABLE BASES) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(CEC) SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	H2O
		<- MEQ / 100 G									->	<- PCT		->			1:2	1:1
80 499	1	1.1	.0	.0	.2	1.3	11.3	3.9	12.6	9.5	5.2	75	10	14			4.1	4.8
80 500	2	1.7	.5	TR	.2	2.4	8.2	1.7	10.6	6.8	4.1	41	23	35			4.6	5.6
80 501	3	2.3	.2	.0	.5	3.7	6.4	1.3	9.1	5.8	5.0	32	30	47			4.9	5.8
80 502	4	1.1	.3	TR	.2	1.6	3.2	.9	4.8	3.6	2.5	36	33	44			5.0	5.3

FAMILY CONTROL SECTION: DEPTH 25- 65 PCT CLAY 6.9 PCT .1-75MM 75.9

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 5
UTM Coordinate: 49-65N/5-21E
Pedon Classification: Typic Cryoboroll: coarse-loamy, mixed.
Vegetative Habitat: IW
Geological Unit: Qs
Surficial Unit: fa
Parent Material: Fine grained alluvium over sand and gravel.
Topography: Nearly level. Gradient is 2 percent. Northwest aspect. Very gently rolling valley. Slope length is 600 meters. Elevation is 2225 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A1 503 0 to 25 cm. Very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; strong medium and coarse granular structure; friable; many fine and few medium roots: 4 percent pebbles; medium acid; clear smooth boundary.

A2 504 25 to 54 cm. Very dark gray (10YR 3/1) silt loam, very dark grayish brown (10YR 3/2) dry; strong coarse subangular blocky structure; firm; common fine roots; 1 percent pebbles; medium acid: abrupt smooth boundary.

A3 505 54 to 153 cm. Very dark brown (10YR 2/2) silt loam; moderate medium and coarse subangular blocky structure; friable; few fine roots; 14 percent pebbles; neutral· abrupt smooth boundary.

C 506 153 to 192 cm. Dark brown (10YR 4/3) silt loam: weak medium subangular blocky structure; friable; 3 percent pebbles: neutral; clear smooth boundary.

2C 507 192 to 210 cm. Very dark grayish brown (10YR 3/3) loam; massive; friable; 9 percent pebbles: neutral.

Note: Sample No. 508 is a satellite sample from the 2C horizon.

PLOT-5

CLASSIFICATION: Typic Cryoboroll, coarse-loamy, mixed

R 60WY-329 - 04 SAMPLE NOS. 80P 503 - 508 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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L'ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	TOTAL FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	.1- -75	>2MM WT 75	WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (2A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
80 503	1S	0- 25	A1	26.4	51.8	23.8			29.7	22.1	7.3	4.7	3.9	3.9	4.2	3	3	--	22	6
80 504	2S	25- 54	A2	22.0	55.2	22.8			29.6	25.6	9.6	5.9	2.6	5.6	2.1	2	TR	--	15	2
80 505	3S	54-153	A3	13.0	56.9	31.1			30.2	25.7	7.7	4.8	4.8	7.0	7.2	15	9	--	40	21
80 506	4S	153-192	C	19.9	58.7	21.4			35.1	23.6	7.7	3.9	2.2	4.0	3.6	2	1	2V	18	5
80 507	5S	192-210	2C	14.7	37.6	47.7		--	13.8	19.8	12.4	14.1	11.3	8.4	5.5	6	1	7V	48	14
80 508	6S	192-210	2C-S	10.5	25.7	63.8		--	12.8	12.9	6.3	9.2	11.7	18.4	18.2	17	13	--	70	30

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - - ->				CM/CM
80 503	1	2.93	.230						1.01	.54						--			37.8	13.2	.34
80 504	2	1.78	.109			1.1	.2	2.0	1.10	.57						--			36.1	12.6	.34
80 505	3	.67	.068			.7	.1	1.2	1.11	.58						--			26.5	7.5	.24
80 506	4	.29	.038						.77	.51						--			31.9	10.2	.31
80 507	5	.19				.6	.1	.6	.76	.50						--			22.6	7.4	.20
80 508	6	.27							.75	.52						--			19.4	5.5	.16

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	SUM BASES	ACID- ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 503	1	11.5	5.0	.1	.6	19.3	10.8	.2	30.0	24.7	16.4	1	54	66			5.2	5.7
80 504	2	10.1	5.0	.1	.3	19.5	10.8	.4	30.4	24.2	19.7	2	64	81			5.5	6.0
80 505	3	7.1	5.0	.1	.4	10.9	3.0	.2	14.9	14.4	11.1	2	73	76			5.9	6.6
80 506	4	7.6	5.7	.1	.5	14.5	3.3	.2	17.8	15.3	14.7	1	81	95			6.1	6.7
80 507	5	7.0	3.6	.1	.3	10.8	1.5	.0	12.3	11.2			88	96			6.1	6.7
80 508	6	5.1	3.2	.1	.2	8.6	0.6	.0	11.2	7.9			88	96			5.8	6.4

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 16.5 PCT .1-75MM 30.0

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 6
UTM Coordinate: 49-52.2N/5-35.8E
Pedon Classification: Dystric Cryochrept; sandy-skeletal, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qpcf
Surficial Unit: pt
Parent Material: Rhyolitic till
Topography: Strongly sloping. Gradient is 8 percent. Southeast aspect. Convex. Slope length is 250 meters. Elevation is 2500 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 509 0 to 1 cm. Very dark grayish brown (10YR 3/2) coarse sandy loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; many fine and common medium roots; 8 percent pebbles; very strongly acid; abrupt smooth boundary.

Bw1 510 1 to 12 cm. Dark brown (10YR 3/3) gravelly coarse sandy loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky and weak fine granular structure; friable; many fine, common medium and few coarse roots; 21 percent pebbles; very strongly acid; clear smooth boundary.

Bw2 511 12 to 28 cm. Dark brown (10YR 4/3) gravelly loamy coarse sand, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; friable; common fine, common medium and few coarse roots; 27 percent pebbles, approximately 50 percent obsidian; strongly acid; clear smooth boundary.

BC 512 28 to 54 cm. Brown (10YR 5/3) gravelly loamy coarse sand, very pale brown (10YR 7/3) dry; single grained, loose; few fine and few medium roots; 28 percent pebbles, 5 percent cobbles, approximately 60 percent obsidian; strongly acid; abrupt wavy boundary.

C 513 54 to 85 cm. Pale brown (10YR 6/3) very gravelly loamy coarse sand; single grained; loose; 36 percent pebbles, 10 percent cobbles, approximately 80 percent obsidian; medium acid.

PLOT-6

CLASSIFICATION: Dystric Cryochrept, sandy-skeletal, mixed

R 80WY-029 - 05 SAMPLE NOS. 80P 509 - 513 DATE 05/07/86

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L'ANSE, MICHIGAN

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002 <.002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS (MM) WEIGHT 2-5	5-20	20-75	.1-75	>2MM WT PCT OF WHOLE SOIL
				PCT OF <2MM												PCT OF <75MM (3B1)				
80 509	1	0- 1	A	5.2	25.1	69.7			8.7	16.4	4.0	10.2	14.0	19.2	22.3	11	1	--	70	12
80 510	2	1- 12	Bw1	5.5	25.7	68.8			11.5	14.2	8.6	16.1	17.1	17.0	10.0	11	8	13V	73	32
80 511	3	12- 28	Bw2	1.7	17.4	78.9			5.9	11.5	6.3	13.8	18.8	21.0	19.9	12	6	22V	85	43
80 512	4	28- 54	BC	1.4	12.4	86.2			4.6	7.8	5.5	15.8	26.8	24.1	15.1	10	4	31V	89	49
80 513	5	54- 85	C	4.1	11.8	84.1			5.0	6.8	4.7	11.2	18.1	25.9	24.2	13	9	43V	93	69

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC 15 BAR	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		PCT OF <2MM									PCT <0.4MM		G/CC			CM/CM	PCT OF <2MM				CM/CM
80 509	1	10.2	.41						4.35	2.71						--		50.8		14.1	.50
80 510	2	.67	.039			.3	.2	.3	1.13	.58						--		15.3		3.2	.14
80 511	3	.26	.034			.2	.1	.1	1.11	.62						--		10.9		2.3	.09
80 512	4	.11				.1	.1	.1	1.43	1.00						--		6.0		1.4	.04
80 513	5	.05				.2	TR	.1	.78	.54						--		8.3		2.2	.04

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		MEQ / 100 G										PCT					1:2	1:1
80 509	1	5.1	1.0	TR	.6	6.7	24.1	1.7	30.8	22.6	8.4	20	22	30				4.7
80 510	2	1.5	.5	TR	.1	1.3	6.5	2.2	7.8	6.2	3.5	63	17	21				5.0
80 511	3	1.0	.3	TR	.1	1.4	4.4	1.1	5.8	4.1	2.5	44	24	34				4.8
80 512	4	.5	.3	TR	.1	.9	2.2	.6	3.1	2.0	1.5	40	29	45				4.5
80 513	5	1.1	.6	TR	.1	1.8	1.7	.6	3.5	3.2	2.4	25	51	56				5.0

FAMILY CONTROL SECTION: DEPTH 25- 85 PCT CLAY 2.9 PCT .1-75MM 90.9

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 7
UTM Coordinate: 49-52.2N/5-36.5E
Pedon Classification: Dystric Cryochrept; sandy-skeletal, mixed.
Vegetative Habitat: Fd
Geological Unit: Qf
Surficial Unit: pg
Parent Material: Rhyolitic till over outwash.
Topography: Level. Elevation is 2470 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 514 0 to 4 cm. Very dark grayish brown (10YR 3/2) gravelly coarse sandy loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; common fine roots; 31 percent pebbles; very strongly acid; clear wavy boundary.

Bw1 515 4 to 16 cm. Dark brown (10YR 3/3) gravelly coarse sandy loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; firm; common fine roots; 27 percent pebbles; very strongly acid; gradual smooth boundary.

Bw2 516 16 to 35 cm. Dark yellowish brown (10YR 4/4) very gravelly coarse loamy sand, pale brown (10YR 6/3) dry; single grained; friable; common fine roots; 39 percent pebbles; very strongly acid; abrupt wavy boundary.

2C 517 35 to 70 cm. Yellowish brown (10YR 5/6) stratified coarse sand and gravel, yellowish brown (10YR 5/4) dry; single grained; loose; iron coatings on most particle surfaces; 47 percent pebbles; strongly acid.

2C Sub 518 35 to 40 cm. Brown (10YR 5/3) gravelly coarse sand, light brownish gray (10YR 6/2) dry, single grained; very friable; few fine roots; 27 percent pebbles; very strongly acid horizon is discontinuous and lies above 2C horizon, ranges in thickness from 0 to 6 cm. Sampled as the contact between the upper sequum and the 2C horizon.

PLOT-7

CLASSIFICATION: Dystric Cryochrept, sandy-skeletal, mixed

P 80WY-029 - 06 SAMPLE NOS. 80P 514 - 518 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL - - -) CLAY LT <.002	SILT .002-.05	SAND .05-2	(- -CLAY- -) FINE LT .002	CO3 LT .002	(- -SILT- -) FINE .002-.05	COARSE .05-.02	(- - - - - -SAND- - - - - -) VF .10-.05	F .25-.10	M .50-.25	C 1-.5	VC 2-1	(-COARSE FRACTIONS(MM)-) 5-2	20-5	75-20	+75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - PCT OF <2MM (3A1) - - - - - - - ->												<- PCT OF <75MM(3B1)->				
80 514	1S	0- 4	A	9.2	27.2	63.6			14.6	12.6	2.6	8.1	14.3	17.9	20.6	23	8	15V	79	46
80 515	2S	4- 16	Bw1	8.0	26.8	65.2			14.1	12.7	3.5	10.5	16.5	19.2	16.6	20	5	15V	77	40
80 516	3S	16- 35	Bw2	5.1	17.3	77.6			9.2	8.1	2.8	11.4	19.2	22.1	22.0	19	5	34V	89	58
80 517	4S	35- 70	2Cg		4.0	96.0			.5	3.5	1.0	13.6	31.4	29.3	20.7	8	1	62V	99	71
80 518	5S	35- 40	2C-S		9.7	90.3			5.0	4.7	1.9	10.6	20.6	23.6	33.6	31	9	--	93	40

SAMPLE NO.	HZN NO.	ORGN TOTAL C	N	EXTR TOTAL P	S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	CEC	RATIO/CLAY 1S BAR	ATTERBERG - LIMITS - LL	PI	BULK DENSITY - FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 514	1	3.00	.229													--		30.9		8.0	.23
80 515	2	1.03	.075													--		26.7		5.3	.23
80 516	3	.53	.031			.5	.1	.2	1.48	.87						--		20.5		4.8	.13
80 517	4	.03				.4	.1	.2	1.40	.96						--		5.0		1.3	.02
80 518	5	.14				.4	.1	.1	1.61	.94						--		11.4		1.8	.10

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID- ITY	EXTR AL	CEC SUM CATS	CEC NH4 OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - -PH - - -) CACL2 .01M	H2O
		<- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->										<- - - - -PCT - - - ->						
80 516	1	.9																
80 515	2	.6	.4															
80 516	3	.5	.3		.3	1.8	11.1	2.5	12.9	15.[illegible]	4.3	58	14	13			1:2	1:1
80 517	4	.2	.2		.1	1.2	4.9	2.5	9.1	11.[illegible]	3.[illegible]	[illegible]	13	11				
80 518	5	.2	.2	.1	.1	.6	1.2	.6	2.6	3.[illegible]	1.[illegible]	60	16	12			4.0	4.6
							1.7	1.1	2.3	[illegible]	1.[illegible]	65	18	36			3.9	4.7
													26	18			4.0	4.[illegible]
																	4.4	5.[illegible]
																	4.1	4.9

FAMILY CONTROL SECTION: DEPTH 25- 35 PCT CLAY 5.1 PCT .1-75MM 89.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

B14

Plot No.: 8
UTM Coordinate: 49-59N/5-22E
Pedon Classification: Typic Cryorthent; fine-loamy, mixed, acid.
Vegetative Habitat: 2LL
Geological Unit: Qhe
Surficial Unit: phe
Parent Material: Hydrothermally altered rhyolitic till.
Topography: Moderately steep. Gradient is 12 percent. North aspect. Convex. Slope length is 500 meters. Elevation is 2440 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 519 0 to 3 cm. Dark grayish brown (10YR 4/2) gravelly silt loam; moderate medium granular structure; friable; many fine and many medium roots; 17 percent pebbles; extremely acid; abrupt smooth boundary.

Bw1 520 3 to 23 cm. Light yellowish brown (10YR 6/4) loam; strong and moderate medium subangular blocky structure; friable; many fine, common medium, and few coarse roots; 13 percent pebbles; very strongly acid; clear wavy boundary.

Bw2 521 23 to 28 cm. Very pale brown (10YR 7/4) gravelly loam; strong subangular blocky structure; friable; common fine and common medium roots; 29 percent pebbles; very strongly acid; clear wavy boundary.

C 522 28 to 70 cm. Yellow (10YR 7/6) gravelly loam; moderate coarse and medium subangular blocky structure; friable; few fine and few medium roots; 21 percent pebbles; very strongly acid; abrupt smooth boundary.

2C1 523 70 to 90 cm. Brownish yellow (10YR 6/6) silt loam; strong coarse platy structure; very firm; few fine roots; less than 1 percent pebbles; extremely acid; hydrothermally altered material.

2C2 524 90 to 135 cm. White (2.5YR 8/0) loam; moderate medium subangular blocky structure; very firm; extremely acid; hydrothermally altered material.

PLOT-5

CLASSIFICATION: Typic Cryorthent, fine-loamy, mixed

R 80NY-029 - 07

SAMPLE NOS. 80P 519 - 524

NPS - YELLOWSTONE SOILS STUDY

DATE 05/07/86

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL - - -) CLAY LT .002	SILT .002 -.05	SAND .05 -2	(- -CLAY- -) FINE LT .0002	CO3 LT .002	(- -SILT- -) FINE .002 -.02	COARSE .02 -.05	(- - - -SAND- - - -) VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2	(-COARSE FRACTIONS(MM)-) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - -	- - - -	- - -	- - -	- PCT OF <2MM	(3A1) - -	- - -	- - -	- - -	- - -	- - ->	<- PCT OF	<75MM(3B1)	->		
80 519	1S	0- 3	A	11.7	58.2	30.1			32.6	25.6	7.7	6.2	4.6	5.8	5.8	6	12	8V	43	26
80 520	2S	3- 23	Bw1	15.5	43.5	41.0			29.0	14.5	8.7	11.6	9.1	7.6	4.2	7	5	9V	49	20
80 521	3S	23- 28	Bw2	16.2	35.1	48.7			25.5	9.6	7.3	11.5	11.0	11.0	7.9	10	11	22V	67	43
80 522	4S	28- 70	C	15.6	29.7	51.7			22.3	7.4	5.2	9.6	11.8	13.8	11.3	20	7	5V	64	32
80 523	5S	70- 90	2C1	14.1	51.4	34.5			42.6	9.0	5.2	7.1	8.3	10.4	3.4	1	TR	--	30	1
80 524	6S	90-135	2C2	19.1	37.4	43.5			29.1	8.3	6.0	9.8	11.6	12.7	3.3	TR	--	--	37	TR

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG) - LIMITS - LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - -	- - - -	-PCT OF <2MM	- - - -	- - - -	- - -	- ->			PCT <0.4MM		<- - G/CC	- -	- ->	CM/CM	<- - -PCT OF	<2MM	- -	->	CM/CM
80 519	1	5.09	.130			1.1	.2	.1	2.38	1.11						--			46.7	13.0	.41
80 520	2	.36	.052			1.3	.2	.1	1.17	.73						--			30.7	11.3	.25
80 521	3	.43	.024			2.6	.3	.1	1.38	.72						--			26.6	11.6	.15
80 522	4	.33	.025			.5	.1	.1	.97	.79						--			25.1	14.7	.12
80 523	5	.12					.1	.1	.24	.62						--			30.5	8.7	.31
80 524	6	.35					TR		.11	.57						--			27.7	10.8	.25

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(- - - -CEC - - -) SUM CATS	NH4-OAC	BASES + AL	AL SAT	-BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - - -) CACL2 .01M 1:2	H2O 1:1
		<- - - -	- - - -	- - - -	-MEQ / 100 G	- - - -	- - - -	- - - -	- - - -	- - - -	- ->	<- - - -	-PCT -	- - ->				
80 519	1	3.3	1.2	.0	.6	5.6	10.9	9.9	16.5	27.9	15.5	64	34	20			3.7	4.2
80 520	2	3.6	1.3	.0	.4	5.3	13.5	9.6	18.8	18.1	14.9	64	28	29			4.0	4.8
80 521	3	3.3	1.1	.0	.3	4.7	14.5	12.0	18.8	22.3	16.3	74	23	19			3.9	4.6
80 522	4	3.6	1.7	TR	.4	5.7	16.6	14.3	24.3	18.1	20.0	71	23	31			3.8	4.0
80 523	5	.4	.2	.0	TR	.6	3.0	2.2	3.6	3.4	2.8	79	17	18			3.7	4.4
80 524	6	.2	.0	TR	TR	.3	2.7	1.3	2.9	2.1	1.5	87	7	10			3.8	4.4

FAMILY CONTROL SECTION: DEPTH 25- 70 PCT CLAY 18.4 PCT .1-75MM 63.6

ANALYSES: S= ALL ON SIEVED <2MM BASIS

V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 8
UTM Coordinate: 49-59N/5-22E
Pedon Classification: Typic Cryorthent; fine-loamy, mixed, acid.
Vegetative Habitat: 2LL
Geological Unit: Qhe
Surficial Unit: phe
Parent Material: Hydrothermally altered rhyolitic till.
Topography: Moderately steep. Gradient is 12 percent. North aspect. Convex. Slope length is 500 meters. Elevation is 2440 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 519 0 to 3 cm. Dark grayish brown (10YR 4/2) gravelly silt loam; moderate medium granular structure; friable; many fine and many medium roots; 17 percent pebbles; extremely acid; abrupt smooth boundary.

Bw1 520 3 to 23 cm. Light yellowish brown (10YR 6/4) loam; strong and moderate medium subangular blocky structure; friable; many fine, common medium, and few coarse roots; 13 percent pebbles; very strongly acid; clear wavy boundary.

Bw2 521 23 to 28 cm. Very pale brown (10YR 7/4) gravelly loam; strong subangular blocky structure; friable; common fine and common medium roots; 29 percent pebbles; very strongly acid; clear wavy boundary.

C 522 28 to 70 cm. Yellow (10YR 7/6) gravelly loam; moderate coarse and medium subangular blocky structure; friable; few fine and few medium roots; 21 percent pebbles; very strongly acid; abrupt smooth boundary.

2C1 523 70 to 90 cm. Brownish yellow (10YR 6/6) silt loam; strong coarse platy structure; very firm; few fine roots; less than 1 percent pebbles; extremely acid; hydrothermally altered material.

2C2 524 90 to 135 cm. White (2.5YR 8/0) loam; moderate medium subangular blocky structure; very firm; extremely acid; hydrothermally altered material.

PLOT-7

CLASSIFICATION: Dystric Cryochrept, sandy-skeletal, mixed

R 80WY-029 - 06 SAMPLE NOS. 80P 514 - 518 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS(MM) WEIGHT 2-5	5-20	20-75	1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - ->												<- PCT OF <75MM(3B1) ->				
80 514	1S	0- 4	A	9.2	27.2	63.6			14.6	12.6	2.6	8.1	14.3	17.9	20.6	23	8	15V	79	46
80 515	2S	4- 16	Bw1	8.0	26.9	65.2			14.1	12.7	3.5	10.5	16.5	18.1	16.6	20	5	15V	77	40
80 516	3S	16- 35	Bw2	5.1	17.3	77.6			9.2	8.1	2.8	11.4	19.2	22.1	22.0	19	5	34V	89	58
80 517	4S	35- 70	2C		3.0	96.0			.5	3.2	1.0	13.6	31.4	29.3	20.7	8	1	62V	99	71
80 518	5S	35- 40	2C-S		2.7	90.3			5.0	4.7	1.9	10.6	20.6	23.6	33.6	31	9	--	93	40

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 514	1	3.00	.229													--		30.9		8.0	.23
80 515	2	1.03	.075			.5	.1	.2	1.48	.87						--		26.7		5.3	.23
80 516	3	.53	.031			.4	.1	.2	1.40	.66						--		20.5		4.8	.13
80 517	4	.05				.4	.1	.1	1.61	.94						--		5.0		1.3	.02
80 518	5	.14														--		11.4		1.8	.10

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID- ITY	EXTR AL	CEC SUM CATS	CEC NH4 OAC	BASES + AL	AL SAT	BASE SUM	BASE SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 514	1	.9	.4	.2	.3	1.8	11.1	2.5	12.9	13.2	4.3	58	14	13			4.0	4.6
80 515	2	.6	.2	.2	.1	1.2	7.9	2.5	9.1	11.2	3.7	68	13	11			3.9	4.7
80 516	3	.3	.2	.2	.1	1.0	5.4	2.1	6.4	7.1	3.1	68	16	12			4.0	4.6
80 517	4	.2	.3	.2	.1	.8	1.2	.6	3.6	5.6	1.4	60	18	36			4.6	5.3
80 518	5	.2	.2	.1	.1	.6	1.7	1.1	2.3	3.0	1.7	65	26	18			4.1	4.9

FAMILY CONTROL SECTION: DEPTH 25- 35 PCT CLAY 5.1 PCT .1-75MM 89.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 7
UTM Coordinate: 49-52.2N/5-36.5E
Pedon Classification: Dystric Cryochrept; sandy-skeletal, mixed.
Vegetative Habitat: Fd
Geological Unit: Qf
Surficial Unit: pg
Parent Material: Rhyolitic till over outwash.
Topography: Level. Elevation is 2470 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 514 0 to 4 cm. Very dark grayish brown (10YR 3/2) gravelly coarse sandy loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; common fine roots; 31 percent pebbles; very strongly acid; clear wavy boundary.

Bw1 515 4 to 16 cm. Dark brown (10YR 3/3) gravelly coarse sandy loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; firm; common fine roots; 27 percent pebbles; very strongly acid; gradual smooth boundary.

Bw2 516 16 to 35 cm. Dark yellowish brown (10YR 4/4) very gravelly coarse loamy sand, pale brown (10YR 6/3) dry; single grained; friable; common fine roots; 39 percent pebbles; very strongly acid; abrupt wavy boundary.

2C 517 35 to 70 cm. Yellowish brown (10YR 5/6) stratified coarse sand and gravel, yellowish brown (10YR 5/4) dry; single grained; loose; iron coatings on most particle surfaces; 47 percent pebbles; strongly acid.

2C Sub 518 35 to 40 cm. Brown (10YR 5/3) gravelly coarse sand, light brownish gray (10YR 6/2) dry, single grained; very friable; few fine roots; 27 percent pebbles; very strongly acid horizon is discontinuous and lies above 2C horizon, ranges in thickness from 0 to 6 cm. Sampled as the contact between the upper sequum and the 2C horizon.

PLOT-5

CLASSIFICATION: Typic Cryorthent, fine-loamy, mixed

R SDNY-029 - 07 SAMPLE NOS. 80P 519 - 524 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	CLAY LT .002	SILT .002-.05	SAND .05-2	FINE LT .0002	CO3 LT .002	FINE SILT .002-.02	COARSE SILT .02-.05	VF SAND .05-.10	F SAND .10-.25	M SAND .25-.50	C SAND .5-1	VC SAND 1-2	2-5	5-20	20-75	.1-75	WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
80 519	1S	0- 3	A	11.7	58.2	30.1			32.6	25.6	7.7	6.2	4.6	5.8	5.8	6	12	8V	43	26
80 520	2S	3- 23	Bw1	15.5	43.5	41.0			29.0	14.5	8.7	11.4	9.1	7.6	4.2	7	5	8V	46	20
80 521	3S	23- 56	Bw2	16.2	35.1	48.7			25.5	9.6	7.3	11.5	11.0	11.0	7.9	10	11	22V	67	43
80 522	4S	56- 70	C	19.6	29.7	51.7			22.3	7.4	5.2	9.6	11.8	13.8	11.3	20	7	5V	64	32
80 523	5S	70- 90	2C1	14.1	51.4	34.5			44.4	9.0	5.2	7.1	8.3	10.4	3.4	1	TR	--	30	1
80 524	6S	90-135	2C2	19.1	37.4	43.5			29.1	8.3	6.0	9.8	11.6	12.7	3.3	TR	--	--	37	TR

SAMPLE NO.	HZN NO.	ORGN TOTAL C	N	P	S	DITH-CIT EXTRACTABLE FE	AL	MN	CEC	RATIO/CLAY 1S BAR	ATTERBERG LIMITS LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - - PCT OF <2MM - - ->				CM/CM
80 519	1	5.09	.130						2.38	1.11						--			46.7	13.0	.41
80 520	2	.36	.052			1.1	.2	.1	1.17	.73						--			30.7	11.3	.25
80 521	3	.43	.024			1.3	.2	.1	1.38	.72						--			26.6	11.6	.15
80 522	4	.35	.025			2.4	.3	.1	.97	.79						--			25.1	14.7	.12
80 523	5	.12				.5	.1	.1	.24	.62						--			30.5	9.7	.31
80 524	6	.05					TR		.11	.57						--			27.7	10.8	.25

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID- ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 519	1	3.8	1.2	.0	.6	5.6	10.9	9.9	16.5	27.9	15.5	64	34	20			3.7	4.2
80 520	2	5.6	1.3	.0	.4	7.3	13.5	9.6	18.8	18.1	14.9	64	28	29			4.0	4.6
80 521	3	5.8	1.1	.0	.3	7.2	14.5	12.0	18.8	22.3	16.3	74	23	19			3.9	4.6
80 522	4	3.6	1.7	TR	.4	5.7	13.6	14.3	24.3	18.1	20.3	71	23	31			3.8	4.0
80 523	5	.4	.2	.0	TR	.6	3.0	2.2	3.6	3.4	2.8	79	17	18			3.7	4.4
80 524	6	.2	.0	TR	TR	.2	2.7	1.3	2.9	2.1	1.5	87	7	10			3.8	4.4

FAMILY CONTROL SECTION: DEPTH 25- 70 PCT CLAY 18.4 PCT .1-75MM 63.6

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 9
UTM Coordinate: 49-64.5N/5-20.5E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Quf
Surficial Unit: pt
Parent Material: Lacustrine sediments.
Topography: Moderately steep. Gradient is 12 percent. North aspect. Convex. Slope length is 100 meters. Elevation is 2345 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 4 to 0 cm. Black (10YR 2/1) sapric material.

Bw1 525 0 to 11 cm. Very dark grayish brown (10YR 3/2) silt loam with patches of light brownish gray (10YR 6/2) E material; moderate medium subangular blocky and weak fine granular structure; friable; common fine, common medium and few coarse roots; 13 percent pebbles; very strongly acid; abrupt wavy boundary.

Bw2 526 11 to 26 cm. Very dark grayish brown (10YR 3/2) silt loam; strong medium subangular blocky structure; friable; common fine and common medium roots; 12 percent pebbles; extremely acid; clear wavy boundary.

BC 527 26 to 46 cm. Dark brown (10YR 3/3) silt loam; moderate coarse and medium subangular blocky structure; friable; few fine and few medium roots; 12 percent pebbles; extremely acid; clear wavy boundary.

C1 528 46 to 113 cm. Dark brown (10YR 4/3) gravelly loam; weak medium subangular blocky structure; friable; few fine roots; common fine pores; 17 percent pebbles; strongly acid.

C2 529 113 to 140 cm. Dark grayish brown (10YR 4/2) stratified silt loam and gravelly silt loam; massive; friable; 12 percent pebbles; gravelly silt loam bands comprised of 40 to 50 percent pebbles; slightly acid.

Note: Sample No. 530 is a satellite sample of the A horizon, which was not sampled; sample No. 531 is a satellite sample of the C2 horizon.

PLOT-9

CLASSIFICATION: Typic Cryochrept, coarse-loamy, mixed

R 80WY-029 - 08 SAMPLE NOS. 80P 525 - 531 DATE 05/07/86

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FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L'ANSE, MICHIGAN

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

-1- -2- -3- -4- -5- -6- -7- -8- -9- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	CLAY LT .002	SILT .002-.05	SAND .05-2	FINE LT .0002	CO3 LT .002	FINE SILT .002-.02	COARSE SILT .02-.05	VF SAND .05-.10	F SAND .10-.25	M SAND .25-.50	C SAND .5-1	VC SAND 1-2	WEIGHT 2-5	WEIGHT 5-20	WEIGHT 20-75	WEIGHT .1-75	WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
80 525	1S	0- 11	Bw1	11.4	55.3	33.3			30.9	24.4	10.1	8.0	6.2	5.4	3.7	7	10	3V	39	20
80 526	2S	11- 26	Bw2	10.3	53.8	35.9			30.0	23.8	11.4	8.9	6.5	5.8	3.3	6	9	3V	38	18
80 527	3S	26- 46	BC	9.7	51.7	38.6			29.1	22.6	11.4	9.3	7.2	6.7	4.0	7	8	3V	40	18
80 528	4S	46-113	C1	10.1	44.4	45.5			23.4	21.0	9.9	10.0	7.9	9.5	8.2	12	6	8V	52	26
80 529	5S	113-140	C2	15.2	74.0	10.8			43.3	30.7	5.5	2.2	1.2	1.0	.9	2	--	15V	21	13
80 530	6S	0- 0	A1S-S	23.9	54.2	21.9			30.1	24.1	7.7	4.1	2.9	1.9	3.3	4	7	--	24	11
80 531	7S	0- 0	C2 -S	41.1	49.9	9.0			32.7	17.2	3.8	2.2	1.2	1.3	.5	2	3	--	10	5

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	CEC	RATIO/CLAY 1/3 BAR	ATTERBERG LIMITS - LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WPD WHOLE SOIL
		<- - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - PCT OF <2MM - ->				CM/CM
80 525	1	1.71	.066			1.3	.3	.2	1.54	.75						--			29.2	8.6	.26
80 526	2	.91	.032			1.3	.3	.2	1.45	.81						--			26.9	8.3	.24
80 527	3	.41	.047			1.2	.3	.3	1.19	.72						--			24.7	7.0	.23
80 528	4	.27							1.08	.68						--			22.5	6.9	.19
80 529	5	.11							.99	.64						--			34.4	9.8	.32
80 530	6	2.07	.125			1.1	.2	1.1	.90	.54						--			33.1	12.8	.28
80 531	7	.29							.20	.46						--			40.2	18.7	.30

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - - ->										<- - - - PCT - - - ->					1:2	1:1
80 525	1	2.5	.7	TR	.3	3.5	19.7	6.8	23.2	17.5	10.3	66	15	20			3.9	4.5
80 526	2	2.2	.8	TR	.3	3.3	16.2	5.3	19.5	14.9	8.6	62	17	22			3.9	4.0
80 527	3	4.8	1.7	TR	.3	6.8	7.5	2.5	14.4	11.4	9.0	24	47	60			4.3	4.4
80 528	4	7.0	2.5	.1	.3	9.9	3.6	.2	13.5	10.9	10.1	2	73	91			4.9	5.1
80 529	5	9.7	5.1	.1	.5	15.4	2.0	.2	17.4	15.1	15.4	1	89	100			6.0	6.2
80 530	6	11.8	4.4	TR	1.1	17.3	10.2	.2	27.5	21.6	17.5	1	63	80			4.8	4.8
80 531	7	19.2	10.4	.1	.7	30.4	3.2	.0	33.6	8.3			90	100			5.7	6.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 10
UTM Coodinate: 49-77N/5-21E
Pedon Classification: Lithic Cryoboroll; fine-loamy, mixed.
Vegetative Habitat: TF
Geological Unit: Qh
Surficial Unit: tr
Parent Material: Glacial till.
Topography: Gently sloping. Gradient is 6 percent. South aspect. Concave. Slope length is 800 meters. Elevation is 2410 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 532 0 to 10 cm. Very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine and few medium roots; 17 percent pebbles; medium acid; abrupt wavy boundary.

Bw1 533 10 to 25 cm. Dark brown (10YR 3/3) loam, yellowish brown (10YR 5/4) dry; strong medium and fine granular structure; firm; common fine and few medium roots; 12 percent pebbles; medium acid; abrupt wavy boundary.

Bw2 534 25 to 32 cm. Dark brown (10YR 3/3) gravelly loam, brown (10YR 4/3) dry; weak fine granular structure; friable; common fine and few medium roots; 15 percent pebbles; slightly acid; abrupt irregular boundary.

R 32+ cm. Rhyolite bedrock.

