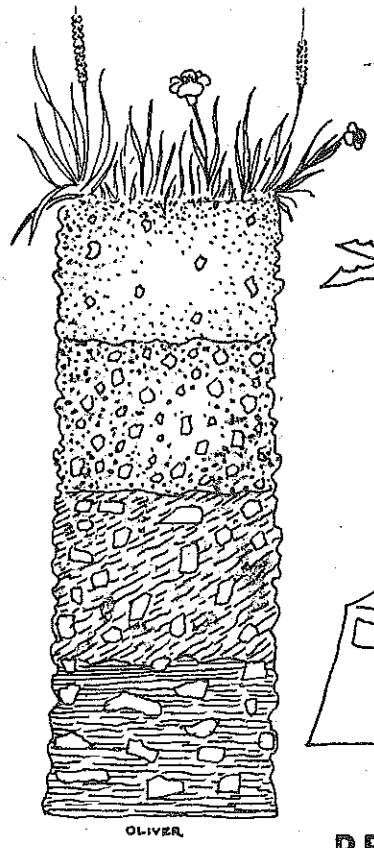
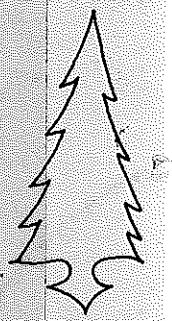
OIL RESOURCE INVENTORY

SLAW NATIONAL FOREST

SOIL INFORMATION AND INTERPRETIVE TABLES





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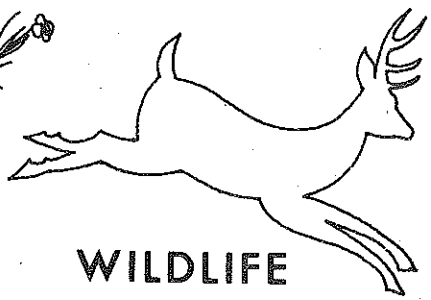

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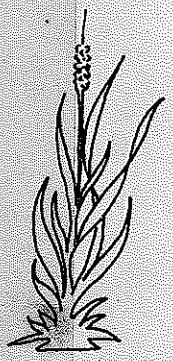

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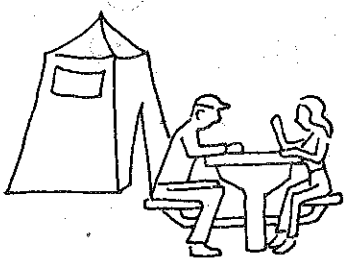
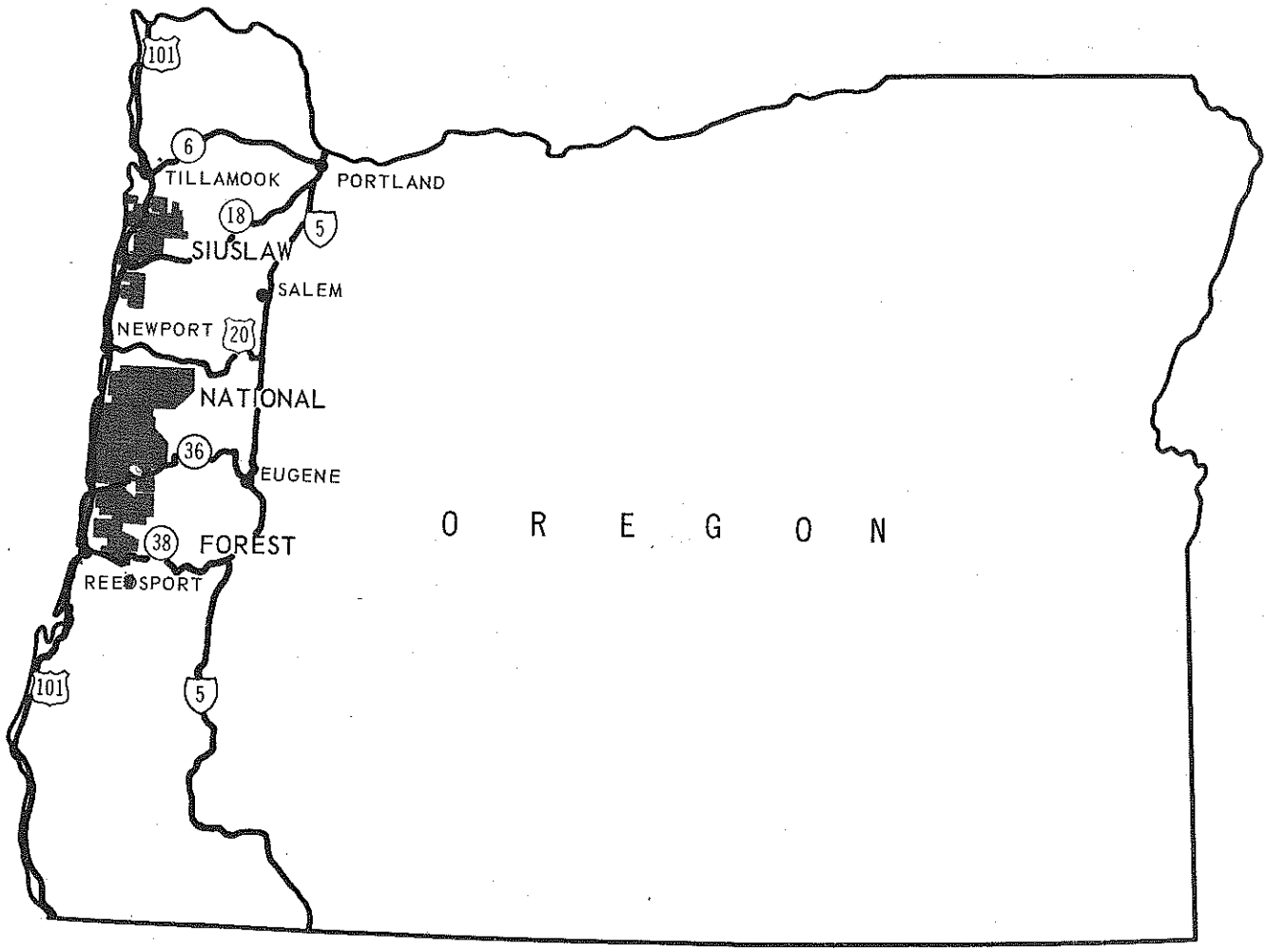
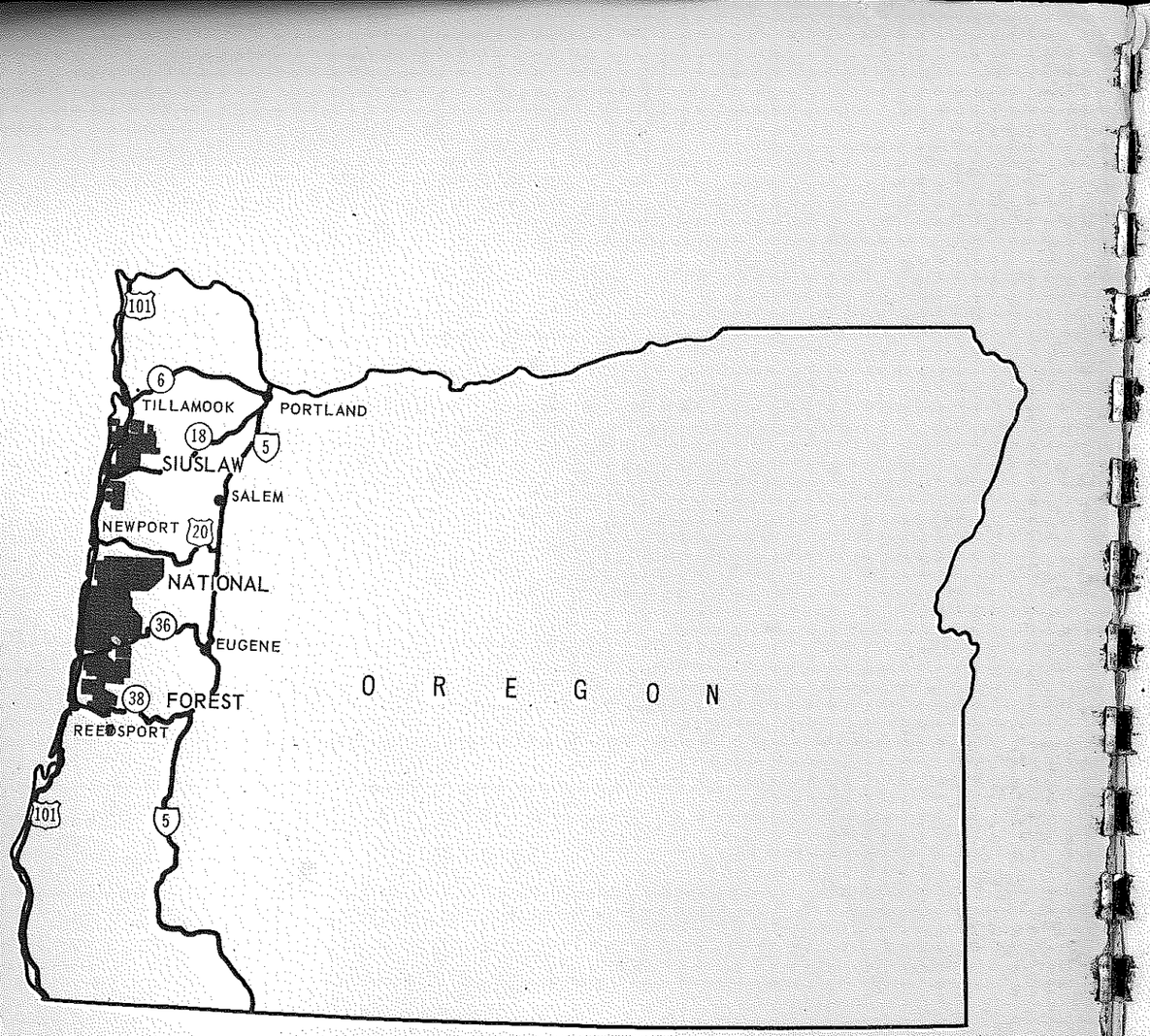


RECREATION

WATER

FOREST SERVICE
PACIFIC NORTHWEST REGION





SIUSLAW NATIONAL FOREST

SOIL RESOURCE INVENTORY

Pacific Northwest Region

June 1974

Prepared by

George J. Badura, Harold A. Legard, and LeRoy C. Meyer
Soil Scientists

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PREFACE

This Soil Resource Inventory of the Siuslaw National Forest was made to provide some basic soil, bedrock, and landform information for management interpretations. The inventory is part of the Regional soils program developed by the Soil Management Branch of the Division of Watershed Management to assist forest land managers in applying multiple-use principles.

The objective of this Soil Resource Inventory is to provide soils information in a form useful to the land manager as an aid to multiple use management as directed by Public Law 86-517. This law states that the National Forests are to be administered to achieve and maintain in perpetuity a high level of annual or regular periodic output of the various renewable resources of the National Forests without impairment of the productivity of the land.

All renewable surface resources of the National Forest are dependent upon soil, which is a nonrenewable resource. Soils develop at a slow rate, about one inch every thousand years in residual soils developing from rock. Soils developing from alluvium and colluvium proceed at a somewhat faster rate. This fact necessitates conservation, wise use, and in many instances, preservation of this basic resource in order to produce high-level, sustained yields of water, timber, recreation, wildlife, and forage. To accomplish sustained yield of renewable resources, to conserve or preserve the soil resource while making wise use of this resource, it is necessary to have basic soils information and to make sound management interpretations.

This report contains information on climate, soils, geology, landform features, and some management interpretations. Under separate cover is an Atlas of maps showing location and extent of the various landtypes or complexes, Tables of Management Interpretations, Table of Soil Characteristics of Modal Sites, Table of Some Mapping Unit Characteristics, Features and Qualities, and Table of Bedrock Characteristics.

Field mapping was conducted from June 1973 through March 1974 by Soil Scientists George J. Badura, Harold A. Legard, and LeRoy C. Meyer. Supervision was provided by Loren Herman.

Valuable assistance, advice, and cooperation received from Forest personnel during the course of the survey was sincerely appreciated.

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USE

Land management activities generally relate to the soil resource. Timber harvest, road construction, recreation development, and many other activities have an effect on the soil resource to some degree. It is extremely important for the land manager to thoroughly understand the effect of the various activities on the soil. It is equally important for the land manager to fully understand the capabilities of the soil resource. Basic soils information contained in this report will help the land managers and planners to (1) determine the effects of management on the soil and water resource, and (2) evaluate the capabilities of the soil for various uses.

The information in this report is presented at the Mapping Unit level and is the basic level of soil identification and management interpretation used in the report. The mapping unit is derived and defined on the basis of its soil, landform, geology, and vegetation characteristics. The average delineation size is 50 to 600 acres.

At this level, management problems related to the landform and soil are easily defined and interpretations have been made. This information has been tabulated and can be found within the Appendix of this report, or in the Atlas along with the landtype maps.

The Soil Resource Inventory (SRI) has its primary use at the planning level. Soils, landforms, and bedrock characteristics are defined at an intensity sufficient to help develop resource management policies and basic plans. Due to the reconnaissance nature of this survey, it lacks detail for use in high-intensity, small-area projects. These projects require additional on-site study by various technical specialists, including soil scientists.

There are many uses for the information in this report. Some are quite simple and apparent, while others have not yet been conceived. The real work lies ahead in effectively and fully using this information. The use of this information is achieved best by those with full understanding of the interrelationships of the basic earth features.

Examples of how SRI information can be used are listed below:

1. Transportation Planning - This is an area where the soils information has key application. Conditions and problems can be met or avoided based on information such as landscape stability, soil depth, soil drainage and/or bedrock type and competency. Roads may be selected that avoid unstable areas, and construction and maintenance costs may be more accurately estimated. Sources of road rock may also be located through use of soil maps. SRI information is available for assistance in road design such as cutbank ratios and road rock thickness.

2. Recreation Planning - The SRI information indicates the various soil suitabilities and limitations that may apply to ski areas, camping areas, trails, roads, and other aspects of recreation development. By knowing the soil suitabilities and limitations, the planner is better able to make plans that are consistent with the capabilities of the land.

3. Multiple Use Plans - The soils information in this report should be incorporated into the multiple use plans. As an example of application, the soil areas in this report can provide a map to show the critical soil areas and their associated problems. These problems are discussed for individual landtypes. This is the kind of information that will support the policy and directives, and assist in multiple use. Another example of use would be to color the maps in the Atlas to illustrate various soil management relationships. For instance, the maps can be colored to show stability, erosion, site index, etc.

4. 5-Year Action Plan - This report provides information on the relative susceptibility of soil and other resource damage from timber harvest, road construction, and other timber-related activities. Provided also, is information on regeneration problems and erosion control requirements.

5. Timber Management Plan - The soils information can suggest direction and support policy for allowable cut determinations, logging systems, slash disposal methods, operating season, and deferred cutting areas. With a better understanding of problems and their location, the cut can be planned so that at a given time the majority of cutting is not taking place in critical areas. By spreading out and deferring the more critical areas, more time is available for proper road location and design on these areas. Also, within a few years, logging technology may have developed so that harvest methods are compatible with critical soil areas without causing excessive soil and resource damage.

6. Impact Reports - Any report involving the impact of a management activity requires soils input. Whether it is a ski area, recreation, or damsite proposal, there are soil factors that must be considered to make the report complete.

7. Land Appraisal and Exchange - Soils information should be used for land appraisal and exchange activities. The value of the land is related to such soil factors as texture, depth, drainage, productivity, and stability. Without knowledge of these and other soil factors, how how can land value be appraised?

8. Multiple Use Survey Reports - Any MUS study can find the basic soils data in the SRI. However, additional interpretations may be needed for more specific information concerning soils and their behavior.

9. The following is a list of more specific uses of the report. These uses are adaptable and compatible with the survey data and are well within the scope and intensity of the survey:

   a. Engineering Testing - By using the soil maps, more efficient testing can be done. The soil maps can be used to determine which soils are most susceptible to certain engineering problems. These problem soils may need more closely spaced testing than soils in which few problems are anticipated.

   b. Reservoir Sites - This report gives information that can be used to determine problems that may be encountered for a reservoir site. The soil interpretations will enable the planner to better determine the general suitability of a particular site and the soil stability as they affect reservoir uses.

   c. Hydrologic Analysis - The information in the SRI is sufficient to determine a broad hydrologic analysis and water balance on the Forest, and as a basis for comparisons between larger watersheds.

   d. Multiple Discipline Teams - Under the concept of MDT, where a number of specialists coordinate on a management problem through team effort, the soils report will supply essential background information. It will give the team basic soils information on the uses, limitations, and hazards of soils as they relate to resource management.

   e. Timber Harvest Methods - Additional facts known about the potential for erosion and landscape stability will encourage selection of timber harvest methods that cause minimum damage to soil and other resources.

   f. Timber Harvest and Road Construction Operating Season - These activities should be scheduled at times when they will cause minimum soil damage. Many soils are subject to damage (compaction, erosion, site deterioration) by timber harvest activities when overly wet or excessively dry.

   g. Erosion Control - Since there is wide variability in soil texture, depth, structure, permeability, drainage, and topography, wide differences also occur in the ability of the soil to resist erosion. Forest soils are rated as to their potential erosion class. The land manager can use this information to determine which areas will need special erosion protective measures. These will need to be developed on a site-by-site basis.

   h. Recreational Developments - Several kinds of information are available in this report to assist in selecting favorable sites for campground development. Among these are soil and landform properties and characteristics, specific ratings of filter drainage field suitability, the relative resistance of soil and vegetation to site deterioration, and indications of special problems which may be encountered.

DEFINITIONS OF MAPPING UNITS

This section defines the numbers and symbols found on the soil maps. The numbers identify mapping units. The symbols represent land features important to land management that are too small to delineate at the scale used for this survey. An exception is the dashed line used to delineate recently active or active slumps and unstable areas. The symbols used in this survey are listed below:

Potential rock pit location

Water

Unstable area

Wet spot and small marshes

Slump or slide scarp

Slump or unstable area

Modal site location

Sample location

Debris avalanche or slide track

Mapping Units [1/] are shown on the landtype maps as numbers. Mapping units contain a dominant landtype which accounts for at least 70 percent of the landtype delineation.

The dominant landtype of the mapping unit is described in the mapping unit description and identified by the same number as used for the mapping unit. Within the mapping unit, other landtypes occur. Those most commonly associated with the dominant landtype of the mapping unit are included in the descriptions as inclusions. These inclusions of other landtypes account for no more than 30 percent of the mapping unit.

The management interpretations presented in the Atlas apply only to the dominant landtype in each mapping unit. The interpretations for most inclusions within any mapping unit are listed on the interpretative tables according to the appropriate landtype number. The Tables of Some Mapping Unit Characteristics, Features, and Qualities, and Table of Bedrock Characteristics of Mapping Units are also numbered according to the dominant landtype in the mapping unit and apply to that dominant landtype.

1/ Mapping units contain a dominant taxonomic unit.

Mapping Unit Complexes

Many symbols shown on the maps have three digits [2/] and are called "Mapping Unit Complexes." These are mapping units used in areas where two or more defined mapping units are present in an arrangement too complex to separate at the one-inch per mile scale. The Legend of Complexes indicates the mapping unit components of the complex and the approximate percentage of each component.

Mapping Unit Descriptions

Most of the mapping units are described in detail. These landtypes have a definable range of characteristics that can be represented by a soil profile description. Mapping Units 0 through 9 are miscellaneous landtypes, quite variable, and not described in detail. They are described in a short narrative.

Information in Mapping Unit Descriptions

The first paragraph states the primary soil and the most common inclusions found within the Mapping Unit. The second paragraph gives a brief generalized description of the primary soil. The third paragraph briefly describes the bedrock occurring in the Mapping Unit. The fourth paragraph describes the landform and slope. The fifth paragraph describes the elevation and timber type. The sixth paragraph describes the drainage class and permeability rates. The seventh paragraph gives some distinguishing characteristics for the Mapping Unit. Reference should be made to Appendix VI for definition of terms used in these descriptions.

Range of Profile Characteristics

This describes the range of soil profile characteristics that have been established for the dominant landtype within the mapping unit.

2/ Some have an "F" on the end which denotes that they occur within a fog zone where Sitka spruce is commonly found.

LEGEND OF COMPLEXES [1/]

Mapping Unit Number	Mapping Unit Components
121	60 percent Unit 16 and 40 percent Unit 21
121F	60 percent Unit 17F and 40 percent Unit 21F
122	60 percent Unit 16 and 40 percent Unit 22
122F	60 percent Unit 16F and 40 percent Unit 22F
151	60 percent Unit 16 and 40 percent Unit 51
151F	60 percent Unit 16F and 40 percent Unit 51F
153	50 percent Unit 16 and 50 percent Unit 53
153F	50 percent Unit 16F and 50 percent Unit 53F
154	55 percent Unit 16 and 45 percent Unit 54
154F	55 percent Unit 16F and 45 percent Unit 54F
161	70 percent Unit 16 and 30 percent Unit 61
161F	70 percent Unit 16F and 30 percent Unit 61F
185	65 percent Unit 18 and 35 percent Unit 51
186	70 percent Unit 18 and 30 percent Unit 61
191	60 percent Unit 19 and 40 percent Unit 61
212	60 percent Unit 21 and 40 percent Unit 22
212F	60 percent Unit 21F and 40 percent Unit 22F
216	60 percent Unit 21 and 40 percent Unit 16
216F	60 percent Unit 21F and 40 percent Unit 16F
217	55 percent Unit 21 and 45 percent Unit 17
218	55 percent Unit 21 and 45 percent Unit 18
221	60 percent Unit 22 and 40 percent Unit 21

1/ These percentages may differ slightly from map unit to map unit. These total 100 percent but other inclusions as described in individual landtypes may be present.