PLOT-10

CLASSIFICATION: Lithic Cryoboroll, fine-loamy, mixed

R 80WY-029 - 09 SAMPLE NOS. 80P 532 - 534 DATE 05/07/86

MICHIGAN TECHNOLOGICAL UNIV.
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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002 <- PCT OF	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02 (3A1)	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2 ->	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	75 -1- 75 (3B1) ->	(>2MM) WT PCT OF WHOLE SOIL
80 532	1S	0- 10	A	21.6	46.3	32.1			26.4	19.9	8.5	7.5	4.9	5.8	5.4	8	12	5V	43	25
80 533	2S	10- 25	Bw1	33.5	44.4	32.1			24.4	20.0	9.6	8.8	4.8	4.6	4.3	7	3	8V	36	18
80 534	3S	25- 32	Bw2	25.0	44.1	30.9			24.1	20.0	9.3	8.5	4.7	4.5	4.0	8	7	8V	40	23

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	CEC 7S	RATIO/CLAY BAR	ATTERBERG LIMITS - LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - - PCT OF <2MM - ->				CM/CM
80 532	1	2.64	.180						1.09	.50						--			26.9	10.9	.20
80 533	2	1.02	.074						.89	.45						--			22.0	10.6	.15
80 534	3	1.22	.093			1.4	.2	1.6	.94	.46						--			22.9	11.4	.14

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - ->										<- - - - PCT - - - ->					1:2	1:1
80 532	1	20.8	1.8	.2	1.0	23.6	8.0	.0	31.6	23.5			75	100			5.8	5.6
80 533	2	19.2	1.4	.1	.5	21.4	6.5	.0	27.9	20.9			77	100			5.3	5.7
80 534	3	23.9	1.2	TR	.5	25.6	5.0	.0	30.6	23.4			84	100			6.0	6.1

FAMILY CONTROL SECTION: DEPTH 12- 32 PCT CLAY 24.0 PCT .1-75MM 37.8

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 11
UTM Coordinate: 49-76.1N/5-19.6E
Pedon Classification: Typic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: TFG
Geological Unit: Qs
Surficial Unit: pt
Parent Material: Glacial till.
Topography: Gently sloping. Gradient is 8 percent. East aspect. Convex.
Slope length is 800 meters. Elevation is 2210 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 535 0 to 17 cm. Black (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many fine and few medium roots; 28 percent pebbles, 1 percent cobbles; very strongly acid; abrupt smooth boundary.

Bw 536 17 to 35 cm. Dark yellowish brown (10YR 3/4) very gravelly loam, dark yellowish brown (10YR 4/4) dry; strong medium subangular blocky structure; firm; common fine and few medium roots; 33 percent pebbles, 2 percent cobbles; medium acid; clear wavy boundary.

BC 537 35 to 70 cm. Dark brown (10YR 3/3) extremely gravelly loam, brown (10YR 5/3) dry; strong medium subangular blocky and fine granular structure; firm; common fine roots; 58 percent pebbles, 8 percent cobbles; slightly acid; clear wavy boundary.

C 538 70 to 78 cm. Dark brown (10YR 4/3) extremely gravelly coarse sandy loam, pale brown (10YR 6/3) dry; massive; firm; few fine roots; 70 percent pebbles, 10 percent cobbles; neutral.

PLOT-11

CLASSIFICATION: Typic Cryoboroll, loamy-skeletal, mixed

R EDWY-029 - 10 SAMPLE NOS. 80P 535 - 538 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1- -2- -3- -4- -5- -6- -7- -8- -9- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .05	TOTAL SAND 2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002	SILT COARSE .05	SAND VF .10	SAND F .25	SAND M .50	SAND C 1	SAND VC 2	COARSE FRACTIONS (MM) WEIGHT 5	20	.1 75	(>2MM) WT PCT OF WHOLE SOIL
				<- .002	-.05	-2	-.0002	-.002	-.02	-.05	-.10	-.25	-.50	-1	-2	-5	-20	-75	(3A1) ->
				<- PCT OF <2MM												<- PCT OF <75MM (3B1) ->			
SOIL SC 535	1S	0- 17	A	19.7	42.4	38.9			22.6	19.8	11.8	10.6	5.5	6.1	4.9	5	3	29V	58	43
SOIL SC 536	2S	17- 35	Bw	20.5	41.5	38.0			21.4	20.1	13.8	12.5	4.7	3.9	3.1	4	5	40V	61	50
SOIL SC 537	3S	35- 70	BC	14.9	34.0	51.1			17.3	16.7	12.9	14.9	7.5	7.5	5.3	4	4	68V	85	78
SOIL SC 538	4S	70- 78	C	5.1	27.5	67.4		TR	13.8	13.7	12.5	16.9	10.0	11.9	16.3	4	5	79V	95	89

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
SOIL SC 535	1	3.49	.249						1.14	.59						--			26.6	11.1	.16
SOIL SC 536	2	1.79	.162						.69	.48						--			19.4	9.3	.09
SOIL SC 537	3	.95	.075						.87	.45						--			15.3	6.7	.04
SOIL SC 538	4	.44								.69									10.4	3.5	.02

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTRACTABLE AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->											<- - - - -PCT - - - ->				1:2	1:1
SOIL SC 535	1	16.3	2.4	.0	1.1	19.8	12.7	.0	32.5	21.3			61	93			5.0	5.0
SOIL SC 536	2	13.3	3.3	TR	.9	17.5	7.9	.0	25.4	14.2			69	100			5.4	5.7
SOIL SC 537	3	15.3	5.1	TR	.4	20.8	2.3		23.1	13.0			90	100			6.6	6.4
SOIL SC 538	4	.0	.0	.0	.0										15		7.0	7.2

FAMILY CONTROL SECTION: DEPTH 25- 78 PCT CLAY 14.4 PCT .1-75MM 82.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 12
UTM Coordinate: 49-75.2N/5-28.5E
Pedon Classification: Typic Cryoboroll; coarse-loamy, mixed.
Vegetative Habitat: 5GO
Geological Unit: Qsl
Surficial Unit: pt
Parent Material: Glacial till.
Topography: Nearly level. Gradient is 3 percent. Northwest aspect. Concave. Slope length is 300 meters. Elevation is 2105 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 539 0 to 13 cm. Very dark grayish brown (10YR 3/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine, many medium and few coarse roots; 12 percent pebbles; few charcoal fragments; very strongly acid; abrupt wavy boundary.

Bw 540 13 to 29 cm. Dark grayish brown (10YR 4/2) gravelly sandy loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine, common medium and few coarse roots; 17 percent pebbles; very strongly acid; clear wavy boundary.

BC 541 29 to 70 cm. Dark grayish brown (10YR 4/2) gravelly coarse sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable, but firm in some places; common fine and few coarse roots; 24 percent pebbles; strongly acid; gradual smooth boundary.

C 542 70 to 120 cm. Brown (7.5YR 5/2) very gravelly coarse sandy loam, light gray (5YR 7/1) dry; strong coarse and medium subangular blocky structure; firm; few fine and few coarse roots; 45 percent pebbles, 3 percent cobbles; medium acid; abrupt smooth boundary.

2C2 543 120 to 195 cm. Dark red (10YR 4/3) sandy loam, pale red (2.5YR 6/2) dry; weak very fine granular structure; friable; few fine roots; common fine brittle peds which are porous and contain some quartz crystals; few fine roots; 3 percent pebbles; slightly acid.

PLOT-12

CLASSIFICATION: Typic Cryoboroll, coarse-loamy, mixed

R 80WY-029 - 11 SAMPLE NOS. 80P 539 - 543 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -2

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.05	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	PCT WHO SC
				<-- PCT OF <2MM (3A1) -->												<- PCT OF <75MM (3B1) ->				
80 539	1S	0- 13	A	7.1	47.0	45.9			25.0	22.0	9.0	7.3	8.2	12.3	9.1	8	7	3V	48	1
80 540	2S	13- 29	Bw	6.5	44.3	49.2			23.2	21.1	9.1	7.3	8.3	12.3	12.3	7	6	13V	56	2
80 541	3S	29- 70	BC	6.4	38.9	54.7			19.7	19.2	9.0	8.2	10.2	15.2	12.2	7	6	23V	65	3
80 542	4S	70-120	C	5.0	33.4	61.6			16.9	16.5	8.9	10.9	13.1	15.9	12.9	5	6	50V	82	6
80 543	5S	120-195	2C2	4.6	47.1	48.3			25.0	22.1	9.7	7.7	8.9	12.4	9.5	3	1	--	41	4

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WHO SC
		<- - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - - PCT OF <2MM - - ->				CM/
80 539	1	1.49	.065			.8	.1	.6	1.51	.82						--			18.3	5.8	
80 540	2	.91	.046			.8	.1	.5	1.12	.72						--			16.8	4.7	
80 541	3	.28	.021			.7	.1	.3	.56	.48						--			12.4	3.1	
80 542	4	.08							.46	.56						--			9.0	2.8	
80 543	5								.28	.46						--			10.5	2.1	

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	HI
		<- - - - - - - - - - - MEQ / 100 G - - - - - - - - - - ->										<- - - - PCT - - - ->					1:2	1
80 539	1	5.6	.9	TR	.5	7.0	[illegible]	.0	13.3	10.7			53	65			4.6	
80 540	2	4.2	.7	.0	.4	5.3	[illegible]	.2	10.5	7.3	5.5	4	50	73			4.5	
80 541	3	2.3	.5	TR	.3	3.1	[illegible]	.2	5.7	3.6	5.3	6	54	86			4.9	
80 542	4	2.0	.6	TR	.2	2.8	[illegible]		3.8	2.3			74	100			5.7	
80 543	5	1.5	.4	TR	.1	2.0	[illegible]		2.8	1.3			71	100			6.1	

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 5.8 PCT .1-75MM 71.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 13
UTM Coordinate: 49-48.1N/5-38E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qpcf
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Gently sloping. Gradient is 4 percent. Southwest aspect. Convex. Slope length is 200 meters. Elevation is 2485 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Bw1 544 0 to 6 cm. Dark grayish brown (10YR 4/2) loam; moderate fine granular structure; friable; many fine, many medium and few coarse roots; 10 percent pebbles; few charcoal fragments; extremely acid; clear wavy boundary.

Bw2 545 6 to 22 cm. Dark brown (10YR 3/3) loam: strong medium subangular blocky structure; friable; common fine, common medium and few coarse roots; 9 percent pebbles; extremely acid; abrupt wavy boundary.

BC1 546 22 to 46 cm. Grayish brown (10YR 5/2) sandy loam; moderate fine and weak coarse subangular blocky structure; friable; few fine and few medium roots; 16 percent pebbles; abundant obsidian: very strongly acid; clear wavy boundary.

BC2 547 46 to 100 cm. Brown (10YR 5/3) gravelly sandy loam: strong medium subangular blocky structure; friable; few fine and few medium roots; 16 percent pebbles; abundant obsidian; very strongly acid; clear wavy boundary.

C 548 100 to 137 cm. Light brownish gray (10YR 6/2) gravelly sandy loam: single grained: firm; few fine roots; 23 percent pebbles; abundant obsidian; medium acid.

PLOT-13

CLASSIFICATION: Typic Cryochrept, coarse-loamy, mixed

R 80WY-029 - 12 SAMPLE NOS. 80P 544 - 548 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
80 544	1S	0- 6	Bw1	8.4	39.7	51.9			19.2	20.5	11.0	15.3	10.4	8.3	6.9	10	3	2V	50	15
80 545	2S	6- 22	Bw2	9.7	39.1	51.2			19.4	19.7	10.5	15.3	11.2	8.4	5.9	8	3	3V	49	14
80 546	3S	22- 46	BC1	5.5	25.1	69.4			11.9	13.2	12.9	20.7	15.4	12.3	8.2	11	5	8V	67	24
80 547	4S	46-100	BC2	10.5	33.1	56.4			18.3	14.8	13.4	18.0	11.8	8.5	4.7	11	3	8V	56	22
80 548	5S	100-137	C	11.4	23.5	65.1			11.4	12.1	11.9	19.1	13.6	11.2	9.4	16	7	12V	70	35

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - - PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 544	1	1.34	.043			.5	.1	.2	1.08	.62						--			15.0	5.2	.13
80 545	2	.66	.033			.5	.1	.1	.81	.51						--			16.1	4.9	.15
80 546	3	.10	.003			.2	.1	TR	.58	.49						--			8.9	2.7	.08
80 547	4	.09				.3	.1	TR	.55	.47						--			12.1	4.9	.09
80 548	5					.3	.1	.1	.39	.36						--			11.2	4.1	.08

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 544	1	2.0	.5	TR	.3	2.8	9.5	.0	12.3	9.1			23	31				
80 545	2	1.7	.4	TR	.3	2.6	8.8	3.3	11.4	7.9	5.9	56	23	33				
80 546	3	1.8	.7	TR	.2	2.7	1.6	.7	4.3	3.2	3.4	21	63	84				
80 547	4	3.6	1.6	TR	.3	5.5	2.1	.2	7.6	5.8	5.7	4	72	95				
80 548	5	3.3	1.6	.1	.3	5.3	.8	.2	6.1	4.4	5.5	4	87	100				

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 9.1 PCT .1-75MM 58.7

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 14
UTM Coordinate: 49-42.3N/5-38E
Pedon Classification: Pachic Cryoboroll; coarse-loamy, mixed.
Vegetative Habitat: KF
Geological Unit: Qs
Surficial Unit: pt
Parent Material: Alluvium over outwash.
Topography: Nearly level. Gradient is 1 percent. East aspect. Convex. Slope length is 1600 meters. Elevation is 2345 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 549 0 to 44 cm. Very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine roots; 12 percent pebbles; strongly acid; clear smooth boundary.

B 550 44 to 100 cm. Dark brown (10YR 3/3) fine sandy loam, gray (10YR 5/1) dry: moderate medium subangular blocky structure; friable; common fine roots; 12 percent pebbles: strongly acid; abrupt smooth boundary.

2C 551 100 to 170 cm. Very dark gray (7.5YR 3/0) very gravelly coarse sand, gray (7.5YR 5/0) dry; single grained; very friable; few fine roots; 36 percent pebbles; medium acid.

PLOT-14

CLASSIFICATION: Pachic Cryoboroll, coarse-loamy, mixed

R 80WY-029 - 13

SAMPLE NOS. 80P 549 - 551 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL CLAY LT .002	SILT .002 -.05	SAND .05 -2 - - -)(-	-CLAY- -)(- FINE LT .0002	CO3 LT .002	-SILT- -)(- FINE .002 -.02	COARSE .02 -.05	- - - -SAND- VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2 - -)(-COARSE	FRACTIONS(MM)-) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - -	- - - - - - -	PCT OF <2MM	(3A1)	- - - - - - -	- - - - - - -	- - - - - - -	- - - - - - -	- - - - - - -	- - - - - - -	- - - - ->	<- PCT	OF	<75MM(3B1)->		
80 549	1S	0- 44	A	8.4	30.8	60.8			13.1	17.7	12.4	13.7	13.3	10.8	10.5	9	4	5V	58	18
80 550	2S	44-100	B	7.4	38.9	53.7			14.8	24.1	16.3	12.7	10.8	8.2	5.7	7	3	8V	49	18
80 551	3S	100-170	2C	1.4	4.4	94.2			1.8	2.6	9.1	29.2	20.8	19.5	15.6	19	12	21V	93	52

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG) - LIMITS - LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - -	-PCT OF <2MM	- - - - - - -		- - - - -	- - - - -	- ->			PCT <0.4MM		<- - G/CC	- - -	->	CM/CM	<- - -PCT OF <2MM		- -	->	CM/CM
80 549	1	1.30	.088			.5	.1	.5	1.12	.73						--			13.2	6.1	.09
80 550	2	.55	.059			.6	.1	.5	1.34	.76						--			12.5	5.6	.09
80 551	3								2.00	1.07						--		4.7		1.5	.03

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(- - - -CEC - - -) SUM CATS	NH4-OAC	BASES + AL	AL SAT	-BASE SAT- SUM	NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - - -) CACL2 .01M	H2O
		<- - - - -	- - - - -	- - - - -	- - -	-MEQ / 100 G	- - - - -	- - - - -	- - - - -	- - - - -	- ->	<- - - -	-PCT -	- - ->			1:2	1:1
80 549	1	4.5	1.1	TR	.7	6.3	6.7	.7	13.0	9.4	7.0	10	48	67			4.6	5.2
80 550	2	5.5	1.5	TR	.5	7.5	5.5	.7	13.0	9.9	8.2	9	58	76			4.9	5.4
80 551	3	2.3	.7	TR	.2	3.2	.9	.2	4.1	2.8	3.4	6	78	100			5.2	5.7

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 7.7 PCT .1-75MM 50.8

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 15
UTM Coordinate: 49-73N/5-51.8E
Pedon Classification: Typic Cryorthent, sandy-skeletal, mixed.
Vegetative Habitat: TFG
Geological Unit: Qs
Surficial Unit: pk
Parent Material: Glacial outwash.
Topography: Nearly level. Gradient is 2 percent. North aspect. Convex. Slope length is 200 meters. Elevation is 1890 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 552 0 to 15 cm. Very dark grayish brown (10YR 3/2) gravelly loamy coarse sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine and few medium roots; 25 percent pebbles; slightly acid; abrupt wavy boundary.

B 553 15 to 34 cm. Very dark brown (10YR 2/2) gravelly loamy coarse sand, dark brown (10YR 4/3) dry; moderate coarse platy and medium subangular blocky structure; firm; common fine roots; 32 percent pebbles; neutral; clear wavy boundary.

BC 554 34 to 60 cm. Very dark grayish brown (10YR 3/2) very gravelly coarse sand, grayish brown (10YR 5/2) dry; single grained; friable; common fine roots; 57 percent pebbles; neutral; abrupt wavy boundary.

C 555 60 to 110 cm. Very dark gray (10YR 3/1) very gravelly coarse sand, gray (10YR 5/1) dry; single grained; loose; 36 percent pebbles; mildly alkaline.

PLOT-15

CLASSIFICATION: Typic Cryorthent, sandy-skeletal, mixed

R 80WY-029 - 14 SAMPLE NOS. 80P 552 - 555 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	TOTAL FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS (MM) WEIGHT 2-5	5-20	20-75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1) ->					<- PCT OF <75MM (3B1) ->											
80 552	1S	0- 15	A	6.0	12.0	82.0			6.5	5.5	5.4	18.8	23.9	20.0	13.8	7	8	23V	85	38
80 553	2S	15- 34	B	6.0	12.4	81.6			6.9	5.5	5.9	23.3	25.2	17.0	10.2	6	4	36V	87	46
80 554	3S	34- 60	BC	2.8	5.4	91.8		TR	3.2	2.2	4.2	24.9	31.4	19.7	11.7	6	9	56V	96	71
80 555	4S	60-110	C	1.4	2.5	96.1		TR	.9	1.6	4.8	26.0	34.8	23.7	6.8	5	5	42V	95	52

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC 15 BAR	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
80 552	1	.70	.060			.8	.1	.5	1.70	.97						--		12.1		5.8	.07
80 553	2	.48	.048			.8	.1	.5	1.82	1.00						--		11.3		6.0	.05
80 554	3	.20	.023			.7	.1	.3	3.68	1.64						--		7.7		4.6	.02
80 555	4								5.57	2.50						--		4.8		3.5	.01

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT-NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- MEQ / 100 G ->							<- PCT ->									
80 552	1	7.5	2.6	TR	.7	10.8	1.7		12.5	10.2								
80 553	2	9.8	3.3	TR	.5	13.6	1.8		15.4	10.9			86	100			1:2	1:1
80 554	3	7.2	3.2	.1	.3	11.3	1.1		12.4	10.3			88	100				
80 555	4	5.8	2.5	.1	.7	9.1	1.4		10.5	7.8			91	100			5.9	6.4
													87	100			6.3	6.7
																	7.0	7.3
																	7.1	7.5

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 2.2 PCT .1-75MM 94.9

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 16
UTM Coordinate: 49-73N/5-52.2E
Pedon Classification: Terric Cryohemist, euic.
Vegetative Habitat: FD
Geological Unit: Qs
Surficial Unit: fa
Parent Material: Organic deposit over outwash between kames.
Topography: Level. Elevation is 1830 meters.
Drainage: Very poorly drained.

(All colors are for moist condition unless otherwise stated.)

Oi 556 0 to 27 cm. Dark reddish brown (5YR 2/2) fibric material; about 90 percent fibers, 65 percent after rubbing; structureless; many fine roots; slightly acid.

Oe 557 27 to 65 cm. Black (5YR 2/1) hemic material; about 60 percent fibers, 20 percent after rubbing; massive; common fine roots; strongly acid.

Oa 558 65 to 95 cm. Black (10YR 2/1) sapric material; about 10 percent fibers, 2 percent after rubbing; massive; few fine roots; 4 percent pebbles; slightly acid.

2C1 559 95 to 120 cm. Dark greenish gray (5GY 4/1) loamy sand; single grained; loose; 4 percent pebbles; neutral.

2C2 560 120 to 165 cm. Very dark grayish brown (2.5Y 3/2) sand; single grained; loose; 3 percent pebbles; neutral.

PLOT-16

CLASSIFICATION: Terric Cryohemist, euic

R 80WY-029 - 15

SAMPLE NOS. 80P 556 - 560 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1- TOTAL CLAY LT .002	-2- TOTAL SILT .002 -.05	-3- TOTAL SAND .05 -2	-4- CLAY FINE LT .0002	-5- CLAY CO3 LT .002	-6- SILT FINE .002 -.02	-7- SILT COARSE .02 -.05	-8- SAND VF .05 -.10	-9- SAND F .10 -.25	-10- SAND M .25 -.50	-11- SAND C .5 -1	-12- SAND VC 1 -2	-13- COARSE FRACTIONS (MM) WEIGHT 2 -5	-14- 5 -20	-15- 20 -75	-16- .1- 75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1) ->												<- PCT OF <75MM(3B1) ->				
80 556	1S	0- 27	Oi													--	--	--	--	--
80 557	2S	27- 65	Oe													--	--	--	--	--
80 558	3S	65- 95	Oa													4	2	--	--	6
80 559	4S	95-120	22C1	7.9	13.0	79.1			7.5	5.5	8.4	31.7	30.2	6.4	2.5	3	3	--	73	6
80 560	5S	120-155	22C2	1.8	3.9	94.3		TR	1.8	2.1	3.5	35.7	43.0	8.8	3.1	3	1	--	91	4

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
80 556	1	6.37																			
80 557	2	6.56																			
80 558	3	5.43																		19.5	
80 559	4	.45							1.57	.84						--		18.9		6.6	.17
80 560	5								4.89	1.89						--		7.7		3.4	.06

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	H2O
		<- MEQ / 100 G ->										<- PCT ->					1:2	1:1
80 556	1	8.0	2.4	.4	.1	10.9	3.1		14.0	12.3			78	89			6.1	6.3
80 557	2	22.8	5.2	.3	.1	28.4	6.9		35.3	39.2			80	72			5.1	5.1
80 558	3	30.1	11.5	.3	.6	42.7	5.3		48.0	39.6			89	100			6.1	
80 559	4	9.6	4.2	.3	.4	14.5			14.5	12.4			100	100			6.5	6.7
80 560	5	7.1	3.5	.3	.4	11.3			11.3	8.8			100	100	TR		6.6	7.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 17
UTM Coordinate: 49-73.9N/5-52.2E
Pedon Classification: Typic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: TFG
Geological Unit: Qs
Surficial Unit: pt
Parent Material: Glacial till.
Topography: Gently sloping. Gradient is 4 percent. Southwest aspect.
Concave. Slope length is 400 meters. Elevation is 2010 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 4 to 0 cm. Very dark brown (10YR 2/2) sapric material: few fine and few medium roots: abrupt wavy boundary.

A1 561 0 to 13 cm. Very dark gray (10YR 3/1) gravelly loam, dark grayish brown (10YR 4/2) dry; moderate medium and fine granular structure; friable; many fine and few medium roots; 19 percent pebbles; medium acid; abrupt wavy boundary.

A2 562 13 to 34 cm. Black (10YR 2/1) gravelly loam, very dark grayish brown (10YR 3/2) dry; moderate medium subangular blocky structure; friable; common fine roots; 16 percent pebbles; medium acid; abrupt wavy boundary.

C 563 34 to 110 cm. Dark yellowish brown (10YR 3/4) extremely gravelly loam, yellowish brown (10YR 5/4) dry; massive; extremely firm; few fine roots; 50 percent pebbles, 22 percent cobbles; slightly acid.

PLOT-17

CLASSIFICATION: Typic Cryoboroll, loamy-skeletal, mixed

R 80WY-029 - 16 SAMPLE NOS. 80P 561 - 563 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
80 561	1S	0- 13	A1	20.4	44.0	35.6			25.8	18.2	9.4	8.2	6.1	5.9	6.0	7	14	8V	48	29
80 562	2S	13- 34	A2	21.3	42.9	35.8			24.2	18.7	11.0	9.2	6.2	5.5	3.9	6	7	11V	43	24
80 563	3S	34-110	C	21.3	32.1	46.6			18.0	14.1	10.8	12.2	8.8	7.5	7.3	3	5	75V	69	83

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - - ->				CM/CM
80 561	1	4.15	.336			1.6	.2	2.1	1.55	.72						--			31.3	14.7	.20
80 562	2	2.41	.196			1.6	.2	2.1	1.31	.61						--			25.7	12.9	.16
80 563	3		.067						1.20	.65						--			23.8	13.8	.04

SAMPLE NO.	HZN NO.	NH4OAC EXTR BASES CA	NH4OAC EXTR BASES MG	NH4OAC EXTR BASES NA	NH4OAC EXTR BASES K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - - ->										<- - - - -PCT - - - ->						
80 561	1	14.9	3.1	TR	2.7	21.7	12.1	.2	33.8	31.7	21.9	1	64	68			1:2	1:1
80 562	2	19.1	3.8	.1	2.0	24.8	9.0	.0	33.8	27.9			73	89			5.5	6.0
80 563	3	19.3	5.1	.1	1.1	25.6	4.4	.0	30.0	25.6			85	100			5.5	5.8
																	5.7	6.1

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 21.3 PCT .1-75MM 83.2

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 18
UTM Coordinate: 49-70.2N/5-54.7E
Pedon Classification: Argic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: 5N0
Geological Unit: Tir
Surficial Unit: pt
Parent Material: Andesitic till
Topography: Moderately steep. Gradient is 30 percent. North aspect. Concave. Slope length is 300 meters. Elevation is 2395 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A1 564 0 to 5 cm. Very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine and many medium roots; 9 percent pebbles; strongly acid; abrupt wavy boundary.

A2 565 5 to 15 cm. Very dark grayish brown (10YR 3/2) gravelly silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine, few medium and few coarse roots; 15 percent pebbles; medium acid; clear wavy boundary.

A3 566 15 to 27 cm. Very dark grayish brown (10YR 3/2) gravelly loam; dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine, common medium and few coarse roots; 19 percent pebbles; strongly acid; abrupt wavy boundary.

Bt1 567 27 to 49 cm. Dark yellowish brown (10YR 3/4) very gravelly clay loam; dark yellowish brown (10YR 4/4) dry; strong medium subangular blocky and fine granular structure; firm; many fine roots; few dark brown (10YR 3/3) thin clay films on faces of peds; 39 percent pebbles; medium acid; clear wavy boundary.

Bt2 568 49 to 77 cm. Dark brown (10YR 3/3) extremely gravelly loam, brown (10YR 4/3) dry; strong fine granular and moderate coarse subangular blocky structure; firm; common fine and few medium roots; few dark brown (10YR 3/3) thin clay films on faces of peds; 80 percent pebbles; medium acid.

PLOT-18

CLASSIFICATION: Argic Cryoboroll, loamy-skeletal, mixed

R 80WY-029 - 17

SAMPLE NOS. 80P 564 - 568   DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 23

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL CLAY LT .002	SILT .002 -.05	SAND .05 -2 - - -)	(- -CLAY- FINE LT .0002	CO3 LT .002 -)	(- -SILT- FINE .002 -.02	COARSE .02 -.05 -)	(- - - VF .05 -.10	F .10 -.25	-SAND- M .25 -.50	C .5 -1	VC 1 -2 - -)	(-COARSE FRACTIONS(MM)-) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - -				PCT OF <2MM (3A1)						- - - ->	<- PCT OF <75MM(3B1)->					
80 564	1S	0- 5	A1	16.9	53.5	29.6			30.2	23.3	12.5	8.0	3.8	2.7	2.5	5	5	3V	28	13
80 565	2S	5- 15	A2	18.7	50.7	30.6			27.3	23.4	13.3	8.0	3.8	3.0	2.5	6	9	8V	36	23
80 566	3S	15- 27	A3	18.2	49.0	32.8			26.8	22.2	13.8	8.6	4.2	3.2	3.0	4	8	16V	42	28
80 567	4S	27- 49	Bt1	27.3	39.0	33.7			22.1	16.9	12.1	8.9	5.0	4.0	3.7	4	7	42V	63	53
80 568	5S	49- 77	Bt2	25.3	39.0	35.7			21.9	17.1	10.8	8.7	5.5	5.5	5.2	2	2	86V	92	90

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	(- - DITH-CIT EXTRACTABLE FE	AL	MN - -)	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG - LIMITS - LL	) PI	(- BULK FIELD MOIST	DENSITY 1/3 BAR	OVEN DRY -)	COLE WHOLE SOIL	(- - -WATER FIELD MOIST	CONTENT 1/10 BAR	1/3 BAR	15 BAR - -)	WRD WHOLE SOIL
		<- - - - - - -	-PCT OF <2MM	- - - - - -	- - ->						PCT <0.4MM		<- - G/CC	- - - ->		CM/CM	<- - -PCT OF <2MM			- ->	CM/CM
80 564	1	5.47	.209			1.0	.2	.6	2.33	.96						--			40.9	16.2	.33
80 565	2	1.80	.099			1.0	.2	.6	1.41	.71						--			27.7	13.3	.18
80 566	3	1.44	.094			1.2	.2	.8	1.55	.78						--			28.2	14.2	.17
80 567	4	.85	.057						1.32	.69						--			32.8	18.7	.13
80 568	5	.54	.014						1.39	.68						--			35.7	17.2	.05

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE CA	MG	NA	K	BASES -) SUM BASES	ACID- ITY	EXTR AL	(- - - SUM CATS	-CEC NH4- OAC	- - -) BASES + AL	AL SAT	-BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH CACL2 .01M	- - -) H2O
		<- - - - - -	- - - - -	-MEQ / 100 G	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - ->	<- - - -	-PCT	- - - ->			1:2	1:1
80 564	1	24.0	4.6	TR	2.8	31.4	15.4	.0	46.8	39.4			67	80			5.2	5.5
80 565	2	16.3	4.0	.1	2.2	22.6	9.8	.5	32.4	26.4	23.1	2	70	86			5.1	5.6
80 566	3	16.4	4.7	.1	2.1	23.3	8.8	.5	32.1	28.2	23.8	2	73	83			5.1	5.5
80 567	4	24.7	3.1	.2	1.9	34.9	7.0	.5	41.9	36.0	35.4	1	83	97			5.4	5.8
80 568	5	24.0	9.5	.2	1.8	35.5	4.8	.0	40.3	35.1			88	100			5.7	6.0

FAMILY CONTROL SECTION: DEPTH 25- 77 PCT CLAY 25.9 PCT .1-75MM 78.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS   V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 19
UTM Coordinate: 49-70.1N/5-55.4E
Pedon Clasification: Pachic Cryoboroll; coarse-loamy, mixed.
Vegetative Habitat: FN
Geological Unit: Tir
Surficial Unit: R
Parent Material: Andesitic till.
Topography: Moderately steep. Gradient is 30 percent. Northwest aspect. Concave. Slope length is 600 meters. Elevation is 2470 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A1 569 0 to 13 cm. Black (10YR 2/1) loam; very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; many fine and common medium roots; 11 percent pebbles; strongly acid; clear smooth boundary.

A2 570 13 to 47 cm. Very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak coarse subangular blocky and fine granular structure; friable; many fine and common medium roots; 12 percent pebbles; strongly acid; gradual smooth boundary.

A3 571 47 to 87 cm. Black (10YR 2/1) gravelly loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; very friable; many fine roots; 15 percent pebbles; strongly acid; abrupt wavy boundary.

2C 572 87 to 118 cm. Dark brown (10YR 3/3) extremely gravelly sandy loam, yellowish brown (10YR 5/4) dry; strong medium subangular blocky and fine granular structure; firm; few fine roots; many very fine and few fine pores; 72 percent pebbles; medium acid.

PLOT-19

CLASSIFICATION: Pachic Cryoboroll, coarse-loamy, mixed

R 80WY-029 - 16 SAMPLE NOS. 80P 569 - 572 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1914, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	>2MM WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
80 569	1S	0- 13	A1	21.4	43.2	35.4			25.0	18.2	11.9	9.2	5.7	4.8	3.7	7	7	3V	36	17
80 570	2S	13- 47	A2	19.0	48.3	32.7			26.0	22.3	12.5	8.9	4.8	3.7	2.8	8	8	2V	35	18
80 571	3S	47- 87	A3	20.2	45.9	33.9			26.6	19.3	12.2	8.7	4.8	3.8	4.4	8	12	2V	39	22
80 572	4S	87-118	2C	3.3	28.4	68.3			12.4	16.0	16.2	17.3	11.8	11.3	11.8	6	9	68V	92	83

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 569	1	4.67	.353						2.11	.89						--			39.5	19.0	.27
80 570	2	3.10	.227			1.2	.3	2.7	2.23	.95						--			33.0	18.1	.19
80 571	3	2.70	.228			1.2	.3	2.7	1.98	.90						--			32.0	18.1	.17
80 572	4								11.24	4.39						--			20.5	14.5	.02

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACID- ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	BASE SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->											<- - - - -PCT - - - ->				1:2	1:1
80 569	1	29.3	5.0	TR	3.2	37.5	19.7	.0	57.2	45.1			66	83			5.1	5.6
80 570	2	24.9	4.4	TR	2.6	31.9	18.9	.0	50.8	42.4			63	75			5.1	5.5
80 571	3	24.6	4.1	.1	2.0	30.8	16.0	.0	46.8	39.9			66	77			5.0	5.5
80 572	4	24.3	5.9	.1	1.0	31.3	5.5	.7	39.8	37.1	32.0	2	79	84			5.1	5.6

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 16.9 PCT .1-75MM 46.7

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 20
UTM Coordinate: 49-69.6N/5-55E
Pedon Classification: Typic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: TFG
Geological Unit: Tir
Surficial Unit: R
Parent Material: Andesitic rubble.
Topography: Nearly level. Gradient is 3 percent. North aspect. Convex. Slope length is 100 meters. Elevation is 2440 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 573 0 to 12 cm. Very dark brown (10YR 2/2) gravelly loam, very dark grayish brown (10YR 3/2) dry;; weak fine granular structure; friable; many fine and common medium roots; 22 percent pebbles; slightly acid: abrupt smooth boundary.

Bw 574 12 to 45 cm. Very dark grayish brown (10YR 3/2) very gravelly loam, dark brown (10YR 3/3) dry; strong coarse and medium subangular blocky structure; very firm; common fine and few medium roots; 41 percent pebbles; neutral; gradual smooth boundary.

C 575 45 to 103 cm. Very dark grayish brown (10YR 3/2) extremely gravelly loam; dark brown (10YR 4/3) dry; massive; firm; common fine roots; 64 percent pebbles: mildly alkaline.

PLOT-20

CLASSIFICATION: Typic Cryoboroll, loamy-skeletal, mixed

R 80WY-029 - 19 SAMPLE NOS. 80P 573 - 575 DATE 05/07/86

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FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1-- TOTAL CLAY LT .002	-2-- TOTAL SILT .002 -.05	-3-- TOTAL SAND .05 -2	-4-- CLAY FINE LT .0002	-5-- CLAY CO3 LT .002	-6-- SILT FINE .002 -.02	-7-- SILT COARSE .02 -.05	-8-- SAND VF .05 -.10	-9-- SAND F .10 -.25	-10-- SAND M .25 -.50	-11-- SAND C .5 -1	-12-- SAND VC 1 -2	-13-- COARSE FRACTIONS (MM) WEIGHT 2 -5	-14-- COARSE FRACTIONS (MM) WEIGHT 5 -20	-15-- COARSE FRACTIONS (MM) WEIGHT 20 -75	-16-- COARSE FRACTIONS (MM) WEIGHT .1- 75	-17-- (>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
80 573	1S	0- 12	A	22.1	40.0	37.9			20.6	19.4	12.9	11.0	5.7	4.3	3.9	6	7	20V	50	33
80 574	2S	12- 45	Bw	22.2	37.7	40.1			18.3	19.4	14.0	11.8	6.0	4.5	3.8	5	5	47V	68	57
80 575	3S	45-103	C	17.8	36.5	45.7		1	17.8	18.7	14.3	12.5	7.4	6.7	4.9	5	6	66V	84	77

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 573	1	4.01	.338						1.69	.81			1.05		.81	--	30.20		31.6	18.0	.16
80 574	2	1.63	.130						1.51	.67			1.14		1.06	--	7.20		24.7	14.8	.08
80 575	3	1.02	.080						1.88	.80						--			23.4	14.3	.05

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 573	1	24.5	9.3	TR	2.6	36.4		.0	36.4	37.3			100	98				6.[illegible]	6.3
80 574	2	24.8	9.6	.1	2.1	36.6		.0	36.6	33.5			100	100				6.[illegible]	6.6
80 575	3	34.0	10.5	.5	.6			.0		33.4				100	1			[illegible].2	7.4

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 18.2 PCT .1-75MM 79.8

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 21
UTM Coordinate: 49-67N/5-46E
Pedon Classification: Pachic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: TFG
Geological Unit: Ti
Surficial Unit: pt
Parent Material: Andesitic till.
Topography: Gently sloping. Gradient is 7 percent. Northeast aspect.
Concave. Slope length is 300 meters. Elevation is 2315 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A1 576 0 to 9 cm. Black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; many fine and common medium roots; 9 percent pebbles; medium acid; abrupt wavy boundary.

A2 577 9 to 61 cm. Black (10YR 2/1) gravelly loam, dark grayish brown (10YR 4/2) dry; strong coarse and medium subangular blocky structure; firm; common fine and few medium roots; 15 percent pebbles; medium acid; abrupt wavy boundary.

C 578 61 to 110 cm. Dark brown (10YR 4/3) extremely gravelly loam, brown (10YR 5/3) dry, strong fine granular and moderate medium platy structure; very firm; few fine roots; 58 percent pebbles, 5 percent cobbles; medium acid.

PLOT-21

CLASSIFICATION: Pachic Cryoboroll, loamy-skeletal, mixed

R 80WY-029 - 20 SAMPLE NOS. 80P 576 - 578 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
80 576	1S	0- 9	A1	20.1	44.1	35.8			24.3	19.8	10.3	9.3	5.8	5.8	4.5	4	4	5V	35	13
80 577	2S	9- 61	A2	20.7	43.1	36.2			23.6	19.5	11.6	10.4	6.4	5.6	2.2	4	3	16V	42	23
80 578	3S	61-110	C	23.5	36.1	40.4			20.2	15.9	12.8	12.2	6.5	5.0	3.8	2	3	70V	82	76

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 576	1	7.65	.548			1.1	.2	1.1	1.61	1.02						--			36.9	20.4	.22
80 577	2	2.24	.184			1.2	.2	1.0	1.31	.60						--			24.8	12.5	.15
80 578	3	.52	.040						.57	.52						--			21.2	12.2	.05

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACIDITY EXTRAL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->									<- - - - -PCT - - - ->						
80 576	1	19.8	3.8	TR	1.8	25.4	.0	25.4	32.4			100	78			1:2	1:1
80 577	2	16.2	4.1	.1	1.8	22.2	.0	22.2	27.1			100	82			5.3	5.7
80 578	3	17.4	5.3	.2	1.1	24.0	.0	24.0	13.3			100	100			5.3	5.6
																5.4	5.8

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 22.2 PCT .1-75MM 62.7

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 22
UTM Coordinate: 49-73.7N/5-42.0E
Pedon Classification: Typic Cryoboralf; coarse-loamy, mixed.
Vegetative Habitat: 5NO
Geological Unit: Ts
Surficial Unit: pt
Parent Material: Andesitic till.
Topography: Strongly sloping. Gradient is 14 percent. Northwest aspect. Convex. Slope length is 400 meters. Elevation is 2195 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oe 5 to 0 cm. Decomposed pine needles; many fine and common medium roots; few charcoal fragments; abrupt wavy boundary.

E 579 0 to 18 cm. Dark grayish brown (10YR 4/2) gravelly silt loam, light brownish gray (10YR 6/2) dry; strong medium subangular blocky structure; friable, but firm in places; common fine, common medium and few coarse roots; 21 percent pebbles; strongly acid; abrupt wavy boundary.

BE 580 18 to 44 cm. Brown (10YR 5/3) very gravelly silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; friable; common fine and common medium roots; 54 percent pebbles; strongly acid; abrupt wavy boundary.

Bt 581 44 to 63 cm. Brown (10YR 5/3) very gravelly loam, pale brown (10YR 6/3) dry; strong medium subangular blocky structure; firm; common fine and common medium roots; few thin brown (10YR 4/3) clay skins on faces of peds; 40 percent pebbles; strongly acid; clear wavy boundary.

BC 582 63 to 93 cm. Dark yellowish brown (10YR 4/4) gravelly loam, light yellowish brown (10YR 6/4) dry; moderate coarse and medium subangular blocky structure; friable; few fine and few medium roots; few thin dark brown (10YR 3/3) clay skins on faces of peds; 16 percent pebbles; strongly acid; abrupt wavy boundary.

C 583 93 to 137 cm. Brown (10YR 4/3) gravelly silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; 19 percent pebbles; medium acid.

PLOT-22

CLASSIFICATION: Typic Cryoboralf, coarse-loamy, mixed

R 60WY-029 - 21 SAMPLE NOS. 80P 579 - 583 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
80 579	1S	0- 18	E	9.3	57.9	32.8			32.2	25.7	11.8	7.9	5.6	4.6	2.9	7	10	14V	45	31
80 580	2S	18- 44	BE	8.4	50.8	40.8			27.7	23.1	13.5	9.3	6.9	5.9	5.2	7	23	38V	77	68
80 581	3S	44- 63	BW1	8.4	48.1	43.5			26.2	21.9	13.8	9.7	6.9	6.6	6.6	8	13	34V	68	55
80 582	4S	63- 93	BC2	8.4	40.5	51.1			23.4	17.1	11.7	13.8	10.6	8.8	6.2	10	5	9V	54	24
80 583	5S	93-137	C	12.1	54.0	33.9			29.8	24.2	13.8	8.5	4.6	4.1	2.9	10	10	8V	42	23

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - - PCT OF <2MM - - ->				CM/CM
80 579	1	.77	.036						1.77	.84						--					
80 580	2	.82	.057						2.20	1.04			1.31		1.22	--	8.00		23.1	7.8	.18
80 581	3	.52	.017	.9	.2	.2			2.32	1.11						--			19.8	8.7	.07
80 582	4	.40		.9	.2	.2			2.49	1.21			1.49		1.35	--	10.70		22.0	9.3	.11
80 583	5			.9	.2	.3			1.62	.77			1.35		1.22	--	10.00		21.7	10.2	.14
																--			23.8	9.3	.17

SAMPLE NO.	ZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT-NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - ->										<- - - - PCT - - - ->						
80 579	1	9.5	2.4	TR	1.1	13.0	6.4	.7	19.4	16.5	13.7	5	67	79				1:2	1:1
80 580	2	12.3	3.1	.1	.8	16.3	.0	.9	16.3	18.5	17.2	5	100	88					
80 581	3	14.4	3.9	.1	.6	19.0	.0	1.0	25.0	19.5	20.0	5	76	97				4.8	5.3
80 582	4	16.6	4.7	.1	.6	22.0	.0	.9	27.2	20.9	22.9	4	81	100				4.8	5.6
80 583	5	16.7	5.3	.3	.3	22.6	.7	.0	25.3	19.6			89	100				4.9	5.5
																		5.1	5.7

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 8.7 PCT .1-75MM 62.2

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 23
UTM Coordinate: 49-69.5N/5-47.3E
Pedon Classification: Typic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: 2GO
Geological Unit: Qyl
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Moderately steep. Gradient is 28 percent. South aspect. Convex. Slope length is 500 meters. Elevation is 2195 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A1 584 0 to 8 cm. Black (10YR 2/1) gravelly loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; many fine, many medium and few coarse roots; 29 percent pebbles; few charcoal fragments; strongly acid; abrupt wavy boundary.

A2 585 8 to 26 cm. Very dark brown (10YR 2/2) gravelly sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine, common medium and few coarse roots; 34 percent pebbles; strongly acid; gradual wavy boundary.

B 586 26 to 68 cm. Very dark grayish brown (10YR 3/2) very gravelly sandy loam; dark grayish brown (10YR 4/2) dry, moderate fine granular structure; friable; common fine and common medium roots; 44 percent pebbles; medium acid; gradual smooth boundary.

C 587 68 to 112 cm. Dark grayish brown (10YR 4/2) gravelly coarse sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine and few medium roots; 30 percent pebbles; medium acid.

Note: Sample No. 588 is a satellite sample of the A1 horizon and sample No. 589 is a satellite sample of the A2 horizon.

PLOT-23

CLASSIFICATION: Typic Cryoboroll, loamy-skeletal, mixed

R 80WY-029 - 22 SAMPLE NOS. 80P 584 - 589 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL - - -) CLAY LT .002	SILT .002 -.05	SAND .05 -2	(- -CLAY- -) FINE LT .0002	CO3 LT .002	(- -SILT- -) FINE .002 -.02	COARSE .02 -.05	(- - - - - -SAND- - - - - -) VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2	(-COARSE FRACTIONS(MM)-) - - - - WEIGHT - - - - 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
80 584	1S	0- 8	A1	9.8	39.4	50.8			22.1	17.3	9.2	10.2	9.4	10.9	11.2	15	21	7V	67	43
80 585	2S	8- 26	A2	8.5	35.7	55.8			19.8	15.9	9.9	11.8	11.9	13.1	9.2	13	15	21V	72	49
80 586	3S	26- 68	B	7.5	31.5	61.0			16.3	15.2	10.3	13.5	13.7	13.8	9.9	10	14	34V	79	58
80 587	4S	68-112	C	5.1	25.4	69.5			13.4	12.0	10.4	14.1	14.5	16.8	13.7	14	14	15V	77	43
80 588	5S	0- 0	A1-SA	10.7	29.1	60.2			16.1	13.0	9.1	14.1	13.4	13.4	10.1	14	27	8	75	49
80 589	6S	0- 0	A2-SA	8.4	20.7	70.9			11.7	9.0	7.4	14.8	16.0	16.2	16.4	15	18	5	77	38

SAMPLE NO.	HZN NO.	ORGN TOTAL C	N	EXTR TOTAL P	S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG) - LIMITS - LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 584	1	4.88	.269						2.93	1.42						--			34.0	13.9	.21
80 585	2	1.96	.133			.9	.2	1.4	1.67	.80						--			19.3	6.8	.12
80 586	3	1.21	.054			.9	.1	.5	1.43	.76						--			14.7	5.7	.07
80 587	4								1.47	.90						--			11.9	4.6	.08
80 588	5	3.55	.201						2.07	.98						--			24.0	10.5	.13
80 589	6	1.35	.093			.9	.2	1.2	1.89	.82						--			16.1	6.9	.10

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID- ITY	EXTR AL	(- - - -CEC - - -) SUM CATS	NH4- OAC	BASES + AL	AL SAT	-BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - - -) CACL2 .01M	H2O
		<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->						1:2	1:1
80 584	1	24.1	3.0	.0	1.7	28.8	14.8	.0	43.6	28.7			66	100				5.2	5.4
80 585	2	13.0	1.4	TR	.8	15.2	7.6	.0	22.8	14.2			67	100				5.0	5.4
80 586	3	12.1	1.1	TR	.4	13.6	4.8	.0	18.4	10.7			74	100				5.1	5.6
80 587	4	8.3	.7	TR	.3	9.3	2.5	.0	11.8	7.5			79	100				5.4	5.9
80 588	5	20.5	2.4	TR	1.3	24.2	11.1	.2	35.3	22.1	24.4	1	69	100				5.2	5.7
80 589	6	9.0	1.4	TR	.8	11.2	7.2	.0	18.4	15.9			61	70				5.0	5.5

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 24
UTM Coordinate: 49-42N/5-38.6E
Pedon Classification: Typic Cryoboroll; coarse-loamy, mixed.
Vegetative Habitat: TFG
Geological Unit: Qs
Surficial Unit: bu
Parent Material: Glacial outwash.
Topography: Gently sloping. Gradient is 8 percent. South aspect. Convex. Slope length is 300 meters. Elevation is 2400 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 590 0 to 20 cm. Very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine and common medium roots; 12 percent pebbles; medium acid; abrupt smooth boundary.

Bw 591 20 to 28 cm. Dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; many fine and common medium roots; 11 percent pebbles; medium acid; clear wavy boundary.

BC1 592 28 to 49 cm. Dark grayish brown (10YR 4/2) gravelly fine sandy loam, light gray (10YR 7/2) dry; moderate medium subangular blocky structure; friable; common fine and few medium roots; 22 percent pebbles; medium acid; gradual smooth boundary.

BC2 593 49 to 73 cm. Dark brown (10YR 4/3) gravelly sandy loam, pale brown (10YR 6/3) dry; moderate coarse subangular blocky structure; very friable; few fine and few medium roots; 15 percent pebbles; slightly acid; clear smooth boundary.

C 594 73 to 115 cm. Dark grayish brown (10YR 4/2) gravelly coarse sandy loam, light brownish gray (10YR 6/2) dry; weak coarse platy structure; very friable; few fine roots; 19 percent pebbles, composed predominantly of obsidian; slightly acid; band of grayish brown (2.5Y 5/2) very fine sand at 100 to 110 cm.

PLOT-24

CLASSIFICATION: Typic Cryoboroll, coarse-loamy, mixed

R SOHY-029 - 23

NPS - YELLOWSTONE SOILS STUDY　　SAMPLE NOS. 80P 590 - 594　　DATE 05/07/86

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1-- TOTAL CLAY LT .002	-2-- TOTAL SILT .002-.05	-3-- TOTAL SAND .05-2	-4-- CLAY FINE LT .0002	-5-- CLAY CO3 LT .002	-6-- SILT FINE .002-.02	-7-- SILT COARSE .02-.05	-8-- SAND VF .05-.10	-9-- SAND F .10-.25	-10- SAND M .25-.50	-11- SAND C .5-1	-12- SAND VC 1-2	-13- COARSE FRACTIONS (MM) WEIGHT 2-5	-14- 5-20	-15- 20-75	-16- .1-75	-17- (>2 MM) WT PCT WHOLE SOIL
				<- PCT OF <2MM (3A1)											->	<- PCT OF <75MM (3B1)			->	
80 590	1S	0- 20	A	9.0	44.1	46.9			19.5	24.6	18.3	11.1	6.9	6.1	4.5	8	5	5V	41	18
80 591	2S	20- 28	Bw1	7.9	46.2	45.9			19.9	26.3	20.6	10.7	6.1	5.0	3.6	6	4	6V	37	16
80 592	3S	28- 49	BC1	6.9	33.5	59.6			15.6	17.9	17.1	16.0	11.6	8.6	6.4	10	6	17V	62	33
80 593	4S	49- 73	BC2	6.9	25.4	67.7			12.4	13.0	14.8	19.6	14.3	12.1	7.0	10	5	8V	64	23
80 594	5S	73-115	C	5.0	23.2	71.8			11.4	11.8	12.3	18.6	15.4	15.0	10.5	9	6	13V	71	28

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WHOLE SOIL
		<- PCT OF <2MM						->			PCT <0.4MM		<- G/CC		->	CM/CM	<- PCT OF <2MM			->	CM/
80 590	1	2.26	.123			.6	.1	.2	1.36	.78			1.50		1.31	--	14.60		19.1	7.0	
80 591	2	.60	.036			.6	.1	.1	1.11	.57			1.25		1.20	--	4.30		14.9	4.5	
80 592	3	.24	.020						.91	.57			1.36		1.31	--	4.00		13.7	3.9	
80 593	4	.09							.70	.48			1.59		1.52	--	4.70		10.6	3.3	
80 594	5								.96	.58									9.4	2.9	

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	H2O 1:
		<- MEQ / 100 G									->	<- PCT			->			
80 590	1	9.0	2.1	TR	[illegible]	11.9	7.1	.0	19.0	12.2			63	98			5.3	5
80 591	2	4.7	2.2	TR	[illegible]	7.[illegible]	4.2	.0	11.9	3.8			65	87			5.5	6
80 592	3	3.9	1.8	TR	[illegible]	6.2	5.2	.0	11.4	6.3			54	98			5.6	5
80 593	4	3.4	1.5	.3	[illegible]	5.3	.4	.0	5.7	4.8			93	100			5.5	6
80 594	5	3.0	1.5	.1	[illegible]	4.8	.4	.0	5.2	4.8			92	100			5.6	6

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 6.3 PCT .1-75MM 64.2

ANALYSES: S= ALL ON SIEVED <2MM BASIS　　V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 25
UTM Coordinate: 49-43.3N/5-74.2E
Pedon Classification: Typic Cryoboroll; coarse-loamy, mixed.
Vegetative Habitat: kf
Geological Unit: Qs
Surficial Unit: pt
Parent Material: Glacial outwash.
Topography: Nearly level. Gradient is 3 percent. Southwest aspect. Convex. Slope length is 200 meters. Elevation is 2375 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 595 0 to 13 cm. Black (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many fine and many medium roots; 15 percent pebbles: strongly acid; abrupt smooth boundary.

Bw 596 13 to 57 cm. Very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry, strong medium subangular blocky structure; friable; many fine and common medium roots; 19 percent pebbles; strongly acid; abrupt wavy boundary.

BC 597 57 to 120 cm. Dark brown (10YR 3/3) gravelly silt loam, grayish brown (10YR 5/2) dry; weak coarse subangular blocky structure; very friable; few fine and few medium roots; 15 percent pebbles; medium acid; abrupt wavy boundary.

C 598 120 to 190 cm . Brown (10YR 5/3) stratified very fine sand and silt layers, light brownish gray (10YR 6/2) dry; massive; very friable; few fine roots; 3 percent pebbles; slightly acid.

PLOT-25

CLASSIFICATION: Typic Cryoboroll, coarse-loamy, mixed

P 80WY-029 - 24

NPS - YELLOWSTONE SOILS STUDY

SAMPLE NOS. 80P 595 - 598

DATE 05/07/86

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

GENERAL METHODS 1B1A, 2A1, 2B

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL - - -) CLAY LT .002	SILT .002 -.05	SAND .05 -2	(- -CLAY- -) FINE LT .0002	CO3 LT .002	(- -SILT- -) FINE .002 -.02	COARSE .02 -.05	(- - - - -SAND- - - - - -) VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2	(-COARSE FRACTIONS(MM)-) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - -												<- PCT OF <75MM(3B1)->				
80 595	1S	0- 13	A	12.0	45.3	42.7			18.9	26.4	13.2	6.9	4.4	6.0	7.1	7	9	7V	42	23
80 596	2S	13- 57	Bw	11.4	46.6	42.0			18.5	28.1	18.8	6.9	4.7	5.9	5.7	7	3	14V	45	29
80 597	3S	57-120	BC	8.6	53.8	37.4			19.9	33.9	21.7	6.2	3.2	3.8	2.5	6	11	5V	34	22
80 598	4S	120-190	C	7.8	56.0	36.2			17.9	38.1	27.6	5.5	1.5	1.0	.6	1	1	2V	12	4

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG - LIMITS -) LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 595	1	4.58	.359			.9	.2	.5	1.71	1.13			1.03		.89	--	15.60		[illegible]	13.6	.13
80 596	2	1.77	.180			.8	.1	.5	1.22	.65			1.28		1.21	--	6.20		[illegible]	7.4	.15
80 597	3	.71	.057						1.15	.55			1.55		1.32	--	16.80		17.3	4.8	.16
80 598	4								1.04	.56						--			15.5	4.4	.16

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(- - - -CEC - - -) SUM CATS	NH4-OAC	BASES + AL	AL SAT	-BASE SAT- SUM	NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - - -) CACL2 .01M	H2O
		<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 595	1	12.2	2.9	TR	1.4	16.5	12.9	.0	29.4	20.5			56	80			5.0	[illegible]
80 596	2	6.8	2.1	TR	1.1	10.0	8.8	.0	18.8	13.9			53	72			5.0	[illegible]
80 597	3	7.3	[illegible]	.1	.9	10.4	1.8	.0	12.2	10.1			85	100			5.4	[illegible]
80 598	4	5.0	[illegible]	.2	.3	8.3		.0	8.3	8.1			100	100			5.7	6.1

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 9.9 PCT .1-75MM 35.9

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 26
UTM Coordinate: 49-37.4N/5-32.9E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qpce
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Strongly sloping. Gradient is 15 percent. North aspect. Convex. Slope length is 300 meters. Elevation is 2585 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 599 0 to 12 cm. Very dark grayish brown (10YR 3/2) gravelly loamy coarse sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine, common medium and few coarse roots; 18 percent pebbles; few charcoal fragments; very strongly acid; abrupt wavy boundary.

Bw1 600 12 to 32 cm. Dark grayish brown (10YR 4/2) gravelly coarse sandy loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky and fine granular structure; friable; many fine and common medium roots; 20 percent pebbles; very strongly acid; clear wavy boundary.

Bw2 601 32 to 55 cm. Dark brown (10YR 3/3) gravelly loamy coarse sand, brown (10YR 5/3) dry; weak coarse and medium subangular blocky structure; friable; common fine and few medium roots; 21 percent pebbles; very strongly acid; clear wavy boundary.

C 602 55 to 101 cm. Grayish brown (10YR 5/2) gravelly coarse sandy loam, light gray (10YR 7/2) dry; weak medium platy structure; friable; few fine roots; 30 percent pebbles; medium acid.

Note: Obsidian fragments were present throughout the profile.

FLCT-26

CLASSIFICATION: Typic Cryochrept, caoarse-loamy, mixed

R EONY-029 - 25

NPS - YELLOWSTONE SOILS STUDY SAMPLE NOS. 80P 599 - 602 DATE 05/07/86

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1- CLAY LT .002	-2- SILT .002 -.05	-3- SAND .05 -2	-4- FINE CLAY LT .0002	-5- CO3 CLAY LT .002	-6- FINE SILT .002 -.02	-7- COARSE SILT .02 -.05	-8- VF SAND .05 -.10	-9- F .10 -.25	-10- M .25 -.50	-11- C .5 -1	-12- VC 1 -2	-13- 2 -5	-14- 5 -20	-15- 20 -75	-16- .1 -75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1)											->	<- PCT OF <75MM (3B1) ->				
80 599	1S	0- 12	A	6.1	18.0	75.9			9.8	8.2	7.9	15.6	18.2	18.5	16.1	11	9	7V	77	27
80 600	2S	12- 32	Bw1	7.5	18.5	74.0			9.8	8.7	10.1	18.8	18.0	15.3	11.8	10	6	14V	75	30
80 601	3S	32- 55	Bw2	6.5	16.9	76.6			9.7	7.2	[illegible]	17.7	19.9	16.8	13.3	10	5	16V	78	31
80 602	4S	55-104	C	7.3	19.0	73.7			11.9	7.1	9.4	18.1	19.1	17.5	9.6	8	7	29V	80	44

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	(RATIO/CLAY) CEC	(RATIO/CLAY) 15 BAR	(ATTERBERG LIMITS) LL	(ATTERBERG LIMITS) PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM						->			PCT <0.4MM		<- G/CC		->	CM/CM	<- PCT OF <2MM			->	CM/CM
80 599	1	.99	.062			.6	.2	.2	1.31	.71			1.43		1.31	--	8.90	16.4	11.0	4.3	.08
80 600	2	.79	.050			.6	.2	.1	1.12	.59			1.25		1.20	--	3.40	16.3	11.3	4.4	.08
80 601	3	.47	.029						1.05	.58			1.46		1.41	--	3.90	13.8	11.8	3.8	.09
80 602	4								.63	.49						--		10.2		3.6	.07

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	PH H2O 1:1
		<- MEQ / 100 G									->	<- PCT			->			
80 599	1	[illegible]	.7	TR	.4	4.3	[illegible]	.9	10.6	8.0	[illegible]	17	41	54			4.3	4.9
80 600	2	[illegible]	.7	TR	.4	[illegible]	[illegible]	1.0	10.0	9.4	[illegible]	[illegible]	41	49			4.4	4.9
80 601	3	[illegible]	.7	TR	.4	3.9	[illegible]	.5	8.5	6.8	4.4	11	46	57			4.5	4.9
80 602	4	[illegible]	.9	TR	.4	4.1	1.6	.0	5.7	4.6			72	89			5.1	5.8

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 7.1 PCT .1-75MM 78.8

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 27
UTM Coordinate: 49-24N/5-73E
Pedon Classification: Lithic Cryumbrept; loamy-skeletal, mixed.
Vegetative Habitat: 2EE
Geological Unit: Tt
Surficial Unit: R
Parent Material: Andesitic till.
Topography: Nearly level. Gradient is 3 percent. South aspect. Convex. Slope length is 100 meters. Elevation is 2315 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oi 3 to 0 cm. Undecomposed pine and spruce needles.

A1 0 to 2 cm. Very dark brown (10YR 2/2) silt loam, dark brown (10YR 4/3) dry; weak very fine granular structure; very friable; many fine and common medium roots; 5 percent pebbles: very strongly acid.

A2 603 2 to 11 cm. Dark brown (10YR 3/3) very gravelly silt loam, dark yellowish brown (10YR 4/4) dry; weak very fine granular structure; friable; many fine and many medium roots; 32 percent pebbles; very strongly acid.

AB 604 11 to 22 cm. Dark brown (7.5YR 3/2) very gravelly silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine and common medium roots; 39 percent pebbles; strongly acid.

B 605 22 to 42 cm. Dark yellowish brown (10YR 3/4) very gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak fine granular structure; friable; few fine and few medium roots; 58 percent pebbles; strongly acid..

R 42+cm. Fractured andesitic bedrock.

Note: The E horizon was not sampled.

PLCT-27

CLASSIFICATION: Lithic Cryumbrept, loamy-skeletal, mixed

R 80WY-029 - 26

NPS - YELLOWSTONE SOILS STUDY — SAMPLE NOS. 80P 603 - 605 — DATE 05/07/86

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS (MM) WEIGHT 2-5	5-20	20-75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1) ->												<- PCT OF <75MM (3B1) ->				
80 603	2S	2- 11	A2	16.6	57.5	25.9			33.1	24.4	7.4	4.6	3.5	4.6	5.6	11	20	15V	56	46
80 604	3S	11- 22	AB	16.2	57.8	26.0			33.0	24.8	8.6	5.3	3.6	4.2	4.3	8	24	21V	61	53
80 605	4S	22- 42	B	18.0	54.0	23.0			31.1	22.9	7.9	5.9	4.5	4.9	4.8	5	6	61V	78	72

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
80 603	2	2.39	.174			2.2	.7	1.6	1.30	.83						--			37.8	13.7	.24
80 604	3	[illegible]	.142			1.9	.7	1.6	1.72	.82						--			36.4	13.3	.21
80 605	4	1.59	.117						1.41	.75						--			33.9	13.5	.12

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	(CEC) SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(PH) CACL2 .01M 1:2	H2O 1:1
		<- MEQ / 100 G ->										<- PCT ->						
80 603	2	11.2	1.4	.1	.3	13.5	26.5	3.1	40.0	29.9	16.6	19	34	45			4.4	4.7
80 604	3	13.3	1.2	TR	.3	20.3	24.6	.9	44.9	27.8	21.2	4	45	73			[illegible]	5.1
80 605	4	11.2	1.9	.1	.7	13.9	21.6	1.9	35.5	25.3	15.8	12	39	55			[illegible]	[illegible]

ANALYSES: S= ALL ON SIEVED <2MM BASIS — V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 28
UTM Coordinate: 49-24.4N/5-74.2E
Pedon Classification: Pachic Cryoboroll; loamy-skeletal over fragmental, mixed.
Vegetative Habitat: 2EE
Geological Unit: Tt
Surficial Unit: R
Parent Material: Andesitic till.
Topography: Steep. Gradient is 55 percent. East aspect. Convex. Slope length is 300 meters. Elevation is 2290 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 606 0 to 30 cm. Very dark brown (10YR 2/2) extremely gravelly silt loam, very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; friable; many fine, many medium and few coarse roots; 81 percent pebbles; very strongly acid.

AB 607 30 to 43 cm. Dark brown (10YR 3/3) extremely gravelly silt loam, dark brown (7.5YR 4/4) dry; weak very fine granular structure; friable; common fine and common medium roots; 83 percent pebbles; very strongly acid.

B 43 to 56 cm. Dark yellowish brown (10YR 3/4) extremely gravelly silt loam, yellowish brown (10YR 5/4) dry; weak very fine granular structure; friable; few fine and few medium roots; 90 percent pebbles; slightly acid.

NOTE: The B horizon was not sampled due to the extremely high rock fragment content. Could not penetrate below 56 cm.

PLOT-28

CLASSIFICATION: Pachic Cryoboroll, loamy-skeletal, mixed

R 50WY-029 - 27 SAMPLE NOS. 80P 606 - 607 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 131A, 241, 2

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FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS(MM) WEIGHT 2-5	5-20	20-75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
80 606	1S	0- 30	A	18.8	58.4	22.8			32.1	26.3	8.4	3.7	2.4	3.1	5.2	2	13	76V	92	91
80 607	2S	30- 43	AB	18.7	54.5	26.8			31.4	23.1	9.0	5.1	3.2	4.0	5.5	1	3	89V	94	93

SAMPLE NO.	HZN NO.	ORGN TOTAL C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - - PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 606	1	4.08	.165			1.8	.7	1.2	1.98	.86						--			44.7	16.2	.07
80 607	2	2.52	.124			1.5	.6	.4	1.64	.78						--			36.4	14.6	.03

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT-NH4 OAC	CO3 AS CACO3 <2MM	REQ. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - MEQ / 100 G - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 606	1	18.0	2.6	.1	.7	21.4	39.4	3.1	51.8	37.2	24.5	13	41	58			4.4	4.6
80 607	2	19.2	2.0	.1	.8	22.1	23.1	1.7	45.2	30.7	23.9	7	49	72			4.7	4.9

FAMILY CONTROL SECTION: DEPTH 25- 43 PCT CLAY 18.7 PCT .1-75MM 94.0

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 29
UTM Coordinate: 49-83.7N/4-94.4E
Pedon Classification: Pachic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: 2CL
Geological Unit: Mm
Surficial Unit: co
Parent Material: Limestone till.
Topography: Steep. Gradient is 63 percent. Northwest aspect. Convex. Slope length is 500 meters. Elevation is 2345 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 608 0 to 27 cm. Very dark brown (10YR 2/2) gravelly loam, very dark grayish brown (10YR 3/2) dry; moderate medium and fine granular structure; friable; many fine and common medium roots; 23 percent pebbles; neutral; abrupt wavy boundary.

Bw1 609 27 to 71 cm. Very dark grayish brown (10YR 3/2) very gravelly loam, dark brown (10YR 3/3) dry; moderate fine granular structure; very friable; many fine, many medium and few coarse roots; 41 percent pebbles, 10 percent cobbles; slight effervescence; neutral; gradual wavy boundary.

Bw2 610 71 to 106 cm. Dark brown (10YR 3/3) very gravelly loam, brown (10YR 4/3) dry; weak very fine granular structure; loose; common fine, common medium and few coarse roots; 36 percent pebbles, 15 percent cobbles; slight effervescence; neutral; clear wavy boundary.

Cca 611 106 to 118 cm. Yellowish brown (10YR 5/4) very gravelly loam, very pale brown (10YR 7/4) dry; single grained; very friable; few fine and few medium roots; 39 percent pebbles, 15 percent cobbles; strong effervescence; mildly alkaline.

PLOT-29

CLASSIFICATION: Pachic Cryoboroll, loamy-skeletal, mixed

R 80MT-031 - C1 SAMPLE NOS. 80P 608 - 611 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1- -2- -3- -4- -5- -6- -7- -8- -9- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	FINE CLAY LT .0002	CO3 CLAY LT .002 PCT OF <2MM	FINE SILT .002-.02 (3A1)	COARSE SILT .02-.05 (3A1)	VF SAND .05-.10 (3A1)	F SAND .10-.25 (3A1)	M SAND .25-.50 (3A1)	C SAND .5-1 (3A1)	VC SAND 1-2 (3A1)	COARSE FRACTIONS (MM) WEIGHT 2-5 <- PCT OF <75MM (3B1) ->	COARSE FRACTIONS (MM) WEIGHT 5-20 <- PCT OF <75MM (3B1) ->	COARSE FRACTIONS (MM) WEIGHT 20-75 <- PCT OF <75MM (3B1) ->	COARSE FRACTIONS (MM) WEIGHT .1-75 <- PCT OF <75MM (3B1) ->	>2MM WT PCT OF WHOLE SOIL
80 608	1S	0- 27	A	20.8	45.3	33.9		1	23.2	22.1	9.1	4.4	4.5	7.1	8.8	11	12	12V	51	35
80 609	2S	27- 71	Bw1	19.0	42.7	38.3		1	21.4	26.3	10.5	4.4	4.1	6.1	8.2	8	17	37V	71	67
80 610	3S	71-106	Bw2	12.3	47.4	34.3		2	20.3	27.1	12.7	5.8	4.5	5.5	5.8	8	10	40V	67	66
80 611	4S	106-118	Cca	9.7	40.3	50.0		1	12.9	27.4	16.0	7.8	7.4	9.3	9.3	9	12	39V	74	68

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 608	1	2.77	.190						1.42	.61						--			30.6	12.7	.20
80 609	2	3.20	.216						1.43	.67						--			30.5	12.8	.12
80 610	3	3.34	.289						1.37	.76						--			30.9	13.9	.12
80 611	4								.91	.53						--			15.9	5.1	.07

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACID-ITY EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - ->									<- - - - -PCT - - - ->					1:2	1:1
80 608	1	45.2	10.0	TR	.5				29.5				100	10		7.0	7.2
80 609	2	66.6	5.6	TR	.4				27.1				100	21		7.1	7.3
80 610	3	54.7	7.8	TR	.4				25.1				100	26		7.1	7.3
80 611	4	33.7	3.4	TR	.2				8.8				100	53		7.2	7.4

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 17.4 PCT .1-75MM 68.5

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 30
UTM Coordinate: 49-66.3N/4-93E
Pedon Classification: Lithic Cryochrept; loamy-skeletal, mixed.
Vegetative Habitat: 2FO
Geological Unit: pCg
Surficial Unit: R
Parent Material: Rhyolitic till.
Topography: Strongly sloping. Gradient is 9 percent. East aspect. Convex. Slope length is 150 meters. Elevation is 2375 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 612 0 to 4 cm. Dark brown (10YR 3/3) gravelly loam; weak very fine granular structure; very friable; many fine roots; 21 percent pebbles; strongly acid; clear smooth boundary.