Mapping Unit Number	Mapping Unit Components
221F	60 percent Unit 22F and 40 percent Unit 21F
223	65 percent Unit 22 and 35 percent Unit 23
223F	65 percent Unit 22F and 35 percent Unit 23F
225	60 percent Unit 22 and 40 percent Unit 51
226	60 percent Unit 22 and 40 percent Unit 16
226F	60 percent Unit 22F and 40 percent Unit 16F
227	55 percent Unit 22 and 45 percent Unit 17
227F	55 percent Unit 22F and 45 percent Unit 17F
228	55 percent Unit 22 and 45 percent Unit 18
231F	50 percent Unit 21F and 50 percent Unit 31F
232	65 percent Unit 23 and 35 percent Unit 22
232F	65 percent Unit 23F and 35 percent Unit 22F
236	70 percent Unit 23 and 30 percent Unit 16
236F	70 percent Unit 23F and 30 percent Unit 16F
237	50 percent Unit 23 and 50 percent Unit 17
241	60 percent Unit 21 and 40 percent Unit 41
241F	60 percent Unit 21F and 40 percent Unit 41F
251	55 percent Unit 21 and 45 percent Unit 51
251F	55 percent Unit 21F and 45 percent Unit 51F
252	60 percent Unit 22 and 40 percent Unit 52
261	50 percent Unit 21 and 50 percent Unit 61
261F	50 percent Unit 21F and 50 percent Unit 61F
262	60 percent Unit 22 and 40 percent Unit 62
262F	60 percent Unit 22F and 40 percent Unit 62F
272	60 percent Unit 27 and 40 percent Unit 42

Mapping Unit Number	Mapping Unit Components
411	70 percent Unit 41 and 30 percent Unit 61
412	60 percent Unit 41 and 40 percent Unit 42
412F	60 percent Unit 41F and 40 percent Unit 42F
414	50 percent Unit 41 and 50 percent Unit 44
416	50 percent Unit 41 and 50 percent Unit 16
417	50 percent Unit 41 and 50 percent Unit 47
421	60 percent Unit 42 and 40 percent Unit 41
421F	60 percent Unit 42F and 40 percent Unit 41F
423	70 percent Unit 42 and 30 percent Unit 23
423F	70 percent Unit 42F and 30 percent Unit 23F
424	60 percent Unit 42 and 40 percent Unit 44
424F	60 percent Unit 42 and 40 percent Unit 44
426	65 percent Unit 42 and 35 percent Unit 16
427	60 percent Unit 42 and 40 percent Unit 27
442	60 percent Unit 44 and 40 percent Unit 42
443	60 percent Unit 42 and 40 percent Unit 43
443F	60 percent Unit 42F and 40 percent Unit 43F
447	50 percent Unit 44 and 50 percent Unit 47
452	55 percent Unit 42 and 45 percent Unit 52
461	60 percent Unit 42 and 40 percent Unit 61
462	65 percent Unit 42 and 35 percent Unit 62
511	60 percent Unit 51 and 40 percent Unit 21
512	60 percent Unit 51 and 40 percent Unit 22
521	65 percent Unit 52 and 35 percent Unit 21
523	50 percent Unit 52 and 50 percent Unit 53

Mapping Unit Number	Mapping Unit Components
523F	50 percent Unit 52F and 50 percent Unit 53F
525	60 percent Unit 52 and 40 percent Unit 51
525F	60 percent Unit 52F and 40 percent Unit 51F
526	50 percent Unit 52 and 50 percent Unit 16
526F	50 percent Unit 52F and 50 percent Unit 16F
532	60 percent Unit 53 and 40 percent Unit 42
533	60 percent Unit 53 and 40 percent Unit 23
541	50 percent Unit 51 and 40 percent Unit 41
542	55 percent Unit 51 and 45 percent Unit 42
543	55 percent Unit 53 and 45 percent Unit 43
546	60 percent Unit 54 and 40 percent Unit 16
552	60 percent Unit 51 and 40 percent Unit 52
552F	60 percent Unit 51F and 40 percent Unit 52F
554	50 percent Unit 51 and 50 percent Unit 54
554F	50 percent Unit 51F and 50 percent Unit 54F
561	60 percent Unit 51 and 40 percent Unit 61
561F	60 percent Unit 51F and 40 percent Unit 61F
562	60 percent Unit 52 and 40 percent Unit 62
562F	60 percent Unit 52F and 40 percent Unit 62F
616	60 percent Unit 61 and 40 percent Unit 16
616F	60 percent Unit 61F and 40 percent Unit 16F
617	65 percent Unit 61 and 35 percent Unit 17
617F	65 percent Unit 61F and 35 percent Unit 17F
618	60 percent Unit 61 and 40 percent Unit 18

Mapping Unit Number	Mapping Unit Components
622	60 percent Unit 62 and 40 percent Unit 22
622F	60 percent Unit 62F and 40 percent Unit 22F
626	50 percent Unit 62 and 50 percent Unit 16
626F	50 percent Unit 62F and 50 percent Unit 16F
628	50 percent Unit 62 and 50 percent Unit 18
642	60 percent Unit 61 and 40 percent Unit 42
651	60 percent Unit 61 and 40 percent Unit 51
652	60 percent Unit 62 and 40 percent Unit 52
652F	60 percent Unit 62F and 40 percent Unit 52F
653	50 percent Unit 62 and 50 percent Unit 53
661	60 percent Unit 62 and 40 percent Unit 61
661F	60 percent Unit 62F and 40 percent Unit 61F
662	60 percent Unit 61 and 40 percent Unit 62
662F	60 percent Unit 61F and 40 percent Unit 62F
710	70 percent Unit 71 and 30 percent Unit 70
712	60 percent Unit 71 and 40 percent Unit 72

MAPPING UNIT DESCRIPTIONS [1/]

1 - Tidelands

Areas affected by tides such as bays, estuaries, and riverbanks below tidewater. These areas are subject to periodic flooding. This unit has native vegetation, primarily consisting of marsh grasses and small shrubs.

2 - Beach and Open Dune Sands

Gently sloping beaches and windblown dunes located along the ocean shore. Topographic changes are constant due to the wind and waves. Materials consist of light-colored, loose, subangular to rounded sand greater than ten feet deep. This unit is essentially devoid of vegetation.

3 - Vegetated, Young Dunal Features and Plantations

This unit is similar to the dunal feature portion of Unit 2. Included are plantations of introduced species for dune stabilization purposes and native vegetation encroachment resulting from wind excavation to a water table base (deflation plain). Marshes and seasonal lakes are also included. The soil materials are the same as Unit 2.

4 - Old, Vegetated Dunal Features

Included in this unit are: (1) dense thickets of shrubs and trees in the deflation plains and flood plains; (2) older, partially to fully stabilized dunal features; (3) marshes, and (4) lakes. The soil materials are similar to Units 2 and 3, but exhibit slightly more weathering in place as a result of advanced vegetation successional stages and time. Vegetation includes low quality lodgepole pine, Douglas-fir, western redcedar, and Sitka spruce, as well as rhododendron, manzanita, evergreen, huckleberry, chinkapin, salal, bearberry, and bracken fern.

5 - Ancient Dunal Features and Terraces Overlying Sandstone

The materials and vegetation of this unit are the same as for Unit 4, except that they are older and exhibit varying degrees of soil development. The timber quality is much higher on this unit than Unit 4. Local small deposits of peat and wet areas are common in depressions. Slopes are generally steeper since these lands blend into the mountain front.

6 - Non-tidal Marshland

This is a depressional, wet unit similar to Unit 1, but is not affected directly by tides. These areas are subject to periodic flooding and/or ponding during the rainy season and are poorly drained. Native vegetation is primarily marsh grasses and sedges.

7 - Landslide Terrain with Interrupted Drainages

This area consists of rough broken slopes derived from mass wasting. Sag ponds are present, resulting in many interrupted drainageways, and differentiates this landtype from many that are similar but with developed drainages. Soils vary from very deep on the flats to very shallow on the scarps (headwalls). The flats range in drainage from well to poorly drained and ponded. Seeps and springs are common in this unit. Bedrock varies and may be any mapped in this report. It is usually highly fractured. Vegetation consists of Douglas-fir, Sitka spruce, western hemlock, western redcedar, and red alder.

8 - Wind-swept Colluvial Slopes

This area occurs along the ocean front and is directly affected by the strong winds and salt spray which has rendered it essentially non-forest land. Conifers are found on it but they are dwarfed and shaped by the wind. Species consist of lodgepole pine, Sitka spruce, western hemlock, Douglas-fir, red alder, salmonberry, thimbleberry, huckleberry, salal, sword fern, strawberry, grasses and mosses. The soils are very to extremely gravelly, cobbly and stony loams with up to two feet total depth. Rock outcrops are commonly associated with this unit.

MAPPING UNIT 14

Mapping Unit 14 consists dominantly of Landtype 14 and minor amounts of Landtypes 6, 15, 23, and 43.

Landtype 14 is a very deep, nonplastic to slightly plastic landtype derived from alluvium. Surface soils are thin to moderately thick fine sandy loams to silt loams. Subsoils are thick to very thick loams, silt loams and clay loams.

Bedrock material is variable and may consist of any found in the survey area. Depth to bedrock is greater than 12 feet.

Typically, Landtype 14 occurs along streams in valley bottoms with slopes less than 10 percent. Flooding and ponding are common during the winter and spring months.

This landtype ranges in elevation from near sea level to 350 feet and supports Site Class I and II Douglas-fir, western hemlock and western redcedar. In drainages along the coast, Sitka spruce is common. Most of this landtype has been cleared for homesteads.

The landtype is moderately well drained. Permeability is moderate in the surface soils and moderate to slow in the subsoils.

Landtype 14 is distinguished by one or more of the following from any similar landtypes or inclusions. Very deep soils that contain less than 35 percent coarse fragments by volume, occurs above tidewater, is moderately well drained, and is derived from alluvium.

Range of Profile Characteristics of Landtype 14

Litter:	Leaves, needles and twigs. Up to 4 inches thick.
Surface Layers:	Dark brown very fine sandy loams and fine sandy loams; massive; moderately compacted in the surface 7 inches; nonsticky, nonplastic; pH 6.0: 7-40 inches.
Subsoil Layers:	Dark brown to brown loam; massive; slightly sticky, nonplastic; pH 6.0: 60 to 100 plus inches in thickness.

MAPPING UNIT 15

Mapping Unit 15 consists dominantly of Landtype 15 and minor amounts of Landtypes 14, 16, 17, 23, and 53.

Landtype 15 is a deep to very deep, nonplastic landtype derived from alluvium and minor colluvium. Surface soils are thin loams and gravelly loams. Subsoils are usually very thick, very cobbly and gravelly sandy loams and loams.

Bedrock materials are variable and not differentiated. Depth to bedrock is greater than 12 feet.

Typically, Landtype 15 occurs along streams in valley bottom positions and is subject to flooding during periods of high runoff. Slopes are generally less than 10 percent but may locally be up to 20 percent.

This landtype ranged in elevation from near sea level to 500 feet. It supports Site Class II and III Douglas-fir, western hemlock, western redcedar and Sitka spruce in drainages facing the ocean.

The landtype is well drained. Permeability is rapid to very rapid throughout the soil.

Landtype 15 is distinguished from all other landtypes or inclusions by one or more of the following characteristics. Very deep to deep, very gravelly and cobbly soil profiles derived chiefly from alluvium on slopes usually less than 10 percent in valley bottoms.

Range of Profile Characteristics of Landtype 15

Litter:	Needles, leaves, twigs, and decomposing organic matter. 1 to 2 inches thick.
Surface Layers:	Dark brown silt loam and very gravelly sandy loams; weak medium and fine granular and single grain; 40 to 60 percent rounded and subangular gravels by volume; nonsticky, nonplastic; pH ranges from 5.0 to 5.5: 12 to 24 inches thick.
Subsoil Layers:	Brown to dark yellowish brown very stony, cobbly, gravelly sandy loams; single grain; greater than 70 percent gravels, cobbles and stones by volume; nonsticky, nonplastic; pH 5.5 to 6.0; 70 to 100 inches plus in thickness.

MAPPING UNIT 16

Mapping Unit 16 consists dominantly of Landtype 16 and minor amounts of Landtypes 17, 18, 19, 51, and 54.

Landtype 16 is a deep to very deep, nonplastic to slightly plastic landtype derived from colluvium. Surface soils are generally thin loams. Subsoils are moderately thick to thick gravelly and cobbly silt loams and silty clay loams.

Bedrock is variable and may consist of any found in the survey area. Depth to bedrock is greater than 6 feet and usually near 12 feet.

Typically, Landtype 16 occurs on smooth, moderate to steep slopes primarily beneath ridgetops. Slopes range from 30 to greater than 80 percent.

This landtype ranges in elevation from 300 to 3,500 feet and supports Site Class III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid in the surface soils and rapid to moderate in the subsoils.

Landtype 16 is distinguished by one or more of the following from any similar landtypes or inclusions. Deep to very deep soils with greater than 35 percent coarse fragments by volume; derived from colluvium; slopes greater than 30 percent and occurring east of the fog belt.

Range of Profile Characteristics of Landtype 16

Litter:	Needles, leaves, and twigs up to 1 inch thick.
Surface Layers:	Dark brown to brown loams; moderate, fine granular and subangular blocky structure; generally less than 35 percent gravel by volume; slightly sticky, nonplastic; pH 6.0; 10 to 20 inches thick.
Subsoil Layers:	Dark reddish brown to brown gravelly silt loams to cobbly silty clay loams; moderate, medium subangular blocky structure becoming weaker with depth; 20 to 60 percent stones, cobbles, and gravels by volume; slightly sticky, slightly plastic; pH 6.0 to 6.5; 60 to 100 inches plus thick.

MAPPING UNIT 16F

Mapping Unit 16F consists dominantly of Landtype 16F and minor amounts of Landtypes 17F, 51F, and 54F.

Landtype 16F is a deep to very deep, nonplastic to slightly plastic landtype derived from colluvium. Surface soils are generally thin loams. Subsoils are moderately thick to thick gravelly and cobbly silt loams and silty clay loams.

Bedrock is variable and may consist of any found in the survey area. Depth to bedrock is greater than 6 feet and usually near 12 feet.

Typically, Landtype 16F occurs on smooth, moderate to steep slopes primarily beneath ridgetops. Slopes range from 30 to greater than 80 percent.

This landtype ranges in elevation from near sea level to 1,500 feet, and supports Site Class II and III Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is rapid in the surface soils and rapid to moderate in the subsoils.

Landtype 16F is distinguished by one or more of the following from any similar landtypes or inclusions. Deep to very deep soils with greater than 35 percent coarse fragments by volume; derived from colluvium; slopes greater than 30 percent and occurring in the fog belt along the coast.

Range of Profile Characteristics of Landtype 16F

Litter:	Needles, leaves, and twigs up to 1 inch thick.
Surface Layers:	Dark brown to brown loams; moderate, fine granular and subangular blocky structure; generally less than 35 percent gravel by volume; slightly sticky, nonplastic; pH 6.0; 10 to 20 inches thick.
Subsoil Layers:	Dark reddish brown to brown gravelly silt loams to cobbly silty clay loams; moderate, medium subangular blocky structure becoming weaker with depth; 20 to 60 percent stones, cobbles and gravels by volume; slightly sticky, slightly plastic; pH 6.0 to 6.5: 60 to 100 inches plus thick.

MAPPING UNIT 17

Mapping Unit 17 consists dominantly of Landtype 17 and minor amounts of Landtypes 16, 18, 19, 23, 53, and 63.

Landtype 17 is a deep to very deep, slightly plastic landtype derived from colluvium. Surface soils are generally thin loams containing 10 to 30 percent gravels by volume. Subsoils are usually thick loams to silty clay loams containing 40 to 75 percent gravels, cobbles, and stones by volume.

Bedrock materials are variable and can consist of any found in the survey area. Depth to bedrock varies from 6 to over 12 feet.

Typically, Landtype 17 occurs on benches beneath ridgetops and on toe-slopes. Slopes range from 10 to 30 percent.

This landtype ranges in elevation from 300 to 3,500 feet and supports Site Class II and III Douglas-fir, western hemlock and some western red-cedar.

The landtype is well drained. Permeability is rapid in the surface soils and moderate to rapid in the subsoils.

Landtype 17 is distinguished by one or more of the following from any similar landtype or inclusion. Deep to very deep soils with greater than 35 percent coarse fragments by volume; derived from colluvium; slopes between 10 and 30 percent, and occurring east of the fog belt.

Range of Profile Characteristics of Landtype 17

Litter:	Decomposing organic matter. 2 inches thick.
Surface Layers:	Dark brown loam; moderate, fine, and medium granular and subangular blocky structure; 10 to 30 percent angular to rounded gravels, cobbles and stones by volume; slightly sticky, slightly plastic; pH ranges from 6.0 to 6.5; 10 to 24 inches thick.
Subsoil Layers:	Brown to dark brown gravelly to very gravelly and cobbly loams; moderate medium subangular blocky structure; 40 to 75 percent angular to rounded gravels, cobbles and stones by volume; sticky, slightly plastic to plastic; pH is about 6.0; 60 to 80 inches plus thick.

MAPPING UNIT 17F

Mapping Unit 17F consists dominantly of Landtype 17F and minor amounts of Landtypes 16F, 19F, 23F, 53F, and 63F.

Landtype 17F is a deep to very deep, slightly plastic landtype derived from colluvium. Surface soils are generally thin loams containing 10 to 30 percent gravels by volume. Subsoils are usually thick loams to silty clay loams containing 40 to 75 percent gravels, cobbles and stones by volume.

Bedrock materials are variable and can consist of any found in the survey area. Depth to bedrock varies from 6 to over 12 feet.

Typically, Landtype 17F occurs on benches beneath ridgetops and on toeslopes. Slopes range from 10 to 30 percent.

This landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class II and some III Sitka spruce, western hemlock, Douglas-fir, and western redcedar.

The landtype is well drained. Permeability is rapid in the surface soils and moderate to rapid in the subsoils.

Landtype 17F is distinguished by one or more of the following from any similar landtype or inclusion. Deep to very deep soils with greater than 35 percent coarse fragments by volume; derived from colluvium; slopes between 10 and 30 percent, and occurring in the fog belt.

Range of Profile Characteristics of Landtype 17F

Litter:	Decomposing organic matter. 2 inches thick.
Surface Layer:	Dark brown loam; moderate, fine and medium granular and subangular blocky structure; 10 to 30 percent angular to rounded gravels, cobbles and stones by volume; slightly sticky, slightly plastic; pH ranges from 6.0 to 6.5; 10 to 24 inches thick.
Subsoil Layers:	Brown to dark brown gravelly to very gravelly and cobbly loams; moderate medium subangular blocky structure; 40 to 75 percent angular to rounded gravels, cobbles and stones by volume; sticky, slightly plastic to plastic; pH is about 6.0; 60 to 80 inches plus thick.

MAPPING UNIT 18

Mapping Unit 18 consists dominantly of Landtype 18 and minor amounts of Landtypes 16, 17, 19, 51, and 61.

Landtype 18 is a moderately deep to shallow landtype derived from colluvium. Surface soils are thin loams containing gravels. Subsoils are thin gravelly and cobbly loams and silt loams.

Bedrock materials are variable and may consist of any found in the survey area. Depth to bedrock varies from 2 to 5 feet.

Typically, Landtype 18 occurs on smooth, moderate to steep slopes beneath ridgetops. Slopes range from 30 to 80 percent plus.

This landtype ranges in elevation from 300 to 3,500 feet and supports Site Class III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid throughout the soil.

Landtype 18 is distinguished by one or more of the following from any similar landtypes or inclusions. Smooth, relatively nondissected, steep slopes, ranging from 30 to greater than 80 percent; greater than 35 percent gravels, cobbles and stones in the soil; derived from colluvium and less than 5 feet deep, occurring east of the fog belt.

Range of Profile Characteristics of Landtype 18

Litter:	The burnt remains of needles and twigs. Up to 1 inch thick.
Surface Layers:	Dark brown to brown loam; weak fine granular and subangular blocky structure; about 20 percent gravels by volume; slightly sticky, nonplastic; pH 6.0; 14 to 18 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly silt loam; weak fine and medium subangular blocky structure; 50 to 70 percent angular and subangular gravels, cobbles and stones by volume; slightly sticky, slightly plastic; pH 6.0; 20 to 40 inches thick.

MAPPING UNIT 19

Mapping Unit 19 consists dominantly of Landtype 19 and minor amounts of Landtypes 15, 16, 17, 53, and 63.

Landtype 19 is a moderately deep and locally shallow landtype derived from colluvium of volcanic materials. Surface soils are thin gravelly loam and loams. Subsoils are thin gravelly and cobbly loams and clay loams.

Bedrock is variable and may consist of any found in the survey area. Depth to bedrock is usually between two and five feet.

Typically, Landtype 19 occurs on benches a short distance below ridgetops. Slopes range between 10 and 30 percent.

This landtype ranges in elevation from 1,500 to 3,100 feet and supports Site Class III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid to moderate throughout the soil.

Landtype 19 is distinguished by one or more of the following from any similar landtypes or inclusions. Slopes from 10 to 30 percent; soils containing greater than 35 percent coarse fragments by volume; soils derived from colluvium and less than 5 feet deep, and occurring east of the fog belt.

Range of Profile Characteristics of Landtype 19

Litter:	Needles, leaves, and twigs up to 1 inch thick.
Surface Layers:	Dark brown to brown loams; weak to moderate, fine to medium, granular and subangular blocky structure; 30 percent angular to rounded gravels, cobbles, and stones by volume; slightly sticky, slightly plastic; pH 6.0; 30 to 36 inches thick.
Subsoil Layers:	Dark brown to brown loams and silty clay loams; moderate medium subangular blocky structure; 35 to 70 percent angular to rounded gravels, cobbles and stones by volume; slightly sticky and sticky, slightly plastic; pH 6.0; 10 to 20 inches thick.

MAPPING UNIT 21

Mapping Unit 21 consists dominantly of Landtype 21 and minor amounts of Landtypes 22, 23, 51, and 61.

Landtype 21 is a shallow, slightly plastic landtype derived from residuum and colluvium. Surface soils are thin loams. Subsoils are thin silt loams.

Bedrock is soft to moderately hard, highly fractured, moderately competent, dark gray to buff-colored siltstone with small amounts of mudstone and sandstone. Depth to bedrock is usually less than three feet.

Typically, Landtype 21 occurs on smooth to moderately dissected slopes and ridges. Slopes range from 50 to 90 percent.

This landtype ranges in elevation from 100 to 3,000 feet, and supports Site Class III and II Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid to moderately rapid in the soils.

Landtype 21 is distinguished by one or more of the following from any similar landtypes or inclusions. Soft siltstone bedrock; shallow soils; slopes in excess of 50 percent, and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 21

Litter:	Needles, leaves, and twigs. ½ to 1 inch thick.
Surface Layers:	Very dark grayish brown loams; moderate, fine, and medium granular structure; slightly sticky, nonplastic; pH 4.5 to 5.5; 4 to 8 inches thick.
Subsoil Layers:	Dark brown to dark yellowish brown silt loams; moderate, medium subangular blocky structure; slightly sticky, slightly plastic; pH 4.5 to 5.5; 14 to 20 inches thick.

MAPPING UNIT 21F

Mapping Unit 21F consists dominantly of Landtype 21F and minor amounts of Landtypes 22F, 23F, 51F, and 61F.

Landtype 21F is a shallow, slightly plastic landtype derived from residuum and colluvium. Surface soils are thin loams. Subsoils are thin silt loams.

Bedrock is soft to moderately hard highly fractured, moderately competent, dark gray to buff-colored siltstone with small amounts of mudstone and sandstone. Depth to bedrock is usually less than three feet.

Typically, Landtype 21F occurs on smooth to moderately dissected slopes and ridges. Slopes range from 50 to 90 percent.

This landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class II and III Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is rapid to moderately rapid in the soils.

Landtype 21F is distinguished by one or more of the following from any similar landtypes or inclusions. Soft siltstone bedrock; shallow soils; slopes in excess of 50 percent, and it occurs within the fog belt.

Range of Profile Characteristics of Landtype 21F

Litter:	Needles, leaves, and twigs. ½ to 1 inch thick.
Surface Layers:	Very dark grayish brown loams; moderate, fine, and medium granular structure; slightly sticky, nonplastic; pH 4.5 to 5.5; 4 to 8 inches thick.
Subsoil Layers:	Dark brown to dark yellowish brown silt loams; moderate, medium subangular blocky structure; slightly sticky, slightly plastic; pH 4.5 to 5.5; 14 to 20 inches thick.

MAPPING UNIT 22

Mapping Unit 22 consists dominantly of Landtype 22 and minor amounts of Landtypes 21, 23, and 52.

Landtype 22 is a moderately deep to shallow landtype derived primarily from residuum. Surface soils are thin loams. Subsoils are thin to moderately thick silt loams and silty clay loams.

Bedrock is soft to moderately hard, highly fractured, moderately competent to incompetent, gray to tan siltstone with minor amounts of mudstone and sandstone. Depth to bedrock ranges from two to six feet.

Typically, Landtype 22 occurs on uneven, hummocky terrain much of which is derived from old landslide activity. Slopes range from 30 to 50 percent.

This landtype ranges in elevation from 200 to 3,000 feet and supports Site Class II and III Douglas-fir and western hemlock.

The landtype is well to moderately well drained. Permeability is moderately rapid to rapid in the surface soils, and moderate in the subsoils.