Bw 613 4 to 24 cm. Dark brown (10YR 3/3) gravelly loam; moderate medium and fine granular structure; friable; common fine, common medium and few coarse roots; 28 percent pebbles; very strongly acid; abrupt wavy boundary.

Cr 614 24 to 48 cm. Brown (10YR 5/3) extremely gravelly sandy loam; single grained; very friable; few fine and few medium roots; 53 percent pebbles, 15 percent cobbles; very strongly acid; abrupt irregular boundary.

R 48+ cm. Fractured rhyolitic bedrock.

PLOT-30

CLASSIFICATION: Lithic Cryochrept, loamy-skeletal, mixed

R 80MT-031 - 02 SAMPLE NOS. 80P 612 - 614 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	-1- DEPTH (CM)	-2-	-3- HORIZON	-4- TOTAL CLAY LT .002	-5- TOTAL SILT .002-.05	-6- TOTAL SAND .05-2	-7- CLAY FINE LT .0002	-8- CLAY CO3 LT .002	-9- SILT FINE .002-.02	-10- SILT COARSE .02-.05	-11- SAND VF .05-.10	-12- SAND F .10-.25	-13- SAND M .25-.50	-14- SAND C .5-1	-15- SAND VC 1-2	-16- COARSE FRACTIONS (MM) WEIGHT 2-5	-17- 5-20	-18- 20-75	-19- .1-75	-20- (>2MM) WT PCT OF WHOLE SOIL
					<- PCT OF <2MM (3A1) ->												<- PCT OF <75MM (3B1) ->				
80 612	1S	0- 4		A	10.1	46.5	43.4			22.4	24.1	7.5	4.8	5.7	10.5	14.9	15	14	2V	56	31
80 613	2S	4- 24		Bw1	11.7	49.8	38.5			26.1	23.7	9.0	5.5	6.5	9.8	7.7	17	13	12V	59	42
80 614	3S	24- 48		Cr	4.6	41.5	53.9			21.0	20.5	10.0	9.0	10.1	13.9	11.0	6	13	57V	87	80

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
80 612	1	9.46	.268						2.92	1.62						--		61.9	44.1	16.4	.32
80 613	2	.82	.010			1.0	.3	1.4	1.00	.61						--		34.8	27.8	7.1	.21
80 614	3					.5	.1	.1	.76	.65						--		19.6		3.0	.08

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	H2O 1:1
		<- MEQ / 100 G ->										<- PCT ->						
80 612	1	10.7	1.5	TR	1.3	13.5	26.8	1.2	40.3	29.5	14.7	8	33	46			4.8	5.1
80 613	2	3.6	.8	TR	.4	4.8	10.0	1.9	14.8	11.7	6.7	28	32	41			4.4	4.7
80 614	3	2.0	.5	TR	.2	2.7	1.6	.5	4.3	3.5	3.2	16	63	77			4.4	4.7

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 31
UTM Coordinate: 49-65.8N/4-93.7E
Pedon Classification: Typic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: 2FO
Geological Unit: Qyh
Surficial Unit: co
Parent Material: Andesitic till.
Topography: Steep. Gradient is 55 percent. East aspect. Convex. Slope length is 300 meters. Elevation is 2270 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 615 0 to 12 cm. Very dark grayish brown (10YR 3/2) very gravelly loam, dark yellowish brown (10YR 4/4) dry; moderate fine granular structure; friable; many fine, many medium and few coarse roots; 54 percent pebbles, 3 percent cobbles; strongly acid: gradual smooth boundary.

Bw1 616 12 to 33 cm. Dark brown (10YR 3/3) very gravelly loam, yellowish brown (10YR 5/4) dry; moderate fine granular structure; friable; many fine, many medium and common coarse roots; 47 percent pebbles, 12 percent cobbles; medium acid clear smooth boundary.

Bw2 617 33 to 74 cm. Dark grayish brown (10YR 4/2) extremely gravelly loam: weak medium granular structure; friable; common fine and common medium roots; 54 percent pebbles, 20 percent cobbles; medium acid.

Note: The substratum was not sampled due to the abundance of rock fragments.

PLOT-31

CLASSIFICATION: Typic Cryoboroll, loamy-skeletal, mixed

R 80MT-031 - 03

SAMPLE NOS. 80P 615 - 617 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

HZN NO.	DEPTH (CM)	HORIZON	-1- Total CLAY LT .002	-2- Total SILT .002-.05	-3- Total SAND .05-2	-4- Clay FINE LT .0002	-5- Clay CO3 LT .002	-6- Silt FINE .002-.02	-7- Silt COARSE .02-.05	-8- Sand VF .05-.10	-9- Sand F .10-.25	-10- Sand M .25-.50	-11- Sand C .5-1	-12- Sand VC 1-2	-13- Coarse fractions (MM) weight 2-5	-14- 5-20	-15- 20-75	-16- .1-75	-17- (>2MM) WT PCT OF WHOLE SOIL
			<- PCT OF <2MM (3A1)											->	<- PCT OF <75MM(3B1) ->				
1S	0- 12	A	15.0	43.5	41.5			23.2	20.3	8.6	4.7	5.1	8.8	14.3	15	36	19V	80	71
2S	12- 33	Bw1	15.2	43.4	41.4			21.8	21.6	9.4	5.4	5.4	8.2	12.9	14	27	28V	79	74
3S	33- 74	Bw2	15.0	44.7	40.3			22.5	22.2	9.1	5.3	5.2	8.2	12.6	9	21	51V	87	85

HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
	<- PCT OF <2MM						->			PCT <0.4MM		<- G/CC		->	CM/CM	<- PCT OF <2MM			->	CM/CM
1	3.16	.188			1.3	.2	1.2	1.46	.65						--			26.7	9.8	.10
2	1.62	.099			1.5	.2	1.1	1.16	.56						--			24.8	8.5	.09
3	1.12	.080						1.11	.59						--			25.9	8.9	.06

HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	H2O 1:1
	<- MEQ / 100 G									->	<- PCT			->			
1	17.9	1.5	TR	.8	20.2	10.7	.0	30.9	21.9			65	92			5.4	5.5
2	15.7	1.5	TR	.6	17.8	7.6	.0	25.4	17.6			70	100			5.5	5.7
3	16.1	2.1	TR	.7	18.9	6.1	.0	25.0	16.6			76	100			5.5	5.8

FAMILY CONTROL SECTION: DEPTH 25- 74 PCT CLAY 15.0 PCT .1-75MM 85.4

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 32
UTM Coordinate: 49-65.7N/94.2E
Pedon Classification: Typic Cryochrept loamy skeletal, mixed.
Vegetative Habitat: 2LG
Geological Unit: Qyh
Surficial Unit: co
Parent Material: Rhyolitic till.
Topography: Steep. Gradient is 35 percent. East aspect. Convex. Slope length is 500 meters. Elevation is 2180 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 618 0 to 5 cm. Very dark grayish brown (10YR 3/2) very gravelly silt loam; weak fine granular structure; friable; many fine and common medium roots; 38 percent pebbles, 2 percent cobbles; strongly acid; clear wavy boundary.

Bw1 619 5 to 23 cm. Dark yellowish brown (10YR 3/4) very gravelly silt loam; moderate fine granular structure; friable; many fine, many medium and few coarse roots; 38 percent pebbles, 10 percent cobbles; very strongly acid; clear wavy boundary.

Bw2 620 23 to 56 cm. Dark brown (10YR 4/3) extremely gravelly loam: moderate medium granular structure; friable; common fine and few medium roots; 42 percent pebbles, 25 percent cobbles; yellowish brown (10YR 5/4) clay films on rock surfaces; strongly acid.

Note: The substratum was not sampled due to the abundance of rock fragments.

PLOT-32

CLASSIFICATION: Typic Cryochrept, loamy-skeletal, mixed

R 80MT-031 - 04

SAMPLE NOS. 80P 618 - 620

DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	-1-- DEPTH (CM)	-2-- HORIZON	-3-- (- - -TOTAL - - -) CLAY LT .002	-4-- SILT .002 -.05	-5-- SAND .05 -2	-6-- (- -CLAY- -) FINE LT .0002	-7-- CO3 LT .002	-8-- (- -SILT- -) FINE .002 -.02	-9-- COARSE .02 -.05	-10- (- - - - -SAND- - - - - -) VF .05 -.10	-11- F .10 -.25	-12- M .25 -.50	-13- C .5 -1	-14- VC 1 -2	-15- (-COARSE FRACTIONS(MM)-) WEIGHT 2 -5	-16- 5 -20	-17- 20 -75	-18- .1- 75	-19- (>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
80 618	1S	0- 5	A	10.0	50.3	39.7			25.6	24.7	10.8	6.8	6.5	7.7	7.8	10	33	11V	67	55
80 619	2S	5- 23	Bw1	10.8	50.5	38.7			24.4	26.1	9.6	6.2	6.4	7.9	8.6	11	23	23V	70	63
80 620	3S	23- 56	Bw2	9.2	49.8	41.0			23.1	26.7	11.2	7.1	6.7	8.5	7.4	9	12	50V	80	79

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG) - LIMITS - LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
80 618	1	4.74	.161						2.44	1.13						--			30.8	11.3	.17
80 619	2	1.23	.071			1.1	.2	1.1	1.15	.69						--			23.0	7.4	.12
80 620	3	.51	.040			1.1	.2	.5	1.04	.63						--			15.7	5.8	.06

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(- - -CEC - - -) SUM CATS	NH4-OAC	BASES + AL	AL SAT	-BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - -PH - - -) CACL2 .01M	H2O
		<- - - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
80 618	1	13.4	2.5	TR	.9	16.8	16.7	.2	33.5	24.4	17.0	1	50	69			4.8	5.2
80 619	2	6.6	1.4	TR	.7	3.7	8.9	1.1	17.6	12.4	9.8	11	49	70			4.5	4.9
80 620	3	4.5	1.1	TR	.5	6.1	5.7	.7	11.8	9.6	6.8	10	52	64			4.6	5.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 33
UTM Coordinate: 49-44.5N/4-94E
Pedon Classification: Typic Cryorthent; sandy-skeletal, mixed.
Vegetative Habitat: 4PO
Geological Unit: Qs
Surficial Unit: ws
Parent Material: Gravelly rhyolitic outwash.
Topographhy: Nearly level. Gradient is 0 to 1 percent. Elevation is 2030 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 621 0 to 4 cm. Very dark grayish brown (10YR 3/2) gravelly coarse sandy loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; very friable; common fine and common medium roots; 23 percent pebbles; strongly acid; abrupt smooth boundary.

B 622 4 to 18 cm. Dark brown (10YR 4/3) gravelly coarse sandy loam, brown (10YR 5/3) dry; weak medium subangular blocky and fine granular structure; very friable; common fine, common medium and few coarse roots; 22 percent pebbles; strongly acid; clear smooth boundary.

BC 623 18 to 39 cm. Brown (10R 5/3) gravelly loamy coarse sand, very pale brown (10YR 7/3) dry; weak very fine granular structure; loose; few fine and few medium roots; 27 percent pebbles; medium acid; abrupt wavy boundary.

C 624 39 to 110 cm. Grayish brown (10YR 5/2) very gravelly coarse sand, light gray (10YR 7/1) dry; single grained; loose; few medium roots; 44 percent pebbles; slightly acid.

Note: Abundant obsidian fragments were present throughout the profile.

PLOT-33

CLASSIFICATION: Typic Cryorthent, sandy-skeletal, mixed

R 80MT-031 - 35 SAMPLE NOS. 80P 621 - 624 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
				(- - -TOTAL	- - -	-)	(- -CLAY-	-)	(- -SILT-	-)	(- - - -	- -SAND-	- -	- -	-)	(-COARSE FRACTIONS(MM)-)	WEIGHT			(>2MM) WT
SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	CLAY LT .002	SILT .002 -.05	SAND .05 -2	FINE LT .0002	CO3 LT .002	FINE .002 -.02	COARSE .02 -.05	VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2	2 -5	5 -20	20 -75	.1- 75	PCT OF WHOLE SOIL
				<- - -	- - -	- - PCT	OF <2MM	(3A1)	- -	- -	- -	- -	- -	- -	- ->	<- PCT	OF <75MM(3B1)		->	
80 621	1S	0- 4	A	8.7	27.6	63.7			15.0	12.6	4.2	7.4	12.8	20.7	18.6	18	13	3V	73	34
80 622	2S	4- 18	B	6.0	31.5	62.5			16.1	15.4	5.6	9.5	13.9	19.8	13.8	17	11	5V	71	33
80 623	3S	18- 39	BC	5.9	16.4	77.7			10.0	6.4	4.5	10.8	16.6	25.6	20.2	16	13	12V	84	41
80 624	4S	39-110	C	4.6	1.7	93.7			.9	.8	1.3	9.1	23.9	33.4	25.9	17	21	20V	97	58

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	(- - DITH-CIT EXTRACTABLE FE	AL	MN - -)	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG - LIMITS - LL	PI)	(- BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY -)	COLE WHOLE SOIL	(- - -WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR - -)	WRD WHOLE SOIL
		<- - -	- - -	-PCT OF <2MM	- - -	- - -	- - -	->			PCT <0.4MM		<- - G/CC	- -	->	CM/CM	<- - -PCT	OF <2MM	- -	->	CM/CM
80 621	1	3.40	.097						1.55	.78						--		30.0	22.0	6.8	.17
80 622	2	.43	.027			.6	.1	.5	.97	.67			1.53		1.35	--	12.80	15.6	12.3	4.0	.10
80 623	3	.16	.017			.5	.1	.2	.80	.56						--		13.1	8.8	3.3	.06
80 624	4	.06	.014						.57	.52						--		5.9		2.4	.03

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(- - -CEC SUM CATS	NH4-OAC	- - -) BASES + AL	AL SAT	-BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH CACL2 .01M	- - -) H2O
		<- - -	- - -	- - -	- - -	-MEQ / 100 G	- - -	- - -	- - -	- - -	->	<- - -	-PCT	- - -	->		1:2	1:1
80 621	1	6.7	1.1	TR	.4	10.2	10.4	.2	20.6	13.5	10.4	2	50	76			4.7	5.2
80 622	2	3.0	.5	TR	.2	3.7	5.0	.5	8.7	5.8	4.2	12	43	64			4.7	5.4
80 623	3	2.4	.7	TR	.2	3.3	1.9	.2	5.2	4.7	3.5	6	63	70			5.0	5.9
80 624	4	1.6	.5	TR	.2	2.3	1.1	.0	3.4	2.6			68	88			5.3	6.2

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 4.8 PCT .1-75MM 94.5

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 34
UTM Coordinate: 49-26N/5-67.4E
Pedon Classification: Aquic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: 2L3
Geological Unit: Ti
Surficial Unit: pt
Parent Material: Andesitic till.
Topography: Moderately steep. Gradient is 30 percent. Southwest aspect. Convex. Slope length is 300 meters. Elevation is 2680 meters.
Drainage: Somewhat poorly drained.

(All colors are for moist condition unless otherwise stated.)

A 625 0 to 3 cm. Black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry: weak fine granular structure; friable; common fine and common medium roots; 11 percent pebbles: slightly acid; abrupt wavy boundary.

Bw 626 3 to 31 cm. Very dark brown (10YR 2/2) gravelly loam, dark brown (10YR 4/3) dry; moderate medium granular structure; friable; many medium, common fine and common coarse roots; 32 percent pebbles; slightly acid; abrupt wavy boundary.

BC 627 31 to 42 cm. Dark yellowish brown (10YR 3/4) very gravelly loam: single grained; friable; few medium roots; 57 percent pebbles; slightly acid.

Note: The C horizon was not sampled due to the presence of groundwater at 33 cm.

PLOT-34

CLASSIFICATION: Aquic Cryoboroll, Loamy-skeletal, mixed

R 80WY-029 - 28 SAMPLE NOS. 80P 625 - 627 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1- TOTAL CLAY LT .002	-2- TOTAL SILT .002-.05	-3- TOTAL SAND .05-2	-4- CLAY FINE LT .0002	-5- CLAY CO3 LT .002	-6- SILT FINE .002-.02	-7- SILT COARSE .02-.05	-8- SAND VF .05-.10	-9- SAND F .10-.25	-10- SAND M .25-.50	-11- SAND C .5-1	-12- SAND VC 1-2	-13- COARSE FRACTIONS WEIGHT 2-5	-14- 5-20	-15- 20-75	-16- .1-75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1) ->												<- PCT OF <75MM(3B1) ->				
80 625	1S	0- 3	A	19.3	53.6	22.1			34.9	23.7	3.4	3.4	3.6	5.2	6.6	5	12	--	33	17
80 626	2S	3- 31	BW	18.4	43.2	38.4			22.9	20.3	6.6	7.3	6.8	8.7	9.0	15	24	8	64	47
80 627	3S	31- 42	BC	13.9	36.6	49.5			20.5	16.1	7.5	8.7	9.0	12.2	12.1	8	14	49V	83	71

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG - LIMITS -) LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - WATER CONTENT - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
80 625	1	23.7	.91						4.75	2.65						--			98.6	51.2	.62
80 626	2	3.47	.243			1.2	.2	1.4	1.60	.79						--			34.3	14.5	.19
80 627	3		.178						1.47	.81						--			26.9	11.2	.09

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	PH H2O 1:1
		<- MEQ / 100 G ->										<- PCT ->						
80 625	1	80.2	9.0	.2	-1.3	89.7	43.4	.0	133.1	91.6			67	98			6.1	6.[illegible]
80 626	2	24.5	2.5	.1	.3	27.7	13.3	.0	41.0	29.5			68	94			5.9	[illegible]
80 627	3	17.9	2.2	.1	.2	20.4	9.3	.0	29.7	20.4			69	100			5.8	[illegible]

FAMILY CONTROL SECTION: DEPTH 25- 42 PCT CLAY 15.5 PCT .1-75MM 76.5

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 35
UTM Coordinate: 49-26.8N/5-67E
Pedon Classification: Dystric Cryochrept; sandy, mixed.
Vegetative Habitat: 2L3
Geological Unit: Qs
Surficial Unit: pk
Parent Material: Outwash sand and gravel.
Topography: Nearly level. Gradient is 3 percent. West aspect. Convex. Slope length is 75 meters. Elevation is 2575 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 0 to 3 cm. Dark brown (7.5YR 3/2) dry, loamy sand: weak fine granular structure: friable many fine and common medium roots; very strongly acid: abrupt smooth boundary.

Bw1 628 3 to 29 cm. Dark brown (10YR 3/3) dry, sandy loam moderate medium granular and weak coarse subangular blocky structure; friable; many fine, common medium, and few coarse roots; 13 percent pebbles; medium acid: clear smooth boundary.

Bw2 629 29 to 48 cm. Dark yellowish brown (10YR 3/4) dry, sandy loam; weak medium subangular blocky structure; friable; common fine and common medium roots; 12 percent pebbles; medium acid; clear wavy boundary.

BC1 630 48 to 74 cm. Dark yellowish brown (10YR 4/4) dry, loamy sand; weak medium subangular blocky structure: very friable; few fine and common medium roots; 11 percent pebbles; medium acid; clear wavy boundary.

BC2 631 74 to 136 cm. Dark brown (10YR 4/3) dry, gravelly loamy coarse sand; single grained; very friable: few fine and few medium roots; 16 percent pebbles; medium acid: abrupt wavy boundary.

C1 632 136 to 190 cm. Grayish brown (10YR 5/2) dry, gravelly loamy fine sand; single grained; loose; 18 percent pebbles; 10 cm. thick stone line at top of horizon: slightly acid; abrupt wavy boundary.

C2 633 190 to 210 cm. Dark grayish brown (10YR 4/2) dry, loamy coarse sand; single grained very friable; 2 percent pebbles; slightly acid.

Note: The A horizon was not sampled.

PLOT-35

CLASSIFICATION: Dystric Cryochrept, sandy, mixed

R 80WY-029 - 29

SAMPLE NOS. 80P 628 - 633

DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM) -1-	HORIZON -2-	(TOTAL) CLAY LT .002 -3-	(TOTAL) SILT .002-.05 -4-	(TOTAL) SAND .05-2 -5-	(CLAY) FINE LT .0002 -6-	(CLAY) CO3 LT .002 -7-	(SILT) FINE .002-.02 -8-	(SILT) COARSE .02-.05 -9-	(SAND) VF .05-.10 -10-	(SAND) F .10-.25 -11-	(SAND) M .25-.50 -12-	(SAND) C .5-1 -13-	(SAND) VC 1-2 -14-	(COARSE FRACTIONS (MM) WEIGHT) 2-5 -15-	5-20 -16-	20-75 -17-	.1-75 -18-	(>2MM) WT PCT OF WHOLE SOIL -19-
				<- - PCT OF <2MM (3A1) - ->												<- PCT OF <75MM(3B1) ->				
80 628	1S	3- 29	Bw1	7.2	34.6	58.2			17.3	17.3	11.2	16.6	13.8	9.8	6.8	10	9	1	58	20
80 629	2S	29- 48	Bw2	3.7	25.3	71.0			12.6	12.7	10.4	18.2	17.8	14.7	9.7	10	8	--	68	18
80 630	3S	48- 74	BC1	3.7	20.0	76.3			9.7	11.3	11.3	21.0	20.2	13.6	10.1	10	6	1	71	17
80 631	4S	74-136	BC2	2.7	17.1	80.2			8.2	8.9	8.8	18.3	22.9	19.2	11.1	14	10	--	78	24
80 632	5S	136-190	C1	1.4	20.2	78.4			3.2	17.0	32.3	35.8	9.1	1.3	.9	11	11	5V	61	27
30 633	6S	190-210	C2	2.3	14.5	83.2			6.9	7.6	11.1	20.0	17.6	18.6	15.9	1	2	--	73	3

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	(DITH-CIT EXTRACTABLE) FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - PCT OF <2MM - ->									PCT <0.4MM		<- - G/CC - ->			CM/CM	<- - PCT OF <2MM - ->				CM/CM
80 628	1	1.69	.159			.9	.6	.4	1.94	1.19			1.39		1.14	--	21.40	24.5	20.4	8.6	.15
80 629	2	.60	.073			.8	.5	.2	2.14	1.76			1.42		1.22	--	16.00	20.7	14.3	6.5	.10
80 630	3	.33	.079						1.73	1.49			1.60		1.44	--	11.20	19.5	12.1	5.5	.09
80 631	4	.20	.007						2.00	1.67			1.52		1.39	--	9.50	14.6	12.2	4.5	.10
80 632	5								5.36	2.71						--		11.3		3.8	.09
80 633	6								2.26	1.35						--		17.5		3.1	.21

SAMPLE NO.	HZN NO.	(NH4OAC EXTRACTABLE BASES) CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	(CEC) SUM CATS	NH4-OAC	BASES + AL	AL SAT	(BASE SAT) SUM	NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(PH) CACL2 .01M	H2O
		<- - MEQ / 100 G - ->										<- - PCT - ->					1:2	1:1
80 628	1	1.1	.2	TR	[illegible]	1.7	19.7	2.9	21.4	14.0	4.[illegible]	63	3	12			4.6	5.6
30 629	2	.7	.2	TR	[illegible]	1.1	12.[illegible]	1.2	13.3	7.9	2.[illegible]	52	8	14			4.9	5.8
80 630	3	.6	.1	TR	[illegible]	.9	[illegible]	.8	11.1	6.4	1.[illegible]	47	8	14			4.9	5.8
80 631	4	.5	.1	TR	[illegible]	.8	7.[illegible]	.9	8.0	5.4	1.[illegible]	53	10	15			5.0	6.0
80 632	5	1.1	.2	TR	[illegible]	1.5	[illegible]	.6	8.2	7.5	2.[illegible]	35	18	20			5.0	6.1
80 633	6	1.0	.2	TR	[illegible]	1.4	5.7	.7	7.1	5.2	2.1	33	20	27			5.1	6.2

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 3.5 PCT .1-75MM 71.8

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 36
UTM Coordinate: 49-21N/5-22.2E
Pedon Classification: Dystric Cryochrept: coarse-loamy, mixed.
Vegetative Habitat: 2L3
Geological Unit: Qpm
Surficial Unit: pt
Parent Material: Rhyolitic till over outwash.
Topography: Rolling. Gradient is 11 percent. South aspect. Convex. Slope length is 100 m. Elevation is 2600 m.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 634 0 to 4 cm. Very dark brown (10YR 2/2) silt loam; weak fine granular structure: friable; few fine and common coarse roots; 3 percent pebbles; medium acid; abrupt wavy boundary.

Bw 635 4 to 25 cm. Brown (10YR 5/3) gravelly sandy loam; moderate medium subangular blocky and fine granular structure; friable; common fine, common medium and few coarse roots; 18 percent pebbles; strongly acid; abrupt wavy boundary.

BC 636 25 to 49 cm. Yellowish brown (10YR 5/4) gravelly loamy coarse sand: weak medium subangular blocky structure; friable; few fine and few medium roots; 25 percent pebbles; medium acid; clear wavy boundary.

C1 637 49 to 69 cm. Dark brown (10YR 4/3) gravelly sandy loam; single grained: firm; few medium roots; 29 percent pebbles; medium acid; clear wavy boundary.

2C2 638 69 to 95 cm. Stratified brownish yellow (10YR 6/8) gravelly sand and yellowish brown (10YR 5/4) fine sandy loam: strata approximately 5 cm. thick; single grained: friable; few medium roots; 20 percent pebbles; strongly acid; abrupt wavy boundary.

2C3 639 95 to 140 cm. Stratified light brownish gray (10YR 6/2) very fine sandy loam and grayish brown (10YR 5/2) gravelly coarse sand; very fine sandy loam strata, massive; coarse sand strata, single grained; friable; few coarse roots· 26 percent pebbles; strongly acid.

Note: Abundant obsidian fragments were present throughout the profile.

PLOT-36

CLASSIFICATION: Dystric Cryochrept, coarse-loamy, mixed

R 80WY-039 - 01

SAMPLE NOS. 80P 634 - 639 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

				-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-
SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- - PCT OF <2MM (3A1)												<- PCT OF <75MM(3B1) ->				
80 634	1S	0- 4	A	18.9	63.6	17.5			34.1	29.5	4.3	3.3	2.5	3.5	3.9	4	1	--	18	5
80 635	2S	4- 25	BW	7.4	37.2	55.4			17.9	19.3	11.1	11.3	8.3	11.3	13.4	20	6	1	59	27
80 636	3S	25- 49	BC	4.6	21.0	74.4			9.1	11.9	16.2	16.1	10.0	13.9	18.2	19	13	5V	74	37
80 637	4S	49- 69	C1	5.9	23.4	70.7			9.1	14.3	15.8	18.3	12.3	14.1	10.3	16	12	15V	74	43
80 638	5S	69- 95	2C2	7.3	15.8	76.9			6.4	9.4	12.5	26.5	13.9	14.1	10.0	13	12	5	75	30
80 639	6S	95-140	2C3	6.4	38.1	55.5			9.1	29.0	17.4	7.1	8.4	12.7	10.0	23	12	4	62	39

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	(RATIO/CLAY) CEC	(RATIO/CLAY) 15 BAR	(ATTERBERG) LIMITS LL	(ATTERBERG) LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
80 634	1	17.7	.34						.30	1.10						--		86.9	56.9	20.8	.51
80 635	2	.41	.022			.6	.1	.1	.31	.46			1.59		1.39	--	14.50	24.1	16.9	3.4	.16
80 636	3	.13	.006			.4	TR	.1	.65	.50						--		16.7	9.4	2.3	.08
80 637	4		.004						.70	.46						--		16.6		2.7	.14
80 638	5								.69	.55						--		19.6		4.0	.18
80 639	6								.58	.50						--		22.5		3.2	.21

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	PH H2O 1:1
		<- MEQ / 100 G ->										<- PCT ->						
80 634	1	1.9	.5	TR	.3	2.6	37.2	.5	39.8	5.6	3.1	16	7	46			5.2	5.8
80 635	2	1.7	.5	TR	.3	2.5	4.3	1.0	6.8	6.0	3.5	29	37	42			4.4	5.4
80 636	3	1.2	.3	TR	.2	1.7	2.0	.4	3.7	3.0	2.1	19	46	57			4.4	5.7
80 637	4	1.6	.5	TR	.2	2.3	1.7	.4	4.0	4.1	2.7	15	57	56			4.4	5.5
80 638	5	1.9	.6	TR	.2	2.7	4.4	.4	7.1	5.0	3.1	13	38	54			4.4	5.5
80 639	6	1.3	.4	TR	.2	1.9	2.6	.4	4.5	3.7	2.3	17	42	51			4.3	5.3

FAMILY CONTROL SECTION: DEPTH 25- 69 PCT CLAY 5.2 PCT .1-75MM 73.8

ANALYSES: S= ALL ON SIEVED <2MM BASIS

V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 37
UTM Coordinate: 49-20.2N/5-26.7E
Pedon Classification: Dystric Cryochrept; sandy, mixed.
Vegetative Habitat: 3HO
Geological Unit: Qpcd
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Rolling. Gradient is 10 percent. Northwest aspect. Convex. Slope length is 25 m. Elevation is 2585 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 640 0 to 6 cm. Very dark grayish brown (10YR 3/2) silt loam: moderate fine granular structure; friable; many fine and common medium roots; 8 percent pebbles: medium acid· abrupt wavy boundary.

Bw 641 6 to 15 cm. Dark yellowish brown (10YR 4/4) gravelly loam: moderate medium subangular blocky and fine granular structure: friable; many fine, many medium and few coarse roots; 16 percent pebbles: medium acid; abrupt wavy boundary.

B/E 642 15 to 30 cm. Yellowish brown (10YR 5/6) gravelly coarse sandy loam (B) with brown (10YR 5/3) gravelly coarse sandy loam (E) comprising 25 percent of the horizon volume; weak fine granular (B) and medium subangular blocky (E) structure; friable; common fine and common medium roots; 27 percent pebbles; medium acid; abrupt wavy boundary.

2BC 643 30 to 43 cm. Dark brown (10YR 4/3) gravelly coarse sand; single grained: firm· few fine roots; 16 percent pebbles; medium acid; abrupt wavy boundary.

2C 644 43 to 170 cm. Dark grayish brown (10YR 4/2) gravelly coarse sand: single grained: firm; 32 percent pebbles; abundant obsidian fragments; slightly acid.

PLOT-37

CLASSIFICATION: Dystric Cryochrept, sandy, mixed

R 80WY-039 - 02 SAMPLE NOS. 80P 640 - 644

NPS - YELLOWSTONE SOILS STUDY DATE 05/07/86

GENERAL METHODS 1B1A, 2A1, 2B

MICHIGAN TECHNOLOGICAL UNIV
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1-- TOTAL CLAY LT .002	-2-- TOTAL SILT .002-.05	-3-- TOTAL SAND .05-2	-4-- CLAY FINE LT .0002	-5-- CLAY CO3 LT .002	-6-- SILT FINE .002-.02	-7-- SILT COARSE .02-.05	-8-- SAND VF .05-.10	-9-- SAND F .10-.25	-10- SAND M .25-.50	-11- SAND C .5-1	-12- SAND VC 1-2	-13- COARSE FRACTIONS (MM) WEIGHT 2-5	-14- 5-20	-15- 20-75	-16- .1-75 PW
				<- - -	- - -	- - -	- - -	PCT OF <2MM	(3A1)	- - -	- - -	- - -	- - -	- - -	- - ->	<- PCT OF	<75MM(3B1)		->
80 640	1S	0- 6	A	14.2	61.2	24.6			28.4	32.8	7.1	6.1	4.7	4.0	2.6	3	4	--	27
80 641	2S	6- 15	BW	8.8	47.7	43.5			23.7	24.0	8.1	7.8	6.4	9.2	12.1	21	3	--	51
80 642	3S	15- 30	B/E	4.1	28.0	67.9			12.8	15.2	10.7	15.1	14.0	13.5	14.6	28	12	--	74
80 643	4S	30- 43	2BC	1.8	9.1	89.1			4.6	4.5	10.0	22.9	22.1	20.1	14.0	16	6	2V	84
80 644	5S	43-110	2C		7.1	92.9			2.3	4.8	7.3	14.7	17.2	24.9	28.8	41	4	1V	92

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG - LIMITS -) LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR W
		<- - -	- - -	-PCT OF <2MM	- - -	- - -	- - -	->			PCT <0.4MM		<- - G/CC	- -	->	CM/CM	<- - -PCT OF	<2MM	- -	-> C
80 640	1	8.25	.245			.7	.2	.1	1.97	.30			1.47		1.30	--	12.80	60.0	42.6	11.4
80 641	2	.78	.033			.3	.1	.1	1.13	.66			1.52		1.39	--	9.50	27.5	21.7	5.8
80 642	3	.21	.008			.2	.1	TR	1.37	.71						--		11.8	12.3	2.9
80 643	4	.07	.010						1.56	.89						--		5.9	4.6	1.6
80 644	5															--		7.4		1.1

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(- - -CEC - - -) SUM CATS	NH4-OAC	BASES + AL	AL SAT	-BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - CACL2 .01M	1:2
		<- - -	- - -	- - -	- - -	-MEQ / 100 G	- - -	- - -	- - -	- - -	- ->	<- - -	-PCT -	- - ->				
80 640	1	10.7	1.7	.0	.7	13.1	23.7	1.1	36.8	23.0	14.2	8	36	47			4.8	
80 641	2	2.6	.8	TR	.2	3.6	10.5	2.6	14.1	9.9	6.2	42	26	36			4.4	
80 642	3	1.0	.3	TR	.1	1.4	4.7	.9	6.1	5.6	2.3	39	23	25			4.5	
80 643	4	.5	.1	TR	.1	.7	2.8	.4	3.5	2.8	1.1	36	20	25			4.9	
80 644	5	.2	.1	.0	TR	.3	1.3	.0	1.6	.8			19	37			5.0	

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY .6 PCT .1-75MM 89.6

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 38
UTM Coordinate: 49-14.3N/5-35E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qs
Surficial Unit: pkl
Parent Material: Rhyolitic lake terrace deposits.
Topography: Undulating. Gradient is 5 percent. North aspect. Concave. Slope length is 100 meters. Elevation is 2425 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 645 0 to 2 cm. Dark grayish brown (10YR 4/2) loam; moderate medium subangular blocky structure; very friable; many fine and common medium roots; 11 percent pebbles; strongly acid; discontinuous; abrupt irregular boundary.

B/E 646 2 to 20 cm. Dark yellowish brown (10YR 4/4) fine sandy loam (B) with brown (10YR 5/3) fine sandy loam (E) that comprises 25 percent of the horizon volume; moderate fine granular (B) and coarse subangular blocky (E) structure; friable; common fine, common medium and few coarse roots; 13 percent pebbles; strongly acid; clear wavy boundary.

E/B 647 20 to 41 cm. Grayish brown (10YR 5/2) sandy loam (E) with yellowish brown (10YR 5/4) sandy loam (B) comprising 40 percent of the horizon volume; weak coarse subangular blocky (E) and medium subangular blocky (B) structure; friable; common fine and few medium roots; 13 percent pebbles; medium acid; abrupt wavy boundary.

C 648 41 to 104 cm. Light brownish gray (10YR 6/2) sandy loam; massive; very friable; few fine roots; 13 percent pebbles; layer of cobbles at 55 cm medium acid.

PLOT-38

CLASSIFICATION: Typic Cryochrept, coarse-loamy, mixed

R 80WY-039 - 03 SAMPLE NOS. 80P 645 - 648 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1- TOTAL CLAY LT .002	-2- TOTAL SILT .002-.05	-3- TOTAL SAND .05-2	-4- CLAY FINE LT .0002	-5- CLAY CO3 LT .002	-6- SILT FINE .002-.02	-7- SILT COARSE .02-.05	-8- SAND VF .05-.10	-9- SAND F .10-.25	-10- SAND M .25-.50	-11- SAND C .5-1	-12- SAND VC 1-2	-13- COARSE FRACTIONS WEIGHT 2-5	-14- 5-20	-15- 20-75	-16- .1-75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1)											->	<- PCT OF <75MM(3B1)			->	
80 645	1S	0- 2	A	7.0	42.9	50.1			19.7	23.2	10.1	12.0	9.8	10.3	7.9	13	4	--	50	17
80 646	2S	2- 20	B/E	7.0	37.9	55.1			17.2	20.7	11.7	14.5	11.3	10.4	7.2	13	7	--	55	20
80 647	3S	20- 41	E/B	4.6	32.0	63.4			12.8	19.2	13.5	16.5	13.0	12.0	8.4	13	6	--	59	19
80 648	4S	41-104	C	3.2	27.7	69.1			11.9	15.8	13.1	17.4	14.6	14.9	9.2	11	5	3V	64	19

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM						->			PCT <0.4MM		<- G/CC		->	CM/CM	<- PCT OF <2MM			->	CM/CM
80 645	1	1.34	.043						1.47	.74						--		37.5	23.0	5.2	.23
80 646	2	.64	.036			.6	.2	.2	1.09	.73			1.47		1.26	--	16.80	29.7	20.8	5.1	.20
80 647	3	.24	.012			.5	.1	.1	1.09	.70			1.56		1.36	--	14.80	20.5	14.6	3.2	.15
80 648	4								1.50	.81						--		18.1		2.6	.20

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(CEC) SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(PH) CACL2 .01M	H2O
		<- MEQ / 100 G									->	<- PCT		->			1:2	1:1
80 645	1	2.1	.5	TR	.3	2.9	11.7	2.9	14.6	10.3	5.3	50	20	28			4.1	5.1
80 646	2	2.0	.5	TR	.2	2.7	9.7	1.9	12.4	7.6	4.6	41	22	36			4.4	5.3
80 647	3	2.2	.6	TR	.2	3.0	3.8	.4	9.8	5.0	3.4	12	44	60			4.9	5.7
80 648	4	2.4	.8	TR	.2	3.4	1.7	.2	5.1	4.8	3.6	6	67	71			5.5	6.0

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 3.5 PCT .1-75MM 63.6

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 39
UTM Coordinate: 49-45.4N/5-11E
Pedon Classification: Lithic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2LG
Geological Unit: Qyl
Surficial Unit: co
Parent Material: Rhyolitic tuff.
Topography: Gently sloping. Gradient is 5 percent. North aspect. Convex. Slope length is 150 meters. Elevation is 2570 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 649 0 to 3 cm. Very dark grayish brown (10YR 3/2) gravelly sandy loam, brown (10YR 5/3) dry; moderate fine granular structure; very friable; common fine roots; 21 percent pebbles; strongly acid; abrupt wavy boundary.

Bw1 650 3 to 10 cm. Dark brown (10YR 3/3) gravelly loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; friable; many fine, many medium and common coarse roots; 23 percent pebbles; strongly acid; abrupt wavy boundary.

2Bw2 651 10 to 20 cm. Dark brown (10YR 4/3) gravelly sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common fine, common medium roots; 26 percent pebbles; strongly acid; abrupt wavy boundary.

2BC 652 20 to 48 cm. Grayish brown (10YR 5/2) extremely gravelly sandy loam, light gray (10YR 7/1) dry; single grained; firm; common fine roots; 59 percent pebbles, 2 percent cobbles; strongly acid; abrupt smooth boundary.

R 48+cm. Rhyolitic tuff; yellowish brown (10YR 5/4) and very pale brown (10YR 7/3) silt coatings on surface of bedrock.

PLOT-39

CLASSIFICATION: Lithic Cryochrept, coarse-loamy, mixed

S 80WY-039 - 04 SAMPLE NOS. 80P 649 - 652 DATE 05/07/86

NPS - YELLOWSTONE SOILS STUDY

GENERAL METHODS 1B1A, 2A1, 2B

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-4- TOTAL CLAY LT .002	-5- TOTAL SILT .002-.05	-6- TOTAL SAND .05-2	-7- CLAY FINE LT .0002	-8- CLAY CO3 LT .002	-9- SILT FINE .002-.02	-10- SILT COARSE .02-.05	-11- SAND VF .05-.10	-12- SAND F .10-.25	-13- SAND M .25-.50	-14- SAND C .5-1	-15- SAND VC 1-2	-16- COARSE FRACTIONS (MM) WEIGHT 2-5	-17- 5-20	-18- 20-75	-19- .1-75	-20- (>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1)											->	<- PCT OF <75MM (3B1)			->	
80 649	1S	0- 3	A	4.7	47.8	47.5			25.6	22.2	8.7	8.3	7.4	11.3	11.9	19	3	5V	58	32
80 650	2S	3- 10	Bw1	7.0	47.0	46.0			25.5	21.5	9.9	9.4	7.9	9.7	9.2	15	7	12V	58	34
80 651	3S	10- 20	2Bw2	6.0	38.7	55.3			19.9	18.8	9.8	11.0	9.9	12.4	12.2	17	7	15V	67	39
80 652	4S	20- 48	2BC	3.2	38.9	57.9			22.0	16.9	11.6	12.8	11.0	12.2	10.2	10	26	37V	85	74

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM						->			PCT <0.4MM		<- G/CC		->	CM/CM	<- PCT OF <2MM			->	CM/CM
80 649	1	2.97	.076			.8	.3	1.4	2.11	1.11						--		29.4	23.3	5.2	.21
80 650	2	.78	.048			.7	.2	.5	1.14	.69			1.35		1.19	--	13.80	28.5	21.5	4.3	.19
80 651	3	.96	.029			.6	.2	.2	1.22	.82						--		24.9	19.5	4.9	.16
80 652	4	.44	.014			.4	TR	.1	.94	.84						--		22.0	17.0	2.7	.08

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- MEQ / 100 G									->	<- PCT			->		1:2	1:1
80 649	1	3.4	.6	.0	.6	4.6	9.7	1.5	14.3	9.9	6.1	25	32	46			5.0	5.5
80 650	2	2.6	.5	.0	.5	3.6	8.0	1.7	11.6	8.0	5.7	32	31	45			4.8	5.5
80 651	3	2.3	.5	TR	.2	3.0	6.7	1.7	9.7	7.3	4.7	36	31	41			4.5	5.4
80 652	4	1.3	.3	TR	.1	1.7	3.1	.7	4.8	3.0	2.4	29	35	57			4.6	5.5

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 40
UTM Coordinate: 48-99.0N/5-25.6E
Pedon Classification: Typic Cyrumbrept; coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qpcp
Surficial Unit: pt
Parent Material: Loess over rhyolitic till.
Topography: Undulating. Gradient is 4 percent. Northeast aspect. Concave. Elevation is 2560 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oi 2 to 0 cm. Decomposed pine needles; many fine roots; abrupt smooth boundary.

A1 199 0 to 5 cm. Very dark brown (10YR 2/2) silt loam, very dark grayish brown (2.5Y 3/2) dry; weak fine granular structure; very friable (moist), nonsticky (wet); many fine and common medium roots; 1 percent pebbles; extremely acid; abrupt smooth boundary.

A2 200 5 to 17 cm. Dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; very friable (moist), slightly sticky (wet); many fine and many medium roots; 5 percent pebbles; very strongly acid; clear smooth boundary.

2Bw1 201 17 to 31 cm. Yellowish brown (10YR 5/6) gravelly sandy loam: moderate medium subangular blocky structure; friable (moist), slightly sticky (wet); common fine roots; 15 percent pebbles; strongly acid; clear smooth boundary.

2Bw2 202 31 to 53 cm. Olive brown (2.5Y 4/4) loamy sand· moderate medium subangular blocky structure; friable (moist), nonsticky (wet); few fine roots; 13 percent pebbles; medium acid; clear smooth boundary.

2BC 203 53 to 89 cm. Light olive brown (2.5Y 5/4) gravelly loamy sand: weak medium granular structure; friable (moist), nonsticky (wet); 19 percent pebbles: medium acid: clear smooth boundary.

2C 204 89 to 105 cm. Olive (5Y 4/3) gravelly coarse loamy sand; massive; friable (moist), nonsticky (wet); 17 percent pebbles; medium acid.

Note: Obsidian fragments were abundant below 17 cm.

PLOT 40

CLASSIFICATION: Typic Cryumbrept, coarse-loamy, mixed

S 81WY-039 - 1 SAMPLE NOS. 81P 199 - 204 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

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FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS (MM) WEIGHT 2-5	COARSE FRACTIONS (MM) WEIGHT 5-20	COARSE FRACTIONS (MM) WEIGHT 20-75	COARSE FRACTIONS (MM) WEIGHT .1-75	>2MM WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
81 199	1S	0- 5	A1	20.7	64.7	14.6			33.8	30.9	4.2	3.2	2.6	2.2	2.4	2	--	--	12	2
81 200	2S	5- 17	A2	17.9	58.7	23.4			34.8	23.9	4.7	4.4	3.9	5.0	5.4	7	TR	--	24	7
81 201	3S	17- 31	2Bw1	5.9	25.0	69.1			13.3	11.7	12.0	17.9	14.9	12.2	12.2	18	4	--	67	22
81 202	4S	31- 53	2Bw2	6.8	15.5	77.7			7.3	8.2	14.8	23.9	17.4	13.1	8.6	18	2	--	70	20
81 203	5S	53- 89	2BC	3.6	14.5	81.9			7.7	6.8	13.4	27.4	18.6	12.8	9.6	25	4	--	78	29
81 204	6S	89-105	2C	3.2	10.7	86.1			5.0	5.7	12.9	27.6	19.3	14.5	11.7	22	3	--	80	25

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
81 199	1	9.26	.299			.8	.4	TR	1.48	1.37						--			34.5	28.3	.09
81 200	2	1.32	.084			1.2	.6	--	1.06	.68						--			28.3	12.1	.23
81 201	3	.29	.032			.6	.5	--	.92	.75						--			11.2	4.4	.09
81 202	4	.16	.015			.3	.4	--	.51	.53						--			9.1	3.6	.07
81 203	5	.13				.3	.4	--	.81	.63						--			3.0	3.0	.06
81 204	6					.2	.3	--	.44	.81						--			7.3	2.6	.06

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - - - ->										<- - - - PCT - - - ->					1:2	1:1
81 199	1	5.1	1.5	.1	.6	7.3	25.8	5.4	33.1	30.6	13.7	47	22	24			3.9	4.3
81 200	2	.8	.4	.1	.3	1.6	20.5	6.7	22.1	18.9	8.3	81	7	8			4.1	4.7
81 201	3	.2	.1	TR	.1	.4	6.9	1.5	7.3	5.4	1.9	79	5	7			4.6	5.2
81 202	4	.2	.1	TR	.1	.4	4.0	.7	4.4	3.5	1.1	64	9	11			5.0	5.7
81 203	5	.1	.1	TR	TR	.2	3.2	.7	3.4	2.9	.9	78	6	7			5.1	5.7
81 204	6	.0	.0	TR	TR	TR	2.2	.5	2.2	1.4	.5	100	1	1			5.1	5.8

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 4.7 PCT .1-75MM 74.9

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 41
UTM Coordinate: 48-98.7N/5-20.1E
Pedon Classification: Lithic Cryorthent; sandy-skeletal, mixed.
Vegetative Habitat: PPX
Geological Unit: Qpcp
Surficial Unit: R
Parent Material: Rhyolitic tuff - residual.
Topography: Gently sloping. Gradient is 6 percent. South aspect. Convex. Slope length is 45 meters. Elevation is 5835 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 205 0 to 9 cm. Very dark grayish brown (10YR 3/2) gravelly loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable (moist), slightly sticky (wet); many fine and common medium roots; 17 percent pebbles; strongly acid; abrupt wavy boundary.

2B 206 9 to 26 cm. Yellowish brown (10YR 5/6) very gravelly loamy coarse sand; massive: firm; common fine roots; 50 percent pebbles; medium acid; clear wavy boundary.

2CR 26 to 40 cm. Fractured rhyolitic bedrock.

Note: The B horizon contains abundant obsidian fragments and unweathered rhyolitic fragments. The C horizon is fractured rhyolitic bedrock and was not sampled.

PLOT-41

CLASSIFICATION: Lithic Cryorthent, sandy-skeletal, mixed

S 81WY-039 - 2 SAMPLE NOS. 31P 205 - 206 DATE 03/05/86

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1-- TOTAL CLAY LT .002	-2-- TOTAL SILT .002 -.05	-3-- TOTAL SAND .05 -2	-4-- CLAY FINE LT .0002	-5-- CLAY CO3 LT .002	-6-- SILT FINE .002 -.02	-7-- SILT COARSE .02 -.05	-8-- SAND VF .05 -.10	-9-- SAND F .10 -.25	-10- SAND M .25 -.50	-11- SAND C .5 -1	-12- SAND VC 1 -2	-13- COARSE FRACTIONS (MM) WEIGHT 2 -5	-14- COARSE FRACTIONS (MM) WEIGHT 5 -20	-15- COARSE FRACTIONS (MM) WEIGHT 20 -75	-16- COARSE FRACTIONS (MM) WEIGHT .1- 75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
31 205	1S	0- 9	A	10.6	46.6	42.8			27.3	19.3	7.6	9.1	7.9	9.2	9.0	15	11	--	52	26
31 206	2S	9- 26	2B	7.8	9.5	82.7			3.2	6.3	7.6	12.6	14.5	21.7	26.3	28	33	4	91	65

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - - -PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
31 205	1	1.69	.072			.8	.3	TR	.79	.58						--		28.5	20.7	6.1	.18
31 206	2	.09	.011			.6	.2	--	.37	.60						--		13.5	8.0	4.7	.02

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
31 205	1	2.9	.8	TR	.3	4.0	5.8	1.5	9.8	8.4	5.5	27	41	48			4.7	5.5
31 206	2	.8	.2	TR	.1	1.1	3.3	.9	4.4	2.9	2.0	45	25	38			4.7	5.5

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 42
UTM Coordinate: 48-99.6N/5-20.0E
Pedon Classification: Typic Cryorthent; coarse-loamy, mixed.
Vegetative Habitat: PPX
Geological Unit: Qpcp
Surficial Unit: R
Parent Material: Loess over rhyolite.
Topography: Gently sloping. Gradient is 4 percent. Southeast aspect. Concave. Slope length is 50 meters. Elevation is 2680 meters.
Drainage: Moderately well drained.

(All colors are for moist condition unless otherwise stated.)

A 207 0 to 5 cm. Very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry weak fine granular structure; very friable (moist), nonsticky (wet); many fine roots; 3 percent pebbles; very strongly acid; clear smooth boundary.

B 208 5 to 55 cm. Yellowish brown (10YR 5/6) silt loam: weak fine granular structure; friable (moist), slightly sticky (wet); many fine roots; 10 percent pebbles: strongly acid; clear wavy boundary.

2CR 55+ cm. Fractured rhyolitic bedrock.

PLOT 42

CLASSIFICATION: Typic Cryorthent, coarse-loamy, mixed

S 81WY-039 - 3 SAMPLE NOS. 81P 207 - 208 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1R1A, 2A1, 23

MICHIGAN TECHNOLOGICAL UNIV.
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SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-4- (- - -TOTAL - - -) CLAY LT .002	-5- SILT .002 -.05	-6- SAND .05 -2	-7- (- -CLAY- -) FINE LT .0002	-8- CO3 LT .002	-9- (- -SILT- -) FINE .002 -.02	-10- COARSE .02 -.05	-11- (- - - - -SAND- - - - - -) VF .05 -.10	-12- F .10 -.25	-13- M .25 -.50	-14- C .5 -1	-15- VC 1 -2	-16- (-COARSE FRACTIONS(MM)-) WEIGHT 2 -5	-17- 5 -20	-18- 20 -75	-19- .1- 75	(- PC WH
				<- - - -	- - - -	- - -	- - -	PCT	OF <2MM	(3A1)	- - -	- - -	- - -	- - -	- ->	<- PCT	OF	<75MM(3B1)	->	
81 207	1S	0- 5	A	16.9	67.3	15.8			32.2	35.1	3.7	3.4	2.8	3.2	2.7	3	2	--	16	
81 208	2S	5- 55	B	15.6	57.6	26.8			32.2	25.4	5.7	6.3	5.5	5.2	4.1	7	3	5	33	1

SAMPLE NO.	HZN NO.	-1- ORGN C	-2- TOTAL N	-3- EXTR P	-4- TOTAL S	-5- (- - DITH-CIT - -) EXTRACTABLE FE	-6- AL	-7- MN	-8- (RATIO/CLAY) CEC	-9- 15 BAR	-10- (ATTERBERG LIMITS) LL	-11- PI	-12- (- BULK DENSITY -) FIELD MOIST	-13- 1/3 BAR	-14- OVEN DRY	-15- COLE WHOLE SOIL	-16- (- - -WATER CONTENT - -) FIELD MOIST	-17- 1/10 BAR	-18- 1/3 BAR	-19- 15 BAR	WH
		<- - - -	- - -	-PCT	OF <2MM	- - -	- - -	->			PCT	<0.4MM	<- -	G/CC -	- ->	CM/CM	<- -	-PCT	OF <2MM	- ->	CM
81 207	1	7.98	.515			.8	.5	TR	1.41	1.81						--			40.6	30.6	
81 208	2	1.93	.153			1.0	.6	TR	.91	.81						--			23.8	12.6	

SAMPLE NO.	HZN NO.	-1- (- NH4OAC EXTRACTABLE BASES -) CA	-2- MG	-3- NA	-4- K	-5- SUM BASES	-6- ACID- ITY	-7- EXTR AL	-8- (- - - -CEC - - -) SUM CATS	-9- NH4- OAC	-10- BASES + AL	-11- AL SAT	-12- -BASE SUM	-13- SAT- NH4 OAC	-14- CO3 AS CACO3 <2MM	-15- RES. OHMS /CM	-16-	-17-	-18-	-19- (- - - -PH - - CACL2 .01M	H
		<- - - -	- - -	- - -	- - -	-MEQ /	100 G	- - -	- - -	- - -	- ->	<- - -	- -PCT	- - -	->					1:2	1
81 207	1	4.8	1.5	.1	1.3	7.7	25.0	2.5	32.7	23.9	10.2	25	24	32						4.5	
81 208	2	1.3	.3	.1	.1	1.8	18.0	4.4	19.8	14.2	6.2	71	9	13						4.4	

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 43
UTM Coordinate: 49-46.7N/4-93.1E
Pedon Classification: Typic Cryochrept; sandy, mixed.
Vegetative Habitat: 4PO
Geological Unit: Qs
Surficial Unit: ws
Parent Material: Rhyolitic Detritus.
Topography: Nearly level. Gradient is 2 percent. Southwest aspect. Planar. Elevation is 2030 meters.
Drainage: Somewhat excessively drained.

(All colors are for moist condition unless otherwise stated.)

A 209 0 to 4 cm. Very dark gray (10YR 3/1) loamy coarse sand, gray (10YR 5/1) dry; weak fine granular structure; friable; many fine roots; 14 percent pebbles; medium acid; abrupt smooth boundary.

Bw1 210 4 to 14 cm. Dark grayish brown (10YR 4/2) coarse sandy loam; yellowish brown (10YR 5/4) dry; weak fine granular structure; friable; many fine, common medium, and few coarse roots; 14 percent pebbles; medium acid; clear smooth boundary.

Bw2 211 14 to 42 cm. Brown (10YR 4/3) coarse sandy loam; pale brown (10YR 6/3) dry; moderate medium and coarse subangular blocky structure; very friable; common fine and few medium roots; 12 percent pebbles; medium acid; abrupt smooth boundary.

2C 212 42 to 110 cm. Gray (10YR 5/1) gravelly coarse sand; massive; very friable; few fine roots; 23 percent pebbles; slightly acid.

Note: Abundant obsidian fragments were present throughout the profile.

PLOT 43

CLASSIFICATION: Typic Cryochrept, sandy, mixed

S 81MT-031 - 1 SAMPLE NOS. 31P 209 - 212 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

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SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1- CLAY LT .002	-2- SILT .002-.05	-3- SAND .05-2	-4- FINE CLAY LT .0002	-5- CO3 CLAY LT .002	-6- FINE SILT .002-.02	-7- COARSE SILT .02-.05	-8- VF SAND .05-.10	-9- F SAND .10-.25	-10- M SAND .25-.50	-11- C SAND .5-1	-12- VC SAND 1-2	-13- 2-5	-14- 5-20	-15- 20-75	-16- .1-75	-17- PCT OF WHOLE SOIL
				<- - PCT OF <2MM (3A1)											->	<- PCT OF <75MM(351)			->	(>2MM) WT
81 209	1S	0- 4	A	4.8	10.9	84.3			4.3	6.6	2.4	9.0	18.2	28.4	26.2	16	5	--	36	21
81 210	2S	4- 14	Bw1	6.4	24.4	69.2			12.0	12.4	2.9	8.2	17.9	19.9	20.3	16	5	1	74	22
81 211	3S	14- 42	Bw2	5.0	19.7	75.3			11.0	8.7	3.7	13.3	20.3	22.3	15.8	14	4	--	77	18
81 212	4S	42-110	2C	2.3	3.9	93.8			1.8	2.1	1.9	11.7	28.3	30.3	21.6	22	12	--	95	34

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	(RATIO/CLAY) CEC	(RATIO/CLAY) 15 BAR	(ATTERBERG LIMITS) LL	(ATTERBERG LIMITS) PI	(BULK DENSITY) FIELD MOIST	(BULK DENSITY) 1/3 BAR	(BULK DENSITY) OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	(WATER CONTENT) 1/10 BAR	(WATER CONTENT) 1/3 BAR	(WATER CONTENT) 15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM						->			PCT <0.4MM		<- G/CC		->	CM/CM	<- PCT OF <2MM			->	CM/CM
81 209	1	3.23	.208			.5	.2	TR	2.06	2.25						--		20.4	13.1	10.8	.03
81 210	2	.64	.035			.6	.2	.1	1.06	.86						--		17.7	12.2	5.5	.08
81 211	3		.035			.5	.1	TR	.84	.84						--		13.2	8.0	4.2	.05
81 212	4					.4		TR	.78	1.22						--		5.4		2.8	.03

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	PH H2O 1:1
		<- MEQ / 100 G									->	<- PCT			->			
81 209	1	5.7	.9	.1	.3	7.0	6.3	.4	13.3	9.9	7.4	5	53	71			5.1	5.6
81 210	2	3.4	.7	TR	.2	4.3	4.4	.7	8.7	6.8	5.0	14	49	63			4.8	5.7
81 211	3	2.7	.7	TR	.1	3.5	1.5	.5	5.0	4.2	4.0	13	70	83			5.0	6.0
81 212	4	1.2	.3	TR	.1	1.6	.0	.2	1.6	1.8	1.8	11	100	89			5.3	6.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 44
UTM Coordinate: 49-22.5N/4-93.1E
Pedon Classification: Dystric Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qpcl
Surficial Unit: bt
Parent Material: Rhyolitic till.
Topography: Nearly level. Gradient is 2 percent. South aspect. Convex. Slope length is 500 meters.
Drainage: Moderately well drained.

(All colors are for moist condition unless otherwise stated.)

A 213 0 to 7 cm. Very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine and common medium roots; 11 percent pebbles; extremely acid; clear smooth boundary.

Bw1 214 7 to 20 cm. Dark brown (10YR 3/3) silt loam; moderate medium subangular blocky structure; friable; many fine, common medium and common coarse roots; 11 percent pebbles; very strongly acid; clear smooth boundary.

Bw2 215 20 to 44 cm. Yellowish brown (10YR 5/6) gravelly sandy loam; moderate medium subangular blocky structure; firm; few fine roots; 27 percent pebbles; strongly acid; clear smooth boundary.

BC 44 to 53 cm. Yellowish brown (10YR 5/6) gravelly sandy loam; massive; firm; 25 percent pebbles; strongly acid; clear irregular boundary.

2C1 216 53 to 67 cm. Light olive brown (2.5Y 5/4) gravelly coarse sandy loam; massive; very firm; 23 percent pebbles; strongly acid; abrupt wavy boundary.

3C2 217 67 to 112 cm. Strong brown (7.5YR 5/6) loam; massive to strong medium columnar structure; very firm; 16 percent pebbles; strongly acid.

Note: The BC horizon was not sampled. The C horizon contains compacted sand lenses. No roots observed below 67 cm.

PLOT 44

CLASSIFICATION: Dystric Cryochrept, coarse-loamy, mixed

S 81ID-000 - 1 SAMPLE NOS. 81P 213 - 217 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 23

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
81 213	1S	0- 7	A	15.6	59.3	25.1			32.7	26.6	8.5	5.4	3.0	4.1	4.1	10	6	1	31	17
81 214	2S	7- 20	Bw1	13.5	53.7	32.8			27.0	26.7	10.1	7.3	4.6	5.5	5.2	11	5	--	35	16
81 215	3S	20- 44	Bw2	10.2	35.5	54.3			23.6	11.9	13.0	10.7	8.1	9.9	12.6	16	16	8	65	45
81 216	4S	53- 67	2C1	3.7	30.0	66.3			12.8	17.2	13.7	12.2	11.5	15.4	13.6	20	12	3	69	55
81 217	5S	67-110	3C2	15.3	48.7	36.0			29.1	19.6	9.4	8.9	7.3	6.6	3.9	12	10	3	45	25

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - - PCT OF <2MM - - ->				CM/CM
81 213	1	5.05	.196						1.54	1.35						--			22.4	21.0	.02
81 214	2	1.39	.083			1.1	.6	TR	1.16	.79						--			21.0	10.7	.14
81 215	3	.37	.056			.8	.3	TR	.81	.66						--			13.6	6.7	.07
81 216	4	.13				.5	.2	TR	1.14	1.00						--			9.1	3.7	.06
81 217	5								.76	.54						--			20.2	8.3	.15

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - MEQ / 100 G - - - - - - - - - - ->										<- - - - PCT - - - ->					1:2	1:1
81 213	1	1.5	.4	.1	.8	2.8	21.3	6.6	24.1	24.1	9.4	70	12	12			4.3	4.4
81 214	2	1.1	.5	.1	.5	2.2	16.6	3.9	18.8	15.6	6.1	64	12	14			4.6	5.0
81 215	3	.8	.3	TR	.3	1.4	8.5	3.2	9.9	8.3	4.6	70	14	17			4.5	5.1
81 216	4	.5	.2	TR	.2	.9	4.5	1.3	5.4	4.2	2.2	59	17	21			4.7	5.4
81 217	5	2.6	1.0	.1	.4	4.1	9.0	3.7	13.1	11.6	7.8	47	31	35			4.3	5.3

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 10.0 PCT .1-75MM 49.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 45
UTM Coordinate: 49-27.6N/4-92.8E
Pedon Classification: Dystic Cryochrept: sandy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qpcy
Surficial Unit: yr
Parent Material: Colluvium.
Topography: Gently sloping. Gradient is 7 percent. South aspect. Convex. Slope length is 500 meters. Elevation is 2490 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 218 0 to 2 cm. Very dary gray (10YR 3/1) sandy loam, yellowish brown (10YR 5/4) dry; weak fine granular structure; friable; many fine roots; 12 percent pebbles; strongly acid; abrupt smooth boundary.

Bt 219 2 to 15 cm. Dark yellowish brown (10YR 3/4) loam, pale brown (10YR 6/3) dry: weak fine granular structure; very friable; many fine, many medium and few coarse roots; 4 percent pebbles; strongly acid; abrupt smooth boundary.

2C 220 15 to 122 cm. Yellowish brown (10YR 5/6) sand, very pale brown (10YR 7/4) dry; massive; very friable; few fine and few medium roots; medium acid.

PLOT 45

CLASSIFICATION: Dystric Cryochrept, sandy, mixed

S S1MT-031 - 2 SAMPLE NOS. 81P 218 - 220 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

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-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .002	CLAY CO3 LT .002	SILT FINE .002-.05	SILT COARSE .05-.10	SAND VF .10-.25	SAND F .25-.50	SAND M .50-1	SAND C 1-2	SAND VC 2-5	COARSE FRACTIONS (MM) WEIGHT 5-20	COARSE FRACTIONS (MM) WEIGHT 20-75	COARSE FRACTIONS (MM) WEIGHT .1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->			
81 218	1S	0- 2	A	7.7	37.6	54.7			16.9	20.7	7.3	11.8	15.2	13.4	7.1	10	8	--	57	18
81 219	2S	2- 15	Bt	10.4	43.3	46.3			27.9	15.4	6.8	11.4	12.9	10.6	4.5	4	2	--	43	6
81 220	3S	15-122	2C	2.3	10.6	87.1			3.6	7.0	16.2	32.5	24.6	10.9	2.8	TR	--	--	71	--

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR TOTAL P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC	15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - - ->				CM/CM
81 218	1	5.07	.258			.6	.2	TR	2.27	2.03						--			22.2	15.6	.08
81 219	2	1.31	.069			.8	.3	.1	1.15	.76						--			20.3	7.9	.17
81 220	3					.2	.2	--	1.04	1.43						--		14.4		3.3	.16

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
81 218	1	4.0	.9	TR	.6	5.5	15.0	1.8	20.5	17.5	7.3	25	27	31			4.5	5.1
81 219	2	2.8	.8	.1	.4	4.1	11.7	2.0	15.8	12.0	6.1	33	26	34			4.6	5.2
81 220	3	.2	.1	TR	.2	.5	4.0	.4	4.5	2.4	.9	44	11	21			5.4	5.9

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 46
UTM Coordinate: 49-87.2N/4-93.6E
Pedon Classification: Lithic Cryoboralf; loamy-skeletal, mixed.
Vegetative Habitat: 2F0
Geological Unit: Tsd
Surficial Unit: co
Parent Material: Colluvium.
Topography: Moderately steep. Gradient is 25 percent. Northwest aspect. Convex. Slope length is 2000 meters. Elevation is 2465 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 3 to 0 cm. Decomposed pine needles; abrupt wavy boundary.

A 221 0 to 8 cm. Very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; many fine, many medium and many coarse roots; 25 percent pebbles; medium acid; clear wavy boundary.

E 222 8 to 27 cm. Brown (10YR 4/3) gravelly loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine, common medium and few coarse roots; 27 percent pebbles; medium acid; abrupt wavy boundary.

Bt 223 27 to 40 cm. Yellowish brown (10YR 5/4) gravelly sandy clay loam; moderate fine subangular blocky structure; firm; few fine and few coarse roots; few thin clay skins on faces of peds; 29 percent pebbles, 5 percent cobbles; slightly acid.

Note: Soil below 40 cm. was not described due to the presence of an impenetrable rock layer.

PLOT 46

CLASSIFICATION: Lithic Cryoboralf, loamy-skeletal, mixed

S 81MT-031 - 3 SAMPLE NOS. 81P 221 - 223 DATE 03/05/86

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L ANSE, MICHIGAN

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS (MM) WEIGHT 2-5	5-20	20-75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1) ->												<- PCT OF <75MM (3B1) ->			
81 221	1S	0- 8	A [	11.9	43.7	44.4			26.2	17.5	8.5	8.4	9.0	8.9	9.6	13	18	6	66	37
81 222	2S	8- 27	E	13.1	35.1	51.8			21.1	14.0	9.3	12.1	11.1	9.2	10.1	15	18	7	65	40
81 223	3S	27- 40	Bt	25.5	24.8	49.7			17.0	7.8	3.8	10.3	11.7	12.1	11.9	20	25	--	75	49

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - - PCT OF <2MM - ->				CM/CM
81 221	1	1.29	.017			.6	.2	.1	1.33	.83						--			22.1	9.9	.13
81 222	2	.82	.041			.8	.2	TR	1.06	.70						--			19.0	9.2	.14
81 223	3	.53				.8	.2	TR	.82	.56						--			24.1	14.2	.10

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT-NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - ->										<- - - - PCT - - - ->					1:2	1:1
81 221	1	7.2	1.8	TR	1.1	10.1	10.7	.8	20.8	15.8	10.9	7	49	64			5.2	5.8
81 222	2	7.3	2.1	TR	.8	10.2	7.7	.9	17.9	13.9	11.1	8	57	73			5.1	5.9
81 223	3	13.2	4.6	.1	.7	18.6	6.4	.7	25.0	21.0	19.3	4	74	89			5.2	6.1

FAMILY CONTROL SECTION: DEPTH 25- 40 PCT CLAY 23.8 PCT .1-75MM 69.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 47
UTM Coordinate: 49-73.6N/4-96.8E
Pedon Classification: Typic Cryochrept; fine-loamy, mixed.
Vegetative Habitat: 2FO
Geological Unit: Qs
Surficial Unit: pt
Parent Material: Glacial till.
Topography: Steep. Gradient is 32 percent. Northwest aspect. Convex. Elevation is 2325 meters.
Drainage: Moderately well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 8 to 0 cm. Decomposed litter; many fine, many medium and few coarse roots; abrupt wavy boundary.

A 224 0 to 9 cm. Dark brown (10YR 3/3) gravelly loam, brown (10YR 5/3) dry weak fine granular structure; friable; many fine, common medium and few coarse roots; 19 percent pebbles; strongly acid; clear wavy boundary.

Bw 225 9 to 28 cm. Yellowish brown (10YR 5/4) gravelly loam; weak medium subangular blocky structure; very friable; common fine and common medium roots; 19 percent pebbles; medium acid; clear wavy boundary.

C 226 28 to 55 cm. Strong brown (7.5YR 5/6) gravelly sandy loam; massive; friable; few fine and few medium roots; 24 percent pebbles, 5 percent cobbles; neutral.

PLOT 47

CLASSIFICATION: Typic Cryochrept, fine-loamy, mixed

S 81WY-029 - 1 SAMPLE NOS. 81P 224 - 226 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 23

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
	(- - -TOTAL - - -)			(- -CLAY- -)		(- -SILT- -)			(- - - - - -SAND- - - - - -)						(-COARSE FRACTIONS(MM)-)					(>2MM)
SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	CLAY LT .002 <-	SILT .002 -.05	SAND -2	FINE LT .0002	CO3 LT .002	FINE .002 -.02	COARSE -.05	VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2	WEIGHT 2 -5	5 -20	20 -75	.1- 75 (3B1)->	WT PCT OF WHOLE SOIL
				PCT OF <2MM (3A1) - - - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
81 224	1S	0- 9	A	14.9	48.8	36.3			33.6	15.2	9.7	9.7	5.6	5.9	5.3	9	13	7	48	29
81 225	2S	9- 28	Bw	15.0	39.0	46.0			23.4	15.6	10.0	11.3	7.9	8.7	8.1	9	14	6	55	29
81 226	3S	28- 55	C	18.6	28.5	52.9			17.2	11.3	10.5	15.9	9.9	10.8	5.8	10	14	12	63	36

		ORGN C	TOTAL N	EXTR P	TOTAL S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG) - LIMITS - LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
SAMPLE NO.	HZN NO.	<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - - ->				CM/CM
81 224	1	2.01	.049			1.1	.4	TR	1.19	.75						--			23.7	11.2	.15
81 225	2	.95	.034			1.0	.3	TR	.95	.62						--			20.6	9.3	.13
81 226	3					1.0	.2	TR	.72	.50						--			19.2	9.3	.11

		(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID- ITY	EXTR AL	(- - - CEC - - -) SUM CATS	NH4- OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - - -) CACL2 .01M	H2O
SAMPLE NO.	HZN NO.	<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
81 224	1	4.1	1.0	.1	.4	5.6	18.3	5.1	23.9	17.8	10.7	48	23	31			4.5	5.3
81 225	2	5.7	1.3	.1	.3	7.4	10.6	2.4	18.0	14.3	9.3	24	41	52			4.9	5.6
81 226	3	14.3	4.4	TR	.3	19.0	.0	.2	19.0	13.4	19.2	1	100	100			6.8	7.3

FAMILY CONTROL SECTION: DEPTH 25- 55 PCT CLAY 18.2 PCT .1-75MM 62.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 48
UTM Coordinate: 49-41.0N/5-00.2E
Pedon Classification: Lithic Cryochrept; loamy-skeletal, mixed.
Vegetative Habitat: 2LG
Geological Unit: Qyl
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Nearly level. Gradient is 3 percent. West aspect. Elevation is 2245 meters.
Drainage: Moderately well drained.