Landtype 22 is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to soft siltstone bedrock; moderately deep to shallow soils, slopes between 30 and 50 percent, and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 22

Litter:	Needles, leaves, twigs, and decomposing organic matter. 2 to 4 inches thick.
Surface Layers:	Very dark grayish brown loams; weak to strong, fine and medium subangular blocky and granular structure; nonsticky to slightly sticky, nonplastic; pH 5.5; 7 to 12 inches thick.
Subsoil Layers:	Dark brown to strong brown silt loams and silty clay loams; moderate to strong, medium and coarse subangular blocky structure becoming massive with depth; 0 to 15 percent angular and subangular gravels and cobbles by volume; slightly sticky, slightly plastic; pH 5.0 to 6.0; 30 to 60 inches thick.

MAPPING UNIT 22F

Mapping Unit 22F consists dominantly of Landtype 22F and minor amounts of Landtypes 21F, 23F, and 52F.

Landtype 22F is a moderately deep to shallow landtype derived primarily from residuum. Surface soils are thin loams. Subsoils are thin to moderately thick silt loams and silty clay loams.

Bedrock is soft to moderately hard, highly fractured, moderately competent to incompetent, gray to tan siltstone with minor amounts of mudstone and sandstone. Depth to bedrock ranges from two to six feet.

Typically, Landtype 22F occurs on uneven, hummocky terrain much of which is derived from old landslide activity. Slopes range from 30 to 50 percent.

This landtype ranges in elevation from near sea level to 1,500 feet, and supports Site Class II Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well to moderately well drained. Permeability is moderately rapid to rapid in the surface soils, and moderate in the subsoils.

Landtype 22F is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to soft siltstone bedrock; moderately deep to shallow soils, slopes between 30 and 50 percent, and it occurs within the fog belt.

Range of Profile Characteristics of Landtype 22F

Litter:	Needles, leaves, twigs, and decomposing organic matter. 3 to 4 inches thick.
Surface Layers:	Very dark grayish brown loams; weak to strong, fine and medium subangular blocky and granular structure; non-sticky to slightly sticky, nonplastic; pH 5.5; 7 to 12 inches thick.
Subsoil Layers:	Dark brown to strong brown silt loams and silty clay loams; moderate to strong, medium and coarse subangular blocky structure, becoming massive with depth; 0 to 15 percent angular and subangular gravels and cobbles by volume; slightly sticky; slightly plastic; pH 5.0 to 6.0: 30 to 60 inches thick.

MAPPING UNIT 23

Mapping Unit 23 consists dominantly of Landtype 23 and minor amounts of Landtypes 14, 17, 22, and 63.

Landtype 23 is a moderately deep, locally deep, landtype derived primarily from residuum. Surface soils are thin loams and silt loams. Subsoils are moderately thick to thick silt loams and silty clay loams.

Bedrock is soft to moderately hard, highly fractured, moderately competent to incompetent, gray to tan siltstone with minor amounts of mudstone and sandstone. Depth to bedrock ranges from 4 to 8 feet.

Typically, Landtype 23 occurs on gentle undulating terrain including benches and toeslopes which are often the result of old landslides. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from near sea level to 2,000 feet, and supports Site Class II and locally I Douglas-fir, western hemlock, and western redcedar.

The landtype is moderately well drained. Permeability is rapid to moderately rapid in the surface soils, and moderate to moderately slow in the subsoils.

Landtype 23 is distinguished by one or more of the following from any similar landtypes or inclusions. Soft to moderately hard siltstone bedrock; moderately deep to deep soils; slopes from 0 to 30 percent, and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 23

Litter:	Highly decomposed organic matter. 0 to 3 inches thick.
Surface Layers:	Very dark grayish brown to dark brown loams and silt loams; weak, fine granular to strong medium subangular blocky structure; nonsticky to slightly sticky, nonplastic to slightly plastic; pH ranges from 5.5 to 6.0; 12 to 24 inches thick.
Subsoil Layers:	Dark brown, dark yellowish brown and strong brown, silt loams, and silty clay loams; weak to moderate fine to medium subangular blocky structure becoming massive with depth; trace of siltstone gravels; pH ranges from 5.0 to 6.0; 24 to 84 inches thick.

MAPPING UNIT 23F

Mapping Unit 23F consists dominantly of Landtype 23F and minor amounts of Landtypes 14, 17F, 22F, and 63F.

Landtype 23F is a moderately deep, locally deep, landtype derived primarily from residuum. Surface soils are thin loams and silt loams. Subsoils are moderately thick to thick silt loams and silty clay loams.

Bedrock is soft to moderately hard, highly fractured, moderately competent to incompetent, gray to tan siltstone with minor amounts of mudstone and sandstone. Depth to bedrock ranges from 4 to 8 feet.

Typically, Landtype 23F occurs on gentle undulating terrain including benches and toeslopes which are often the result of old landslides. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class II and I Sitka spruce, western hemlock, Douglas-fir, and western redcedar.

The landtype is moderately well drained. Permeability is rapid to moderately rapid in the surface soils and moderate to moderately slow in the subsoils.

Landtype 23F is distinguished by one or more of the following from any similar landtypes or inclusions. Soft to moderately hard siltstone bedrock; moderately deep to deep soils; slopes from 0 to 30 percent, and it occurs within the fog belt.

Range of Profile Characteristics of Landtype 23F

Litter:	Highly decomposed organic matter. 0 to 3 inches thick.
Surface Layers:	Very dark grayish brown to dark brown loams and silt loams; weak, fine granular to strong medium subangular blocky structure; nonsticky to slightly sticky, nonplastic to slightly plastic; pH ranges from 5.5 to 6.0; 12 to 24 inches thick.
Subsoil Layers:	Dark brown, dark yellowish brown and strong brown, silt loams and silty clay loams; weak to moderate fine to medium subangular blocky structure, becoming massive with depth; trace of siltstone gravels; pH ranges from 5.0 to 6.0; 24 to 84 inches thick.

MAPPING UNIT 26

Mapping Unit 26 consists dominantly of Landtype 26 and minor amounts of Landtypes 42 and 63.

Landtype 26 is a shallow landtype derived from residuum. Surface soils are thin loams. Subsoils are thin silt loams and silty clay loams.

Bedrock is soft to moderately hard, lightly fractured, competent, buff-colored siltstone with minor amounts of sandstone. Depth to bedrock is generally less than two feet.

Typically, Landtype 26 occurs on smooth gently sloping benches and ridge-tops. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from 2,000 to 3,000 feet and supports Site Class IV Douglas-fir and western hemlock.

The landtype is well drained. Permeability is moderately rapid throughout the soils.

Landtype 26 is distinguished by one or more of the following from any similar landtypes or inclusions. Siltstone bedrock; shallow soils on 0 to 30 percent slopes, and Site Class IV timber.

Range of Profile Characteristics of Landtype 26

Litter:	Needles, leaves, twigs, and decomposing organic matter. 2 to 3 inches thick.
Surface Layers:	Dark brown loam and silt loam; moderate fine granular to subangular blocky structure; slightly sticky, non-plastic; pH 6.0; 4 to 7 inches thick.
Subsoil Layers:	Dark brown to dark yellowish brown, silt loams and silty clay loams; weak fine subangular blocky structure to massive; 10 to 35 percent soft subangular siltstone gravels by volume; pH 5.5; 12 to 20 inches thick.

MAPPING UNIT 27

Mapping Unit 27 consists dominantly of Landtype 27 and minor amount of Landtypes 23, 42, 52, and 53.

Landtype 27 is a shallow to moderately deep landtype derived from residuum. Surface soils are thin silt loams. Subsoils are usually thin silty clay loams.

Bedrock is soft to moderately hard, highly fractured, to moderately competent gray to tan siltstone with minor amounts of mudstone and sandstone. Depth to bedrock ranges from 2 to 5 feet.

Typically, Landtype 27 occurs on gently sloping ridgetops. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from 1,000 to 3,000 feet and supports Site Class II and III Douglas-fir, western hemlock and western redcedar.

The landtype is well to moderately well drained. Permeability is moderately rapid to moderate throughout the soil.

Landtype 27 is distinguished by one or more of the following from any similar landtypes or inclusions. Siltstone bedrock; shallow soils; 0 to 30 percent slopes; Site Class II and III timber.

Range of Profile Characteristics of Landtype 27

Litter:	Decomposing organic matter. 0 to 1 inch thick.
Surface Layers:	Reddish brown to brown, silt loams; moderate fine and medium granular and subangular blocky structure; 10 percent shot by volume; slightly sticky, slightly plastic; pH 6.0; 12 to 15 inches thick.
Subsoil Layers:	Dark brown to brown silty clay loams; massive; 10 percent angular siltstone gravels by volume; sticky, plastic; pH 6.0 to 6.5: 12 to 48 inches thick.

MAPPING UNIT 31F

Mapping Unit 31F consists dominantly of Landtype 31F and minor amounts of Landtypes 21F, 34F, 51F, and 61F.

Landtype 31F is a shallow landtype derived from residuum and some colluvium. Surface soils are thin loams and silt loams. Subsoils are thin silt loams and loams.

Bedrock is soft to moderately hard, slightly fractured, moderately competent, gray to tan-colored sandstone with minor amounts of siltstone and mudstone. Depth to bedrock is usually less than three feet.

Typically, Landtype 31F occurs on smooth to moderately dissected slopes and ridges. Slopes range from 50 to greater than 90 percent.

This landtype ranges in elevation from 100 to 1,200 feet and supports Site Class III, locally II Sitka spruce, western hemlock and Douglas-fir.

The landtype is well drained. Permeability is rapid in the surface soils and moderate in the subsoils.

Landtype 31F is distinguished by one or more of the following from any similar landtypes or inclusions. Soft to moderately hard sandstone bedrock; shallow soils; 50 to 90+ percent slopes, and smooth to moderately dissected slopes. This landtype differs from landtype 41 by having softer bedrock that is younger in age.

Range of Profile Characteristics of Landtype 31F

Litter:	Needles, leaves, and twigs over decomposing organic matter. 2 to 3 inches thick.
Surface Layers:	Dark brown to brown loams and silt loams; moderate medium and fine granular structure; slightly sticky, slightly plastic; pH 5.0; 8 to 11 inches thick.
Subsoil Layers:	Dark brown to strong brown silt loams and loams; moderate medium and fine subangular blocky structure to massive with depth; 10 to 20 percent subangular to angular cobbles and gravels by volume; slightly sticky, slightly plastic; pH 4.5 to 6.0; 20 to 26 inches thick.

MAPPING UNIT 34F

Mapping Unit 34F consists dominantly of Landtype 34F and minor amounts of Landtypes 21F and 31F.

Landtype 34F is a shallow, locally moderately deep landtype derived from residuum and colluvium. Surface soils and subsoils are thin loams.

Bedrock is soft to moderately hard, slightly fractured, moderately competent, gray to tan sandstone with minor amounts of siltstone and mudstone.

Typically, Landtype 34F occurs on steep, highly dissected slopes ranging from 50 to greater than 90 percent.

This landtype ranges in elevation from 200 to 1,200 feet and supports Site Class III Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is rapid to very rapid throughout the soil.

Landtype 34F is distinguished by one or more of the following from any similar landtypes or inclusions. Soft to moderately hard sandstone bedrock; slopes in excess of 50 percent; highly dissected slopes and generally shallow soils. This landtype differs from Landtypes 44 and 47 by having softer bedrock that is younger in age.

Range of Profile Characteristics of Landtype 34F

Litter:	Needles, leaves, and twigs up to 2 inches thick.
Surface Layers:	Dark grayish brown loams; moderate, fine and medium granular and subangular blocky structure; nonsticky, nonplastic; pH 5.5; 8 to 12 inches thick.
Subsoil Layers:	Strong brown and yellowish brown loams; weak, fine and medium subangular blocky structure; slightly sticky, nonplastic; pH 5.5 to 6.0; 20 to 36 inches thick.

MAPPING UNIT 40

Mapping Unit 40 consists dominantly of Landtype 40 and minor amounts of Landtypes 41 and 42.

Landtype 40 is a shallow, nonplastic landtype derived from residuum and locally colluvium. Soils are thin sandy loams and loams.

Bedrock is moderately hard to hard; massive; competent buff to gray-colored micaceous sandstone with thin siltstone interbeds. Depth to bedrock is usually less than one foot, but may range to two feet.

Thpically, Landtype 40 occurs on smooth to moderately dissected upper ridge slopes. Slopes range from 20 to 60 percent.

This landtype ranges in elevation from 500 to 2,000 feet and supports grasses, forbs with occasional small shrubs and stunted trees. Wind is controlling vegetation character and soil formation.

The landtype is well to excessively drained. Permeability is very rapid in the soils.

Landtype 40 is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to hard sandstone bedrock; very shallow soils and non-timber vegetation.

Range of Profile Characteristics of Landtype 40

Litter:	Dead grass and a few leaves. 0 to 1 inch thick.
Surface Layers:	Brown and dark yellowish brown sandy loams and loams; weak, fine granular structure; trace of 20 percent sub-angular gravels by volume; nonsticky, nonplastic; pH 6.0; 4 to 24 inches thick.

MAPPING UNIT 41

Mapping Unit 41 consists dominantly of Landtype 41 and minor amounts of Landtypes 42, 43, and 44.

Landtype 41 is a shallow nonplastic to slightly plastic landtype derived from residuum and colluvium. Surface soils are thin sandy loams and loams. Subsoils are thin loams to clay loams.

Bedrock is moderately hard to hard, massive, competent, buff to gray micaceous sandstone with thin siltstone interbeds. Depth to bedrock is less than 3 feet.

Typically, Landtype 41 occurs on steep, smooth to moderately dissected sideslopes and ridges. Slopes range from 50 to 90 plus percent.

This landtype ranges in elevation from near sea level to 3,500 feet and supports Site Class III and IV Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid in the surface soils and moderately rapid in the subsoils.

Landtype 41 is distinguished by one or more of the following from any similar landtypes or inclusions. Slopes in excess of 50 percent, to moderately dissected slopes, moderately hard to hard sandstone bedrock, shallow soils and occurs east of the fog belt.

Range of Profile Characteristics of Landtype 41

Litter:	Leaves, needles, and twigs. ½ to 1 inch thick.
Surface Layers:	Very dark grayish brown to dark yellowish brown loam; weak, fine, and medium granular structure; trace to 15 percent angular and subangular gravels by volume; nonsticky to slightly sticky, nonplastic; pH 5.5 to 6.0; 6 to 18 inches thick.
Subsoil Layers:	Dark brown, brown and dark yellowish brown loams, silt loams and clay loams; moderate, fine and medium subangular blocky structure; trace to 25 percent angular to subangular gravels by volume; slightly sticky, slightly plastic; pH 5.5 to 6.0; 10 to 18 inches thick.

MAPPING UNIT 41F

Mapping Unit 41F consists dominantly of Landtype 41F and minor amounts of Landtypes 42F, 43F and 44F.

Landtype 41F is a shallow, nonplastic to slightly plastic landtype derived from residuum and colluvium. Surface soils are thin sandy loams and loams. Subsoils are thin loams and clay loams.

Bedrock is moderately hard and some hard, massive, competent, gray to buff-colored micaceous sandstone with thin siltstone interbeds. Depth to bedrock is less than 3 feet.

Typically, Landtype 41F occurs on steep, smooth to moderately dissected sideslopes and ridges. Slopes range from 50 to 90 plus percent.

This landtype ranges in elevation from near sea level to 1,500 feet, and supports Site Class III western hemlock, Sitka spruce and Douglas-fir.

The landtype is well drained. Permeability is rapid in the surface soils and moderately rapid in the subsoils.

Landtype 41F is distinghished by one or more of the following from any similar landtype or inclusion: Slopes in excess of 50 percent; smooth slopes to moderately dissected; moderately hard to hard sandstone bedrock; shallow soils, and occurs within the fog belt.

Range of Profile Characteristics of Landtype 41F

Litter:	Leaves, needles, and twigs. ½ to 1 inch thick.
Surface Layers:	Very dark grayish brown to dark yellowish brown loam; weak, fine and medium granular structure; trace to 15 percent angular and subangular gravels by volume; non-sticky to slightly sticky, nonplastic; pH 5.5 to 6.0; 6 to 18 inches thick.
Subsoil Layers:	Dark brown, brown and dark yellowish brown loams; silt loams and clay loams; moderate to strong, fine and medium subangular blocky structure; trace to 25 percent angular to subangular gravels by volume; slightly sticky, slightly plastic; pH 5.5 to 6.0; 10 to 18 inches thick.

MAPPING UNIT 42

Mapping Unit 42 consists dominantly of Landtype 42 and minor amounts of Landtypes 41, 43, and 44.

Landtype 42 is a moderately deep, locally shallow, slightly plastic to plastic landtype derived from residuum and some colluvium. Surface soils are thin loams and silt loams. Subsoils are usually moderately thick loams, clay loams, and silty clay loams.

Bedrock is moderately hard, massive, moderately competent to competent gray to buff-colored micaceous sandstone with thin siltstone interbeds. Depth to bedrock ranges from 2 to 6 feet.

Typically, Landtype 42 occurs on smooth slopes and ridges, with slopes ranging from 30 to 50 percent. These slopes are often the result of ancient landslide activity.

This landtype ranges in elevation from near sea level to 3,500 feet and supports Site Class III and II Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid in the surface soils and moderate in the subsoils.

Landtype 42 is distinguished by one or more of the following from any other similar landtypes or inclusions. Smooth slopes ranging from 30 to 50 percent; moderately hard sandstone bedrock; moderately deep soils, and occurs east of the fog belt.

Range of Profile Characteristics of Landtype 42

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark grayish brown to dark brown loams and silt loams; weak to moderate, fine to medium granular and subangular blocky structure; trace to 10 percent rounded to angular gravels by volume; nonsticky to slightly sticky, nonplastic to slightly plastic; pH 5.5 to 6.0; 7 to 20 inches thick.
Subsoil Layers:	Dark brown to yellowish brown loams, clay loams and silty clay loams; moderate, medium and fine subangular blocky structure; trace to 20 percent angular and subangular gravels, cobbles and stones by volume; slightly sticky to sticky, slightly plastic to plastic; pH 5.0 to 6.5; 30 to 50 inches thick.

MAPPING UNIT 42F

Mapping Unit 42F consists dominantly of Landtype 42F and minor amounts of Landtypes 41F, 43F, and 44F.

Landtype 42F is a moderately deep, locally shallow, slightly plastic to plastic landtype derived from residuum and some colluvium. Surface soils are thin loams and silt loams. Subsoils are usually moderately thick loams, clay loams, and silty clay loams.

Bedrock is moderately hard, massive, moderately competent to competent gray to buff-colored micaceous sandstone with thin siltstone interbeds. Depth to bedrock ranges from 2 to 6 feet.

Typically, Landtype 42F occurs on smooth slopes and ridges, with slopes ranging from 30 to 50 percent. These slopes are often the result of ancient landslide activity.

This landtype ranges in elevation from near sea level to 1,000 feet and supports Site Class II and III Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is rapid in the surface soils and moderate in the subsoils.

Landtype 42F is distinguished by one or more of the following from any similar landtypes or inclusions. Smooth slopes ranging from 30 to 50 percent; moderately hard sandstone bedrock; moderately deep soils, and occurs within the fog belt.

Range of Profile Characteristics of Landtype 42F

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark grayish brown to dark brown loams and silt loams; weak to moderate, fine to medium granular and subangular blocky structure; trace to 10 percent rounded to angular gravels by volume; nonsticky to slightly sticky, nonplastic to slightly plastic; pH 5.5 to 6.0; 7 to 20 inches thick.
Subsoil Layers:	Dark brown to strong brown loams, clay loams, and silty clay loams; moderate, medium, and fine subangular blocky structure; trace to 20 percent angular and subangular gravels, cobbles and stones by volume; slightly sticky to sticky, slightly plastic to plastic; pH 5.0 to 6.5; 30 to 50 inches thick.

MAPPING UNIT 43

Mapping Unit 43 consists dominantly of Landtype 43 and minor amounts of Landtypes 41 and 42.

Landtype 43 is a moderately deep to deep plastic landtype derived from residuum and minor colluvium. Surface soils are thin loams. Subsoils are moderately thick clay loams, silty clay loams, and occasionally clays.

Bedrock is soft to moderately hard, becoming hard with depth; massive, moderately competent, locally incompetent; buff-colored micaceous sandstone with thin siltstone interbeds. Depth to bedrock is from 4 to 10 feet.

Typically, Landtype 43 occurs on smooth hummocky sideslopes, toeslopes, terraces, and gently sloping ridgetops. These slopes are often the deposits of ancient landslides. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from near sea level to 3,000 feet and supports Site Class II and III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is moderately rapid in the surface soils and moderately slow in the subsoils.

Landtype 43 is distinguished by one or more of the following from any similar landtypes or inclusions. Soft to moderately hard sandstone bedrock; gentle slopes, 0 to 30 percent; moderately deep to deep soils, and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 43

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Dark brown loams; weak to moderate, fine and medium granular and subangular blocky structure; nonsticky to slightly sticky, nonplastic; pH 5.5 to 6.0; 8 to 12 inches thick.
Subsoil Layers:	Dark reddish brown, dark brown and yellowish brown clay loams, silty clay loams and clays; moderate to strong, medium subangular blocky structure; trace to 10 percent subangular gravel by volume; slightly sticky to sticky, slightly plastic to plastic; pH 5.5 to 6.0; 40 to 68 plus inches thick.

MAPPING UNIT 43F

Mapping Unit 43F consists dominantly of Landtype 43F and minor amounts of Landtypes 41F, 42F, and 47F.

Landtype 43F is a moderately deep to deep plastic landtype derived from residuum and minor colluvium. Surface soils or thin loams. Subsoils are moderately thick clay loams, silty clay loams, and occasionally clays.

Bedrock is soft to moderately hard, becoming hard with depth, massive, moderately competent, locally incompetent, buff-colored micaceous sandstone with thin siltstone interbeds. Depth to bedrock is from 4 to 10 feet.

Typically, Landtype 43F occurs on smooth sideslopes, toeslopes, terraces, and gently sloping ridgetops. These slopes are often the deposits of ancient landslides. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from near sea level to 1,000 feet and supports Site Class II and I Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is moderately rapid in the surface soils and moderately slow in the subsoils.

Landtype 43F is distinguished by one or more of the following from any similar landtypes or inclusions. Soft to moderately hard sandstone bedrock; gentle slopes, 0 to 30 percent; moderately deep to deep soils, and it occurs within the fog belt.

Range of Profile Characteristics of Landtype 43F

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Dark brown loams; weak to moderate, fine and medium granular, and subangular blocky structure; nonsticky to slightly sticky, nonplastic; pH 5.5 to 6.0; 8 to 12 inches thick.
Subsoil Layers:	Dark reddish brown, dark brown and yellowish brown clay loams, silty clay loams and clays; moderate to strong, medium subangular blocky structure; trace to 10 percent subangular gravel by volume; slightly sticky to sticky, slightly plastic to plastic; pH 5.5 to 6.0; 40 to 68 plus inches thick.

MAPPING UNIT 44

Mapping Unit 44 consists dominantly of Landtype 44 and minor amounts of Landtypes 41, 42, and 47.

Landtype 44 is a shallow landtype derived from residuum and colluvium. Surface soils are thin gravelly sandy loams and loams. Subsoils are thin loams and gravelly loams.

Bedrock is moderately hard to hard; massive, competent gray to buff-colored micaceous sandstone with thin siltstone interbeds. Depth to bedrock is less than 3 feet.

Typically, Landtype 44 occurs on steep, moderately to highly dissected slopes with generally somewhat rounded interfluves. Slopes range from 50 to greater than 90 percent.

This landtype ranges in elevation from 300 to 3,000 feet and supports Site Class IV and III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid throughout the soil.

Landtype 44 is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to hard sandstone bedrock, slopes greater than 50 percent that are moderately to highly dissected but generally shorter in length and more rounded than Landtype 47; shallow soils and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 44

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Dark grayish brown gravelly sandy loams and loams; moderate fine and medium granular structure; 10 to 30 percent rounded shot and 20 to 45 percent angular to subangular gravel by volume; slightly sticky, nonplastic; pH 6.0; 8 to 18 inches thick.
Subsoil Layers:	Dark brown to brown gravelly loams and loams; moderate medium subangular blocky structure; 0 to 15 percent cobbles, and 10 to 30 percent angular and subangular gravels by volume; slightly sticky, slightly plastic; pH 6.0; 15 to 18 inches thick.

MAPPING UNIT 44F

Mapping Unit 44F consists dominantly of Landtype 44F and minor amounts of Landtypes 41F, 42F, and 47F.

Landtype 44F is a shallow landtype derived from residuum and colluvium. Surface soils are thin gravelly sandy loams and loams. Subsoils are thin loams and gravelly loams.

Bedrock is moderately hard to hard, massive, competent gray-colored micaceous sandstone with thin siltstone interbeds. Depth to bedrock is less than 3 feet.

Typically, Landtype 44F occurs on steep, moderately to highly dissected slopes with generally somewhat rounded interfluves. Slopes range from 50 to greater than 90 percent.

This landtype ranges in elevation from near sea level to 1,000 feet, and supports Site Class III and IV Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is rapid throughout the soil.

Landtype 44F is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to hard sandstone bedrock, slopes greater than 50 percent that are moderately to highly dissected but generally shorter in length and more rounded than Landtype 47F; shallow soils, and it occurs within the fog belt.

Range of Profile Characteristics of Landtype 44F

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Dark grayish brown gravelly sandy loams and loams; moderate fine and medium granular structure; 10 to 30 percent rounded shot and 20 to 45 percent angular to subangular gravel by volume; slightly sticky, nonplastic; pH 6.0; 8 to 18 inches thick.
Subsoil Layers:	Dark brown to brown gravelly loams and loams; moderate medium subangular blocky structure; 0 to 15 percent cobbles and 10 to 30 percent angular and subangular gravels by volume; slightly sticky, slightly plastic; pH 6.0; 15 to 18 inches thick.

MAPPING UNIT 47

Mapping Unit 47 consists dominantly of Landtype 47 and minor amounts of Landtypes 41, 42, and 44.

Landtype 47 is a shallow landtype derived from residuum and colluvium. Surface soils are thin gravelly sandy loams and loams. Subsoils are thin gravelly and cobbly loams.

Bedrock is hard to moderately hard, massive, competent to moderately competent, gray micaceous sandstone with thin interbeds of siltstone. Depth to bedrock is less than 3 feet.

Typically, Landtype 47 occurs on steep, highly to extremely dissected slopes. These slopes have angular shapes resulting from active debris avalanching in drainageways. Slopes are long and range from 50 to greater than 90 percent.

This landtype ranges in elevation from 300 to 2,800 feet and supports Site Class IV and III Douglas-fir and western hemlock. Timber stands are not dense on this landtype.

The landtype is well drained. Permeability is rapid to moderately rapid in the soils.

Landtype 47 is distinguished by one or more of the following from any similar landtypes or inclusions: Hard to moderately hard sandstone bedrock; highly to extremely dissected long slopes that are angular in shape; slopes greater than 50 percent; shallow soils, and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 47

Litter:	Decomposed needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark grayish brown and dark brown gravelly sandy loams and loams; weak to moderate fine granular structure; trace to 20 percent cobbles and 20 to 40 percent angular to subangular gravels by volume; slightly sticky, nonplastic; pH 6.0; 3 to 7 inches thick.
Subsoil Layers:	Dark brown and dark yellowish brown gravelly and cobbly loams; weak fine and medium subangular blocky structure to massive; 15 to 30 percent cobbles and 20 to 30 percent angular and subangular gravels by volume; slightly sticky, nonplastic to slightly plastic; pH 5.0 to 6.0; 10 to 22 inches thick.

MAPPING UNIT 47F

Mapping Unit 47F consists dominantly of Landtype 47F and minor amounts of Landtypes 41F, 42F, and 44F.

Landtype 47F is a shallow landtype derived from residuum and colluvium. Surface soils are thin gravelly sandy loams and loams. Subsoils are thin gravelly and cobbly loams.

Bedrock is hard to moderately hard, massive, competent to moderately competent, gray micaceous sandstone with thin interbeds of siltstone. Depth to bedrock is less than 3 feet.

Typically, Landtype 47F occurs on steep, highly to extremely dissected slopes. These slopes have angular shapes resulting from active debris avalanching in drainageways. Slopes are long and range from 50 to greater than 90 percent.

This landtype ranges in elevation from near sea level to 1,000 feet and supports Site Class III and IV Sitka spruce, western hemlock and Douglas-fir.

The landtype is well drained. Permeability is rapid to moderately rapid in the soils.

Landtype 47F is distinguished by one or more of the following from any similar landtypes or inclusions. Hard to moderately hard sandstone bedrock; highly to extremely dissected long slopes that are angular in shape; slopes greater than 50 percent; shallow soils and it occurs within the fog belt.

Range of Profile Characteristics of Landtype 47F

Litter:	Decomposed needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark grayish brown and dark brown gravelly sandy loams and loams; weak to moderate fine granular structure; trace to 20 percent cobbles and 20 to 40 percent angular to subangular gravels by volume; slightly sticky, nonplastic; pH 6.0; 3 to 7 inches thick.
Subsoil Layers:	Dark brown and dark yellowish brown gravelly and cobbly loams; weak fine and medium subangular blocky structure to massive; 15 to 30 percent cobbles and 20 to 30 percent angular and subangular gravels by volume; slightly sticky, nonplastic to slightly plastic; pH 5.0 to 6.0; 10 to 22 inches thick.

MAPPING UNIT 51

Mapping Unit 51 consists dominantly of Landtype 51 and minor amounts of Landtypes 16, 21, 52, 54, and 61.

Landtype 51 is a shallow landtype derived from residuum and colluvium. Surface soils are thin loams. Subsoils are thin gravelly loams, silty clay loams and clay loams.

Bedrock is moderately hard to soft, moderately competent, reddish brown to black volcanic sediments, pillow lavas, breccias and tuffs. Depth to bedrock is less than 3 feet.

Typically, Landtype 51 occurs on smooth to moderately dissected steep slopes ranging from 50 to greater than 90 percent.

This landtype ranges in elevation from near sea level to 3,500 feet and supports Site Class III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid in the surface soils and moderate to moderately slow in the subsoils.

Landtype 51 is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to soft volcanic sediments, pillow lavas, breccias or tuffs; smooth to moderately dissected slopes greater than 50 percent; shallow soils, and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 51

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark gray, dark brown to reddish brown loams; weak to moderate fine and medium granular structure; trace to 20 percent angular and subangular gravels by volume; nonsticky to slightly sticky, nonplastic to slightly plastic; pH 5.5 to 6.5; 6 to 15 inches thick.
Subsoil Layers:	Dark brown, brown and yellowish red clay loams, silty clay loams and gravelly loams; moderate to weak, fine and medium subangular blocky structure; trace to 40 percent angular and subangular gravels by volume; slightly sticky to sticky, slightly plastic; pH 5.5 to 6.0; 10 to 30 inches thick.

MAPPING UNIT 51F

Mapping Unit 51F consists dominantly of Landtype 51F and minor amounts of Landtypes 16F, 21F, 52F, 54F, and 61F.

Landtype 51F is a shallow landtype derived from residuum and colluvium. Surface soils are thin loams. Subsoils are thin gravelly loams, silty clay loams and clay loams.

Bedrock is moderately hard to soft, moderately competent, locally incompetent, reddish brown to black volcanic sediments, pillow lavas, breccias, and tuffs. Depth to bedrock is less than 3 feet.

Typically, Landtype 51F occurs on smooth to moderately dissected steep slopes ranging from 50 to greater than 90 percent.

This landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class III and II Sitka spruce, western hemlock and Douglas-fir.

The landtype is well drained. Permeability is rapid in the surface soils and moderate to moderately slow in the subsoils.

Landtype 51F is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to soft volcanic bedrock; smooth to moderately dissected slopes greater than 50 percent; shallow soils, and occurring within the fog belt.

Range of Profile Characteristics of Landtype 51F

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark gray, dark brown to reddish brown loams; weak to moderate fine and medium granular structure; trace to 20 percent angular and subangular gravels by volume; nonsticky to slightly sticky, nonplastic to slightly plastic; pH to 5.5 to 6.5; 6 to 15 inches thick.
Subsoil Layers:	Dark brown, brown and yellowish red clay loams, silty clay loams and gravelly loams; moderate to weak, fine and medium subangular blocky structure; trace to 40 percent angular and subangular gravels by volume; slightly sticky to sticky, slightly plastic; pH 5.5 to 6.0; 10 to 30 inches thick.

MAPPING UNIT 52

Mapping Unit 52 consists dominantly of Landtype 52, and minor amounts of Landtypes 22, 51, 53, and 62.

Landtype 52 is a moderately deep to shallow slightly plastic landtype derived from residuum and colluvium. Surface soils are thin loams, silt loams and clay loams. Subsoils are usually moderately thick clay loams, silty clay loams, and clays.

Bedrock is soft to moderately hard, moderately to highly fractured, moderately competent, reddish brown to black volcanic sediments, pillow lavas, and breccias. Depth to bedrock ranges from 2 to 6 feet.

Typically, Landtype 52 occurs on smooth to moderately dissected sideslopes ranging from 30 to 50 percent. These slopes are often derived from ancient landslide activity.

The landtype ranges in elevation from near sea level to 3,500 feet and supports Site Class III and II Douglas-fir, western hemlock, and western redcedar.

The landtype is well to moderately well drained. Permeability is rapid in the surface soils and moderate to moderately slow in the subsoils.

Landtype 52 is distinguished by one or more of the following from any similar landtypes or inclusions. Soft to moderately hard volcanic sediments, pillow lavas or breccia bedrock; slope 30 to 50 percent; soils 2 to 6 feet deep, and occurs east of the fog belt.

Range of Profile Characteristics of Landtype 52

Litter:	Well decomposed organic matter. 0 to 2 inches thick.
Surface Layers:	Dark brown to dark reddish brown loams, silt loams and clay loams; weak to moderate fine granular and subangular blocky structure; trace to 20 percent angular gravels by volume; slightly sticky, slightly plastic; pH 5.5 to 6.0; 7 to 16 inches thick.
Subsoil Layers:	Dark brown, brown and yellowish red clay loams, silty clay loams, and clays; weak fine and medium subangular blocky structure and massive; trace to 30 percent angular gravels by volume; sticky, slightly plastic to plastic; pH 5.0 to 6.5; 20 to 56 inches thick.

MAPPING UNIT 52F

Mapping Unit 52F consists dominantly of Landtype 52F and minor amounts of Landtypes 22F, 51F, 53F, and 62F.

Landtype 52F is a moderately deep to shallow, slightly plastic landtype derived from residuum and colluvium. Surface soils are thin loams, silt loams and clay loams. Subsoils are usually moderately thick clay loams, silty clay loams and clays.

Bedrock is soft to moderately hard, moderately to highly fractured, moderately competent, reddish brown to black volcanic sediments, pillow lavas and breccias. Depth to bedrock ranges from 2 to 6 feet.

Typically, Landtype 52F occurs on smooth to moderately dissected sideslopes, ranging from 30 to 50 percent. These slopes are often derived from ancient landslide activity.

The landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class II and III Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well to moderately well drained. Permeability is rapid in the surface soils and moderate to moderately slow in the subsoils.

Landtype 52F is distinguished by one or more of the following from any similar landtypes or inclusions. Soft to moderately hard volcanic bedrock; slopes between 30 and 50 percent; soils from 2 to 6 feet deep, and occurring within the fog belt.

Range of Profile Characteristics of Landtype 52F

Litter:	Well decomposed organic matter. 0 to 2 inches thick.
Surface Layers:	Dark brown to dark reddish brown loams, silt loams and clay loams; weak to moderate fine granular and subangular blocky structure; trace to 20 percent angular gravels by volume; slightly sticky, slightly plastic; pH 5.5 to 6.0; 7 to 16 inches thick.
Subsoil Layers:	Dark brown, brown and yellowish red clay loams, silty clay loams, and clays; weak fine and medium subangular blocky structure and massive; trace to 30 percent angular gravels by volume; sticky, slightly plastic to plastic; pH 5.0 to 6.5; 20 to 56 inches thick.

MAPPING UNIT 53

Mapping Unit 53 consists dominantly of Landtype 53 and minor amounts of Landtypes 15, 23, 52, and 63.

Landtype 53 is a moderately deep to deep, slightly plastic to plastic landtype derived from residuum and minor colluvium. Surface soils are thin loams, silt loams, and clay loams. Subsoils are moderately thick to thick clay loams and clays.

Bedrock is soft, moderate to highly fractured, moderately competent to incompetent, reddish brown to black volcanic sediments, pillow lavas and breccias. Depth to bedrock ranges from four to eight feet.

Typically, Landtype 53 occurs on smooth, gentle benches and toeslopes. Slopes range from 0 to 30 percent and are often the deposits of ancient landslides.

This landtype ranges in elevation from 100 to 3,500 feet and supports Site Class II and III Douglas-fir, western hemlock and western redcedar.

The landtype is moderately well drained. Permeability is moderately rapid in the surface soils and moderately slow in the subsoils.

Landtype 53 is distinguished by one or more of the following from any similar landtypes or inclusions. Soft volcanic sediments, pillow lavas or breccias; moderately deep to deep soils on slopes ranging between 0 and 30 percent; and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 53

Litter:	Well decomposed organic matter. 0 to 2 inches thick.
Surface Layers:	Dark reddish brown to dusky red loams; silt loams and clay loams; moderate fine granular to moderate fine and medium subangular blocky structure; trace to 20 percent angular and subangular gravels and cobbles by volume; slightly sticky, slightly plastic; pH 6.0 to 6.5; 6 to 10 inches thick.
Subsoil Layers:	Yellowish red, reddish brown to strong brown clay loams and clays; moderate fine and medium subangular blocky structure over massive; trace to 10 percent angular and subangular gravels, cobbles, and stones by volume; sticky, plastic; pH 5.5 to 6.5; 40 to 83 plus inches thick.

MAPPING UNIT 53F

Mapping Unit 53F consists dominantly of Landtype 53F and minor amounts of Landtypes 15, 23F, 52F, and 63F.

Landtype 53F is a moderately deep to deep, slightly plastic to plastic landtype derived from residuum and minor colluvium. Surface soils are thin loams, silt loams, and clay loams. Subsoils are moderately thick to thick clay loams and clays.

Bedrock is soft, moderate to highly fractured, moderately competent to incompetent, reddish brown to black volcanic sediments, pillow lavas, and breccias. Depth to bedrock ranges from four to eight feet.

Typically, Landtype 53F occurs on smooth, gentle benches and toeslopes. Slopes range from 0 to 30 percent, and are often the deposits of ancient landslides.

This landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class II Sitka spruce, western hemlock, Douglas-fir and western redcedar.

The landtype is moderately well drained. Permeability is moderately rapid in the surface soils, and moderately slow in the subsoils.

Landtype 53F is distinguished by one or more of the following from any similar landtypes or inclusions. Soft volcanic bedrock; moderately deep to deep soils on slopes between 0 and 30 percent, and it occurs within the fog belt.

Range of Profile Characteristics of Landtype 53F

Litter:	Well decomposed organic matter. 0 to 2 inches thick.
Surface Layers:	Dark reddish brown to dusky red loams; silt loams and clay loams; moderate fine granular to moderate fine and medium subangular blocky structure; trace to 20 percent angular and subangular gravels and cobbles by volume; slightly sticky, slightly plastic; pH 6.0 to 6.5; 6 to 10 inches thick.
Subsoil Layers:	Yellowish red, reddish brown to strong brown clay loams and clays; moderate fine and medium subangular blocky structure over massive; trace to 10 percent angular and subangular gravels, cobbles and stones by volume; sticky, plastic; pH 5.5 to 6.5; 40 to 83 plus inches thick.

MAPPING UNIT 54

Mapping Unit 54 consists dominantly of Landtype 54 and minor amounts of Landtypes 16, 51, and 52.

Landtype 54 is a shallow to moderately deep landtype derived from residuum and colluvium. Surface soils are thin loams. Subsoils are thin to moderately thick loams.

Bedrock is moderately hard to soft, moderately competent dark brown to black weathered volcanic sediments, pillow lavas, or breccias. Depth to bedrock ranges from about one foot to five feet.

Typically, Landtype 54 occurs on steep, moderately to highly dissected slopes, ranging from 50 to greater than 90 percent.

This landtype ranges in elevation from 100 to 2,500 feet and supports Site Class III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid in the soils.

Landtype 54 is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to soft bedrock of volcanic sediments, pillow lavas, or breccias; steep, moderately to highly dissected slopes in excess of 50 percent; shallow to moderately deep soils with less than 35 percent gravel and cobble content by volume average throughout the soil, and it occurs east of the fog belt.

Range of Profile Characteristics of Landtype 54

Litter:	Highly decomposed organic matter. 0 to 3 inches thick.
Surface Layers:	Dark brown loams; weak fine granular structure; trace to 20 percent angular gravels by volume; slightly sticky, non-plastic; pH 5.5 to 6.0; 2 to 15 inches thick.
Subsoil Layers:	Dark brown to brown loams; weak fine subangular blocky structure; 10 to 25 percent angular gravels by volume; slightly sticky, slightly plastic; pH 5.5 to 6.0; 10 to 45 inches thick.

MAPPING UNIT 54F

Mapping Unit 54F consists dominantly of Landtype 54F and minor amounts of Landtypes 16F, 51F, and 52F.

Landtype 54F is a shallow to moderately deep landtype derived from residuum and colluvium. Surface soils are thin loams. Subsoils are thin to moderately thick loams.

Bedrock is moderately hard to soft, moderately competent dark brown to black weathered volcanic sediments, pillow lavas or breccias. Depth to bedrock ranges from about one foot to five feet.

Typically, Landtype 54F occurs on steep, moderately to highly dissected slopes ranging from 50 to greater than 90 percent.

This landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class III and II Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is rapid in the soils.

Landtype 54F is distinguished by one or more of the following from any similar landtypes or inclusions. Moderately hard to soft volcanic bedrock; steep, moderately to highly dissected slopes in excess of 50 percent, shallow to moderately deep soils with less than 35 percent gravel and cobbles by volume averaged throughout the soil, and it occurs within the fog belt.

Range of Profile Characteristics of Landtype 54F

Litter:	Highly decomposed organic matter. 0 to 3 inches thick.
Surface Layers:	Dark brown loams; weak fine granular structure; trace to 20 percent angular gravels by volume; slightly sticky, nonplastic; pH 5.5 to 6.0; 2 to 15 inches thick.
Subsoil Layers:	Dark brown to brown loams; weak fine subangular blocky structure; 10 to 25 percent angular gravels by volume; slightly sticky, slightly plastic; pH 5.5 to 6.0; 10 to 45 inches thick.

MAPPING UNIT 60

Mapping Unit 60 consists dominantly of Landtype 60 and minor amounts of Landtypes 61, 62, and 63.

Landtype 60 is a shallow nonplastic landtype derived from residuum that has been altered by high velocity winds. Soils are thin, very gravelly loams.

Bedrock is hard, highly fractured, competent, gray and black unweathered basalts, andesites, and syenites. Depth to bedrock is less than two feet.

Typically, Landtype 60 occurs on smooth slopes on or adjacent to ridge-tops. Slopes range from 0 to 40 percent.

This landtype ranges in elevation from 1,500 to 3,000 feet and supports grasses, forbs, and occasional small shrubs.

The landtype is excessively drained. Permeability is very rapid to rapid in the soils.

Landtype 60 is distinguished by its non-forested gentle to moderate slopes; shallow soils, and occurrence east of the fog belt and lower in elevation than the true fir zone found at approximately 3,500 feet on Mary's Peak.

Range of Profile Characteristics of Landtype 60

Litter:	Leaves and twigs. 0 to 1 inch thick.
Surface Layers:	Very dark grayish brown to dark brown, very gravelly loams; weak fine granular structure; 50 to 70 percent angular and subangular stones, cobbles, and gravels by volume; slightly sticky, nonplastic; pH 5.0 to 6.0; 5 to 20 inches thick.

MAPPING UNIT 61

Mapping Unit 61 consists dominantly of Landtype 61 and minor amounts of Landtypes 16, 21, 51, and 62.

Landtype 61 is a shallow, nonplastic landtype derived from residuum and colluvium. Surface soils are thin loams. Subsoils are thin loams and silt loams.

Bedrock is hard, moderately to highly fractured, competent, dark gray to black unweathered basalts, andesites, syenites and, locally, diorites. Depth to bedrock is less than three feet.

Typically, Landtype 61 occurs on smooth to moderately dissected slopes and ridges with slopes ranging from 50 to greater than 90 percent.

This landtype ranges in elevation from 500 to 3,500 feet and supports Site Class IV and III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is moderately rapid in the surface and subsoils.

Landtype 61 is distinguished by one or more of the following from any similar landtypes or inclusions. Hard bedrock; shallow soils with less than 35 percent coarse fragments by volume averaged through the soil; slopes greater than 50 percent and it occurs east of the fog belt and below the 3,500-foot elevation where true fir is found.

Range of Profile Characteristics of Landtype 61

Litter:	Needles, leaves, twigs and decomposing organic matter. 1 to 3 inches thick.
Surface Layers:	Very dark grayish brown loams; weak fine granular to moderate fine and medium subangular blocky structure; trace gravel content; slightly sticky, nonplastic; pH 5.5; 5 to 10 inches thick.
Subsoil Layers:	Dark brown to dark grayish brown loams and silt loams; moderate medium subangular blocky structure; trace to 20 percent angular and subangular gravels, cobbles and stones by volume; slightly sticky, slightly plastic; pH 6.5; 10 to 20 inches thick.

MAPPING UNIT 61F

Mapping Unit 61F consists dominantly of Landtype 61F and minor amounts of Landtypes 16F, 21F, 31F, 51F, and 62F.

Landtype 61F is a shallow, nonplastic landtype derived from residuum and colluvium. Surface soils are thin loams. Subsoils are thin loams and silt loams.

Bedrock is hard, moderately to highly fractured, competent, dark gray to black unweathered basalts, andesites, syenites and, locally, diorites. Depth to bedrock is less than 3 feet.

Typically, Landtype 61F occurs on smooth to moderately dissected slopes and ridges with slopes ranging from 50 to greater than 90 percent.

This landtype ranges in elevation from 100 to 1,500 feet and supports Site Class III and IV Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is moderately rapid in the surface subsoils.

Landtype 61F is distinguished by one or more of the following from any similar landtypes or inclusions. Hard bedrock; shallow soils with less than 35 percent coarse fragments by volume, averaged; slopes greater than 50 percent, and it occurs in the fog belt.

Range of Profile Characteristics of Landtype 61F

Litter:	Needles, leaves, twigs, and decomposing organic matter. 1 to 3 inches thick.
Surface Layers:	Very dark grayish brown loams; weak fine granular to moderate fine and medium subangular blocky structure; trace gravel content; slightly sticky, nonplastic; pH 5.5; 5 to 10 inches thick.
Subsoil Layers:	Dark brown to dark grayish brown loams and silt loams; moderate medium subangular blocky structure; trace to 20 percent angular and subangular gravels, cobbles, and stones by volume; slightly sticky, slightly plastic; pH 6.5; 10 to 20 inches thick.