(All colors are for moist condition unless otherwise stated).

Oa 2 to 0 cm. Litter; abrupt smooth boundary.

A 0 to 2 cm. Dark brown (10R 3/3) silt loam, brown (10YR 5/3) dry; weak very fine granular structure; firm; many fine roots; very strongly acid; abrupt smooth boundary.

Bw 227 2 to 10 cm. Brown (10YR 4/3) gravelly silt loam, yellowish brown (10YR 5/4) dry; moderate fine subangular blocky structure; friable; many medium, common fine, and few coarse roots; 26 percent pebbles; medium acid; clear smooth boundary.

BC 228 10 to 27 cm. Dark yellowish brown (10YR 4/4) gravelly silt loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky and fine blocky structure; firm; few fine and medium roots; 30 percent pebbles; medium acid; gradual smooth boundary.

C 229 27 to 44 cm. Yellowish brown (10YR 5/4) very gravelly loam, very pale brown (10YR 7/3) dry; massive; firm; few medium roots; 36 percent pebbles; medium acid; abrupt wavy boundary.

R 44+ cm. Rhyolitic bedrock.

Note: The A horizon was not sampled.

PLOT 48

CLASSIFICATION: Lithic Cryochrept, loamy-skeletal, mixed

S 81WY-039 - 4 SAMPLE NOS. 81P 227 - 229 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

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-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS (MM) WEIGHT 2-5	5-20	20-75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
81 227	1S	2- 10	BW	10.8	55.5	33.7			27.7	27.8	8.8	4.6	4.4	7.2	8.7	26	11	2	54	39
81 228	2S	10- 27	BC	8.3	50.2	41.5			25.3	24.9	9.3	6.0	6.3	10.4	9.4	29	11	3	61	43
81 229	3S	27- 44	C	10.1	46.7	43.2			22.6	24.1	9.3	5.5	6.0	9.5	12.9	30	19	3	68	52

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
81 227	1	.97	.055			.7	.1	.1	1.02	.61						--					
81 228	2	.34	.023			.7	.1	TR	1.10	.61						--			21.2	6.6	.16
81 229	3					.6	.1	TR	.71	.51						--			17.2	5.1	.13
																			17.1	5.2	.11

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->									<- - - - -PCT - - - ->					1:2	1:1
81 227	1	4.9	1.3	TR	.6	6.8	5.7	.7	12.5	11.0	7.5	9	54	62			
81 228	2	3.9	1.0	TR	.3	5.2	3.6	.7	8.8	9.1	5.9	12	59	57			5.1	6.0
81 229	3	4.3	1.1	TR	.3	5.7	2.7	.7	8.4	7.2	6.4	11	68	79			5.0	6.0
																	5.0	6.0

FAMILY CONTROL SECTION: DEPTH 25- 44 PCT CLAY 9.9 PCT .1-75MM 67.7

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 49
UTM Coordinate: 49-54.5N/5-40.7E
Pedon Classification: Dystric Cryochrept, sandy, mixed.
Vegetative Habitat: 2LL
Geolgical Unit: Qpu
Surficial Unit: pt
Parent Material: Rhyolitic bedrock.
Topography: Gently sloping. Gradient is 4 percent. South aspect. Convex. Slope length is 75 meters. Elevation is 2440 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 230 0 to 4 cm. Very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry: weak fine granular structure; friable; many fine, common medium and few coarse roots; 7 percent coarse fragments; strongly acid; abrupt smooth boundary.

Bw 231 4 to 22 cm. Yellowish brown (10YR 5/4) gravelly coarse sandy loam: weak medium subangular blocky structure; friable; many fine and medium and few coarse roots; 17 percent pebbles; strongly acid; abrupt wavy boundary.

BC 232 22 to 43 cm. Brown (10YR 5/3) gravelly loamy sand; single grained; very friable; few fine and few medium roots; 16 percent pebbles; abundant obsidian; medium acid: abrupt wavy boundary.

2Cr 233 43 to 80 cm. Black (10YR 2/1) gravelly coarse sand containing yellowish red (5YR 5/6) clay films; massive; very friable; 16 percent pebbles; abundant obsidian: slightly acid.

PLOT 49

CLASSIFICATION: Dystric Cryochrept, sandy, mixed

S 81WY-029 - 2 SAMPLE NOS. 81P 230 - 233 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS (MM) WEIGHT 2-5	5-20	20-75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<-- PCT OF <2MM (3A1) -->												<- PCT OF <75MM (3B1) ->				
81 230	1S	0- 4	A	10.7	40.3	49.0			24.3	16.0	7.4	14.2	8.5	9.3	9.7	5	6	--	48	11
81 231	2S	4- 22	Bw	7.6	32.5	59.9			20.4	12.1	7.0	16.0	8.6	10.3	17.9	15	10	1	65	26
81 232	3S	22- 43	BC	4.1	13.4	82.5			8.3	5.1	10.0	34.4	16.7	10.5	10.9	17	6	2	79	25
81 233	4S	43- 80	2Cr	1.4	4.0	94.6			2.3	1.7	5.4	34.6	13.2	14.7	26.7	24	TR	--	92	24

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
81 230	1	12.1	.27			.7	.3	.2	3.46	2.63						--			47.0	28.1	.26
81 231	2	1.42	.066			.7	.4	.1	1.55	1.05						--			20.3	8.0	.15
81 232	3	.38	.012			.2	.2	--	.95	.88						--		14.7	8.8	3.6	.06
81 233	4					.2	.1	--	.93	1.36						--		6.0		1.9	.05

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- MEQ / 100 G ->										<- PCT ->					1:2	1:1
81 230	1	9.5	1.3	TR	.7	11.5	32.9	3.1	44.4	37.0	14.6	21	26	31			4.7	5.2
81 231	2	1.0	.3	TR	.3	1.6	14.3	2.6	15.9	11.8	4.2	62	10	14			4.5	5.5
81 232	3	.8	.2	TR	.2	1.2	4.4	.9	5.6	3.9	2.1	43	21	31			4.8	5.8
81 233	4	.3	.2	TR	.1	.6	.4	.2	1.0	1.3	.8	25	60	46			5.2	6.2

FAMILY CONTROL SECTION: DEPTH 25- 40 PCT CLAY 4.6 PCT .1-75MM 76.6

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 50
UTM Coordinate: 49-61.7N/5-44.3E
Pedon Classification: Typic Cryoboroll: loamy-skeletal, mixed.
Vegetative Habitat: FNG
Geological Unit: Tlr
Surficial Unit: R
Parent Material: Andesitic till veneer.
Topography: Steep. Gradient is 39 percent. Northwest aspect. Convex. Slope length is 1500 meters. Elevation is 2680 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A1 234 0 to 13 cm. Very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 4/3) dry; weak fine granular structure; friable; many fine and many medium roots; 21 percent pebbles; slightly acid; clear wavy boundary.

A2 235 13 to 22 cm. Very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 4/3) dry; moderate medium granular structure; friable; many fine and many medium roots; 27 percent pebbles; slightly acid; clear wavy boundary.

Bw 236 22 to 45 cm. Dark brown (10YR 3/3) very gravelly loam, dark yellowish brown (10YR 4/4) dry; weak fine granular structure; friable; many fine and common medium roots; 48 percent pebbles, 20 percent cobbles; slightly acid.

Note: This pedon was not described below 45 cm. due to rockiness.

PLOT 50

CLASSIFICATION: Typic Cryoboroll, loamy-skeletal, mixed

S 81WY-029 - 3 SAMPLE NOS. 81P 234 - 236 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1- TOTAL CLAY LT .002	-2- TOTAL SILT .002-.05	-3- TOTAL SAND .05-2	-4- CLAY FINE LT .0002	-5- CLAY CO3 LT .002	-6- SILT FINE .002-.02	-7- SILT COARSE .02-.05	-8- SAND VF .05-.10	-9- SAND F .10-.25	-10- SAND M .25-.50	-11- SAND C .5-1	-12- SAND VC 1-2	-13- COARSE FRACTIONS (MM) WEIGHT 2-5	-14- 5-20	-15- 20-75	-16- .1-75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1) ->												<- PCT OF <75MM(3B1) ->				
81 234	1S	0- 13	A11	20.3	39.3	40.4			21.8	17.5	9.8	7.3	6.0	8.5	8.8	9	14	8	52	31
81 235	2S	13- 22	A22	20.6	37.3	42.1			18.7	18.6	10.4	7.8	6.6	8.5	8.9	8	9	23V	59	40
81 236	3S	22- 45	BW	16.6	32.0	51.4			11.7	20.3	16.1	11.8	8.4	7.9	7.2	3	12	57V	82	80

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
81 234	1	4.40	.347			1.0	.2	.1	1.49	1.02										20.7	
81 235	2	3.04	.219			1.0	.2	.1	1.36	.85										17.6	
81 236	3	1.63	.156			1.0	.2	.1	2.02	1.06										17.6	

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	PH H2O 1:1
		<- MEQ / 100 G ->										<- PCT ->						
81 234	1	18.7	6.2	TR	1.7	26.6	7.2	.2	33.8	30.3	26.8	1	79	88			5.9	6.4
81 235	2	17.6	6.5	.1	1.4	25.6	7.5	.2	33.1	28.1	25.8	1	77	91			5.8	6.2
81 236	3	21.4	9.5	.1	1.2	32.2	2.5	.2	34.7	33.5	32.4	1	93	96			5.8	6.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No.: 51
UTM Coordinate: 49-24.7N/5-35.4E
Pedon Classification: Typic Cryochrept; sand, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qs
Surficial Unit: pl
Parent Material: Lake sediments.
Topography: Gently sloping. Gradient is 8 percent. West aspect. Convex. Slope length is 45 meters. Elevation is 2375 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 237 0 to 4 cm. Black (10YR 2/1) coarse sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many fine and common medium roots; 13 percent coarse fragments; medium acid; abrupt smooth boundary.

Bw 238 4 to 21 cm. Brown (10YR 4/3) coarse sandy loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; very friable; many fine, many medium and few coarse roots; 12 percent pebbles; strongly acid; abrupt smooth boundary.

2BC 239 21 to 55 cm. Dark grayish brown (2.5Y 4/2) coarse sand, gray (10YR 5/1) dry; weak very fine granular structure; very friable; common fine and few medium roots; 13 percent coarse fragments; medium acid; clear smooth boundary.

2C 240 55 to 150 cm. Dark gray (2.5Y 4/0) coarse sand, gray (10YR 5/1) dry; single grained; loose; few fine roots; 11 percent pebbles; slightly acid.

PLOT 51

CLASSIFICATION: Typic Cryochrept, sandy, mixed

S 81WY-039 - 5 SAMPLE NOS. 81P 237 - 240 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1-- TOTAL CLAY LT .002	-2-- TOTAL SILT .002 -.05	-3-- TOTAL SAND .05 -2	-4-- CLAY FINE LT .0002	-5-- CLAY CO3 LT .002	-6-- SILT FINE .002 -.02	-7-- SILT COARSE .02 -.05	-8-- SAND VF .05 -.10	-9-- SAND F .10 -.25	-10- SAND M .25 -.50	-11- SAND C .5 -1	-12- SAND VC 1 -2	-13- COARSE FRACTIONS(MM) WEIGHT 2 -5	-14- COARSE FRACTIONS(MM) WEIGHT 5 -20	-15- COARSE FRACTIONS(MM) WEIGHT 20 -75	-16- COARSE FRACTIONS(MM) WEIGHT .1- 75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
81 237	1S	0- 4	A	6.1	22.6	71.3			10.6	12.0	5.8	13.6	19.1	18.0	14.3	14	5	--	72	19
81 238	2S	4- 21	Bw	7.4	18.7	73.9			9.7	9.0	6.6	18.4	22.5	15.1	11.4	11	5	2	73	18
81 239	3S	21- 55	2BC	2.7	5.2	92.1			5.0	.2	6.1	25.2	30.2	20.4	10.2	12	4	4	89	20
81 240	4S	55-150	2C	1.4	2.5	96.1			1.8	.7	3.7	24.8	31.5	22.1	14.0	14	3	--	94	17

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - - -PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
81 237	1	4.04	.202			.4	.2	.1	3.21	1.62						--		32.4	19.5	9.9	.12
81 238	2	.55	.031			.3	.1	--	.91	.51						--		15.7	10.0	3.8	.08
81 239	3	.21	.005			.3	.1	--	1.56	1.00						--		6.9	4.7	2.7	.03
81 240	4					.2	TR	--	2.07	1.36						--		5.2		1.9	.04

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
81 237	1	8.5	1.4	TR	3.2	13.1	13.1	.4	26.2	19.6	13.5	3	50	67			5.6	5.8
81 238	2	3.0	.8	.1	.5	4.4	3.6	1.3	8.0	6.7	5.7	23	55	66			4.8	5.1
81 239	3	2.5	.8	TR	.2	3.5	.9	.7	4.4	4.2	4.2	17	80	83			5.1	6.0
81 240	4	2.0	.7	.1	.2	3.0	.0	.4	3.0	2.9	3.4	12	100	100			5.5	6.4

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 1.9 PCT .1-75MM 91.7

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 52
UTM Coordinate: 49-34.1N/5-56.9E
Pedon Classification: Typic Cryochrept; fine-loamy, mixed.
Vegetative Habitat: 2FO
Geological Unit: Qs
Surficial Unit: pt
Parent Material: Andesitic till modified by hydrothermal explosion.
Topography: Gently sloping. Gradient is 5 percent. North aspect. Convex. Slope length is 250 meters. Elevation is 2440 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 6 to 0 cm. Well decomposed lodgepole pine and engelmann spruce litter; many fine, many medium and few coarse roots; abrupt smooth boundary.

A 241 0 to 6 cm. Dark grayish brown (10YR 4/2) clay loam, light gray (10YR 7/2) dry; weak very fine granular structure; very friable; many fine and few coarse roots; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

Bw 242 6 to 23 cm. Dark brown (10YR 3/3) loam; pale brown (10YR 6/3) dry; moderate medium subangular blocky and fine granular structure; friable; common fine, common medium and few coarse roots; 12 percent pebbles; strongly acid; clear wavy boundary.

C1 243 23 to 39 cm. Pale yellow (2.5Y 7/4) loam, white (2.5Y 8/2) dry; moderate very fine granular structure; firm; few fine roots; 9 percent pebbles; medium acid; abrupt wavy boundary.

C2 244 39 to 100 cm. Brown (10YR 5/3) gravelly clay loam; strong coarse subangular blocky structure; very firm; few fine roots; 20 percent pebbles; includes small silt stones, hydrothermal rock fragments; medium acid.

PLOT 52

CLASSIFICATION: Typic Cryochrept, fine-loamy, mixed

S 81WY-029 - 4 SAMPLE NOS. 81P 241 - 244 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1- CLAY LT .002	-2- SILT .002-.05	-3- SAND .05-2	-4- CLAY FINE LT .0002	-5- CLAY CO3 LT .002	-6- SILT FINE .002-.02	-7- SILT COARSE .02-.05	-8- SAND VF .05-.10	-9- SAND F .10-.25	-10- SAND M .25-.50	-11- SAND C .5-1	-12- SAND VC 1-2	-13- COARSE FRACTIONS(MM) WEIGHT 2-5	-14- 5-20	-15- 20-75	-16- .1-75	-17- PCT WHO SC (>2)
				<- - - PCT OF <2MM (3A1)											->	<- PCT OF <75MM(3B1)			->	
81 241	1S	0- 6	A	30.2	34.9	34.9			18.0	16.9	7.0	5.8	5.7	7.7	8.8	12	10	--	44	22
81 242	2S	6- 23	BW	16.5	46.9	36.6			29.3	17.6	8.1	6.8	6.4	8.6	6.7	11	6	1	41	18
81 243	3S	23- 39	C1	18.6	45.8	35.6			30.2	15.6	9.1	8.2	6.7	6.6	5.0	9	4	--	36	13
81 244	4S	39-100	C2	32.9	42.3	24.3			27.3	14.5	4.8	4.4	3.9	6.2	5.5	19	9	2	44	30

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WHC SC
		<- - - PCT OF <2MM						->			PCT <0.4MM		<- - G/CC		->	CM/CM	<- - PCT OF <2MM			->	CM/
81 241	1	2.58	.077			.9	.2	--	.58	.35						--			28.9	10.7	.
81 242	2	1.50	.061			.9	.2	--	.79	.59						--			25.4	9.8	.
81 243	3					1.0	.2	TR	.53	.54						--			23.2	10.0	.
81 244	4								.64	.53						--			31.0	17.5	.

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	PH H2O 1:
		<- - - MEQ / 100 G									->	<- - - PCT		->				
81 241	1	5.9	1.3	.1	.4	7.7	12.5	2.3	20.2	17.5	10.0	23	38	44			4.6	.
81 242	2	4.9	1.1	TR	.4	6.4	8.6	2.0	15.0	13.0	8.4	24	43	49			4.7	
81 243	3	4.5	2.0	TR	.3	6.8	4.4	1.3	11.2	9.8	8.1	16	61	69			4.7	
81 244	4	13.8	5.8	.1	.5	20.2	4.6	.9	24.8	21.1	21.1	4	81	96			4.9	

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 30.2 PCT .1-75MM 42.5

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 53
UTM Coordinate: 49-76.8N/5-71.0E
Pedon Classification: Entic Cryumbrept; loamy-skeletal over fragmental, mixed.
Vegetative Habitat: 5NO
Geological Unit: Tlr
Surficial Unit: pt
Parent Material: Andesitic rubble veneer.
Topography: Steep. Gradient is 52 percent. West aspect. Slightly convex. Slope length is 750 meters. Elevation is 2560 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 7 to 0 cm. Well decomposed litter; abrupt smooth boundary.

A1 245 0 to 6 cm. Very dark grayish brown (10YR 3/2) cobbly silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; very friable; many fine, many medium and common coarse roots; 13 percent pebbles, 15 percent cobbles; strongly acid; clear wavy boundary.

A2 246 6 to 52 cm. Very dark brown (10YR 2/2) very cobbly silt loam, dark brown (10YR 4/3) dry; weak fine granular structure; friable; many medium, common fine and common coarse roots; 20 percent pebbles, 20 percent cobbles; medium acid.

Note: This pedon was not sampled below 52 cm. due to the presence of large rocks.

PLOT 53

CLASSIFICATION: Entic Cryumbrept, loamy-skeletal over fragme

S 81WY-029 - 5 SAMPLE NOS. 81P 245 - 246 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1-- TOTAL CLAY LT .002	-2-- TOTAL SILT .002 -.05	-3-- TOTAL SAND .05 -2	-4-- CLAY FINE LT .0002	-5-- CLAY CO3 LT .002	-6-- SILT FINE .002 -.02	-7-- SILT COARSE .02 -.05	-8-- SAND VF .05 -.10	-9-- SAND F .10 -.25	-10- SAND M .25 -.50	-11- SAND C .5 -1	-12- SAND VC 1 -2	-13- COARSE FRACTIONS(MM) WEIGHT 2 -5	-14- 5 -20	-15- 20 -75	-16- .1- 75
				<- - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->			
81 245	1S	0- 6	A1	10.5	58.9	30.6			31.0	27.9	10.8	7.8	5.0	3.9	3.1	5	20	17	53
81 246	2S	6- 52	A2	8.6	59.5	31.9			32.3	27.2	11.0	7.8	5.3	4.3	3.4	5	11	28	56

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR
		<- - - - - - - PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->			
81 245	1	2.88	.127			1.4	.7	TR	3.48	1.51						--			34.2	15.9
81 246	2	2.47	.112			1.5	.7	TR	3.67	1.60						--			31.8	13.8

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M
		<- - - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2
81 245	1	9.4	2.6	.1	2.0	14.1	23.4	4.6	37.5	36.5	18.7	25	38	39			4.5
81 246	2	10.4	2.6	.1	2.0	15.1	24.2	3.6	39.3	31.6	13.7	19	38	48			4.8

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 54
UTM Coordinate: 49-78.0N/5-71.8E
Pedon Classification: Lithic Cryorthent; coarse-loamy, mixed.
Vegetative Habitat: FNG
Geological Unit: Tlr
Surficial Unit: R
Parent Material: Conglomerate and andesitic bedrock.
Topography: Gently sloping. Gradient is 8 percent. South aspect. Convex. Slope length is 500 meters. Elevation is 2680 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

AC 247 0 to 12 cm. Dark brown (10YR 3/3) loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; friable; common fine roots; 12 percent pebbles; slightly acid; abrupt irregular boundary.

R 12+ cm. Conglomerate and andesitic bedrock.

PLOT 54

CLASSIFICATION: Lithic Cryorthent, coarse-loamy, mixed

S 81WY-029 - 6 SAMPLE NOS. 81P 247 - 247 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

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-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRAGMENTS (MM) WEIGHT 2-5	5-20	20-75	.1-75	PCT WHOL SOI
				<- PCT OF <2MM (3A1) ->												<- PCT OF <75MM (3B1) ->				
81 247	1S	0- 12	AC	13.7	43.1	43.2			20.5	22.6	12.4	11.4	7.0	5.9	0.6	9	6	3	43	18

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	CEC 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WHOL SO
		<- - - - - - -PCT OF <2MM - - - - - - ->								PCT <0.4MM		<- - G/CC - - ->		CM/CM	<- - -PCT OF <2MM - ->				CM/
81 247	1	2.01	.178		.7	.2	.1	1.77	.37					--			30.5	11.9	.

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2
		<- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->										<- - - -PCT - - - ->					1:2	1:
81 247	1	12.8	4.3	.1	.6	17.8	9.5	.7	27.3	24.2	18.5	4	65	74			5.0	6

SAMPLE NO.	HZN NO.	SPODIC HORIZON CRITERIA NA PYROPHOSPHATE EXTRACTABLE C	FE	AL	DIVIDED BY FE+AL DI-CI PCT FE+AL	DIVIDED BY FE+AL PCT CLAY	DIVIDED BY AL+C PCT CLAY	INDEX OF ACCUM
		<- PCT OF <2MM->						
81 247	1		.1		.1			

MINERALOGY — CLAY — X-RAY — DTA — TOTAL RES — DO WEA

<- RELATIVE AMOUNTS -> <- - - - -PCT - - -

FAMILY CONTROL SECTION: DEPTH 0- 12 PCT CLAY 2.5 PCT .1-75MM 3.5. SPODIC HORIZON: INDEX OF ACCUMUL

ANALYSES: S= ALL ON SIEVED <2MM BASIS

R10R

Plot No.: 55
UTM Coordinate: 49-74.6N/5-70.8E
Pedon Classification: Typic Cryoboroll; loamy-skeletal, mixed.
Vegetative Habitat: 2CL
Geological Unit: Tlr
Surficial Unit: pt
Parent Material: Andesitic till.
Topography: Strongly sloping. Gradient is 10 percent. South aspect. Concave. Slope length is 300 meters. Elevation is 2195 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 248 0 to 11 cm. Black (10YR 2/1) gravelly loam, very dark gray (10YR 3/1) dry: weak very fine granular structure; very friable; many fine, many medium and few coarse roots; 26 percent pebbles; neutral; abrupt wavy boundary.

Bw 249 11 to 45 cm. Very dark brown (10YR 2/2) gravelly loam, very dark grayish brown (10YR 3/2) dry; moderate fine subangular blocky structure; friable; many fine, common medium and few coarse roots; 30 percent pebbles; neutral; clear wavy boundary.

C 45 to 100 cm. Dark brown (10YR 3/3) extremely gravelly clay loam; moderate fine granular structure; friable; common fine roots; 50 percent pebbles, 25 percent cobbles, both composed of andesitic rock; neutral.

Note: The C horizon was not sampled.

PLOT 55

CLASSIFICATION: Typic Cryoboroll, loamy-skeletal, mixed

S 81WY-029 - 7 SAMPLE NOS. 81P 248 - 249 DATE 03/05/86

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L ANSE, MICHIGAN

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1-- TOTAL CLAY LT .002	-2-- TOTAL SILT .002 -.05	-3-- TOTAL SAND .05 -2	-4-- CLAY FINE LT .0002	-5-- CLAY CO3 LT .002	-6-- SILT FINE .002 -.02	-7-- SILT COARSE .02 -.05	-8-- SAND VF .05 -.10	-9-- SAND F .10 -.25	-10- SAND M .25 -.50	-11- SAND C .5 -1	-12- SAND VC 1 -2	-13- COARSE FRACTIONS (MM) WEIGHT 2 -5	-14- COARSE FRACTIONS (MM) WEIGHT 5 -20	-15- COARSE FRACTIONS (MM) WEIGHT 20 -75	-16- COARSE FRACTIONS (MM) WEIGHT .1- 75	-17- COARSE FRACTIONS (MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1)												<- PCT OF <75MM (3B1)				
81 248	1S	0- 11	A	19.0	34.0	47.0			18.5	15.5	9.1	12.4	10.2	8.3	7.0	7	22	10	62	39
81 249	2S	11- 45	Bw	16.3	32.7	51.0			17.3	15.4	10.6	14.3	11.6	8.4	6.1	9	13	22V	67	44

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	RATIO/CLAY CEC	15 BAR	ATTERBERG LIMITS LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM									PCT <0.4MM		<- G/CC			CM/CM	<- PCT OF <2MM				CM/CM
81 248	1	6.10	.314			.5	.2	.1	2.33	.92						--			31.8	17.4	.15
81 249	2	1.56	.133						1.54	.74						--			23.8	12.1	.12

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- MEQ / 100 G											<- PCT				1:2	1:1
81 248	1	36.0	7.1	TR	2.7	45.8	7.7	.0	53.5	44.2			86	100			6.2	6.6
81 249	2	18.4	5.4	TR	1.9	25.7	2.0	.0	27.7	25.1			93	100			6.1	6.6

SAMPLE NO.	HZN NO.	SPODIC HORIZON CRITERIA NA PYROPHOSPHATE EXTRACTABLE C	FE	AL	FE+AL	FE+AL	AL+C	INDEX OF ACCUM
		<- PCT OF <2MM			DIVIDED BY DI-CI FE+AL	PCT CLAY	PCT CLAY	
81 248	1		.1		.1			
81 249	2							

SAMPLE NO.	HZN NO.	MINERALOGY CLAY X-RAY	DTA	TOTAL DOM RES WEATH
		<- RELATIVE AMOUNTS	<- PCT	

FAMILY CONTROL SECTION: DEPTH 25- 45 PCT CLAY .1 PCT .1-75MM .2. SPODIC HORIZON: INDEX OF ACCUMUL 0

ANALYSES: S= ALL ON SIEVED <2MM BASIS V= 75-20MM FROM VOLUME ESTIMATES

Plot No. 56
UTM Coordinate: 49-28.4N/5-59.0E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2FO
Geological Unit: T1
Surficial Unit: pt
Parent Material: Andesitic Till.
Topography: Strongly sloping. Gradient is 16 percent. South aspect. Elevation is 2465 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated).

Oi 3 to 0 cm. Decomposed organic matter; abrupt smooth boundary.

A 0 to 3 cm. Very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; firm; common fine and common medium roots; 2 percent pebbles; strongly acid; clear wavy boundary.

Bw1 250 3 to 17 cm. Dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; moderate medium angular blocky structure; firm; common fine, common medium and few coarse roots; 11 percent pebbles; medium acid; clear wavy boundary.

Bw2 251 17 to 41 cm. Yellowish brown (10YR 5/4) gravelly sandy loam, pale brown (10YR 6/3) dry; moderate medium and coarse subangular blocky structure; firm; common medium, common coarse and few fine roots; few thin clay films on faces of peds; 24 percent pebbles, 5 percent cobbles; slightly acid; clear wavy boundary.

C 252 41 to 62 cm. Grayish brown (2.5YR 5/2) gravelly sandy loam, light gray (10YR 7/2) dry; moderate coarse subangular blocky structure; friable; few fine and few coarse roots; 12 percent pebbles, 13 percent cobbles; slightly acid; clear smooth boundary.

2C 253 62 to 105 cm. Yellowish brown (10YR 5/5) gravelly loam; massive; friable; 25 percent pebbles; slightly acid.

Note: The A horizon was not sampled.

PLOT 56

CLASSIFICATION: Typic Cryorthent, coarse-loamy, mixed

S 81WY-029 - 8 SAMPLE NOS. 81P 250 - 253 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRAGS WEIGHT 2-5	COARSE FRAGS WEIGHT 5-20	COARSE FRAGS WEIGHT 20-75	COARSE FRAGS WEIGHT .1-75	>2MM WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
81 250	1S	3- 17	Bw1	7.5	43.9	48.6			19.7	24.2	10.6	11.4	9.8	9.2	7.6	8	8	1	49	17
81 251	2S	17- 41	Bw2	4.6	34.9	60.5			14.3	20.6	12.2	14.5	12.6	12.2	9.0	12	16	11	68	43
81 252	3S	41- 62	C	6.5	39.2	54.3			18.1	21.1	12.0	13.7	11.0	10.2	7.4	14	14	2	60	33
81 253	4S	62-105	2C	15.0	39.1	45.9			12.2	26.9	11.6	11.5	9.2	8.1	5.5	12	7	6	51	25

SAMPLE NO.	HZN NO.	ORGN TOTAL C	TOTAL N	EXTR TOTAL P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	ATTERBERG LIMITS - PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - - PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - - PCT OF <2MM - ->				CM/CM
81 250	1	1.00	.040			.3	.2	TR	1.49	.83						--			19.8	6.2	.16
81 251	2	.28	.025			.3	.1	--	2.02	1.13						--			14.9	5.2	.10
81 252	3					.3	.1	--	1.85	1.09						--			17.4	7.1	.12
81 253	4					.5	.1	--	1.09	.73						--			22.1	11.0	.14

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACIDITY	EXTRACTABLE AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - ME2 / 100 G - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
81 250	1	4.5	1.1	.1	.5	6.2	4.2	.9	10.4	11.2	7.1	13	60	55			4.9	5.7
81 251	2	5.2	1.8	.2	.3	7.5	.3	.5	7.5	9.3	8.0	6	100	81			5.2	6.2
81 252	3	7.8	2.5	.2	.3	10.8	.2	.0	11.0	12.0			98	90			5.3	6.4
81 253	4	14.0	4.7	.3	.3	19.3	.4	.0	19.7	16.4			98	100			5.5	6.3

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 10.4 PCT .1-75MM 57.2

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 57
UTM Coordinate: 49-27.5N/5-64.0E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2DO
Geological Unit: Qyl
Surficial Unit: pt
Parent Material: Glacial till over kame deposit.
Topography: Elevation is 2650 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 254 0 to 7 cm. Very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak medium granular structure; friable; many fine, many medium and common coarse roots; 12 percent pebbles; medium acid; abrupt smooth boundary.

Bw1 255 7 to 19 cm. Yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common fine, common medium and common coarse roots; 11 percent pebbles; medium acid; clear smooth boundary.

Bw2 256 19 to 34 cm. Yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; common fine and few medium roots; 7 percent pebbles; medium acid; abrupt wavy boundary.

2BC 257 34 to 85 cm. Dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; few fine roots; few fine vesicular pores; few clay coatings on faces of pebbles; 8 percent pebbles; medium acid; clear wavy boundary.

2C 258 85 to 130 cm. Dark grayish brown (2.5YR 4/2) sandy clay loam; massive; friable; 15 percent pebbles; neutral.

PLOT 57

CLASSIFICATION: Typic Cryochrept, coarse-loamy, mixed

S 81WY-029 - 9 SAMPLE NOS. 81P 254 - 258 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

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SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1- TOTAL CLAY LT .002	-2- TOTAL SILT .002-.05	-3- TOTAL SAND .05-2	-4- CLAY FINE LT .0002	-5- CLAY CO3 LT .002	-6- SILT FINE .002-.02	-7- SILT COARSE .02-.05	-8- SAND VF .05-.10	-9- SAND F .10-.25	-10- SAND M .25-.50	-11- SAND C .5-1	-12- SAND VC 1-2	-13- COARSE FRACTIONS (MM) WEIGHT 2-5	-14- 5-20	-15- 20-75	-16- .1-75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- - -	- - -	- - -	- - -	PCT OF <2MM	(3A1)	- - -	- - -	- - -	- - -	- - -	->	<- PCT OF	<75MM(3B1)		->	
81 254	1S	0- 7	A	12.3	55.6	32.1			27.0	28.6	7.0	6.0	5.4	7.0	6.6	11	7	--	38	18
81 255	2S	7- 19	Bw1	11.0	54.5	34.5			30.7	23.8	7.2	6.7	6.1	7.7	6.7	8	5	4	40	17
81 256	3S	19- 34	Bw2	8.9	49.4	42.7			25.8	22.6	7.9	9.8	8.3	9.5	8.3	9	2	--	42	11
81 257	4S	34- 85	2BC	12.5	38.5	49.0			23.1	15.4	8.7	11.6	10.4	9.8	8.5	7	3	2	47	12
81 258	5S	85-130	2C	24.9	26.7	48.4			13.8	12.9	9.2	11.5	9.9	10.3	7.4	11	6	6	53	23

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - -	- - -	-PCT OF <2MM	- - -	- - -	- - -	->			PCT <0.4MM		<- - G/CC	- - -	->	CM/CM	<- - -PCT OF	<2MM	- -	->	CM/CM
81 254	1	2.42	.099			.6	.5	TR	1.42	.80						--			27.4	9.3	.23
81 255	2	1.33				.6	.5	TR	1.36	.83						--			28.4	9.1	.25
81 256	3	.83	.338			.5	.5	--	1.30	.99						--			21.8	8.8	.18
81 257	4					.3	.2	--	.65	.62						--			16.2	7.7	.12
81 258	5					.2	.2	--	.27	.24						--			15.5	5.9	.12

SAMPLE NO.	HZN NO.	(NH4OAC EXTRACTABLE BASES) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(CEC) SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(PH) CACL2 .01M 1:2	H2O 1:1
		<- - -	- - -	- - -	- - -	-MEQ / 100 G	- - -	- - -	- - -	- - -	->	<- - -	-PCT	- - -	->			
81 254	1	2.1	.4	TR	.5	3.0	14.0	3.9	17.0	17.5	6.9	57	18	17			4.6	5.6
81 255	2	1.8	.4	TR	.3	2.5	12.5	3.5	15.0	15.0	6.0	58	17	17			4.7	5.8
81 256	3	1.7	.3	TR	.2	2.2	9.7	2.3	11.9	11.6	4.5	51	18	19			4.7	5.9
81 257	4	3.3	1.0	.1	.2	5.1	2.2	1.0	7.3	8.1	6.1	16	70	63			4.7	6.0
81 258	5	3.8	1.3	.1	.2	5.4	.0	.2	5.4	6.7	5.6	4	100	81			5.3	6.6

SAMPLE NO.	HZN NO.	(SPODIC HORIZON CRITERIA) (NA PYROPHOSPHATE EXTRACTABLE) C	FE	AL	(DIVIDED BY) FE+AL DI-CI FE+AL	FE+AL PCT CLAY	AL+C PCT CLAY	INDEX OF ACCUM	(MINERALOGY) (CLAY) X-RAY	DTA	TOTAL RES	DOM WEATH
		<- PCT OF	<2MM->						<- RELATIVE AMOUNTS ->		<- - - -PCT	- - ->
81 254	1		TR									
81 255	2		TR									
81 256	3		--									
81 257	4		--									
81 258	5		--									

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 14.5 PCT .1-75MM 47.7

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 58
UTM Coordinate: 49-34.4N/5-54.7E
Pedon Classification: Typic Cryumbrept; fine-loamy, mixed.
Vegetative Habitat: TFG
Geological Unit: Qs
Surficial Unit: pl
Parent Material: Lake sediments over till.
Topography: Gently sloping. Gradient is 4 percent. East aspect. Elevation is 2375 meters.
Drainage: Moderately well drained.