MAPPING UNIT 62

Mapping Unit 62 consists dominantly of Landtype 62 and minor amounts of Landtype 62 and minor amounts of Landtypes 16, 17, 52, and 63.

Landtype 62 is a shallow to moderately deep, nonplastic landtype derived from residuum and colluvium. Surface soils are thin loams and gravelly loams. Subsoils are thin to moderately thick gravelly loams, sandy loams and silt loams.

Bedrock is hard, moderately to highly fractured, competent, dark gray unweathered basalts, andesites, syenites, and, locally, diorites. Depth to bedrock is generally 1 to 4 feet.

Typically, Landtype 62 occurs on smooth slopes and ridges. Slopes range from 30 to 50 percent.

This landtype ranges in elevation from near sea level to 3,500 feet and supports Site Class III Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid in the surface soils and rapid to moderately rapid in the subsoils.

Landtype 62 is distinguished by one or more of the following from any similar landtypes or inclusions. Hard volcanic bedrock; slopes between 30 and 50 percent; and it occurs below the true fir zone as well as east of the fog belt.

Range of Profile Characteristics of Landtype 62

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Dark brown to very dark grayish brown loams, shotty loams, and gravelly loams; weak very fine granular and moderate, fine and medium subangular blocky structure; trace to 20 percent angular and subangular gravel and 30 to 35 percent rounded shot by volume; nonsticky, nonplastic; pH 6.0; 5 to 20 inches thick.
Subsoil Layers:	Dark brown to dark yellowish brown gravelly loams, sandy loams and silt loams; weak, fine subangular blocky structure; 30 percent rounded shot; 35 to 60 percent angular and subangular gravels by volume; slightly sticky, nonplastic to slightly plastic; pH 6.0; 7 to 28 inches thick.

MAPPING UNIT 62F

Mapping Unit 62F consists dominantly of Landtype 62F and minor amounts of Landtypes 16F, 17F, 52F, and 63F.

Landtype 62F is a shallow to moderately deep, nonplastic landtype derived from residuum and colluvium. Surface soils are thin loams and gravelly loams. Subsoils are thin to moderately thick gravelly loams, sandy loams, and silt loams.

Bedrock is hard, moderately to highly fractured, competent, dark gray unweathered basalts, andesites, syenites and, locally, diorites. Depth to bedrock is generally 1 to 4 feet.

Typically, Landtype 62F occurs on smooth slopes and ridges. Slopes range from 30 to 50 percent.

This landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class III and II Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is rapid in the surface soils and rapid to moderately rapid in the subsoils.

Landtype 62F is distinguished by one or more of the following from any similar landtypes or inclusions. Hard volcanic bedrock; slopes between 30 and 50 percent; shallow to moderately deep soils, and it occurs in the fog belt.

Range of Profile Characteristics of Landtype 62F

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Dark brown to very dark grayish brown loams, shotty loams, and gravelly loams; weak, very fine granular and moderate fine and medium subangular blocky structure; trace to 20 percent angular and subangular gravel and 30 to 35 percent rounded shot by volume; nonsticky, nonplastic, pH 6.0; 5 to 20 inches thick.
Subsoil Layers:	Dark brown to dark yellowish brown gravelly loams, sandy loams, and silt loams; weak, fine subangular blocky structure; 30 percent rounded shot; 35 to 60 percent angular and subangular gravels by volume; slightly sticky, nonplastic to slightly plastic; pH 6.0; 7 to 28 inches thick.

MAPPING UNIT 63

Mapping Unit 63 consists dominantly of Landtype 63 and minor amounts of Landtypes 53 and 62.

Landtype 63 is a shallow to moderately deep nonplastic to slightly plastic landtype derived from residuum and some colluvium. Surface soils are thin loams, gravelly loams, and silt loams. Subsoils are thin loams, gravelly loams, and silt loams.

Bedrock is hard to moderately hard, highly fractured, competent, dark gray to black volcanic rocks. Depth to bedrock ranges from 2 to 4 feet.

Typically, Landtype 63 occurs on gentle ridgetops and benches. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from 500 to 3,500 feet and supports Site Class III and locally II Douglas-fir and western hemlock.

The landtype is well drained. Permeability is rapid in the soils.

Landtype 63 is distinguished by one or more of the following from any similar landtypes or inclusions. Hard to moderately hard volcanic bedrock; gentle slopes 0 to 30 percent; and it occurs below the true fir zone as well as east of the fog belt.

Range of Profile Characteristics of Landtype 63

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark grayish brown silt loams, loams, and gravelly loams; weak, fine granular to weak and moderate, fine and medium subangular blocky structure; 5 to 50 percent angular and subangular gravels, cobbles and stones by volume; nonsticky to slightly sticky, nonplastic to slightly plastic; pH 5.0 to 6.0; 8 to 14 inches thick.
Subsoil Layers:	Dark brown to brown silt loams, loams and gravelly loams; weak to moderate, fine to medium subangular blocky structure; trace to 55 percent angular and subangular gravels, cobbles, and stones by volume; slightly sticky, slightly plastic; pH 6.0; 16 to 34 inches thick.

MAPPING UNIT 63F

Mapping Unit 63F consists dominantly of Landtype 63F and minor amounts of Landtypes 53F and 62F.

Landtype 63F is a shallow to moderately deep nonplastic to slightly plastic landtype derived from residuum and some colluvium. Surface soils are thin loams, gravelly loams, and silt loams. Subsoils are thin loams, gravelly loams, and silt loams.

Bedrock is hard to moderately hard, highly fractured, competent, dark gray to black volcanic rocks. Depth to bedrock ranges from 2 to 4 feet.

Typically, Landtype 63F occurs on gentle ridgetops and benches. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from near sea level to 1,500 feet and supports Site Class II and III Sitka spruce, western hemlock, and Douglas-fir.

The landtype is well drained. Permeability is rapid in the soils.

Landtype 63F is distinguished by one or more of the following from any similar landtypes or inclusions. Hard to moderately hard volcanic bedrock; gentle slopes 0 to 30 percent; shallow to moderately deep soils and it occurs in the fog belt.

Range of Profile Characteristics of Landtype 63

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark grayish brown silt loams, loams, and gravelly loams; weak, fine granular to weak and moderate, fine and medium subangular blocky structure; 5 to 50 percent angular and subangular gravels, cobbles and stones by volume; nonsticky to slightly sticky, nonplastic to slightly plastic; 5.0 to 6.0; 8 to 14 inches thick.
Subsoil Layers:	Dark brown to brown silt loams, loams and gravelly loams; weak to moderate, fine to medium subangular blocky structure; trace to 55 percent angular and subangular gravels, cobbles, and stones by volume; slightly sticky, slightly plastic; pH 6.0; 16 to 34 inches thick.

MAPPING UNIT 70

Mapping Unit 70 consists dominantly of Landtype 70 and minor amounts of Landtypes 71 and 72.

Landtype 70 is a shallow, nonplastic landtype derived from residuum and, locally, colluvium. Soils are thin, very gravelly loams.

Bedrock is hard, moderately fractured, competent gray gabbros and diorites. Depth to bedrock is less than 2 feet.

Typically, Landtype 70 occurs on smooth slopes on or adjacent to ridgetops. Slopes range from 0 to 40 percent.

This landtype ranges in elevation from 3,500 to 4,000 feet on Mary's Peak. It supports grasses, forbs, and occasional small shrubs.

The landtype is excessively drained. Permeability is very rapid in the soils.

Landtype 70 is distinguished by its nonforested, gentle to moderate slopes 0 to 40 percent; shallow soils, and it occurs above 3,500-feet elevation.

Range of Profile Characteristics of Landtype 70

Litter:	Leaves and twigs. 0 to ½ inch thick.
Surface Layers:	Very dark grayish brown very gravelly loams; weak, fine granular structure; 50 to 70 percent angular gravels, cobbles and stones by volume; nonsticky to slightly sticky, nonplastic; pH 5.0 to 5.5; 5 to 20 inches thick.

MAPPING UNIT 71

Mapping Unit 71 consists dominantly of Landtype 71 and minor amounts of Landtypes 70 and 72.

Landtype 71 is a shallow, nonplastic landtype derived from residuum and colluvium. Surface soils and subsoils are thin loams and gravelly loams.

Bedrock is hard, moderately fractured, competent, dark gray gabbros and, locally, diorites. Depth to bedrock is less than three feet.

Typically, Landtype 71 occurs on steep, smooth to moderately dissected slopes and ridges. Slopes range from 50 to greater than 90 percent.

This landtype ranges in elevation from 3,500 to 4,000 feet on Mary's Peak. It supports Site Class III and II Noble fir and western hemlock. There are occasional Douglas-fir at the lower elevations.

The landtype is well drained. Permeability is very rapid in the surface and subsoils.

Landtype 71 is distinguished by one or more of the characteristics from any similar landtypes or inclusions. Hard volcanic bedrock; shallow soils; steep slopes, 50 to 90 plus percent, and above 3,500-feet elevation.

Range of Profile Characteristics of Landtype 71

Litter:	Needles, leaves, and twigs. 0 to 1 inch thick.
Surface Layers:	Dark brown loams and gravelly loams; weak fine granular structure; 10 to 40 percent angular and subangular gravels by volume; nonsticky, nonplastic; pH 4.5; 5 to 12 inches thick.
Subsoil Layers:	Brown loams and gravelly loams; weak fine subangular blocky structure; 20 to 50 percent angular and subangular gravels by volume; nonsticky, nonplastic; pH 4.5; 10 to 20 inches thick.

MAPPING UNIT 72

Mapping Unit 72 consists dominantly of Landtype 72 and minor amounts of Landtypes 70, 71, and 73.

Landtype 72 is a shallow to moderately deep, nonplastic landtype derived from residuum and colluvium. Surface and subsoils are thin loams and gravelly loams.

Bedrock is hard, moderately fractured, competent, dark gray unweathered gabbros and, locally, diorites. Depth to bedrock is from 1 to 4 feet.

Typically, Landtype 72 occurs on smooth slopes and ridgetops ranging from 30- to 50-percent slope.

This landtype ranges in elevation from 3,500 to 4,000 feet on Mary's Peak. It supports Site Class II and III Noble fir and western hemlock.

The landtype is well drained. Permeability is very rapid in the soils.

Landtype 72 is distinguished by one or more of the following from any similar landtypes or inclusions. Hard volcanic bedrock; moderate slopes, 30 to 50 percent, and above 3,500-feet elevation.

Range of Profile Characteristics of Landtype 72

Litter:	Needles, leaves, and twigs. 0 to 2 inches thick.
Surface Layers:	Very dark grayish brown loams and gravelly loams; weak fine granular structure; 20 to 40 percent angular and subangular gravel by volume; nonsticky, nonplastic; pH 5.0 to 5.5; 6 to 10 inches thick.
Subsoil Layers:	Brown loams and gravelly loams; weak fine subangular blocky structure; 20 to 50 percent angular and subangular gravels by volume; nonsticky, nonplastic; pH 4.5 to 5.0; 6 to 35 inches thick.

MAPPING UNIT 73

Mapping Unit 73 consists dominantly of Landtype 73 and minor amounts of Landtypes 70 and 72.

Landtype 73 is a shallow to moderately deep nonplastic to slightly plastic landtype derived from residuum and some colluvium. Surface and subsoils are thin loams and gravelly loams.

Bedrock is hard, moderately fractured, competent, gray unweathered gabbros and locally diorites. Depth to bedrock is usually 2 to 4 feet.

Typically, Landtype 73 occurs on smooth, gentle ridgetop positions and benches. Slopes range from 0 to 30 percent.

This landtype ranges in elevation from 3,500 to 4,000 feet on Mary's Peak. It supports Site Class II and III Noble fir and western hemlock.

The landtype is well drained. Permeability is rapid in the soils.

Landtype 73 is distinguished by one or more of the following from any similar landtypes or inclusions. Hard, unweathered volcanic bedrock; gentle slopes ranging from 0 to 30 percent, and occurring above 3,500-feet elevation.

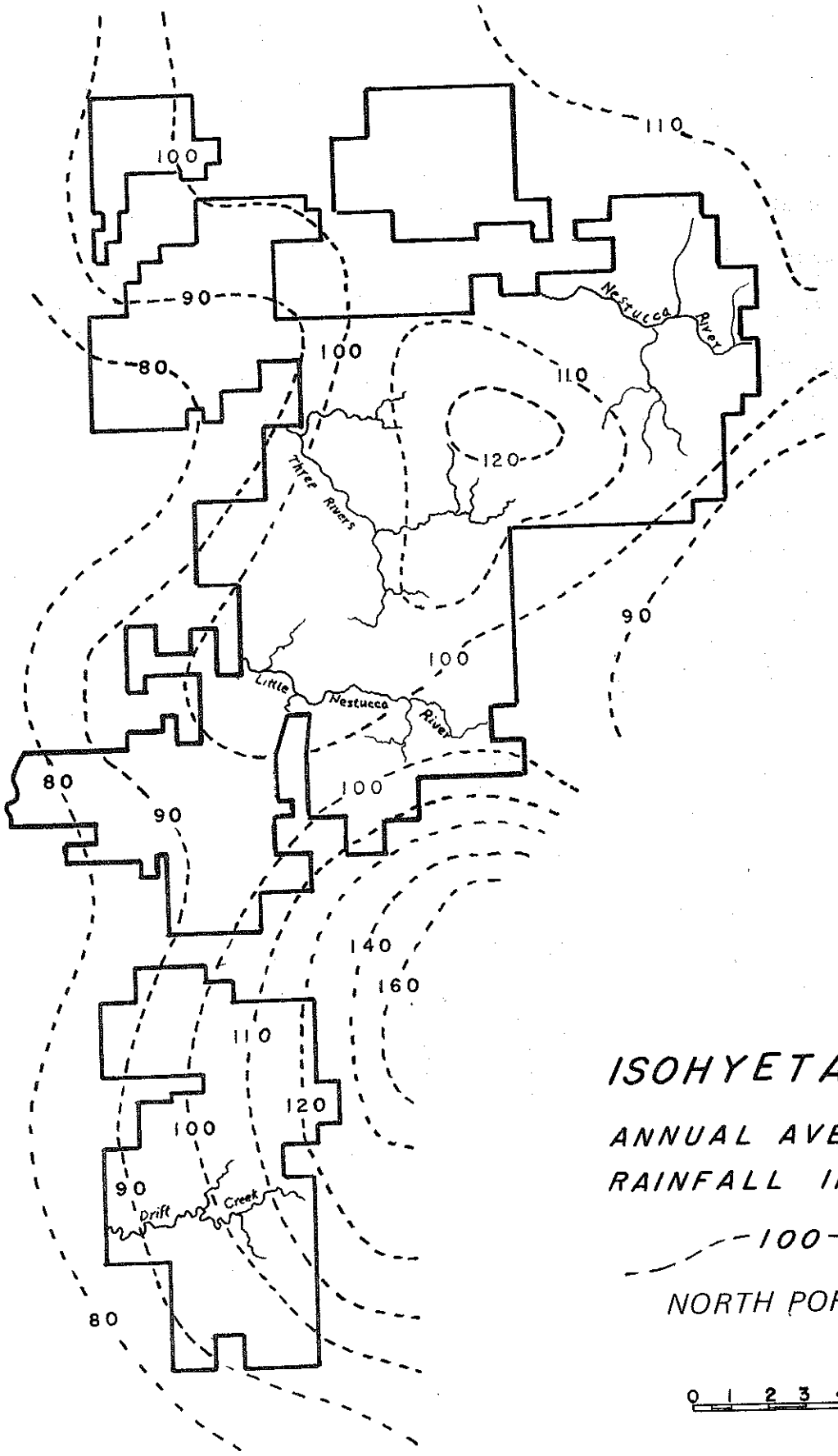
Range of Profile Characteristics of Landtype 73

Litter:	Needles, leaves, and twigs. 0 to 1 inch thick.
Surface Layers:	Very dark grayish brown loams, and gravelly loams; weak, fine granular to weak and moderate, fine and medium granular and subangular blocky structure; 5 to 50 percent angular and subangular gravels, cobbles and stones by volume; nonsticky to slightly sticky, nonplastic; pH 5.0 to 6.0; 8 to 14 inches thick.
Subsoil Layers:	Dark brown to brown, loams and gravelly loams; massive to weak to moderate, fine to medium subangular blocky structure; trace to 60 percent angular and subangular gravels, cobbles, and stones by volume; slightly sticky, slightly plastic; pH 5.0 to 6.0; 10 to 34 inches thick.

APPENDIX I

CLIMATE

This Appendix contains a brief narrative description of the climate of the Soil Resource Inventory survey area. Also included in this Appendix are Tables of Average Mean Monthly Temperatures and Precipitation Data, Average Monthly Snow Survey Measurements, and Isohyetal Maps of the survey area, north and south portions.



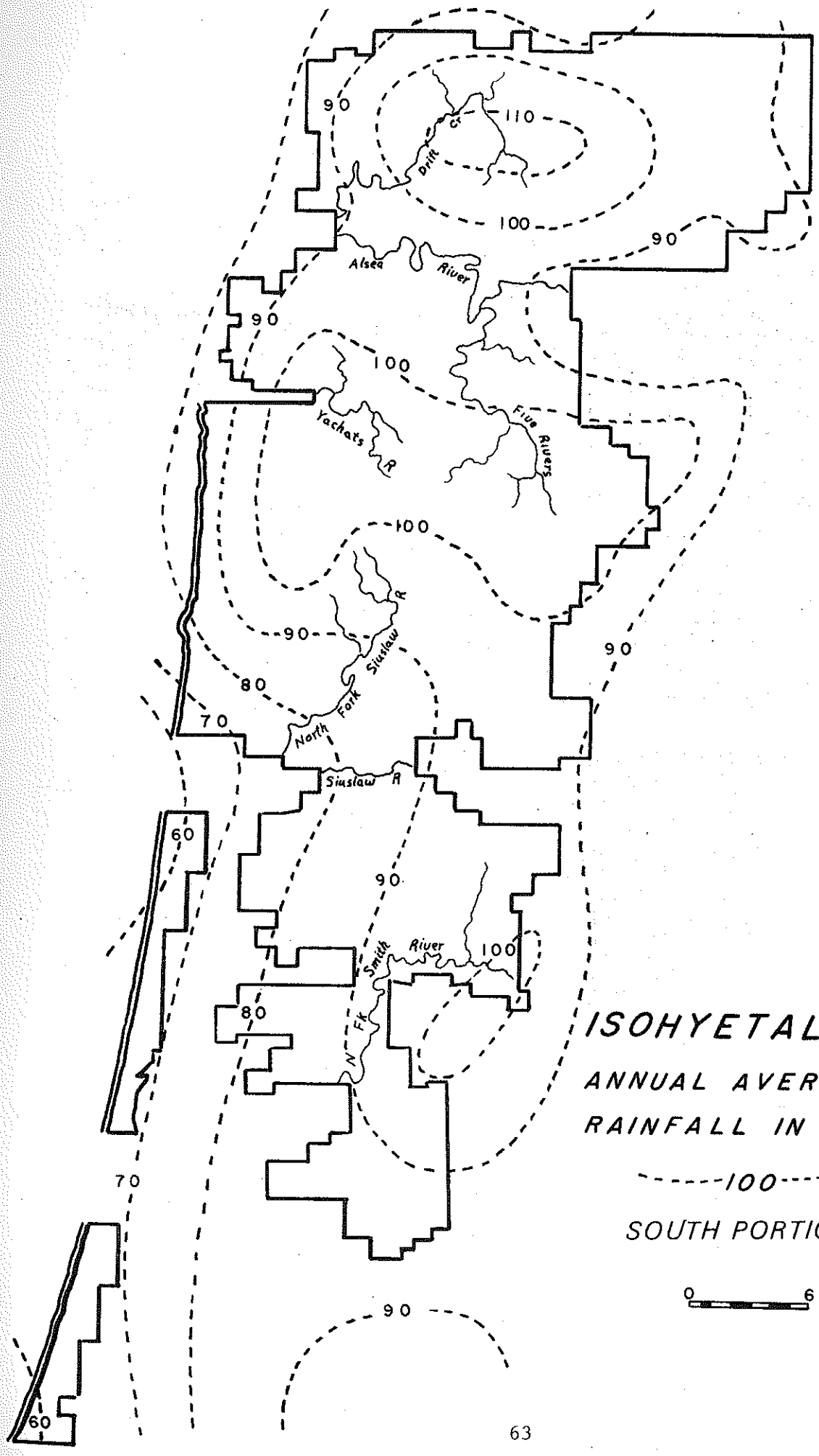
ISOHYETAL MAP

ANNUAL AVERAGE RAINFALL IN INCHES

100

NORTH PORTION

0 1 2 3 4 5 6



ISOHYETAL MAP

ANNUAL AVERAGE RAINFALL IN INCHES

-----100-----

SOUTH PORTION

0 6

CLIMATE [1/]

General

The climate of the Siuslaw National Forest is influenced by the position and intensity of high and low pressure systems over the North Pacific Ocean, and by variation in topography. Moist maritime air masses moving from west to east provide a great deal of moisture for the Coast Range. Although precipitation varies throughout the Forest, the general pattern is similar. Precipitation is lower in the major valley bottoms and increases as elevation increases. Conversely, temperature averages are higher in the major valley bottoms and decreases with increasing elevation. Precipitation varies from 60 inches in some lower valley bottoms to 120 inches on the higher ridges. Most of the precipitation falls as rain, except for the top of Mary's Peak where snow falls for 3 to 4 months of the year.

Coast Range

The Coast Range of mountains begins at or near the coast and extends the full north-south length of Oregon. The Coast Range is the farthest west of the three mountain ranges exerting significant influence on Oregon's climate.

The Coast Range rises to a crest of between 2,000 and 3,000 feet above sea level, with occasional peaks extending from 1,000 to 1,500 feet higher. The Coast Range perpendicular to the path of moisture-laden marine air masses moving in from the Pacific forces their ascent as they pass inland. The resultant cooling produces some of the heaviest annual rainfalls in the United States along the western slopes, and materially lessens the moisture available for distribution further inland. Another influence that strongly affects the Coast Range is the area where fog accumulates, called the fog belt. This is a narrow strip running inland 4 to 5 miles where summer fog affects the climate and vegetation. It is in this strip that Sitka spruce is found. Productivity is generally higher in this fog belt because of the lower evaporation, transpiration rates, higher humidity, and fog condensation adding moisture to the soil.

Precipitation

Along the coast the normal annual total is from 75 to 90 inches, and gradually increases up the west slope of the Coast Range to between 115 and 130 inches near the crest. This decreases on the east slope to between 40 and 45 inches along the valley floor of the Willamette. In the coastal drainage where the climate is mild, most of the precipitation occurs during November through March. Winter precipitation in the Coast Range, due to its lower elevation, occurs largely as rain, although occasionally the area is subject to some snow. Along the Oregon coast the average annual snowfall is only 1 to 3 inches, with many years when there is no measurable amount.

Flooding

Flooding due to heavy rains occurs about once in two years and usually may be expected in late fall and during the winter. In the coastal drainages, notable flood years have been 1861, 1890, 1909, 1927, 1953, 1955, and 1964.

Temperature

Temperatures in the coastal section never drop as low as zero and on very few occasions pass the 100° mark. Generally, the mean of the coldest month (January) is 15° to 25° lower than that of July, the warmest month.

Wind

Winds of hurricane force (74 m.p.h.) strike the Oregon coast several times each year. Winds greater than 100 m.p.h. are occasionally recorded on Mt. Hebo. Damage from winds is usually confined to power and communication lines and to timber. Loss of life and major structural damage to buildings rarely occurs.

Winter Conditions

During the fall and winter, low pressure systems form in the North Pacific Ocean. Counter-clockwise air circulation around these low pressure systems results in a prevailing southwesterly air flow. This results in a wet season from mid-October to mid-April. Between 40 and 50 percent of the total annual precipitation falls during the three winter months, December through February, and 20 to 25 percent falls during the fall months. The forced ascent of the air masses up the west slopes of the Coast Range causes them to release moisture.

Summer Conditions

During mid- to late spring, low pressure centers move further north and are gradually replaced by high pressure systems with their clockwise circulation of air, resulting in a prevailing northwesterly flow of air. The air becomes warmer and drier as it moves inland, resulting in a dry season beginning in late spring and reaching a peak in summer. Only 6 percent of the annual precipitation occurs during the summer and just 20 to 25 percent occurs during the spring months. The hottest weather, lowest relative humidity and the greatest danger of forest fires occur during periods of easterly winds.

The Coast Range has a normal dry period that is of little consequence since drought conditions normally do not occur early enough in the season to affect the seedling and grass seeding survival. Occasionally poor survival does result (particularly on south slopes) when the dry period occurs too early.

SIUSLAW NATIONAL FOREST

AVERAGE MONTHLY SNOW SURVEY MEASUREMENTS [1/]

Mary's Peak, Section 21, T. 12 S., R. 7 W., Elevation 3620', Period 1938 - 1972

Year	January		February		March		April		May		June	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
1938	-	-	-	-	-	-	-	-	18	8.5	-	-
1939	-	-	45	16.0	-	-	35	14.8	-	-	-	-
1940	-	-	0	0.0	-	-	0	0.0	-	-	-	-
1941	-	-	0	0.0	-	-	0	0.0	-	-	-	-
1942	-	-	0	0.0	-	-	14	4.2	-	-	-	-
1943	-	-	44	19.4	-	-	22	3.8	-	-	-	-
1944	-	-	7	2.0	-	-	20	6.9	-	-	-	-
1945	-	-	12	4.1	-	-	48	19.3	-	-	-	-
1946	-	-	23	8.6	-	-	53	23.3	-	-	-	-
1947	-	-	16	2.9	-	-	1	0.4	-	-	-	-
1948	-	-	4	1.8	-	-	34	13.2	-	-	-	-
1949	-	-	56	18.7	-	-	64	27.8	-	-	-	-
1950	-	-	-	-	-	-	-	-	82	37.1	-	-
1951	-	-	-	-	-	-	-	-	16	6.7	-	-
1952	-	-	-	-	-	-	54	25.4	-	-	-	-
1953	-	-	2	0.2	15	4.1	34	13.3	-	-	-	-
1954	-	-	26	10.4	24	9.9	20	8.3	-	-	-	-
1955	-	-	26	8.3	40	14.7	58	22.2	-	-	-	-
1956	-	-	34	10.7	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-	-	-	-	-
1958	-	-	1	0.3	0	0.0	14	4.0	-	-	-	-
1959	-	-	3	0.8	19	7.5	30	13.3	-	-	-	-
1960	-	-	-	-	-	-	-	-	-	-	-	-
1961	-	-	0	0.0	21	5.5	31	12.9	8	3.7	-	-
1962	-	-	3	1.0	-	-	29	13.3	4	1.0	-	-
1963	-	-	0	0.0	0	0.0	40	9.1	25	10.5	-	-
1964	-	-	23	9.0	31	10.8	53	21.7	44	17.5	-	-
1965	-	-	-	-	30	12.2	15	6.6	4	1.1	-	-
1966	-	-	-	-	60	25.0	65	28.9	21	10.4	-	-
1967	-	-	8	3.2	-	-	47	16.2	-	-	-	-
1968	-	-	-	-	1	0.8	2	0.8	1	0.5	-	-
1969	-	-	105	30.4	100	39.3	89	41.6	57	28.6	-	-
1970	-	-	9	2.8	0	0.0	0	0.0	-	-	-	-
1971	-	-	49	19.9	54	16.0	68	29.0	-	-	-	-
1972	-	-	71	26.7	52	22.9	20	9.1	-	-	-	-
(3)	0		26		15		29		11		0	
Mean	-	-	22	7.6	30	11.2	33	13.4	25	11.4	-	-

1/ Frost, W. T. and Tom George, Summary of Snow Measurements for Oregon, Soil Conservation Service, U.S. Dept. of Agriculture, Portland, Ore., 1969.

(1) Average snow depth in inches.
(2) Average water content in inches.
(3) Number of months' measurements taken.

FIGURE

CLIMATIC DATA 1/

SIUSLAW NATIONAL FOREST AND ADJACENT AREAS
AVERAGE MEAN MONTHLY AND ANNUAL TEMPERATURE AND PRECIPITATION

STATION	ELEVATION	PERIOD	NO. OF YEARS' TEMP.	NO. OF YEARS' PRECIP.	JANUARY (1)	JANUARY (2)	FEBRUARY (1)	FEBRUARY (2)	MARCH (1)	MARCH (2)	APRIL (1)	APRIL (2)	MAY (1)	MAY (2)	JUNE (1)	JUNE (2)	JULY (1)	JULY (2)	AUGUST (1)	AUGUST (2)	SEPTEMBER (1)	SEPTEMBER (2)	OCTOBER (1)	OCTOBER (2)	NOVEMBER (1)	NOVEMBER (2)	DECEMBER (1)	DECEMBER (2)	NORMAL MEAN AVERAGE
Alsea Fish Hatchery Sec. 20,T.13S.,R.7W.	230'	1931-72	0	19	-	14.93	-	11.97	-	12.84	-	6.13	-	3.72	-	1.54	-	0.29	-	0.86	-	2.84	-	7.46	-	14.18	-	17.29	-	94.32
Canary Sec.17,T.19S.,R.11W.	100'	1931-70	43	39	43.4	12.10	45.4	9.79	46.5	9.60	49.3	4.78	53.3	3.24	57.5	1.75	60.4	0.68	61.1	0.86	59.6	2.56	54.6	6.55	48.5	11.69	45.2	12.95	52.0	76.53
Cloverdale 1 NW Sec.23,T.4S.,R.10W.	20'	1931-72	31	32	42.4	12.03	45.3	9.18	45.9	9.65	48.6	5.77	53.3	3.37	57.2	2.95	60.2	0.87	60.4	1.19	59.1	3.33	54.2	7.57	48.4	11.94	44.5	13.90	51.6	81.76
Corvallis Sec.34, T.11S.,R.5W.	275'	1931-71	40	35	-	5.93	-	4.98	-	4.87	-	2.12	-	1.56	-	1.11	-	0.22	-	0.32	-	4.04	-	2.94	-	6.04	-	6.59	-	37.95
Corvallis Water Bureau Sec.13, T.12S.,R.7W.	592'	1931-72	7	37	38.7	11.42	42.0	9.33	45.3	8.59	47.1	3.55	54.9	2.25	60.6	1.22	65.4	0.23	66.2	0.50	60.7	1.39	51.2	4.12	44.9	9.51	38.9	11.60	51.3	63.72
Dallas Sec.32,T.7S.,R.5W.	325'	1931-72	34	38	38.2	10.98	41.9	6.27	44.7	6.16	49.3	2.23	55.6	1.82	60.3	1.07	65.4	0.18	64.7	0.37	61.4	1.29	52.9	3.22	44.6	6.99	40.4	9.08	51.6	46.99
Elkton 3 S.W. Sec.19,T.8S.,R.6W.	114'	1931-72	33	37	41.4	7.75	45.2	6.88	47.9	5.84	51.6	3.08	57.3	1.89	62.3	1.04	67.4	0.12	66.9	0.28	63.4	1.21	55.5	3.47	47.3	8.19	43.2	8.26	54.1	48.01
Falls City No. 2 Sec.21,T.8S.,R.6W.	650'	1931-72	42	38	38.1	12.05	41.3	9.09	44.3	9.09	48.9	3.44	54.7	1.81	59.3	1.25	64.6	0.23	64.6	0.36	61.1	1.57	53.0	4.72	44.4	9.77	40.2	14.00	51.2	67.37
Honeyman State Park Sec.10,T.19S.,R.12W.	115'	1971-72	2	2	41.0	12.38	46.0	9.23	47.8	10.77	46.6	8.25	53.0	1.65	56.4	2.00	59.2	0.36	61.2	1.91	58.7	2.85	52.7	2.72	48.4	9.47	40.9	15.46	51.2	62.73
Newport Sec.8,T.11S.,R.11W.	124'	1931-72	40	41	43.5	9.56	45.1	7.85	45.9	7.95	48.5	4.53	51.9	2.47	55.6	2.34	57.3	0.70	57.6	0.88	56.7	2.17	53.3	5.74	48.7	8.89	45.0	11.35	50.3	64.41
North Bend A.P. Sec.9,T.25S.,R.13W.	20'	1931-72	42	42	45.2	9.75	46.7	7.62	47.6	7.30	49.7	3.70	53.5	2.39	57.2	1.45	59.1	0.28	59.7	0.49	58.4	1.70	54.9	4.10	50.2	8.87	46.9	11.07	52.4	58.70
Noti,2E.S.E. Sec.29,T.17S.,R.6W.	480'	1931-67	0	13	-	14.28	-	6.83	-	6.97	-	1.93	-	1.61	-	0.62	-	0.09	-	0.11	-	0.92	-	3.41	-	7.42	-	8.71	-	52.92
Otis 2N.E. Sec. ,T.17S.,R.10W.	20'	1931-72	17	25	41.2	16.68	44.6	11.32	45.5	11.08	47.7	6.72	52.4	3.93	56.9	3.10	59.7	1.07	60.5	1.33	58.7	3.61	52.7	8.30	46.6	12.91	42.1	16.66	50.7	97.04
Philomath 2 S.E. Sec. 12,T.12S.,R.6W.	240'	1931-72	0	30	-	6.70	-	4.73	-	4.82	-	2.18	-	1.30	-	1.08	-	0.16	-	0.37	-	1.30	-	2.87	-	5.98	-	6.79	-	38.21
Reedsport Sec.35, T.21S.,R.12W.	55'	1931-72	33	36	43.8	11.80	46.0	9.70	46.9	9.58	49.6	5.21	53.6	3.01	57.5	1.80	60.1	0.40	60.9	0.64	59.7	2.37	55.1	5.37	49.0	11.21	45.2	12.66	52.3	73.75
Summit Sec.6,T.11S.,R.7W.	720'	1931-72	0	42	-	9.91	-	8.67	-	8.39	-	3.96	-	2.53	-	1.54	-	0.38	-	0.58	-	1.83	-	5.43	-	9.08	-	12.12	-	64.44
Tidewater 1S.W. Sec.25,T.1S.,R.10W.	50'	1931-72	30	42	41.8	14.57	45.3	11.56	46.9	11.55	50.5	6.52	55.2	3.45	59.4	2.46	63.0	0.83	63.6	0.92	61.4	2.76	55.2	6.70	48.0	13.03	43.6	16.48	52.8	90.74
Tillamook 1 W. Sec. 25,T.1 S.,R.10W.	15'	1931-72	40	40	41.8	11.63	44.4	11.34	45.1	10.24	48.1	5.80	52.0	3.34	55.9	3.65	58.0	1.11	58.5	1.24	57.0	2.87	52.7	6.98	47.3	13.75	44.1	15.91	50.4	87.99
Valsetz Sec.34,T.8 S.,R.8W.	1135'	1931-72	32	36	38.0	19.52	41.5	16.32	43.1	15.11	47.1	8.07	53.0	3.81	58.0	2.48	62.5	0.93	61.9	1.33	58.4	3.75	51.6	10.01	44.5	18.15	40.4	22.39	50.0	122.23
Willamina 2 S. Sec.1,T.6S.,R.7W.	285'	1931-72	0	38	-	8.03	-	6.89	-	6.60	-	3.01	-	4.04	-	1.01	-	0.27	-	0.46	-	1.35	-	3.59	-	6.99	-	9.20	-	49.14

1/ Data compiled from the following sources: Weather Bureau, U.S. Department of Commerce; Corvallis Water Bureau, City of Corvallis.
The above values are summations of various sources of data and may vary slightly from other reported information.

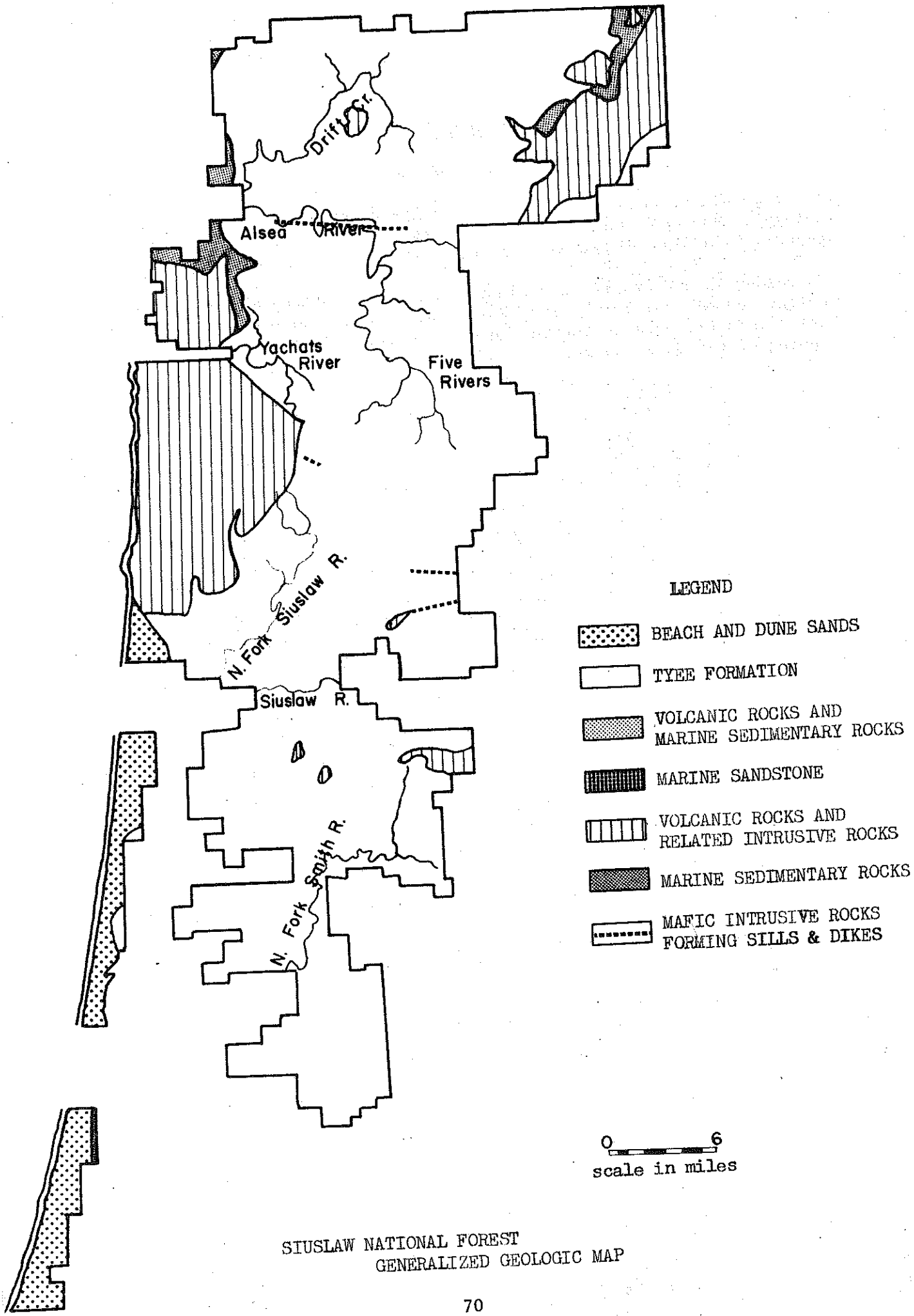
(1) Mean temperature
(2) Mean Precipitation

APPENDIX II

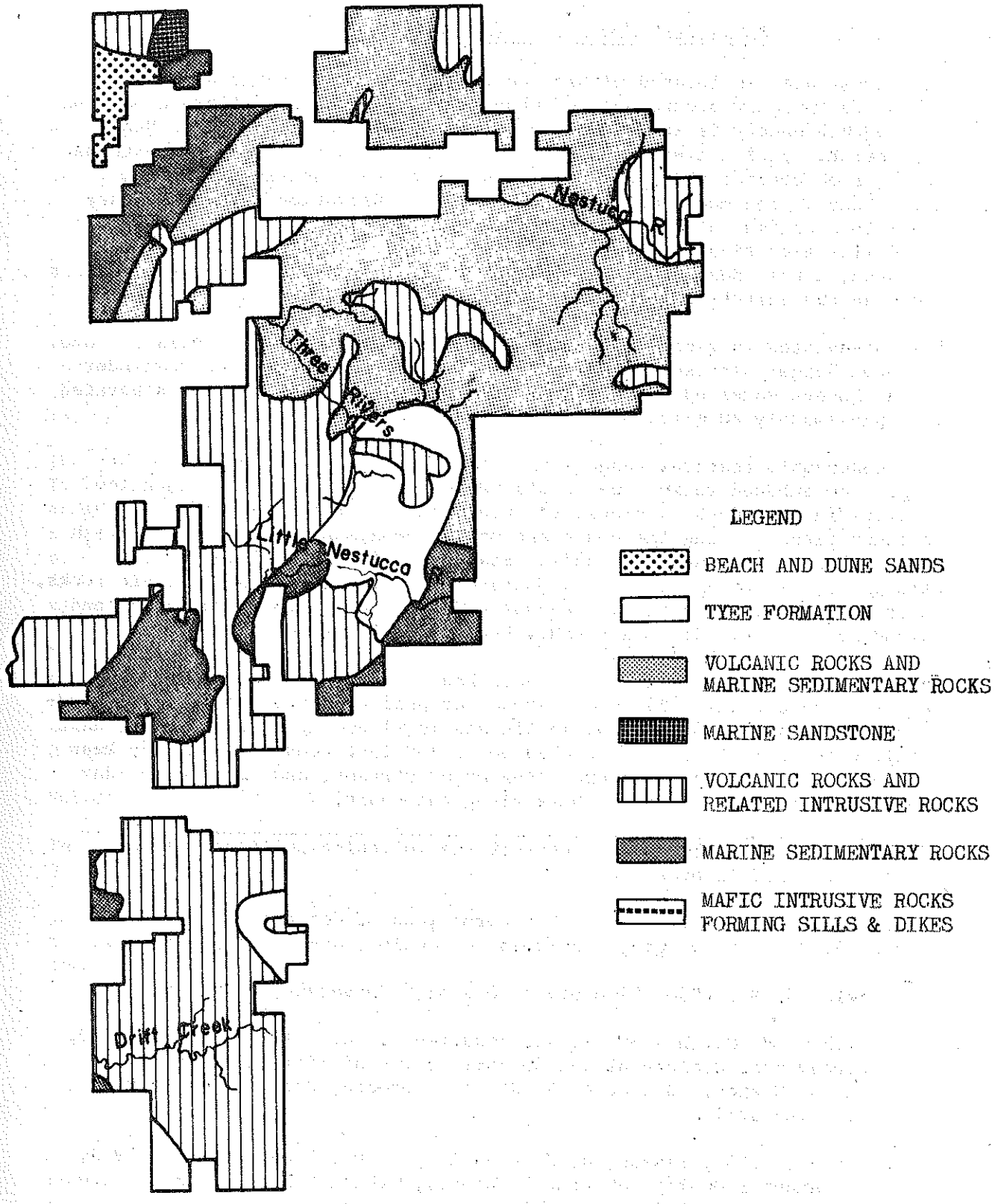
GEOLOGY

This Appendix contains a brief narrative description of the Generalized Geology of the Soil Resource Inventory area. Also included in this Appendix is a Generalized Bedrock Map of the survey area.

The reader is encouraged to consult the State of Oregon, Department of Geology and Mineral Industries, Portland, Oregon, and various universities within the area to secure the most recent and up-to-date geologic mapping of the Coast Range.



SIUSLAW NATIONAL FOREST
GENERALIZED GEOLOGIC MAP



SIUSLAW NATIONAL FOREST
GENERALIZED GEOLOGIC MAP

GENERALIZED GEOLOGY OF THE SURVEY AREA [1/]

The survey area is located within the Coastal Mountain Range of Oregon. The north boundary occurs east of Cape Lookout, south of Tillamook Bay and the south boundary is located along the Umpqua River. The Oregon Dunes National Recreation Area was also included in the survey area and extends as a narrow coastal strip directly adjacent to the Pacific Ocean from North Bend to the mouth of the Siuslaw River. Elevation ranges from sea level to a maximum of 4,097 feet atop Mary's Peak with an average overall ridge-line elevation of about 1,500 feet. Major drainages such as the Nestucca, Little Nestucca, Salmon, Alsea, Siuslaw, Smith, and Umpqua Rivers traverse the survey area and flow directly into the Pacific Ocean.

The survey area is geographically divided into two separate blocks of land. The Hebo Ranger District comprises the northern block, and the remainder of the Forest makes up the southern block. These two blocks are separated by approximately 20 miles of non-Forest Service lands.

The topographic features found within the survey area are varied. They range from subdued relief due to old large-scale landslide and landflow activity in the northern block, to steep, sharp, dissected ridges in the southern block. Along the coast are marine embayments, sand dunes, fresh water lakes, and coastal lowlands. Scattered along the ridge systems throughout the survey area are topographic highs composed of volcanic rocks. In areas directly adjacent to beaches and sand dunes, lowlands can extend inland for several miles where they became stabilized by vegetation.

Past climatic and geologic events have had an effect on the topographic features found within the survey area. Gradual uplift of the coastal landmass, followed by fluctuations in the sea level during glacial times, have resulted in marine terraces perched 50 to 200 feet above present-day mean sea levels, entrenched meanders along major streams, and the present-day configuration of the numerous bays along the coast.

1/ The reader is encouraged to consult the following publications for more detailed information.

Beaulieu, J. D., 1971, "Geologic Formations of Western Oregon," Bulletin 70, State of Oregon, Department of Geology & Mineral Industries.

Baldwin, E. M., 1964, "Geology of Oregon," University of Oregon.

Schlicker, H. G., Deacon, R. J., Beaulieu, J. D., Olcott, G. W., 1972, "Environmental Geology of the Coastal Region of Tillamook & Clatsop Counties, Oregon," Bulletin 74, State of Oregon, Dept. of Geology & Mineral Industries.

Schlicker, H. G., Deacon, R. J. Beaulieu, J. D., Olcott, G. W., 1973, "Environmental Geology of Lincoln County, Oregon," Bulletin 81, State of Oregon, Dept. of Geology & Mineral Industries.

Detailed geologic information is available from various sources for the survey area. The rock types are well described, but the ages of the various rock types and the formation to which they belong varies from author to author. For purposes of this report the following discussion will deal only in a general way with the major rock types and formations within the survey area. For specific detailed information the reader is urged to contact the "State Department of Geology and Mineral Industries" and local universities. 1/

BEACH AND DUNE SANDS:

This material occurs along the Pacific Ocean front and locally extends inland 3 or 4 miles. The sand is unconsolidated to semiconsolidated, angular to rounded medium to fine grained. It is highly susceptible to wind and wave erosion. Dune relief is up to 180 feet.