(All colors are for moist condition unless otherwise stated.)

A1 259 0 to 12 cm. Very dark grayish brown (10YR 3/2) clay loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; many fine and few medium roots; 5 percent pebbles; strongly acid; clear wavy boundary.

A2 260 12 to 24 cm. Very dark grayish brown (10YR 3/2) silty clay loam, pale brown (10YR 6/3) dry; moderate fine granular structure; very friable; many fine and few medium roots; 3 percent pebbles; medium acid; abrupt wavy boundary.

Bw 261 24 to 41 cm. Dark brown (10YR 3/3) clay loam, brown (10YR 5/3) dry; moderate coarse subangular blocky structure; friable; common fine and few medium roots; 3 percent pebbles; medium acid; abrupt wavy boundary.

C 262 41 to 54 cm. Yellowish brown (10YR 5/6) clay loam; weak fine granular structure; friable; few fine and few medium roots; 2 percent pebbles; some thermally altered pebbles; slightly acid; abrupt smooth boundary.

2Ab 263 54 to 65 cm. Dark brown (10YR 4/3) silt loam; moderate medium blocky and fine granular structure; friable; few fine roots; 11 percent pebbles; abundant charcoal fragments; few manganese concretions; slightly acid; abrupt smooth boundary.

2Bb 264 65 to 95 cm. Light olive brown (2.5Y 5/4) silt loam; moderate coarse subangular blocky structure; firm; few yellowish brown (10YR 5/4) shiny clay films; 5 percent pebbles; neutral; abrupt wavy boundary.

3C 265 95 to 115 cm. Pale olive (2.5Y 6/4) loam; massive; firm; few prominent reddish yellow (7.5YR 6/8) mottles; 13 percent pebbles; some water-rounded till fragments and thermally altered rocks; neutral.

PLOT 58

CLASSIFICATION: Typic Cryumbrept, fine-loamy, mixed

S 81WY-029 - 10 SAMPLE NOS. 81P 259 - 265 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

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-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL - - -) CLAY LT .002	SILT .002-.05	SAND .05-2	(- -CLAY- -) FINE LT .0002	CO3 LT .002	(- -SILT- -) FINE .002-.02	COARSE .02-.05	(- - - - - -SAND- - - - - -) VF .05-.10	F .10-.25	M .25-.50	C .5-1	VC 1-2	(-COARSE FRACTIONS(MM)-) 2-5	5-20	20-75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - ->												<- PCT OF <75MM (3B1)->				
81 259	1S	0- 12	A11	28.7	47.7	23.6			31.6	16.1	5.1	5.3	5.1	4.8	3.2	5	3	TR	25	8
81 260	2S	12- 24	A22	30.0	50.1	19.9			32.0	18.1	6.0	5.4	3.5	3.1	1.9	3	1	--	17	4
81 261	3S	24- 41	Bw	27.1	44.8	28.1			29.5	15.3	6.2	7.5	6.4	5.1	3.0	2	2	--	25	4
81 262	4S	41- 54	C	31.7	46.3	22.0			33.1	13.2	5.2	4.4	3.5	5.1	3.8	2	1	--	19	3
81 263	5S	54- 65	2Ab	13.6	58.4	28.0			32.3	26.1	8.2	6.0	4.7	5.0	4.0	8	7	2	33	17
81 264	6S	65- 95	2Bb	16.2	51.6	32.2			35.3	19.3	9.8	7.8	6.1	5.2	3.4	3	2	2	28	7
81 265	7S	95-115	3C	24.7	46.0	29.3			32.1	13.9	6.2	6.0	5.1	6.0	5.8	7	10	3	38	20

SAMPLE NO.	HZN NO.	ORGN TOTAL C	N	EXTR TOTAL P	S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	CEC	(RATIO/CLAY) 15 BAR	(ATTERBERG) - LIMITS - LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
81 259	1	4.38	.282													--					
81 260	2	3.01	.233			.8	.3	TR	1.10	.68						--			37.5	19.4	.25
81 261	3	1.46	.056			.8	.3	TR	1.01	.65						--			37.6	19.5	.26
81 262	4	.58				.7	.2	TR	1.04	.73						--			34.0	19.7	.20
81 263	5	.92				.7	.2	TR	.97	.74						--			39.3	23.5	.23
81 264	6	.17				.5	.2	TR	1.07	.69						--			26.7	9.4	.23
81 265	7	.22				.5	.1	TR	.61	.62						--			24.0	10.1	.19
						.6	.1	TR	.64	.62						--			30.2	15.4	.19

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	(- - - -CEC - - - -) SUM CATS	NH4-OAC	BASES + AL	AL SAT	-BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - - - -) CACL2 .01M	H2O
		<- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->										<- - - - -PCT - - - ->						
81 259	1	16.3	4.6	.1	1.3	22.3	13.3	.7	35.6	31.7	33.0	3	63	70			1:2	1:1
81 260	2	16.1	4.5	.1	1.2	21.9	12.9	1.2	34.8	30.4	33.1	5	63	72			4.9	5.5
81 261	3	17.2	5.2	.1	.6	23.1	10.1	1.4	33.2	28.1	24.5	9	70	82			5.0	5.7
81 262	4	21.0	7.2	.2	.6	29.0	4.9	.7	33.9	30.9	29.7	2	86	94			5.1	5.9
81 263	5	8.2	2.3	.2	.2	10.9	4.2	.5	15.1	14.6	11.4	4	72	75			5.4	6.4
81 264	6	5.8	2.8	.2	.2	9.0	.0	.2	9.0	9.8	9.2	2	100	92			5.3	6.3
81 265	7	12.1	5.1	.2	.3	17.7	.1	.2	17.8	15.9	17.9	1	99	100			5.9	7.1
																	6.0	7.0

SAMPLE NO.	HZN NO.	(- - - -SPODIC HORIZON CRITERIA - - - -) (- -NA PYROPHOSPHATE EXTRACTABLE- -) C	FE	AL	FE+AL	FE+AL AL+C	(- -DIVIDED BY- -) DI-CI PCT FE+AL	PCT CLAY	INDEX OF ACCUM PCT CLAY	(- - - - - - - - -MINERALOGY - - - - - - - - -) (- - - - - - - - CLAY - - - - - - - -) (- - - - X-RAY - - - -)(- -DTA - -) TOTAL	DOM	RES	WEATH
		<- PCT OF <2MM->								* <- RELATIVE AMOUNTS -> <- - - - -PCT - - - ->				
81 259	1		TR											
81 260	2		TR											
81 261	3		TR											
81 262	4		TR											
81 263	5		TR				.1							
81 264	6		TR											
81 265	7		TR											

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 21.4 PCT .1-75MM 27.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 59
UTM Coordinate: 49-23.7N/5-33.8E
Pedon Classification: Typic Cryochrept, sandy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qs
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Gently sloping. Gradient is 5 percent. South aspect. Elevation is 2450 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 4 to 0 cm. Decomposed pine litter; abrupt wavy boundary.

A 0 to 2 cm. Very dark brown (10YR 2/2) silt loam, brown (10YR 6/3) dry: weak fine granular structure; friable; many fine and many medium roots; 5 percent pebbles; very strongly acid; abrupt wavy boundary.

Bw 266 2 to 14 cm. Dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky and fine granular structure; friable; common fine, common medium and few coarse roots; 10 percent pebbles comprised of 15 percent obsidian; medium acid; clear smooth boundary.

BC 267 14 to 30 cm. Brown (10YR 5/3) gravelly loamy coarse sand· weak medium angular blocky structure; firm; few fine and few medium roots; 17 percent pebbles comprised of 45 percent obsidian; slightly acid; clear smooth boundary.

C 268 30 to 105 cm. Olive (5Y 5/4) loamy coarse sand; massive; firm: few medium roots; 13 percent pebbles comprised of 65 percent obsidian; neutral.

Note: The A horizon was not sampled.

PLOT 59

CLASSIFICATION: Typic Cryochrept, sandy, mixed

S 81WY-039 - 6 SAMPLE NOS. 81P 266 - 268 DATE 03/05/86

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
81 266	1S	2- 14	BW	7.0	42.1	50.9			18.3	23.8	9.7	12.8	9.4	10.0	9.1	11	4	--	50	15
81 267	2S	14- 30	BC	1.8	24.5	73.7			10.6	13.9	12.5	18.3	13.3	13.7	15.8	14	5	7	71	26
81 268	3S	30-105	C	6.0	17.9	76.1			9.6	8.3	13.9	19.4	14.2	14.8	13.7	15	3	2	70	20

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	RATIO/CLAY CEC	15 BAR	ATTERBERG LIMITS LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - - PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
81 266	1	1.04	.037			.3	.2	TR	1.59	.83						--		31.6	18.8	5.8	.17
81 267	2	.20	.009			.1	.1	--	2.44	1.61						--		15.9	9.2	2.9	.08
81 268	3					.1	.1	--	.63	.47						--		20.8		2.8	.23

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2C
		<- - - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
81 266	1	4.0	1.1	.1	.5	5.7	12.3	1.6	18.0	11.1	7.3	22	32	51			4.8	5.7
81 267	2	2.3	.8	.1	.3	3.5	5.3	.2	8.8	4.4	3.7	5	40	80			5.3	6.3
81 268	3	2.4	.9	TR	.0	3.3	4.6	.0	7.9	3.8			42	87			5.5	6.6

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 5.7 PCT .1-75MM 70.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 60
UTM Coordinate: 49-57.2N/5-42.9E
Pedon Classification: Lithic Cryochrept; loamy-skeletal over fragmental, mixed.
Vegetative Habitat: FNG
Geological Unit: Ts
Surficial Unit: R
Parent Material: Till veneer.
Topography: Steep. Gradient is 36 percent. West aspect. Convex. Slope length is 200 meters. Elevation is 2590 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 1 to 0 cm. Decomposed pine litter; abrupt smooth boundary.

A 269 0 to 8 cm. Dark brown (10YR 4/3) extremely gravelly coarse sandy loam weak fine granular structure; friable; many fine roots; 57 percent pebbles, 5 percent cobbles; slightly acid; clear smooth boundary.

Bw 270 8 to 22 cm. Brown (10YR 5/3) extremely gravelly coarse sandy loam; weak fine granular structure; friable; many fine, common medium, and few coarse roots; 69 percent pebbles, 8 percent cobbles; slightly acid; abrupt wavy boundary.

C 22 to 35 cm. Yellowish brown (10YR 5/4) extremely gravelly sandy loam; massive; firm; common fine roots; 90 percent pebbles; strongly acid.

Note: This pedon was not described below 35 cm. due to rockiness. The C horizon was not sampled.

PLOT 60

CLASSIFICATION: Lithic Cryochrept, loamy-skeletal over fragm

S 81WY-029 - 11 SAMPLE NOS. 81P 269 - 270 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

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SAMPLE NO.	HZN NO.	-1-- DEPTH (CM)	-2--	-3-- HORIZON	-4-- TOTAL CLAY LT .002	-5-- TOTAL SILT .002 -.05	-6-- TOTAL SAND .05 -2	-7-- CLAY FINE LT .0002	-8-- CLAY CO3 LT .002	-9-- SILT FINE .002 -.02	-10- SILT COARSE .02 -.05	-11- SAND VF .05 -.10	-12- SAND F .10 -.25	-13- SAND M .25 -.50	-14- SAND C .5 -1	-15- SAND VC 1 -2	-16- COARSE FRACTIONS (MM) WEIGHT 2 -5	-17- 5 -20	-18- 20 -75	-19- .1- 75	-20- (>2MM) WT PCT OF WHOLE SOIL
					<- - -	- - -	- - -	- - -	- PCT	OF <2MM	(3A1) - -	- - -	- - -	- - -	- - -	- - ->	<- PCT	OF	<75MM(3B1)->		
81 269	1S	0- 8		A	14.2	19.3	66.5			13.2	6.1	6.7	10.5	12.2	15.9	21.2	16	38	19	89	75
31 270	2S	8- 22		Bw	18.1	22.4	59.5			14.7	7.7	8.0	10.6	11.0	13.3	16.7	7	38	42	94	38

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG - LIMITS -) LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - -	- - -	-PCT OF <2MM	- - -	- - -	- - -	- ->			PCT <0.4MM		<- - G/CC	- - -	- - ->	CM/CM	<- - -PCT OF <2MM		- - ->		CM/CM
31 269	1	4.96	.061			.4	.3	TR	2.23	1.02						--			26.1	14.5	.06
81 270	2	2.35	.110			.5	.3	TR	1.64	.71						--			24.5	12.9	.04

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	(- - - -CEC - - -) SUM CATS	NH4-OAC	BASES + AL	AL SAT	-BASE SAT- SUM	NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(- - - -PH - - -) CACL2 .01M	H2O
		<- - -	- - -	- - -	- - -	-MEQ / 100 G	- - -	- - -	- - -	- - -	- - ->	<- - -	- -PCT	- - - ->			1:2	1:1
31 269	1	19.3	3.2	.1	.8	23.4	21.4	.5	44.8	31.7	23.9	2	52	74			5.4	6.1
81 270	2	18.8	3.9	.1	.8	23.6	17.6	.9	41.2	29.6	24.5	4	57	80			5.3	6.1

SAMPLE NO.	HZN NO.	(- - - -SPODIC HORIZON CRITERIA - - - - - -) (- -NA PYROPHOSPHATE EXTRACTABLE- -) C	FE	AL	FE+AL	(- -DIVIDED BY- -) FE+AL DI-CI FE+AL	AL+C PCT CLAY	INDEX OF ACCUM	(- - - -MINERALOGY - - - -) CLAY X-RAY	DTA	TOTAL RES	DOM WEATH
		<- PCT OF <2MM->			PCT CLAY				<- RELATIVE AMOUNTS ->		<- - - -PCT - - - ->	
81 269	1		TR		.1							
81 270	2		TR									

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 61
UTM Coordinate: 49-57.9N/5-42.6E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2L3
Geological Unit: Tlrf
Surficial Unit: pt
Parent Material: Andesitic till.
Topography: Strongly sloping. Gradient is 15 percent. Northwest aspect. Convex. Slope length is 150 meters. Elevation is 2620 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 2 to 0 cm. Decomposed conifer needles; abrupt wavy boundary.

A 271 0 to 8 cm. Grayish brown (10YR 5/2) gravelly coarse sandy loam; moderate medium granular structure; friable; many fine, common medium, and few coarse roots; 21 percent pebbles; medium acid; clear wavy boundary.

Bw 272 8 to 23 cm. Brown (10YR 5/3) gravelly coarse sandy loam; weak coarse subangular blocky and moderate fine granular structure; friable; many fine, common medium and common coarse roots; 19 percent pebbles; medium acid; clear wavy boundary.

BC 273 23 to 40 cm. Yellowish brown (10YR 5/4) gravelly coarse sandy loam; moderate medium subangular blocky and fine granular structure; friable; few fine and few medium roots; 25 percent pebbles; medium acid; abrupt wavy boundary.

C 274 40 to 110 cm. Light yellowish brown (10YR 6/4) gravelly coarse sandy loam· massive to moderate coarse subangular blocky structure; firm; few fine roots; 17 percent pebbles; slightly acid.

PLOT 61

CLASSIFICATION: Typic Cryochrept, coarse-loamy, mixed

S 81WY-029 - 12 SAMPLE NOS. 81P 271 - 274 DATE 03/05/86

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FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 131A, 241, 23

-1- -2- -3- -4- -5- -6- -7- -8- -9- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRAGS WEIGHT 2-5	COARSE FRAGS WEIGHT 5-20	COARSE FRAGS WEIGHT 20-75	COARSE FRAGS WEIGHT .1-75	WT PCT OF WHOLE SOIL (>2MM)
				<- PCT OF <2MM (3A1) ->												<- PCT OF <75MM (3B1) ->				
81 271	1S	0- 8	A	18.4	28.2	53.4			18.9	9.3	6.1	7.8	8.0	12.2	19.2	19	8	4	64	31
81 272	2S	8- 23	BW	18.6	29.1	52.3			19.1	10.0	6.5	7.3	7.7	12.4	18.4	21	7	--	61	28
81 273	3S	23- 40	BC	14.9	29.1	56.0			18.7	10.4	6.6	7.9	8.9	14.6	18.1	23	9	5	68	37
81 274	4S	40-110	C	10.0	26.1	63.9			15.2	10.9	11.3	13.0	12.4	14.5	12.7	13	11	2	65	26

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM ->									PCT <0.4MM		<- G/CC ->			CM/CM	<- PCT OF <2MM ->				CM/CM
81 271	1	6.57	.106			.8	.3	.1	2.02	1.05						--			33.7	19.4	.17
81 272	2	1.90	.081			.4	.3	TR	1.55	.78						--			26.4	14.5	.14
81 273	3	.96	.058			.4	.3	TR	1.89	.90						--			23.4	13.4	.11
81 274	4					.2	.2	TR	2.77	1.14						--			21.3	11.4	.12

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACIDITY	EXTRACTAL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT-NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- MEQ / 100 G ->										<- PCT ->					1:2	1:1
81 271	1	19.4	2.9	TR	1.2	23.5	23.7	1.4	47.2	37.2	24.9	6	50	63			5.2	5.8
81 272	2	13.2	2.2	.1	.5	16.0	20.9	4.0	36.9	36.9	20.0	20	43	55			4.7	5.7
81 273	3	17.8	2.1	.1	.4	20.4	20.4	3.3	40.8	33.2	23.7	14	50	72			4.8	5.9
81 274	4	16.1	2.6	.1	.5	19.3	15.7	2.0	35.0	27.7	21.3	9	55	70			5.0	6.2

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 11.0 PCT .1-75MM 65.4

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 62
UTM Coordinate: 49-50.6N/5-32.3E
Pedon Classification: Dystric Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qpcf
Surficial Unit: pt
Parent Material: Rhyolitic till.
Topography: Gently sloping. Gradient is 8 percent. South aspect. Convex. Slope length is 150 meters. Elevation is 2470 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

A 275 0 to 3 cm. Very dark gray (10YR 3/1) fine sandy loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine and common medium roots; 11 percent pebbles; strongly acid; abrupt wavy boundary.

Bw1 276 3 to 15 cm. Dark brown (10YR 3/3) sandy loam; pale brown (10YR 6/3) dry; weak coarse subangular blocky and moderate fine granular structure; friable; many fine, common medium and common coarse roots; 14 percent pebbles; medium acid; clear wavy boundary.

Bw2 277 15 to 32 cm. Dark yellowish brown (10YR 4/4) gravelly sandy loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common fine, few medium and few coarse roots; 16 percent pebbles; medium acid; clear wavy boundary.

BC 278 32 to 83 cm. Yellowish brown (10YR 5/4) gravelly sandy loam, very pale brown (10YR 7/3) dry; weak medium granular structure; friable; few fine and few medium roots; 19 percent pebbles comprised dominantly of weathered rhyolite; medium acid; clear wavy boundary.

2C 279 83 to 110 cm. Brownish yellow (10YR 6/6) dry, very gravelly coarse sand, with approximately 10 percent black (10YR 2/1) obsidian fragments; massive; firm; few fine roots; 52 percent pebbles comprised dominantly of weathered rhyolite; slightly acid.

Note: Obsidian fragments were present throughout the profile.

PLOT 62

CLASSIFICATION: Dystric Cryochrept, coarse-loamy, mixed

S 81WY-029 - 13 SAMPLE NOS. 81P 275 - 279 DATE 03/05/86

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 23

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002-.05	TOTAL SAND .05-2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002-.02	SILT COARSE .02-.05	SAND VF .05-.10	SAND F .10-.25	SAND M .25-.50	SAND C .5-1	SAND VC 1-2	COARSE FRACTIONS (MM) WEIGHT 2-5	5-20	20-75	.1-75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
81 275	1S	0- 3	A	13.5	33.8	52.7			16.9	16.9	11.6	15.9	10.5	8.7	5.9	7	10	--	51	17
81 276	2S	3- 15	Bw1	9.3	23.1	67.6			12.6	10.5	11.7	20.1	15.4	11.9	8.5	11	10	TR	65	21
81 277	3S	15- 32	Bw2	7.8	19.7	72.5			9.7	10.0	12.5	22.0	16.6	12.4	9.1	11	10	3	70	24
81 278	4S	32- 83	BC	6.9	20.4	72.7			10.6	9.8	12.9	22.2	17.6	11.8	8.1	12	13	4	71	29
81 279	5S	83-110	2C	1.3	3.2	95.0			1.4	1.8	4.6	10.8	15.1	23.8	40.6	42	25	--	97	67

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
81 275	1	12.0	.30			.3	.2	.2	.81	1.48						--		62.7	33.7	20.0	.13
81 276	2	.84	.007			.3	.2	TR	.67	.40						--		32.1	14.2	3.7	.13
81 277	3	.49	.016			.2	.1	--	.59	.41						--		29.4	11.9	3.2	.11
81 278	4	.44				.1	.1	--	.64	.41						--		28.3	11.1	2.8	.10
81 279	5					.1	TR	--	.44	.44						--		8.3		.9	.05

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY EXTRACTABLE	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT- NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->									<- - - - -PCT - - - ->					1:2	1:1
81 275	1	3.1	.6	TR	.3	4.0	18.2	1.5	22.2	11.0	5.5	27	18	36		4.8	5.5
81 276	2	1.1	.3	TR	.2	1.6	5.9	1.5	7.5	6.2	3.1	48	21	26		4.7	5.3
81 277	3	1.0	.3	TR	.2	1.5	3.9	1.3	5.4	4.6	2.8	46	28	33		4.6	5.6
81 278	4	1.0	.3	TR	.3	1.6	.0	1.1	1.6	4.4	2.7	41	100	36		4.5	5.9
81 279	5	.2	TR	TR	.1	.3	.0	.5	.3	.8	.8	63	100	37		5.1	6.1

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 5.8 PCT .1-75MM 77.1

ANALYSES: S= ALL ON SIEVED <2MM BASIS

B124

Plot No.: 63
UTM Coordinate: 49-40.3N/5-12.9E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: 2LL
Geological Unit: Qpcn
Surficial Unit: pt
Parent Material: Rhyolitic fill.
Topography: Nearly level. Gradient is 2 percent. Southwest aspect. Slightly convex. Slope length is 300 meters. Elevation is 2205 meters.
Drainage: Somewhat excessively drained.

(All colors are for moist condition unless otherwise stated.)

Oa 280 3 to 0 cm. Decomposed organic material; common fine roots; abrupt wavy boundary.

E 280 0 to 1 cm. Dark grayish brown (10YR 4/2) gravelly coarse sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine and common medium roots; 26 percent pebbles; strongly acid; abrupt wavy boundary.

Bw1 281 1 to 5 cm. Dark brown (10YR 3/3) gravelly coarse sandy loam; moderate fine granular structure; friable; many fine, many medium and few coarse roots; 21 percent pebbles; strongly acid; abrupt wavy boundary.

Bw2 282 5 to 15 cm. Dark brown (10YR 4/3) gravelly coarse sandy loam; brown (10YR 5/3) dry; moderate medium subangular blocky and fine granular structure; friable; common fine, common medium and few coarse roots; 22 percent pebbles; medium acid; clear wavy boundary.

BC 283 15 to 43 cm. Yellowish brown (10YR 5/4) gravelly coarse sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; few fine, few medium and few coarse roots; 27 percent pebbles; medium acid; clear wavy boundary.

2C 284 43 to 125 cm. Olive gray (5Y 5/2) gravelly coarse sand; single grained; loose; few coarse roots; 21 percent pebbles; slightly acid.

Note: Then Oa and E horizons were not sampled together.

PLOT 63

CLASSIFICATION: Typic Cryochrept, coarse-loamy, mixed

S 81WY-039 - 7 SAMPLE NOS. 81P 280 - 284 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 23

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	>2MM WT PCT OF WHOLE SOIL
				<- - - - - - - - - - PCT OF <2MM					(3A1) - - - - - - - - - ->						<- PCT OF <75MM (3B1) ->				
81 280	1S	3- 0	Oa&E	9.5	12.5	78.0			7.5	5.0	3.5	8.6	14.1	22.2	29.6	29	10	--	64	39
81 281	2S	1- 5	Bw1	9.0	23.7	67.3			11.8	11.9	5.8	11.0	15.2	18.0	17.3	21	9	1	73	31
81 282	3S	5- 15	Bw2	8.3	27.4	64.3			13.8	13.6	5.2	9.7	14.0	16.8	18.6	22	9	2	73	33
81 283	4S	15- 43	BC	6.0	21.4	72.6			13.3	3.1	5.7	12.6	16.4	19.4	12.4	23	14	3	80	40
81 284	5S	43-125	2C	2.3	1.9	95.8			2.2	1.4	3.4	15.1	26.0	30.9	20.4	22	10	--	95	32

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS - LL	PI	BULK DENSITY FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - - - - - PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - PCT OF <2MM - ->				CM/CM
81 280	1	6.48	.113			.3	.1	.1	1.68	.38						--		37.1		3.6	.30
81 281	2	1.53	.036			.3	.1	.1	.91	1.33						--			10.6	11.1	
81 282	3	.46	.020			.2	.1	TR	.67	.58						--		19.3	11.6	4.8	.08
81 283	4	.26				.1	TR	--	.53	.43						--		14.0	8.2	2.6	.06
81 284	5					.1	TR	--	.43	.61						--		6.7		1.4	.06

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACIDITY	EXTRAL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SUM	SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - MEQ / 100 G - - - - - - - - - - ->										<- - - - PCT - - - ->					1:2	1:1
81 280	1	5.9	1.0	TR	.5	7.4	1.1	.7	8.5	16.0	8.1	9	87	46			4.7	5.3
81 281	2	2.8	.6	TR	.4	3.8	.6	.9	4.4	8.2	4.7	19	86	46			4.7	5.5
81 282	3	2.5	.7	TR	.2	3.4	.3	.5	3.7	5.6	3.9	13	92	61			4.8	5.7
81 283	4	1.7	.5	TR	.1	2.3	1.3	.0	3.3	3.2			70	72			4.8	5.9
81 284	5	.6	.2	TR	.1	.9	.0	.0	.9	1.0			100	90			5.3	6.3

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 3.2 PCT .1-75MM 91.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS

B126

Plot No.: 64
UTM Coordinate: 49-34.4N/5-13.3E
Pedon Classification: Lithic Udorthent; fine-loamy, mixed, frigid.
Vegetative Habitat: Hs
Geological Unit: Qh
Surficial Unit: phe
Parent Material: Thermally altered till.
Topography: Nearly level. Gradient is 3 percent. South aspect. Slightly concave. Slope length is 500 meters. Elevation is 4795 meters.
Drainage: Moderately well drained.

(All colors are for moist condition unless otherwise stated.)

A 285 0 to 3 cm. Very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine, many medium and few coarse roots; 3 perce pebbles; strongly acid; abrupt smooth boundary.

Bw 286 3 to 5 cm. Brown (10YR 5/3) loam, light gray (10YR 7/2) dry; very weak very fine granular structure; friable; common fine, common medium and few coarse roots; 8 percent pebbles strongly acid; abrupt smooth boundary.

C 287 5 to 20 cm. Light brownish gray (10YR 6/2) gravelly clay loam, white (2.5Y 8/1) dry; massive; very firm; few fine roots; 17 percent pebbles; hardpan with reddish yellow (7.5YR 6/6) thermally altered rocks present; strongly acid.

R 20+ cm. Consolidated hot spring deposits.

PLOT 64

CLASSIFICATION: Lithic Udorthent, fine-loamy, mixed, frigid

S 81WY-039 - 8 SAMPLE NOS. 81P 285 - 287 DATE 03/05/86

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YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-1-- TOTAL CLAY LT .002	-2-- TOTAL SILT .002 -.05	-3-- TOTAL SAND .05 -2	-4-- CLAY FINE LT .0002	-5-- CLAY CO3 LT .002	-6-- SILT FINE .002 -.02	-7-- SILT COARSE .02 -.05	-8-- SAND VF .05 -.10	-9-- SAND F .10 -.25	-10- SAND M .25 -.50	-11- SAND C .5 -1	-12- SAND VC 1 -2	-13- COARSE FRACTIONS(MM) WEIGHT 2 -5	-14- COARSE FRACTIONS(MM) WEIGHT 5 -20	-15- COARSE FRACTIONS(MM) WEIGHT 20 -75	-16- COARSE FRACTIONS(MM) WEIGHT .1- 75	-17- (>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
81 285	1S	0- 3	A	17.0	43.0	40.0			27.2	15.8	9.3	8.6	7.6	7.5	7.0	3	1	--	33	4
81 286	2S	3- 5	BW	11.4	45.8	42.8			26.1	19.7	10.7	9.4	8.4	8.7	5.6	8	4	--	40	12
81 287	3S	5- 20	C	29.7	42.0	28.3			30.6	11.4	7.9	6.5	5.9	5.0	3.1	7	9	10	41	26

SAMPLE NO.	HZN NO.	ORGN TOTAL C	ORGN TOTAL N	EXTR TOTAL P	EXTR TOTAL S	DITH-CIT EXTRACTABLE FE	DITH-CIT EXTRACTABLE AL	DITH-CIT EXTRACTABLE MN	RATIO/CLAY CEC	RATIO/CLAY 15 BAR	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	BULK DENSITY FIELD MOIST	BULK DENSITY 1/3 BAR	BULK DENSITY OVEN DRY	COLE WHOLE SOIL	WATER CONTENT FIELD MOIST	WATER CONTENT 1/10 BAR	WATER CONTENT 1/3 BAR	WATER CONTENT 15 BAR	WRD WHOLE SOIL
		<- - - - - - - -PCT OF <2MM - - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
81 285	1	10.8	.48			.3	.1	.1	1.61	.96						--			43.4	16.3	.38
81 286	2	1.97	.080			.3	.1	TR	.88	.61						--			25.8	6.9	.26
81 287	3					.4	.1	--	.35	.33						--			24.8	9.7	.18

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	NH4OAC EXTRACTABLE BASES MG	NH4OAC EXTRACTABLE BASES NA	NH4OAC EXTRACTABLE BASES K	NH4OAC EXTRACTABLE BASES SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	CEC BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M	PH H2O
		<- - - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
81 285	1	12.7	3.0	.1	1.7	17.5	9.6	.0	27.1	27.4			65	64			5.0	5.4
81 286	2	3.5	1.2	.1	.9	5.7	TR	.0	5.7	10.0			100	57			4.9	5.5
81 287	3	3.8	1.6	.2	.6	6.2	.3	1.5	6.5	10.3	7.7	19	95	60			4.2	5.3

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 65
UTM Coordinate: 49-80.9N/5-23.3E
Pedon Classification: Typic Cryochrept; coarse-loamy, mixed.
Vegetative Habitat: FNG
Geological Unit: Qs
Surficial Unit: pt
Parent Material: Limestone till.
Topography: Moderately steep. Gradient is 18 percent. North aspect. Convex. Slope length is 400 meters. Elevation is 1985 meters.
Drainage: Moderately well drained.

(All colors are for moist condition unless otherwise stated.)

A 288 0 to 14 cm. Dark brown (10YR 3/3) gravelly loam, yellowish brown (10YR 5/4) dry; moderate medium granular and weak very fine granular structure; friable; many fine and common medium roots; 15 percent pebbles; neutral; clear wavy boundary.

Bw 289 14 to 25 cm. Dark brown (10YR 4/3) gravelly loam, yellowish brown (10YR 5/4) dry; moderate coarse and medium subangular blocky structure; friable; many fine and common medium roots; 19 percent pebbles; neutral; clear wavy boundary.

BC 290 25 to 30 cm. Brown (10YR 5/3) gravelly loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine and few medium roots; 17 percent pebbles; mildly alkaline; abrupt wavy boundary.

Cca 291 30 to 115 cm. Pale brown (10YR 6/3) gravelly loam, white (10YR 8/1) dry: moderate medium subangular blocky structure: firm; few fine roots; 21 percent pebbles: strongly alkaline.

PLOT 65

CLASSIFICATION: Typic Cryochrept, coarse-loamy, mixed

S 81WY-029 - 14 SAMPLE NOS. 81P 288 - 291 DATE 03/05/86

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SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 23

		-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL CLAY LT .002	SILT .002 -.05	SAND .05 -2 - -)(	-CLAY- FINE LT .0002	CO3 LT .002 -)(	-SILT- FINE .002 -.02	COARSE .02 -.05 -)(	-SAND- VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2 -)	(-COARSE FRACTIONS(MM)-) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - -	- - -	- - -	- - -	- PCT	OF <2MM	(3A1) - -	- - -	- - -	- - -	- - -	- - ->	<- PCT	OF	<75MM(3B1)	->	
81 288	1S	0- 14	A	17.5	36.2	46.3			20.4	15.8	10.8	8.6	7.7	9.0	10.3	10	6	6	50	22
81 289	2S	14- 25	Bw	17.6	33.0	49.4			20.0	13.0	10.4	8.8	8.2	10.7	11.4	12	12	4	56	28
81 290	3S	25- 30	BC	14.6	38.9	46.5			24.9	14.0	11.8	10.4	8.7	8.8	6.8	17	9	--	52	26
81 291	4S	30-115	Cca	13.9	37.3	48.8		2	26.0	11.3	9.3	11.0	9.6	10.3	8.6	15	14	3	59	32

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	(- - DITH-CIT - -) EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG) - LIMITS - LL	PI	(- BULK DENSITY -) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(- - -WATER CONTENT - -) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - -	- - -	-PCT OF	<2MM -	- - -	- - -	- ->			PCT <0.4MM		<- - G/CC	- -	->	CM/CM	<- -	-PCT OF	<2MM -	->	CM/CM
81 288	1	3.31	.154			.3	.1	TR	.96	.57						--			21.2	9.9	.14
81 289	2	2.15	.119			.3	TR	TR	.90	.47						--			18.1	8.2	.12
81 290	3	1.00	.076						.93	.48						--			18.2	7.0	.14
81 291	4								.47	.65						--			23.3	9.0	.16

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA	MG	NA	K	SUM BASES	ACID- ITY	EXTR AL	(- - - -CEC - - -) SUM CATS	NH4- OAC	BASES + AL	AL SAT	-BASE SAT- SUM	NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM				(- - - -PH - - -) CACL2 .01M	H2O
		<- - -	- - -	- - -	- - -	-MEQ /	100 G -	- - -	- - -	- - -	- ->	<- - -	- - -PCT	- - -	- ->					1:2	1:1
81 288	1	13.1	2.1	TR	1.8	17.0	3.3	.0	20.3	16.8			84	100						6.2	6.6
81 289	2	13.1	2.2	TR	1.1	16.4	.5	.0	16.9	15.8			97	100						6.5	6.9
81 290	3	14.7	2.2	.1	.6	17.6			17.6	13.6			100	100						7.0	7.5
81 291	4	23.7	3.0	.1	.2					6.5				100	20					8.0	8.5

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 12.2 PCT .1-75MM 58.4

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 66
UTM Coordinate: 49-81.7N/23.9E
Pedon Classification: Cryic Eutroboralf; loamy-skeletal, mixed.
Vegetative Habitat: TF
Geological Unit: Qs
Surficial Unit: ls
Parent Material: Colluvium.
Topography: Rolling. Gradient is 15 percent. North aspect. Convex. Slope length is 120 meters. Elevation is 1830 meters.
Drainage: Moderately well drained.