TYEE FORMATION:

The Tyee Formation is the major formation within the survey area. The Tyee Formation is composed of rhythmically bedded, micaceous, arkosic, medium-grained sandstone that grades upward to thin siltstone beds. The sandstone is generally grayish in color and hard except for weathered surfaces which are soft to moderately hard and buff in color. The approximate thickness of individual beds ranges from 5 to 15 feet with the siltstone layers comprising the minor component.

The Tyee Formation is commonly characterized by steep slopes with varying degrees of dissection. Drainage channels are often prone to debris slides and channel scouring. Occasional old landslide features are evident on the more gentle undulating slopes. Narrow stringers of alluvium are common along drainageways.

VOLCANIC ROCKS AND MARINE SEDIMENTARY ROCKS:

This is an area of complex bedrock material. It consists of interbedded volcanic rocks and sedimentary rocks. The sedimentary rocks include tuffaceous shale, siltstone, and sandstone which have interbeds of amygdaloidal, porphyritic basalt and andesite in pillow lava, breccia, and tuff. The rock varies from hard to soft, depending upon the degree of weathering and rock type.

The area is dominated by landslide topography with gentle to moderate slopes.

MARINE SANDSTONE:

A small area near Cape Lookout makes up this unit. It consists of massive micaceous, poorly consolidated sandstone. Locally, it is extremely important because of its reaction to management. The slopes are moderate to steep and prone to landsliding.

VOLCANIC ROCKS AND RELATED INTRUSIVE ROCKS:

This area is composed of a number of different volcanic series. It may contain basalt flows, pillow lavas, some columnar basalt, flow breccia, breccia, and tuff. The intrusive portions include fine to coarse-grained granophyric gabbro, granophyric diorite, diabase, camptonite, and nepheline syenite in sills, stocks, or dikes.

This unit makes up the topographic highs because of its resistance to weathering and erosion. The rocks range from soft to hard, depending upon the degree of weathering and depth of sampling.

Topography is varied in this unit because of the wide variety of rock material present and the mode of origin for the rock. Slopes range from steep, highly dissected to gentle and smooth.

MARINE SEDIMENTARY ROCKS:

This unit consists of many formations or parts of formations. It is dominated by fine-textured sedimentary rocks such as siltstone, mudstone and shales. Tuffaceous influences are common. Sandstone is a minor component of the unit. Topography is generally subdued due to old, large-scale landslides. Narrow alluvial stringers occur along drainageways and near sea level develop into broad, flat bottomlands.

MAFIC INTRUSIVE ROCKS FORMING SILLS AND DIKES:

There are numerous small sills and dikes exposed in the survey area that can either be shown only generally as lines, or not at all on the map. The sills and dikes are composed of diabase, gabbro, diorite, or basalt. This rock often creates high spots on ridges or alignments along streams. Landslides are common along contacts with sandstones and siltstones.

APPENDIX III

ENGINEERING TEST DATA

This Appendix contains the Engineering Laboratory Test Results of the soils materials from selected landtypes within the Soil Resource Inventory survey area.

All soil material testing was conducted by Ron Powell of the Engineering Materials Section, Willamette National Forest. Remarks were made by Robert Young of the Engineering Materials Section, Siuslaw National Forest.

The laboratory test data presented in the Appendix is intended to be used as a guide and indicator for planning purposes only. The test samples were collected at the landtype type locations.

Samples were taken of contrasting soil layers and are indicated by (A) top layers; (B) next lower layers, and (C) if any, bottom-most layers. The number indicates the tested landtype.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 14A

			Mechanical Analysis		Hydrometer Analysis	
Location: NE¼SW¼, Sec.1., T. 16S, R. 10 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 0-48"						
Liquid Limit:		N.P.	1 1/2	-	20	99.89
Plasticity Index		N.P.	1	-	40	99.13
Maximum Density - p.c.f.		86.1	3/4	-	60	92.51
Optimum Moisture - %		28.5	1/2	-	100	73.98
Specific Gravity, #10(-) only		2.67	3/8	-	200	48.64
Classification	ASSHO	A-4(0)	#4	100	Dia. mm 1/	
	UNIFIED	SMd	#10	100	.0305	29.29
California Bearing Ratio	95%	6.2	#20	-	.0205	21.78
	90%	2.4	#40	99	.0123	16.14
	85%		#60	-	.0089	12.39
pH		4.8	#100	71	.0064	9.57
Resistivity - ohms per cm		5366	#200	46.8	.0032	5.82
					.0013	2.61

Remarks:

This material is a silty sand. It should have fair value as a subgrade except when subjected to frost, and should exhibit fair workability as a construction material. It has fair to poor drainage characteristics and poor erosion resistance. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 15A

Location: NE¼SW¼, Sec. 33, T. 15 S. R. 11 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 14-90"			Sieve Size	% Passing	Sieve Size	% Passing
			3	100		
Liquid Limit:		N.P.	2	71		
			1 1/2	60	20	15.53
Plasticity Index		N.P.	1	44	40	11.85
Maximum Density - p.c.f.		119.0	3/4	38	#60	8.71
Optimum Moisture - %		14.0	1/2	32	#100	6.21
Specific Gravity, #10(-) only		2.92	3/8	28	#200	4.28
Classification	ASSHO	A-1a(1)	#4	26	Dia.mm 1/	
	UNIFIED	G.P.	#10	22	.0318	2.98
California Bearing Ratio	95%	24.6	#30	15	.0205	2.17
	90%	8.7	#40	12	.0121	1.46
	85%		#60	--	.0085	1.17
pH		6.2	#100	--	.0061	.73
Resistivity - ohms per cm		3810	#200	3.5	.0030	.28
					.0012	.11

Remarks:

This material is a poorly graded sandy gravel with excellent drainage characteristics, and should make a good to excellent subgrade. The soil has only a slight potential for compressibility, expansion or frost action. Erosion resistance is good.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 16A

			Mechanical Analysis		Hydrometer Analysis	
Location:	SE¼, NE¼, Sec. 6, T. 33 S., R. 10 W.		Sieve Size	% Passing	Sieve Size	% Passing
Depth:	0-13"		2"	100		
Liquid Limit:		N.P.	1 1/2	97	#20	74.88
Plasticity Index		N.P.	1	97	#40	71.51
Maximum Density - p.c.f.		63.4	3/4	93	#60	68.46
Optimum Moisture - %		52.4	1/2	90	#100	64.77
Specific Gravity, #10(-) only		2.78	3/8	88	#200	60.28
Classification	ASSHO	A-4(0)	#4	84	Dia. mm 1/	
	UNIFIED	ML	#10	81	.0322	32.41
California Bearing Ratio	95%	5.8	#20	--	.0210	24.61
	90%	3.7	#40	76	.0124	18.37
	85%		#60	--	.0089	13.69
pH		5.2	#100	69	.0064	8.11
Resistivity - ohms per cm		9,293	#200	62.7	.0031	4.21
					.0013	1.87

Remarks:

This material is a nonplastic, inorganic silt with some sand and gravel. Value as a subgrade is poor to fair. It has high frost susceptibility, slight to medium compressibility, and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 16B

Location: SE¼NE¼, Sec. 6, T. 33 S., R. 10 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 13-74"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	2	100		
			1 1/2	92	#20	66.82
Plasticity Index		N.P.	1	87	#40	63.57
Maximum Density - p.c.f.		71.5	3/4	86	#60	60.19
Optimum Moisture - %		46.8	1/2	81	#100	55.86
Specific Gravity, #10(-) only		2.77	3/8	80	#200	50.58
Classification	ASSHO	A-4(o)	#4	76	Dia. mm 1/	
	UNIFIED	SMd	#10	73	.0330	23.44
California Bearing Ratio	95%	6.0	#20	-	.0215	16.85
	90%	4.1	#40	66	.0125	12.13
	85%		#60	-	.0090	8.17
pH		5.2	#100	56	.0064	4.88
Resistivity - ohms per cm		10,917	#200	49.6	.0032	1.58

Remarks:

This material is a silty sand with some gravel. It should have fair value as a subgrade, except when subjected to frost. It should exhibit fair workability as a construction material. It has fair to poor drainage characteristics and poor erosion resistance. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 17A

			Mechanical Analysis		Hydrometer Analysis	
Location: SE¼NE¼, Sec. 23, T. 3 S., R. 10 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 0-19"						
Liquid Limit:		N.P.	1 1/2	100	#20	56.22
Plasticity Index		N.P.	1	90	#40	52.52
Maximum Density - p.c.f.		67.5	3/4	88	#60	50.36
Optimum Moisture - %		44.4	1/2	85	#100	48.32
Specific Gravity, #10(-) only		2.85	3/8	83	#200	46.02
Classification	ASSHO	A-4(0)	#4	79	Dia. mm 1/	
	UNIFIED	SMd	#10	67	.0316	25.49
California Bearing Ratio	95%	12.3	#20	--	.0205	20.58
	90%	10.0	#40	53	.0120	14.96
	85%		#60	--	.0086	12.51
pH		5.0	#100	45	.0062	8.83
Resistivity - ohms per cm		16,422	#200	40.8	.0030	5.76
					.0013	2.70

Remarks:

This material is a silty sand with some gravel. It should have fair value as a subgrade except when subjected to frost. It should exhibit fair workability as a construction material. The drainage characteristics are fair to poor. Erosion resistance is poor. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 17B

			Mechanical Analysis		Hydrometer Analysis	
Location: SE¼NE¼, Sec. 23, T. 3 S., R. 10 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 19-37"			2	100		
Liquid Limit:		N.P.	1 1/2	94	#20	61.47
Plasticity Index		N.P.	1	89	#40	57.09
Maximum Density - p.c.f.		74.1	3/4	85	#60	54.25
Optimum Moisture - %		40.3	1/2	81	#100	51.40
Specific Gravity, #10(-) only		2.67	3/8	78	#200	47.97
Classification	ASSHO	A-4(0)	#4	72	Diam. mm 1/	
	UNIFIED	ML	#10	69	.0319	31.48
California Bearing Ratio	95%	15.4	#20	--	.0207	26.78
	90%	12.2	#40	63	.0123	22.08
	85%		#60	--	.0089	17.38
pH		5.4	#100	61	.0064	14.44
Resistivity - ohms per cm		18,143	#200	58.8	.0031	9.64
					.0013	4.94

Remarks:

This material is a nonplastic, inorganic silt with some sand and gravel. Value as a subgrade is poor to fair. It has high frost susceptibility and slight to medium compressibility and expansion characteristics. Drainage characteristics are poor to fair. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 17C

			Mechanical Analysis		Hydrometer Analysis	
Location: SE¼NE¼, Sec. 23, T. 3S. R. 10 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 37-70"			2½	100		
			2	96		
Liquid Limit:		45.6	1 1/2	94	#20	35.21
Plasticity Index		6	1	75	#40	33.20
Maximum Density - p.c.f.		92.2	3/4	63	#60	31.66
Optimum Moisture - %		28.4	1/2	52	#100	29.98
Specific Gravity, #10(-) only		2.72	3/8	48	#200	27.51
Classification	ASSHO	A-1-b(0)	#4	43	Dia. mm 1/	
	UNIFIED	GMu	#10	39	.0295	22.89
California Bearing Ratio	95%	7.9	#20	--	.0192	20.26
	90%	3.2	#40	32	.0115	16.97
	85%		#60	--	.0083	14.99
pH		5.0	#100	28	.0060	13.02
Resistivity - ohms per cm		16,944	#200	25.3	.0030	9.34
					.0013	5.39

Remarks:

This material is a slightly plastic silty gravel with very poor drainage characteristics. It should make a good subgrade when not subject to frost action. The soil has good workability as a construction material and provides good erosion resistance.

1/Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 21A

Location: SW¼SE¼, Sec. 3, T. 10 S. R. 3 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 6-21"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	1 1/2		#20	79.61
Plasticity Index		N.P.	1		#40	78.17
Maximum Density - p.c.f.		72.6	3/4	100	#60	76.87
Optimum Moisture - %		39.9	1/2	99.5	#100	75.14
Specific Gravity, #10(-) only		2.60	3/8	98	#200	70.67
Classification	ASSHO	A-4(0)	#4	90	Dia. mm 1/	
	UNIFIED	ML	#10	82	.0313	46.19
California Bearing Ratio	95%	13.6	#20	--	.0209	36.02
	90%	5.2	#40	76	.0125	27.30
	85%		#60	--	.0091	21.48
pH		4.6	#100	71	.0065	16.28
Resistivity - ohms per cm		7,620	#200	63.2	.0033	9.01
					.0013	4.65

Remarks:

This material is a nonplastic inorganic silt with some sand and a few gravel sizes. Value as a subgrade is poor to fair. The frost susceptibility is high, slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 22A

			Mechanical Analysis		Hydrometer Analysis	
Location: NE¼NE¼, Sec. 16, T. 6 S., R. 10 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 7-39"						
Liquid Limit:		N.P.	1 1/2		#20	89.25
Plasticity Index		N.P.	1		#40	85.35
Maximum Density - p.c.f.		71.3	3/4	100	#60	81.96
Optimum Moisture - %		42.7	1/2	99.6	#100	77.39
Specific Gravity, #10(-) only		2.67	3/8	99	#200	70.61
Classification	ASSHO	A-4(0)	#4	98	Dia. mm 1/	
	UNIFIED	ML	#10	93	.0314	48.43
California Bearing Ratio	95%	14.9	#20	--	.0207	38.34
	90%	8.6	#40	82	.0124	29.92
	85%		#60	--	.0090	23.19
pH		5.0	#100	72	.0064	18.85
Resistivity - ohms per cm		17,972	#200	64.5	.0032	9.59
					.0013	3.70

Remarks:

This material is a nonplastic, inorganic silt with some sand. Value as a subgrade is poor to fair. It has high frost susceptibility, slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 23A

Location: NE¼SE¼, Sec. 7, T. 6 S., R. 10 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 13-80"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	1 1/2	--	#20	90.94
Plasticity Index		N.P.	1	--	#40	88.90
Maximum Density - p.c.f.		74.7	3/4	--	#60	85.67
Optimum Moisture - %		40.0	1/2	--	#100	81.09
Specific Gravity, #10(-) only		2.71	3/8	100	#200	75.31
Classification	ASSHO	A-4(0)	#4	99.8	Dia. mm 1/	
	UNIFIED	ML	#10	99	.0298	56.49
California Bearing Ratio	95%	12.7	#20	--	.0196	48.13
	90%	4.0	#40	96	.0117	39.77
	85%		#60	--	.0084	33.78
pH		4.8	#100	86	.0060	28.76
Resistivity - ohms per cm		17,639	#200	79.4	.0031	18.73
					.0013	8.70

Remarks:

This material is a nonplastic inorganic silt with some sand. Value as a subgrade is poor to fair. It has a high frost susceptibility, slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 27A

			Mechanical Analysis		Hydrometer Analysis	
Location: NW¼SW¼, Sec. 11, T. 12 S., R. 7 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 0-33"						
Liquid Limit:		54.3	1 1/2	--	#20	91.48
Plasticity Index		12	1	--	#40	86.97
Maximum Density - p.c.f.		83.4	3/4	100	#60	82.46
Optimum Moisture - %		32.8	1/2	99	#100	77.95
Specific Gravity, #10(-) only		2.79	3/8	99	#200	73.10
Classification	ASSHO	A-7-5 (12)	#4	96	Dia. mm 1/	
	UNIFIED	MH	#10	94	.0271	67.74
California Bearing Ratio	95%	9.0	#20	--	.0225	50.03
	90%	5.7	#40	87	.0103	57.75
	85%		#60	--	.0074	52.88
pH		5.2	#100	79	.0053	49.64
Resistivity - ohms per cm		4,885	#200	74.3	.0027	39.91
					.0011	30.18

Remarks:

This material is a slightly plastic inorganic silt with some sand. It makes a poor subgrade material. Frost susceptibility is high and it is highly compressible and expansive. Drainage characteristics are fair to poor. It is a poor construction material. Erosion potential is very high.

1/Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 31A

Location: NE¼SW¼, Sec. 6, T. 3 S., R. 10 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 0-11"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	1 1/2	100	#20	85.45
Plasticity Index		N.P.	1	98	#40	80.32
Maximum Density - p.c.f.		67.7	3/4	97	#60	76.04
Optimum Moisture - %		43.5	1/2	97	#100	70.56
Specific Gravity, #10(-) only		2.50	3/8	96	#200	57.03
Classification	ASSHO	A-4(6)	#4	94	Dia. mm 1/	
	UNIFIED	ML	#10	91	.0360	29.71
California Bearing Ratio	95%	13.5	#20	--	.0234	22.63
	90%	6.7	#40	85	.0138	15.55
	85%		#60	--	.0097	12.75
pH		5.0	#100	73	.0070	8.32
Resistivity - ohms per cm		5,381	#200	57.3	.0034	3.90
					.0014	.35

Remarks:

This material is a nonplastic inorganic silt with some sand and a few gravel sizes. Value as a subgrade is poor to fair. It has high frost susceptibility and slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 31B

			Mechanical Analysis		Hydrometer Analysis	
Location: NE¼SW¼, Sec. 6, T. 3 S., R. 10 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 11-28"						
Liquid Limit:		N.P.	1 1/2	100	#20	83.58
Plasticity Index		N.P.	1	98	#40	80.38
Maximum Density - p.c.f.		75.9	3/4	98	#60	77.17
Optimum Moisture - %		37.7	1/2	96	#100	72.20
Specific Gravity, #10(-) only		2.71	3/8	95	#200	52.81
Classification	ASSHO	A-4(0)	#4	92	Dia. mm 1/	
	UNIFIED	SMd	#10	87	.0308	47.01
California Bearing Ratio	95%	10.9	#20	--	.0217	21.75
	90%	2.0	#40	82	.0128	15.44
	85%		#60	--	.0091	12.94
pH		5.0	#100	69	.0065	8.21
Resistivity - ohms per cm		6,350	#200	48.6	.0032	3.47
					.0013	1.89

Remarks:

This material is a silty sand with some gravel. It should have fair value as a subgrade except when subject to frost and should exhibit fair workability as a construction material. It has fair to poor drainage characteristics and poor erosion resistance. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 34A

Location: NE¼NE¼, Sec. 9, T. 3 S., R. 10 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 10-32"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	1 1/2	100	#20	79.06
Plasticity Index		N.P.	1	98	#40	76.60
Maximum Density - p.c.f.		93.5	3/4	95	#60	67.32
Optimum Moisture - %		22.6	1/2	92	#100	44.62
Specific Gravity, #10(-) only		2.67	3/8	89	#200	35.02
Classification	ASSHO	A-2-4(0)	#4	84	Dia. mm 1/	
	UNIFIED	SMd	#10	80	.0309	24.25
California Bearing Ratio	95%	7.4	#20	-	.0202	19.85
	90%	.0	#40	76	.0121	15.12
	85%		#60	--	.0087	12.30
pH		6.2	#100	39	.0063	9.15
Resistivity - ohms per cm		8,374	#200	34.7	.0031	5.21
					.0013	2.45

Remarks:

This material is a silty sand with fair to poor drainage characteristics. It should have fair value as a subgrade except when subject to frost and should exhibit fair workability as a construction material. The soil has poor erosion resistance and care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 41A

Location: NW¼NE¼, Sec. 11, T. 12 S., R. 7 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 0-16"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	3		#20	97.08
Plasticity Index		N.P.	2 1/2		#40	91.45
Maximum Density - p.c.f.		81.0	2		#60	85.09
Optimum Moisture - %		36.6	1 1/2		#100	78.37
Specific Gravity, #10(-) only		2.81	1		#200	71.65
California Bearing Ratio	95%	11.4	3/4	100	Dia mm 1/	
	90%	6.1	1/2	99.9	.0279	65.36
	85%		3/8	99.8	.0180	59.06
pH		5.0	#4	99	.0106	53.79
Resistivity - ohms cm		5,773	#10	99	.0076	50.28
Classification	Mechanical	Hydrometer	#40	91	.0055	46.76
AASHO	A-4 (0)		#100	78	.0027	37.98
UNIFIED	ML		#200	70.3	.0011	30.95

Remarks:

This material is a nonplastic, inorganic silt with some sand. The value as a subgrade is poor to fair. It has a high frost susceptibility and slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material, and the erosion potential is very high

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 42A

Location: SW¼NW¼, Sec. 30, T. 16 S., R. 9 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 8-18"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	1 1/2	100	#20	79.98
Plasticity Index		N.P.	1	98	#40	77.07
Maximum Density - p.c.f.		81.8	3/4	96	#60	71.97
Optimum Moisture - %		30.0	1/2	94	#100	65.41
Specific Gravity, #10(-) only		2.63	3/8	92	#200	57.55
Classification	ASSHO	A-4(0)	#4	88	Dia. mm 1/	
	UNIFIED	ML	#10	83	.0304	48.44
California Bearing Ratio	95%	6.9	#20	--	.0198	42.61
	90%	2.9	#40	77	.0117	35.92
	85%		#60	--	.0084	33.00
pH		5.4	#100	65	.0060	28.62
Resistivity - ohms per cm		18,143	#200	58.1	.0030	21.33
					.0013	16.95

Remarks:

This material is a nonplastic, inorganic silt with some sand and gravel. Value as a subgrade is poor to fair. It has high frost susceptibility and slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF IABORATORY TEST RESULTS

Landtype No. 42B

			Mechanical Analysis		Hydrometer Analysis	
Location: SW¼NW¼, Sec. 30, T. 16 S., R. 9 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 18-56"						
Liquid Limit:		41.0	1 1/2	100	#20	83.34
Plasticity Index		5	1	99	#40	81.25
Maximum Density - p.c.f.		88.3	3/4	97	#60	75.74
Optimum Moisture - %		28.7	1/2	95	#100	68.29
Specific Gravity, #10(-) only		2.72	3/8	92	#200	59.64
Classification	ASSHO	A-5(3)	#4	88	Dia. mm 1/	
	UNIFIED	ML	#10	85	.0291	51.56
California Bearing Ratio	95%	10.0	#20	--	.0190	45.70
	90%	5.3	#40	81	.0111	41.92
	85%		#60	--	.0080	37.52
pH		5.4	#100	67	.0057	34.59
Resistivity - ohms per cm		18,143	#200	59.4	.0029	28.73
					.0012	24.34

Remarks:

This material is a slightly plastic inorganic silt with some sand and gravel. Value as a subgrade is poor to fair. It has high frost susceptibility and slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 43A

Location: NE¼SE¼, Sec. 26, T. 16 S., R. 10 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 10-40"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		49.2	3		#20	98.54
Plasticity Index		22	2 1/2		#40	96.46
Maximum Density - p.c.f.		80	2		#60	91.93
Optimum Moisture - %		34.8	1 1/2		#100	86.65
Specific Gravity, #10(-) only		2.66	1		#200	80.61
	95%	9.8	3/4		Dia. mm 1/	
California Bearing Ratio	90%	3.7	1/2	100	.0284	75.47
	85%		3/8	100	.0184	69.84
pH		5.0	#4	99.9	.0109	64.21
Resistivity - ohms cm		8,467	#10	99	.0079	56.70
Classification	Mechanical	Hydrometer	#40	95	.0057	51.07
AASHO	A-7-6(16)		#100	81	.0029	41.68
UNIFIED	CL		#200	73.2	.0012	31.51

Remarks:

This material is a plastic, inorganic clay with some sand. Subgrade value is fair to poor. It has medium to high frost susceptibility and medium compressibility and expansion characteristics. It has practically impervious drainage characteristics and poor erosion resistance. The workability as a construction material is good to fair.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No.43B