(All colors are for moist condition unless otherwise stated.)

A 292 0 to 14 cm. Very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry; strong medium granular structure; friable; many fine and common medium roots; 18 percent pebbles; neutral; abrupt smooth boundary.

Bw 293 14 to 30 cm. Olive brown (2.5Y 4/4) extremely gravelly coarse sandy loam, yellowish brown (10YR 5/4) dry; moderate fine granular structure; friable; common fine roots; 62 percent pebbles; neutral; clear discontinuous boundary; occupies one third of pedon.

Bt 294 15 to 35 cm. Olive (5Y 4/4) gravelly loam, pale brown (10YR 6/3) dry; strong medium and fine granular structure; firm; common fine roots; 19 percent pebbles; neutral; clear discontinuous boundary; occupies two-thirds of pedon.

BC 295 30 to 52 cm. Brown (10YR 4/3) extremely gravelly coarse sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; firm; few fine roots; 68 percent pebbles; neutral; clear wavy boundary.

C 296 52 to 100 cm. Pale brown (10YR 6/3) gravelly loam, white (10YR 8/1) dry; massive; very friable; few fine roots; 31 percent pebbles; neutral.

PLOT 66

CLASSIFICATION: Cryic Eutroboralf, loamy-skeletal, mixed

S 81WY-029 - 15 SAMPLE NOS. 81P 292 - 296 DATE 03/05/86

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 23

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SAMPLE NO.	HZN NO.	-1-- DEPTH (CM)	-2-- HORIZON	-3-- TOTAL CLAY LT .002	-4-- TOTAL SILT .002-.05	-5-- TOTAL SAND .05-2	-6-- CLAY FINE LT .0002	-7-- CLAY CO3 LT .002	-8-- SILT FINE .002-.02	-9-- SILT COARSE .02-.05	-10- SAND VF .05-.10	-11- SAND F .10-.25	-12- SAND M .25-.50	-13- SAND C .5-1	-14- SAND VC 1-2	-15- COARSE FRACTIONS WEIGHT 2-5	-16- 5-20	-17- 20-75	-18- .1-75	-19- (>2MM) WT PCT OF WHOLE SOIL
				<- PCT OF <2MM (3A1)											->	<- PCT OF <75MM(3B1) ->				
81 292	1S	0- 14	A	19.1	33.2	47.7			20.1	13.1	11.0	11.0	8.4	8.9	8.4	9	8	10	54	27
81 293	2S	14- 30	BW	17.2	22.2	60.6			12.3	9.9	8.3	10.4	9.4	13.1	19.3	15	39	21	88	75
81 294	3S	15- 35	BW	26.0	35.0	39.0			20.7	14.3	12.4	10.9	6.7	5.2	3.8	12	6	10	47	28
81 295	4S	30- 52	BC	12.7	18.6	68.7			11.3	7.3	6.7	9.3	10.2	17.1	25.4	13	29	38	92	80
81 296	5S	52-100	C	17.6	31.4	51.0			20.5	10.9	10.8	11.4	9.1	9.5	10.2	20	22	4	68	46

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- PCT OF <2MM						->			PCT <0.4MM		<- G/CC		->	CM/CM	<- PCT OF <2MM			->	CM/CM
81 292	1	3.08	.189			.4	TR	.1	1.38	.68						--			25.1	13.0	.15
81 293	2	1.23	.032						2.30	1.10						--			28.1	18.9	.05
81 294	3	1.07	.079						1.07	.56						--			26.5	14.5	.14
81 295	4	1.10							3.08	1.51						--			25.0	19.2	.03
81 296	5								2.41	1.10						--			34.6	19.4	.15

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA	MG	NA	K	SUM BASES	ACID-ITY	EXTR AL	CEC SUM CATS	CEC NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	PH CACL2 .01M 1:2	PH H2O 1:1
		<- MEQ / 100 G									->	<- PCT			->			
81 292	1	15.2	5.7	.1	3.3	24.3	2.2		26.5	26.3			92	92			6.2	6.7
81 293	2	23.9	12.9	.1	2.9	39.8			39.8	39.5			100	100			6.5	6.9
81 294	3	17.3	8.3	.1	2.0	27.7			27.7	27.9			100	99			6.6	7.0
81 295	4	22.0	15.4	.1	2.0	39.5			39.5	39.1			100	100	TR		6.6	7.2
81 296	5	24.2	17.6	.1	1.8	43.7			43.7	42.5			100	100	TR		5.9	7.3

FAMILY CONTROL SECTION: DEPTH 15- 35 PCT CLAY 38.9 PCT .1-75MM ****

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Plot No.: 67
UTM Coordinate: 49-74.3N/5-24.2E
Pedon Classification: Typic Cryumbrept; fine-loamy, mixed.
Vegetative Habitat: 5NO
Geological Unit: Qsl
Surficial Unit: pt
Parent Material: Till.
Topography: Nearly level. Gradient is 3 percent. Southwest aspect. Planar. Slope length is greater than 500 meters. Elevation is 2255 meters.
Drainage: Well drained.

(All colors are for moist condition unless otherwise stated.)

Oa 4 to 0 cm. Decomposed conifer needles and mosses; abrupt wavy boundary.

A 297 0 to 9 cm. Very dark grayish brown (10YR 3/2) gravelly loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine, many medium and few coarse roots; 19 percent pebbles; neutral; clear wavy boundary.

Bw1 298 9 to 23 cm. Dark grayish brown (2.5Y 4/2) gravelly loam, brown (10YR 5/3) dry; weak coarse subangular blocky and fine granular structure; friable; many fine, common medium and common coarse roots; 19 percent pebbles; slightly acid; clear wavy boundary.

Bw2 299 23 to 37 cm. Dark grayish brown (10YR 4/2) gravelly loam, brown (10YR 5/3) dry; weak medium subangular blocky and moderate fine granular structure; friable; common fine, common medium and few coarse roots; 27 percent pebbles; neutral; abrupt wavy boundary.

BC 300 37 to 51 cm. Brown (10YR 4/3) gravelly loam, light olive brown (2.5Y 5/4) dry; moderate medium subangular blocky and fine granular structure; very firm; common fine, few medium and few coarse roots; 19 percent pebbles; neutral; clear wavy boundary.

C 301 51 to 125 cm. Grayish brown (10YR 5/2) gravelly loam, light gray (10YR 7/1) dry; strong coarse and medium subangular blocky structure; very firm; few fine roots; 26 percent pebbles, 1 percent cobbles; neutral.

PLOT 67

CLASSIFICATION: Typic Cryumbrept, fine-loamy, mixed

S 81WY-029 - 16

YELLOWSTONE SOIL CHARACTERIZATION ST

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NOS. 81P 297 - 301

DATE 03/05/86

MICHIGAN TECHNOLOGICAL UNIV.
FORD FORESTRY CENTER
SOIL SURVEY LABORATORY
L ANSE, MICHIGAN

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	-4- TOTAL CLAY LT .002	-5- TOTAL SILT .002-.05	-6- TOTAL SAND .05-2	-7- CLAY FINE LT .0002	-8- CLAY CO3 LT .002	-9- SILT FINE .002-.02	-10- SILT COARSE .02-.05	-11- SAND VF .05-.10	-12- SAND F .10-.25	-13- SAND M .25-.50	-14- SAND C .5-1	-15- SAND VC 1-2	-16- COARSE FRACTIONS (MM) WEIGHT 2-5	-17- 5-20	-18- 20-75	-19- .1-75	-20- (>2MM) WT PCT OF WHOLE SOIL
				<- - -	- - -	- - -	- - -	PCT OF <2MM	(3A1)	- - -	- - -	- - -	- - -	- - -	- - ->	<- PCT OF <75MM (3B1)			->	
81 297	1S	0- 9	A	25.3	30.2	44.5			10.5	19.7	10.1	8.6	6.8	8.5	10.4	8	14	6	53	28
81 298	2S	9- 23	Bw1	22.4	35.2	42.4			15.2	20.0	10.8	8.9	6.8	7.8	9.1	8	10	10	51	28
81 299	3S	23- 37	Bw2	26.9	30.4	42.7			10.4	20.0	10.7	9.2	7.0	8.4	7.4	9	10	22	60	41
81 300	4S	37- 51	BC	23.4	32.1	44.5			11.7	20.4	11.4	9.7	7.4	7.5	8.4	15	13	1	52	29
81 301	5S	51-125	C	14.7	37.0	48.3			13.8	23.2	11.8	11.1	8.4	8.8	8.2	11	13	15	61	40

SAMPLE NO.	HZN NO.	ORGN C	TOTAL N	EXTR P	TOTAL S	DITH-CIT EXTRACTABLE FE	AL	MN	(RATIO/CLAY) CEC	15 BAR	(ATTERBERG LIMITS) LL	PI	(BULK DENSITY) FIELD MOIST	1/3 BAR	OVEN DRY	COLE WHOLE SOIL	(WATER CONTENT) FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WRD WHOLE SOIL
		<- - -	- - -	PCT OF <2MM	- - -	- - -	- - -	- ->			PCT <0.4MM		<- - G/CC	- - -	- ->	CM/CM	<- - -PCT OF <2MM			- ->	CM/CM
81 297	1	1.75	.108			.5	.1	.1	.76	.33						--			23.9	8.4	.18
81 298	2	1.78	.104			.5	.2	TR	.78	.36						--			22.8	8.0	.13
81 299	3	1.13	.062			.5	.1	TR	.57	.29						--			20.4	7.7	.14
81 300	4	.86	.032			.5	.1	TR	.56	.30						--			13.4	7.0	.14
81 301	5					.4	.1	TR	.46	.26						--			14.6	3.8	.11

SAMPLE NO.	HZN NO.	(NH4OAC EXTRACTABLE BASES) CA	MG	NA	K	SUM BASES	ACIDITY	EXTR AL	(CEC) SUM CATS	NH4-OAC	BASES + AL	AL SAT	BASE SAT SUM	BASE SAT NH4 OAC	CO3 AS CACO3 <2MM	RES. OHMS /CM	(PH) CACL2 .01M 1:2	H2O 1:1
		<- - -	- - -	- - -	- - -	-MEQ / 100 G	- - -	- - -	- - -	- - -	- ->	<- - -	PCT	- - ->				
81 297	1	14.1	2.2	TR	1.2	17.5	3.3	.0	20.8	19.3			84	91			6.1	6.6
81 298	2	13.1	2.2	TR	.7	16.0	4.6	.0	20.6	17.4			78	92			5.9	6.5
81 299	3	11.0	2.2	.1	.5	13.9	.3	.0	14.2	15.2			98	91			5.9	6.6
81 300	4	9.6	2.1	.1	.6	12.4	.1	.0	12.5	13.0			99	95			6.1	6.8
81 301	5	4.1	1.0	TR	.3	5.4	.0	.0	5.4	6.7			100	81			6.2	6.9

FAMILY CONTROL SECTION: DEPTH 25-100 PCT CLAY 18.3 PCT .1-75MM 59.2

ANALYSES: S= ALL ON SIEVED <2MM BASIS

APPENDIX III

Soil Interpretation Guidelines

§603.03-1 Sanitary facilities.

The nature of the soil is important in selecting sites for septic tank absorption fields, sewage lagoons, and sanitary landfills and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Those soil properties that determine the ease of excavation or installation of these facilities also affect the ratings. Soil limitation ratings of slight, moderate, or severe are given for septic tank absorption fields, sewage lagoons, and trench and area type sanitary landfills. Soil suitability ratings of good, fair, and poor are given for daily cover for landfill.

(a) Septic tank absorption fields. See table 603-10. Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. The centerline depth of the tile is assumed to be at a depth of 24 inches. Only the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

(1) Properties and features that affect the absorption of the effluent are permeability, depth to a seasonal high water table, depth to bedrock, cemented pan, and susceptibility to flooding. Stones, boulders, and a shallow depth to bedrock, ice, or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. Also, soil erosion is a hazard where absorption fields are installed in sloping soils.

(2) Some soils are underlain by loose sand and gravel or fractured bedrock at a depth less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new, and as a result the groundwater supply may be contaminated. Soils that have a hazard of inadequate filtration are given a severe rating.

(3) Percolation tests are used by some regulatory agencies to evaluate the soil's suitability for septic tank absorption fields. These tests should be performed during the season when the water table is highest and the soil is at minimum absorptive capacity. The percolation rates do not correspond to the permeability rates because they are measured by different methods. Experience indicates that soils that have a percolation rate faster than 45 minutes per inch function satisfactorily, soils that have a rate between 45 and 60 minutes per inch have moderate limitations, and soils that have a rate slower than 60 minutes per inch have severe limitations. 1/

1/ U.S. Department of Health, Education and Welfare, Public Health Service, 1969 Manual of Septic Tanks, PHS Publication No. 526, p. 8.

(4) If slippage or pitting is observed or if combinations of soil properties and geologic conditions suggest susceptibility to or probability of such phenomena, the soil is rated SEVERE and SLIPPAGE or PITTING is listed as the restrictive feature.

(5) In many of the soils that have moderate or severe limitations for septic tank absorption fields, it may be possible to install special systems that lower the seasonal water table or to increase the size of the absorption field so that satisfactory performance is achieved. 2/ However, such systems are not considered in this guide.

2/ Bouma, J. 1974. New Concepts in Soil Survey Interpretations for Onsite Disposal of Septic Tank Effluent.

Table 603-10. Septic tank absorption fields.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. TOTAL SUBSIDENCE (IN)	---	---	>24	SUBSIDES
3. FLOODING	NONE	RARE	COMMON	FLOODING
4. DEPTH TO BEDROCK (IN)	>72	40-72	<40	DEPTH TO ROCK
5. DEPTH TO CEMENTED PAN (IN)	>72	40-72	<40	CEMENTED PAN
6. DEPTH TO HIGH WATER TABLE (FT)	--- >6	--- 4-6	+ <4	PONDING WETNESS
7. PERMEABILITY (IN/HR): (24-60") (24-40")	2.0-6.0 ---	I/0.6-2.0 ---	<0.6 >6.0	PERCS SLOWLY POOR FILTER
8. SLOPE (PCT)	<8	8-15	>15	SLOPE
9. 1/FRACTION >3 IN (WT PCT)	<25	25-50	>50	LARGE STONES
10. DOWNSLOPE MOVEMENT	---	---	II/	SLIPPAGE
11. FORMATION OF PITS	---	---	III/	PITTING

1/Weighted average to 40 inches.
I/Recheck to see if rating should be SLIGHT.
II/If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate "SEVERE-SLIPPAGE."
III/If soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate "SEVERE-PITTING."

603.03-1(b)

(b) Sewage lagoons. See table 603-11. Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed so that the depth of sewage is 2 to 5 feet. Relatively impervious soil for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

(1) Soil permeability is a critical property in evaluating a soil for sewage lagoons. Most porous soils will eventually seal when being used as a sewage lagoon; however, until they do, the hazard of pollution is severe and it is difficult to maintain the constant water depth required for proper operation. Soils that have a permeability rate exceeding 2 inches per hour generally are too porous for proper operation of sewage lagoons and may cause contamination of shallow wells. Fractured bedrock within a depth of 40 inches may create a pollution hazard. Bedrock and cemented pans create construction problems.

(2) The slope limits are based on the specification that the effluent be 2 to 5 feet deep. If it is shallower than this, weeds grow; if it is deeper, an aerobic environment is more difficult to maintain. Slope must be gentle enough and the soil material thick enough over bedrock or a cemented pan to make smoothing practical, so that the lagoon is uniformly deep throughout.

(3) If floodwater overtops the lagoon, it interferes with the functioning of the lagoon and carries away polluting sewage before sufficient decomposition has taken place. Ordinarily, therefore, soils susceptible to flooding have a severe limitation for sewage lagoons. If, however, floodwaters are slow and flooding is rarely, if ever, more than 5 feet deep--not deep enough to overtop the lagoon embankment--the susceptibility to flooding does not constitute a severe limitation rating.

(4) Soils that contain a large amount of organic matter are not suitable for the floor of the lagoon. The organic matter promotes an anaerobic rather than aerobic environment and is detrimental to the proper functioning of the lagoon.

(5) Depth to water table is important if it influences the water level in the lagoon. If it does, then a pollution hazard also exists. Depth to water table is disregarded if the lagoon floor is of slowly permeable soil material at least 4 feet thick. Soils that contain rock fragments are undesirable sites because the fragments interfere with the manipulation and compaction needed to prepare the lagoon floor.

(6) If slippage, pitting, or differential settling is observed or if combinations of soil properties and geologic conditions suggest the susceptibility to or probability of such phenomena, the soil is rated SEVERE and SLIPPAGE, or PITTING, is listed as the restrictive feature.

Table 603-11. Sewage lagoons.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. PERMEABILITY (IN/HR) (12-60")	<0.6	0.6-2.0	>2.0	SEEPAGE
3. DEPTH TO BEDROCK (IN)	>60	40-60	<40	DEPTH TO ROCK
4. DEPTH TO CEMENTED PAN (IN)	>60	40-60	<40	CEMENTED PAN
5. FLOODING	NONE, RARE	---	IV/ COMMON	FLOODING
6. SLOPE (PCT)	<2	2-7	>7	SLOPE
7. UNIFIED (ANY DEPTH)	---	OL, OH	PT	EXCESS HUMUS
8. DEPTH TO HIGH WATER TABLE (FT)	--- >5	--- 2/ 3.5-5	+ 2/ <3.5	PONDING WETNESS
9. 3/ FRACTION >3 IN (WT PCT)	<20	20-35	>35	LARGE STONES
10. DOWNSLOPE MOVEMENT	---	---	II/	SLIPPAGE
11. FORMATION OF PITS	---	---	III/	PITTING
12. DIFFERENTIAL SETTLING	---	---	V/	UNSTABLE FILL

2/ Disregard wetness if a layer at least 20 inches thick has permeability of less than 0.2 in/hr.

3/ Weighted average to 20 inches.

II/ If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate "SEVERE-SLIPPAGE."

III/ If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate "SEVERE-PITTING."

IV/ If floodwater will not enter or damage sewage lagoon (low velocity and depth <5 feet), disregard flooding.

V/ If the soil is susceptible to differential settling, rate "SEVERE-UNSTABLE FILL."

§603.03-5 Recreation development.

Soils are rated according to limitations that affect their suitability for camp areas, picnic areas, playgrounds, and paths and trails. This rating does not consider location and accessibility of the area, size and shape of the area, scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public service lines or capacity of the soil to absorb septic tank effluent; however, these features are important in evaluating a site. Soils subject to flooding are limited, in varying degree, for recreational use by the duration of flooding and the season when it occurs. Onsite assessment of the duration and frequency of flooding is essential in planning recreational facilities.

(a) Camp areas. See table 603-33. Camp areas are tracts of land used intensively as sites for tents, trailers, campers, and the accompanying activities of outdoor living. Camp areas require such site preparation as shaping and leveling in areas for tents and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camping areas and the performance of the camping area after development. Soil properties that influence trafficability and promote the growth of vegetation after heavy use are important.

(1) Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns in developing camp areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. Soil properties that influence trafficability are texture of the surface layer, wetness, permeability, and large stones. Slow permeability and clayey surface texture are not so severe a limitation in dry regions of the country; however, silty soils may be more of a problem because they are dusty. Soil properties that influence the growth of plants are depth to bedrock or a cemented pan, permeability, and presence of toxic materials. Soils that are subject to flooding are particularly hazardous for camp areas because of the danger to life and property.

(2) If soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated SEVERE and FRAGILE is listed as the restrictive feature.

Table 603-33. Camp areas.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. FLOODING	NONE	---	RARE, COMMON	FLOODING
3. SLOPE (PCT)	<8	8-15	>15	SLOPE
4. USDA TEXTURE MODIFIER (SURFACE LAYER)	---	STV, BYV, CB, FL	STX, BYX, CBX, FLX, CBV, FLV, CNX, CRX, SHX, SYX	LARGE STONES
5. 11/COARSE FRAGMENTS (PCT) (SURFACE LAYER)	<25	25-50	>50	SMALL STONES
6. DEPTH TO HIGH WATER TABLE (FT)	--- >2.5	--- 1.5-2.5	+ <1.5	PONDING WETNESS
7. 27/PERMEABILITY (IN/HR) (0-40")	>0.6	0.06-0.6	<0.06	PERCS SLOWLY
8. 27/USDA TEXTURE (SURFACE LAYER)	---	---	SC, SIC, C	TOO CLAYEY
9. UNIFIED (SURFACE LAYER)	---	---	PT	EXCESS HUMUS
10. USDA TEXTURE (SURFACE LAYER)	---	LCOS, VFS 28/LFS, 28/LS	COS, S, FS	TOO SANDY
11. DEPTH TO BEDROCK (IN)	---	---	<20	DEPTH TO ROCK
12. DEPTH TO CEMENTED PAN (IN)	---	---	<20	CEMENTED PAN
13. 29/USDA TEXTURE (SURFACE LAYER)	---	SIL, SI, VFSL, L	---	DUSTY
14. SODIUM ADSORPTION RATIO (0-40") OR GREAT GROUP AND PHASE	---	---	>12 (NATRIC, HALIC, ALKALI PHASES)	EXCESS SODIUM
15. SALINITY (MMHOS/CM) (SURFACE LAYER)	<4	4-8	>8	EXCESS SALT
16. SOIL REACTION (SURFACE LAYER)	---	---	<3.6	TOO ACID
17. OTHER	---	---	XVI/	FRAGILE

11/100-% passing No. 10 sieve.

27/Soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups, rate one class better.

28/Rate SLIGHT if finer textured material is within 20 inches of the surface.

29/Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.

XVI/If the soil is easily damaged by use or disturbance, rate "SEVERE-FRAGILE."

603.03-5(b)

(b) Picnic areas. See table 603-34. Picnic areas are natural or landscaped tracts used primarily for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking lots. Soils are rated on the basis of properties that influence development costs of shaping the site, trafficability, and growth of vegetation after development.

(1) Slope and stoniness are the main concerns in developing picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. Soil properties that influence trafficability are texture of the surface layer, wetness, permeability, and large stones. Slow permeability and clayey surface texture are not so severe a limitation in dry regions of the country; however, silty soils may be more of a problem because they are dusty. Soil properties that influence the growth of plants are depth to bedrock, permeability, and the presence of toxic materials.

(2) If soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated SEVERE and FRAGILE is listed as the restrictive feature.

Table 603-34. Picnic areas.

PROPERTY	LIMITS SLIGHT	LIMITS MODERATE	LIMITS SEVERE	RESTRICTIVE FEATURE
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. SLOPE (PCT)	<8	8-15	>15	SLOPE
3. FLOODING	NONE, RARE, OCCAS	FREQ	---	FLOODING
4. DEPTH TO HIGH WATER TABLE (FT)	--- >2.5	--- 1.0-2.5	+ <1.0	PONDING WETNESS
5. USDA TEXTURE MODIFIER (SURFACE LAYER)	---	STV, BYV, CB, FL	STX, BYX, CBX, FLX, CBV, FLV, CNX, CRX, SHX, SYX	LARGE STONES
6. 27/USDA TEXTURE (SURFACE LAYER)	---	---	SC, SIC, C	TOO CLAYEY
7. USDA TEXTURE (SURFACE LAYER)	---	LCOS, VFS 28/ LFS, 28/ LS	COS, S, FS	TOO SANDY
8. UNIFIED (SURFACE LAYER)	---	---	PT	EXCESS HUMUS
9. 11/COARSE FRAGMENTS (PCT) (SURFACE LAYER)	<25	25-50	>50	SMALL STONES
10. SODIUM ADSORPTION RATIO (0-40") OR GREAT GROUP OR PHASE	---	---	>12 (NATRIC, HALIC, ALKALI PHASES)	EXCESS SODIUM
11. SALINITY (MMHOS/CM) (SURFACE LAYER)	<4	4-8	>8	EXCESS SALT
12. SOIL REACTION (pH) (SURFACE LAYER)	---	---	<3.5	TOO ACID
13. 27/PERMEABILITY (IN/HR) (0-40")	>0.6	0.06-0.6	<0.06	PERCS SLOWLY
14. 29/USDA TEXTURE (SURFACE LAYER)	---	SIL, SI, VFSL, L	---	DUSTY
15. DEPTH TO BEDROCK (IN)	---	---	<20	DEPTH TO ROCK
16. DEPTH TO CEMENTED PAN (IN)	---	---	<20	CEMENTED PAN
17. OTHER	---	---	XVI/	FRAGILE

11/100-% passing No. 10 sieve.

27/Soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups, rate one class better.

28/Rate SLIGHT if finer textured material is within 20 inches of the surface.

29/Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.

XVI/If the soil is easily damaged by use or disturbance, rate "SEVERE--FRAGILE."

603.03-5(c)

(c) Playgrounds. See table 603-35. Playgrounds are areas used intensively for games such as baseball, football, and similar activities. Playgrounds require a nearly level soil that is free of stones and that can withstand heavy foot traffic and still maintain adequate vegetation. Soils are rated on the basis of properties that influence cost of shaping, trafficability, and growth of vegetation.

(1) Slope and stoniness are the main concerns in developing playgrounds. For good trafficability, the surface of playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. Soil properties that influence trafficability are texture of the surface layer, wetness, permeability, and large stones. Slow permeability and clayey surface texture are not so severe a limitation in dry regions of the country; however, silty soils may be more of a problem because they are dusty. Soil properties that influence the growth of plants are depth to bedrock, permeability, and the presence of toxic materials.

(2) If soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated SEVERE and FRAGILE is listed as the restrictive feature.

Table 603-35. Playgrounds.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. USDA TEXTURE MODIFIER (SURFACE LAYER)	---	ST	STV, STX, BYV, BYX, CB, CBV, FL, FLV, BY, CBX, CNX, CRX, FLX, SHX, SYX	LARGE STONES
3. SLOPE (PCT)	<2	2-6	>6	SLOPE
4. 11/COARSE FRAGMENTS (PCT) (SURFACE LAYER)	<10	10-25	>25	SMALL STONES
5. 27/USDA TEXTURE (SURFACE LAYER)	---	---	SC, SIC, C	TOO CLAYEY
6. USDA TEXTURE (SURFACE LAYER)	---	LCOS, VFS 28/ LFS, 28/ LS	COS, S, FS	TOO SANDY
7. UNIFIED (SURFACE LAYER)	---	---	PT	EXCESS HUMUS
8. DEPTH TO HIGH WATER TABLE (FT)	--- <2.5	--- 1.5-2.5	+ <1.5	PONDING WETNESS
9. FLOODING	NONE, RARE	OCCAS	FREQ	FLOODING
10. DEPTH TO BEDROCK (IN)	>40	30/20-40	<20	DEPTH TO ROCK
11. DEPTH TO CEMENTED PAN (IN)	>40	30/20-40	<20	CEMENTED PAN
12. 27/PERMEABILITY (IN/HR) (0-40")	>0.6	0.06-0.6	<0.06	PERCS SLOWLY
13. 29/USDA TEXTURE (SURFACE LAYER)	---	SIL, SI, VFSL, L	---	DUSTY
14. SODIUM ADSORPTION RATIO (0-40") OR GREAT GROUP OR PHASE	---	---	>12 (NATRIC, HALIC, ALKALI PHASES)	EXCESS SODIUM
15. SALINITY (MMHOS/CM) (SURFACE LAYER)	<4	4-8	>8	EXCESS SALT
16. SOIL REACTION (pH) (SURFACE LAYER)	---	---	<3.6	TOO ACID
17. OTHER	---	---	XVI/	FRAGILE

11/100-% passing No. 10 sieve.
27/Soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups, rate one class better.
28/Rate SLIGHT if finer textured material is within 20 inches of the surface.
29/Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
30/Rate SLIGHT on 0-2% slopes.
XVI/If the soil is easily damaged by use or disturbance, rate "SEVERE-FRAGILE."

603.03-5(d)

(d) Paths and trails. See table 603-36. Paths and trails are used for walking, horseback riding, and similar uses and require little or no cutting or filling. The soils are rated on the properties that influence trafficability and erodibility. These are stoniness, wetness, texture of the surface layer, slope, flooding, erodibility, and, in dry regions, dustiness. If soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated SEVERE and FRAGILE is listed as the restrictive feature.

Table 603-36. Paths and trails.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. FRACTION >3 IN (WT PCT) (SURFACE LAYER)	<25	25-50	>50	LARGE STONES
3. DEPTH TO HIGH WATER TABLE (FT)	--- >2	--- 1-2	+ <1	PONDING WETNESS
4. 27/USDA TEXTURE (SURFACE LAYER)	---	---	SC, SIC, C	TOO CLAYEY
5. USDA TEXTURE (SURFACE LAYER)	---	LCOS, VFS 28/ LFS, 28/ LS	COS, S, FS	TOO SANDY
6. UNIFIED (SURFACE LAYER)	---	---	PT	EXCESS HUMUS
7. SLOPE (PCT)	<15	15-25	>25	SLOPE
8. EROSION FACTOR (K) (SURFACE LAYER)	---	---	31/ >.35	ERODES EASILY
9. 11/COARSE FRAGMENTS (WT PCT) (SURFACE LAYER)	---	---	>65	SMALL STONES
10. FLOODING	NONE, RARE, OCCAS	FREQ	---	FLOODING
11. 29/USDA TEXTURE (SURFACE LAYER)	---	SIL, SI, VFSL, L	---	DUSTY
12. OTHER	---	---	XVI/	FRAGILE

11/100-% passing No. 10 sieve.
27/Soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups, rate one class better.
28/Rate SLIGHT if finer textured material is within 20 inches of the surface.
29/Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
31/Disregard on slopes of 8% or less.
XVI/If the soil is easily damaged by use or disturbance, rate "SEVERE-FRAGILE."

(e) Off-road motorcycle trails. See table 603-37. Off-road motorcycle trails are primarily for recreational use. Trails for other off-road vehicles may have similar criteria. Little or no trail preparation is done, and the surface is not vegetated or surfaced. Considerable soil compaction on the trail is expected. Soils are rated on the properties that influence erodibility, difficulty in revegetation, trafficability, and dustiness. Soil properties considered are stoniness, slope, wetness, texture of the surface layer, and flooding. Slope affects the soil erodibility. Large stones affect configuration of the trail. Small stones affect trafficability. Wetness and flooding affect revegetation and frequency of use. Surface texture affects erodibility, trafficability, revegetation, and probability of dust. If soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated SEVERE and FRAGILE is listed as the restrictive feature.

Table 603-37. Off-road motorcycle trails.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. FRACTION >3 IN (WT PCT) (SURFACE LAYER)	<10	10-25	>25	LARGE STONES
3. DEPTH TO HIGH WATER TABLE (FT)	--- >2	--- 1-2	+ <1	PONDING WETNESS
4. EROSION FACTOR (K) X PERCENT SLOPE	>2	2-4	>4	ERODES EASILY
5. 27/USDA TEXTURE (SURFACE LAYER)	---	---	SC, SIC, C	TOO CLAYEY
6. USDA TEXTURE (SURFACE LAYER)	---	LCOS, VFS	COS, S, FS	TOO SANDY
7. UNIFIED (SURFACE LAYER)	---	---	PT	EXCESS HUMUS
8. SLOPE (PCT)	<25	25-40	>40	SLOPE
9. 11/COARSE FRAGMENTS (WT PCT) (SURFACE LAYER)	<40	40-65	>65	SMALL STONES
10. USDA TEXTURE (SURFACE LAYER)	---	SIL, SI VFSL, L	---	DUSTY
11. FLOODING	NONE, RARE, OCCAS	FREQ	---	FLOODING
12. OTHER	---	---	XVI/	FRAGILE

11/100-% passing No. 10 sieve.
27/Soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups, rate one class better.
XVI/If the soil is easily damaged by use or disturbance, rate "SEVERE-FRAGILE."

GLOSSARY

A Glossary of Soil Science Terms

alluvium - A deposit of material resulting from water movement.

base saturation - The extent to which the adsorption complex of a soil is occupied by positively charged ions (other than hydrogen). It is expressed as a percentage of the total cation exchange capacity.

cation exchange capacity - The total amount of exchangeable cations that a soil can adsorb. Expressed in millequivalents per 100 grams of soil.

clay - A soil separate consisting of particles <0.002 mm in diameter.

colluvium - A deposit of rock fragments and soil material resulting from gravitational action on steep slopes.

dolomitic - Rock type formed of calcium and magnesium carbonates.

detritus - Soil material resulting from the disintegration and weathering of rocks that have been moved from their site of origin.

family, soil - In taxonomic classification of soils, a category intermediate between the great soil group and the soil series, defining the predominant texture of the soil.

horizon - A layer of soil material approximately parallel to the land surface and differing from adjacent genetically related layers in physical, chemical, and biological properties or characteristics such as color, structure, texture, or consistency.

A horizon - Mineral horizon consisting of accumulated organic matter, in varied stages of decomposition, located at or near the surface of the soil.

B horizon - Mineral horizon located below the A horizon, differing in color, texture, or chemical composition due to illuviation, or to alteration of material from its original composition.

C horizon - Lower horizon which has been relatively unaffected by soil genesis processes, and lacking properties diagnostic of A or B horizons.

kame - An irregular ridge or hill of stratified glacial drift.

lacustrine - A deposit of material from lake water, which has been exposed due to lowering of the water level or elevation of the land.

parent material - The unconsolidated and somewhat weathered mineral or organic matter from which the solum of soils is developed through chemical and physical processes.

pedon - A unit of sampling used to determine the nature of a soil. The pedon is the smallest volume of sample necessary to represent the characteristics of that type of soil. It ranges in area from 1 to 10 sq. meters depending on variability, and is deep enough to represent all soil horizons.

profile, soil - A vertical section of the soil through all its horizons and extending into the parent material.

sand - A soil particle of between 0.05 and 2.0 mm in diameter.

sequum - A series of soil horizons occurring in a uniform morphological sequence.

silt - A soil separate consisting of particles between 0.002 and 0.05 mm in diameter.

solum - The upper and most weathered part of the soil profile; the A and B horizons.

till - Unstratified glacial drift deposited directly by the ice and consisting of clay, sand, gravel and boulders combined in any proportion.

tuff - Volcanic ash usually more or less stratified and in various states of consolidation.

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