			Mechanical Analysis		Hydrometer Analysis	
Location: NE¼SE¼, Sec. 26, T. 16 S., R. 10 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 40-78"						
Liquid Limit:		50.2	1 1/2	-	20	99.24
Plasticity Index		10	1	-	40	97.47
Maximum Density - p.c.f.		85.0	3/4	-	60	92.52
Optimum Moisture - %		32.2	1/2	-	100	86.69
Specific Gravity, #10(-) only		2.70	3/8	100	200	80.50
Classification	ASSHO	A-5(11)	#4	100	1/ Dia. mm	
	UNIFIED	MH	#10	99.8	.0275	73.58
California Bearing Ratio	95%	7.0	#20	-	.0177	70.10
	90%	4.2	#40	97	.0104	63.85
	85%		#60	-	.0075	60.36
pH		4.4	#100	85	.0054	55.13
Resistivity - ohms per cm		18,143	#200	77.3	.0027	48.15
					.0011	41.18

Remarks:

This material is a slightly plastic, inorganic silt with some sand. It makes a poor subgrade material. Frost susceptibility, compressibility, and expansion are high. Drainage characteristics are fair to poor. It has poor workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 47A

			Mechanical Analysis		Hydrometer Analysis	
Location: Center Sec. 26, T. 28 S., R. 11 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 0-23"			3		#20	63.20
Liquid Limit:		N.P.	2 1/2	100	#40	60.54
Plasticity Index		N.P.	2	97	#60	52.28
Maximum Density - p.c.f.		94.6	1 1/2	96	#100	41.00
Optimum Moisture - %		23.0	1	91	##200	30.14
Specific Gravity, #10(-) only		2.63			1/	
	95%	10.5	3/4	88	Dia. mm	
California Bearing Ratio	90%	2.5	1/2	82	.0295	22.82
	85%		3/8	79	.0195	19.80
pH		5.0	#4	72	.0116	17.39
Resistivity - ohms cm		6,684	#10	65	.0084	14.97
Classification	Mechanical	Hydrometer	#40	43	.0061	12.55
AASHO	A-1-b(0)		#100	31	.0030	9.18
UNIFIED	SMd		#200	25	.0013	5.30

Remarks:

This material is a silty sand with some gravel. It should have fair to good value as a subgrade except when subjected to frost and should exhibit fair workability as a construction material. It has fair to poor drainage characteristics and poor erosion resistance. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 51A

			Mechanical Analysis		Hydrometer Analysis	
Location: NW¼NE¼, Sec. 35, T. 12 S., R. 7 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 8-36"			2 1/2	100		
			2	96		
Liquid Limit:		47.0	1 1/2	94	#20	79.64
Plasticity Index		14	1	91	#40	75.32
Maximum Density - p.c.f.		96.1	3/4	90	#60	71.75
Optimum Moisture - %		26.0	1/2	89	#100	67.44
Specific Gravity, #10(-) only		2.86	3/8	88	#200	62.23
Classification	ASSHO	A-7-5(9)	#4	86	Dia. mm 1/	
	UNIFIED	ML	#10	83	.0281	51.12
California Bearing Ratio	95%	10.4	#20	--	.0180	47.43
	90%	6.1	#40	76	.0106	40.88
	85%		#60	--	.0077	36.60
pH		6.2	#100	68	.0055	32.31
Resistivity - ohms per cm		8,194	#200	64	.0028	23.74
					.0012	18.02

Remarks:

This material is a nonplastic, inorganic silt with some sand and gravel. Value as a subgrade is poor to fair. It has a high frost susceptibility and slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 52A

Location: NW¼NE¼, Sec. 25, T. 12 S., R. 7 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 7-50"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		55.2	3		#20	89.92
Plasticity Index		25	2 1/2		#40	86.94
Maximum Density - p.c.f.		85.3	2		#60	84.12
Optimum Moisture - %		31.1	1 1/2	100	#100	81.13
Specific Gravity, #10(-) only		2.86	1	96	#200	76.99
California Bearing Ratio	95%	6.5	3/4	96	Dia. mm 1/	
	90%	3.2	1/2	94	.0260	68.81
	85%		3/8	93	.0169	64.03
pH		5.2	#4	92	.0103	54.4
Resistivity - ohms cm		2,721	#10	91	.0074	49.69
Classification	Mechanical	Hydrometer	#40	84	.0054	43.32
AASHO	A-7-5(21)		#100	80	.0027	33.77
UNIFIED	MH		#200	77.8	.0012	25.14

Remarks:

This material is a plastic inorganic silt with some sand. Value as a subgrade material is poor. Frost susceptibility is medium to very high and it is highly compressible and expansive. Drainage characteristics are fair to poor. It is a poor construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 53A

			Mechanical Analysis		Hydrometer Analysis	
Location: NE¼NW¼, Sec. 24, T. 12 S., R. 7 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 7-32"						
Liquid Limit:		50	3		#20	98.49
Plasticity Index		18	2 1/2		#40	97.23
Maximum Density - p.c.f.		82.5	2		#60	95.96
Optimum Moisture - %		35.6	1 1/2		#100	94.51
Specific Gravity, #10(-) only		2.93	1		#200	92.16
California Bearing Ratio	95%	11.5	3/4		Dia. mm 1/	
	90%	6.1	1/2		.0238	87.49
	85%		3/8	100	.0155	82.33
pH		5.2	#4	99.8	.0093	75.43
Resistivity - ohms cm		17,318	#10	99	.0068	70.27
Classification	Mechanical	Hydrometer	#40	97	.0049	65.10
AASHO	A-7-5(20)		#100	94	.0025	56.48
UNIFIED	MH		#200	90.9	.0011	46.14

Remarks:

This material is a slightly plastic, inorganic silt. It makes a poor subgrade material. Frost susceptibility is high and it is moderately to highly compressible and expansive. Drainage characteristics are fair to poor. It is a poor to fair construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 53B

Location: NE¼NW¼, Sec. 24, T. 12 S., R. 7 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 32 to 90"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	3		#20	99.47
Plasticity Index		N.P.	2 1/2		#40	98.72
Maximum Density - p.c.f.		81.4	2		#60	97.80
Optimum Moisture - %		39.9	1 1/2		#100	96.31
Specific Gravity, #10(-) only		2.92	1		#200	93.34
	95%	16.0	3/4		Dia. mm 1/	
California Bearing Ratio	90%	9.6	1/2		.0241	88.13
	85%		3/8		.0159	81.05
pH		5.4	#4	100	.0096	72.20
Resistivity - ohms cm		16,858	#10	99.8	.0070	65.12
Classification	Mechanical	Hydrometer	#40	99	.0051	59.80
AASHO	A-4(0)		#100	95	.0026	49.18
UNIFIED	ML		#200	92.5	.0011	38.56

Remarks:

This material is a nonplastic, inorganic silt. Value as a subgrade is poor to fair. High frost susceptibility and slight to medium compressibility and expansion characteristics. Drainage characteristics are fair to poor. The soil has fair workability as a construction material. Erosion potential is very high.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 54A

Location: NE¼NW¼, Sec. 17, T. 3 S., R. 9 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 0-13"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	3		#20	67.02
Plasticity Index		N.P.	2 1/2		#40	61.84
Maximum Density - p.c.f.		60.1	2		#60	57.07
Optimum Moisture - %		51.4	1 1/2		#100	51.07
Specific Gravity, #10(-) only		2.70	1	100	#200	42.20
California Bearing Ratio	95%	11.5	3/4	97	Dia. mm 1/	
	90%	6.3	1/2	91	.0332	26.62
	85%		3/8	88	.0219	17.20
pH		4.6	#4	83	.0130	10.47
Resistivity - ohms cm		14,654	#10	73	.0093	7.78
Classification	Mechanical	Hydrometer	#40	60	.0066	5.09
AASHO	A-4(0)		#100	47	.0033	1.73
UNIFIED	SMd		#200	40.5	.0013	.28

Remarks:

This material is a silty sand with some gravel. It should have fair value as a subgrade except when subject to frost, and should exhibit fair workability as a construction material. It has fair to poor drainage characteristics and poor erosion resistance. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 54B

Location: NE¼NW¼, Sec. 17, T. 3 S. R. 9 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 13-53"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	3		#20	57.03
Plasticity Index		N.P.	2 1/2		#40	51.21
Maximum Density - p.c.f.		69.3	2		#60	46.90
Optimum Moisture - %		44.6	1 1/2	100	#100	42.12
Specific Gravity, #10(-) only		2.62	1	95	#200	35.14
California Bearing Ratio	95%	11.0	3/4	94	Dia. mm 1/	
	90%	2.0	1/2	85	.0338	24.29
	85%		3/8	81	.0222	17.28
pH		4.6	#4	73	.0132	11.43
Resistivity - ohms cm		18,143	#10	62	.0095	7.93
Classification	Mechanical	Hydrometer	#40	40	.0068	5.59
AASHO	A-1-b(0)		#100	26	.0033	2.67
UNIFIED	SMd		#200	18.5	.0014	.91

Remarks:

This material is a silty sand with some gravel. It should have fair to good value as a subgrade except when subjected to frost and should exhibit fair workability as a construction material. It has fair to poor drainage characteristics and poor erosion resistance. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 61A

Location: SW¼NE¼, Sec. 6, T 3 S., R. 10 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 0-21"			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	3		#20	51.14
Plasticity Index		N.P.	2 1/2		#40	48.44
Maximum Density - p.c.f.		63.5	2		#60	44.97
Optimum Moisture - %		49.8	1 1/2		#100	40.92
Specific Gravity, #10(-) only		2.68	1		#200	35.14
California Bearing Ratio	95%	9.4	3/4	100	Dia. mm 1/	
	90%	4.5	1/2	99	.0325	22.70
	85%		3/8	98	.0217	15.07
pH		5.0	#4	81	.0130	9.34
Resistivity - ohms cm		9,525	#10	54	.0094	5.52
Classification	Mechanical	Hydrometer	#40	29	.0067	2.65
AASHO	A-1-b (0)		#100	21	.0033	1.70
UNIFIED	SMd		#200	16.4	.0014	.20

Remarks:

This material is sand with some gravel and silt. It should have fair to good value as a subgrade except when subjected to frost, and should exhibit fair workability as a construction material. It has fair to poor drainage characteristics and poor erosion resistance. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 62A

Location: SW¼SE¼, Sec. 13, T. 15 S., R. 12 W.			Mechanical Analysis		Hydrometer Analysis	
Depth: 0-4 "			Sieve Size	% Passing	Sieve Size	% Passing
Liquid Limit:		N.P.	3		#20	28.77
Plasticity Index		N.P.	2 1/2	100	#40	26.67
Maximum Density - p.c.f.		76.8	2	95	#60	25.23
Optimum Moisture - %		37.2	1 1/2	76	#100	23.74
Specific Gravity, #10(-) only		2.74	1	69	#200	21.94
California Bearing Ratio	95%	12.8	3/4	65	Dia. mm 1/	
	90%	3.2	1/2	58	.0320	13.02
	85%		3/8	53	.0212	8.91
pH		5.4	#4	44	.0126	5.98
Resistivity - ohms cm		18,143	#10	36	.0090	4.22
Classification	Mechanical	Hydrometer	#40	25	.0065	2.46
AASHO	A-1-a(0)		#100	19	.0032	1.29
UNIFIED	GMd		#200	15.4	.0013	.46

Remarks:

This material is a sandy gravel with fair to poor drainage characteristics and should make a good to excellent subgrade when not subject to frost action. Frost susceptibility is slight to medium. The soil has good workability as a construction material, and provides good erosion resistance.

1/ Particle size computed from hydrometer readings.

REPORT OF LABORATORY TEST RESULTS

Landtype No. 63A

			Mechanical Analysis		Hydrometer Analysis	
Location: SE¼NE¼, Sec. 5, T. 4 S., R. 10 W.			Sieve Size	% Passing	Sieve Size	% Passing
Depth: 0-36"						
Liquid Limit:		N.P.	3		#20	61.46
Plasticity Index		N.P.	2 1/2		#40	58.98
Maximum Density - p.c.f.		62.9	2	100	#60	56.86
Optimum Moisture - %		51.4	1 1/2	88	#100	54.13
Specific Gravity, #10(-) only		2.63	1	86	#200	50.40
California Bearing Ratio	95%	6.1	3/4	85	Dia. mm 1/	
	90%	2.0	1/2	83	.0320	34.58
	85%		3/8	81	.0213	25.87
pH		5.0	#4	75	.0129	15.91
Resistivity - ohms cm		9,646	#10	67	.0093	10.93
Classification	Mechanical	Hydrometer	#40	60	.0066	7.72
AASHO	A-4(0)		#100	53	.0033	3.98
UNIFIED	SMd		#200	46.5	.0014	.97

Remarks:

This material is a silty sand with some gravel. It should have fair value as a subgrade except when subject to frost. It should exhibit fair workability as a construction material. It has fair to poor drainage characteristics and poor erosion resistance. Care should be taken in design of drainage structures.

1/ Particle size computed from hydrometer readings.

APPENDIX IV

SOIL CHEMICAL ANALYSIS

This appendix contains the Soil Chemical Analysis results from selected landtypes within the Soil Resource Inventory survey area.

All chemical analysis was performed by the Soil Testing Laboratory, Oregon State University, Corvallis, Oregon.

The laboratory test results presented in this appendix are intended to be used as a guide and indicator for planning purposes only. The test samples were collected at the landtype locations.

FIGURE

CHEMICAL ANALYSIS OF SELECTED LANDTYPES [1/]

Extractable Cations

Landtype No.	pH	Phosphorous (PPM)	Potassium (PPM)	Calcium Meq/100g	Magnesium Meq/100g	Total Bases Meq/100g	% Total Nitrogen	Remarks
14 [2/]	5.4	15	88	6.2	2.20	8.62	0.13	
15	5.9	14	128	18.3	8.90	27.50	0.14	
16	5.4	6	64	0.4	0.36	0.92	0.30	Sample depth, 0-13 inches.
17	5.1	6	96	0.3	0.20	0.74	0.36	Sample depth, 0-19 inches.
21	5.2	9	54	0.4	1.10	1.64	0.36	Sample depth, 0-21 inches.
22	5.1	6	100	2.4	1.10	3.76	0.47	
23	5.2	4	116	0.3	0.63	1.23	0.24	
27	5.2	6	286	3.5	5.00	9.23	0.07	
31F	5.2	6	192	0.4	1.20	3.18	0.34	Sample depth, 0-11 inches.
34F	5.5	5	112	1.3	1.50	3.09	0.12	
41	5.3	5	298	4.2	5.40	10.36	0.08	Sample depth, 0-16 inches.
42	5.7	7	292	1.3	0.82	2.86	0.21	Sample depth, 0-18 inches.
43	5.2	3	136	1.0	0.63	1.98	0.13	Sample depth, 0-19 inches.
47	5.3	5	116	1.5	1.70	3.50	0.09	
51	5.7	4	140	4.5	2.30	7.16	0.06	Sample depth, 0-18 inches
52	5.5	3	180	7.9	5.90	14.26	0.08	
53	5.8	4	304	6.1	2.80	9.68	0.18	
54	4.8	5	76	0.3	0.16	0.65	0.32	Sample depth, 0-13 inches.
61	5.4	4	84	0.4	0.43	1.04	0.17	Sample depth, 0-21 inches.
62	5.9	9	72	1.0	0.53	1.71	0.17	Sample depth, 0-19 inches.
63	5.2	8	152	0.4	0.46	1.25	0.26	
71	5.7	15	164	1.0	0.36	1.78	0.19	
72	5.2	32	124	1.8	0.43	2.55	0.27	

1/ Soil Analysis by Oregon State University Soil Testing Laboratory, Corvallis, Oregon.
2/ Unless otherwise noted, samples consist of a composite sample taken from the surface 20 inches of soil material.

APPENDIX V

DEFINITIONS OF MANAGEMENT INTERPRETATIONS [1/]

This Appendix contains the definitions for the management interpretations found in the Map Atlas under "Tables of Management Interpretations." These include Erosion and Hydrologic Interpretations, Recreation, Timber Management, and Engineering.

1/ Unless otherwise noted, the following definitions were developed for use in Soil Resource Inventories, R-6.

EROSION AND SOME HYDROLOGIC INTERPRETATIONS

Erosion and some hydrologic interpretations include erosion and water management interpretations. Interpretations for erosion include the two major kinds of erosion--surface and mass movement. Surface erosion pertains only to surface soil loss by runoff and overland flow. Mass movement pertains to all types of soil and bedrock movement which occurs below the soil surface such as landslips, slumps, slides, rockfall, and landflow.

Natural Stability

This rating is based on the relative stability of the mapping units as they occur in the natural state. This includes any movement or loss other than surface erosion. Kind of movement includes slumps, slides, and all kinds of deep-seated failures. This rating applies throughout Region 6.

I. Very stable - no evidence of failure.

II. Stable - occasional failures are observed.

III. Moderately stable - several failures are observed.

IV. Unstable - many failures are observed.

V. Very unstable - entire area shows evidence of recent and past failures.

Nature of Mass Movement

This is an estimation of the kind and/or size of mass movement observed.

Expected Mass Movement as a Result of Man's Activities

This rating indicates the expected mass movement resulting from man's activities as compared to stability under natural conditions. Ratings are based on soil and bedrock characteristics, slopes, revegetation potential, and effects of timber removal, road construction, and fire.

Unchanged - the expected mass movement is relatively unchanged from that of the natural state.

Increased - the expected mass movement is greater than that of the natural state.

Greatly increased - the expected mass movement is much greater than that of the natural state.

Surface Soil Erosion Potential

This rating is based on expected losses of surface soil when all vegetative cover, including litter, is removed. Evaluations of climate, slope gradient and length, soil characteristics, hydrologic characteristics of the soil and bedrock materials of each landtype unit are considered in making ratings.

Very slight - practically no loss of surface soil materials is expected.

Slight - little loss of soil materials is expected. Some minor sheet and rill erosion may occur.

Moderate -some loss of surface soil materials can be expected. Rill erosion and some small gullies or sheet erosion may be occurring. Sheet erosion can be determined by some soil pedestals and observable accumulation of soil materials along the upslope edge of rocks and debris. At this level of erosion there is a possible fertility loss.

Severe - considerable loss of surface soil materials can be expected. Rill erosion, numberous small gullies or evidence that considerable loss from sheet erosion may occur. Sheet erosion is indicated by frequent occurrence of soil pedestals and considerable accumulation of soil materials along the upslope edge of rocks and debris. This is accompanied by a probable fertility loss.

Very severe - large loss of surface soil material can be expected in the form of many large gullies and/or numerous small gullies or large loss from sheet erosion. Sheet erosion loss is exhibited by numerous examples of soil pedestals and extensive accumulation of soil materials along the upslope edge of rocks and debris. This is accompanied by a fertility loss.

Subsoil Erosion Potential

This interpretation indicates the potential for subsoil erosion by water for each unit. It includes erosion which takes place after the surface soil has been removed (at least to 1-foot depth) such as in skid trails and firebreaks. Factors considered in making ratings are texture and structure of subsoil materials, slope, permeability, compaction, climate, and landform.

Low - factors are such that little or no erosion may occur. Very little evidence of erosion.

Moderate - considerable erosion occurring such as rills and small gullies. Factors indicate considerable erosion is likely to occur.

High - factors indicate severe erosion may occur.

Suggestions for Controlling Subsoil Erosion

In this column suggestions are given, when applicable, for controlling erosion.

Water Yield Class

This interpretation is an indication of the rate and amount of water yield expected from each soil. It is based on factors such as soil characteristics, infiltration rates, permeability, slope, climate, vegetation, and drainage patterns.

Class I - These soils have a high water detention storage capacity and a low rate of runoff. Little water is yielded to peak flows until detention storage capacity is exceeded or unless the soils are initially saturated or frozen. They are important in sustaining high base flow due to a relatively large volume of water held in detention storage.

Class II - These soils have a moderate water detention storage capacity and a moderate rate of runoff. Water contributes to both peak flows and base flow.

Class III - These soils have a low water detention storage capacity and a high rate of runoff. The storage capacity is low and easily exceeded with most of the water contributing to peak flow. Little water is yielded to sustain base flow.

Bedrock Hydrologic Characteristics

This interpretation indicates the relative capacity of bedrock to store and transmit water. The rating is based on bedrock kind, texture, type and extent of fracturing, frequency of jointing, bedding characteristics, and degree of weathering.

Class I - This indicates that the bedrock has a relatively high capacity to store water. The water transmission rate is low unless the storage capacity is exceeded. Rocks in this class include sandstones because of their texture, fracture, and bedding characteristics, and basalts where water occurs in large tubes and other cavities or in the inferflow zone between successive lava flows.

Class II - This indicates that the bedrock has a moderate capacity to store water. The rate of water transmission is moderate. Rocks in this class are generally hard to moderately hard, moderately fine-textured, and moderately to highly fractured siltstone, mudstone, pyroclastics, argillite and schist.

Class III - This indicates that the bedrock has a relatively low capacity to store water. The rate of water transmission is rapid. Rocks generally in this class are fractured coarse crystalline (i.e., granite, gabbro, and gneiss) and other hard-fractured rocks such as conglomerate.

Class IV - This indicates that the bedrock has both low storage capacity and low rate of water transmission. Rocks in this class are generally highly weathered, fine textured, and lack open fracture channels.

Hydrologic Group

This interpretation is a grouping of soils into four classes, indicating the general infiltration and water movement ability of the soil and bedrock materials. This method of ratings has been developed by the Soil Conservation Service. The four groups are the standard SCS groupings and definitions.

Group A - Soils having high infiltration rates even when thoroughly wetted, consisting chiefly of deep, well to excessively drained sands and/or gravel. These soils have a high rate of water transmission, and would result in a low runoff potential.

Group B - Soils have moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C - Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water, or (2) soils with moderately fine to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission.

Group D - Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of (1) clay soils with high swelling potential, (2) soils with a high permanent water table, (3) soils with claypan or clay layer at or near the surface, and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission.

Silt and Clay Sediment Yield Potential

This interpretation indicates the potential for water sedimentation and pollution from silt and clay particles carried in suspension following timber harvest, road construction, or other activities. Factors considered in making ratings are soil texture and structure, drainage patterns, landform, and climate.

Low - Sedimentation levels of silt and clay particles are not expected to be significant following management activities. Soils are generally moderately coarse-textured.

Moderate - Sedimentation levels of silt and clay particles may be significantly increased following management activities with moderate loss of water quality and damage to fisheries. Soils are generally medium textured.

High - Sedimentation levels of silt and clay particles are expected to be high following management activities. Streams become turbid and there is considerable loss of water quality and damage to fisheries. Soils are generally fine to moderately fine textured.

Expected Sediment Size

This interpretation indicates the expected sediment size reaching the streams resulting from erosion of each unit. This interpretation is a statement of the two dominate separates expected (gravel, sand, silt, or clay) from each soil unit. The ratings are presented in two columns. The first column indicates the separates expected from the surface soils, and the second indicates the separates expected from the subsoils.

RECREATION

Interpretations for recreation pertain primarily to recreation development. They are based on soil and bedrock properties, drainage, landform, and vegetation. Factors such as aesthetics and accessibility are not considered when making these ratings. The following interpretations are some most generally needed for planning recreation developments.

Landtype Suitability for Recreation Area Development

This rating is based on soil and bedrock characteristics and topographic features of each unit as related to recreation development such as campground and picnic sites. Factors important to this interpretation are soil depth, texture, structure, permeability, drainage, topography, and susceptibility to flooding.

Unsuited - this rating indicates that soils and/or topography are of a nature which would prohibit recreation development without extensive modification.

Low - These soil units have major limitations to recreation development but limited development is feasible.

Moderate - This rating indicates that the soil unit is generally suitable for recreation development but has minor limitations.

High - These soils are particularly well suited for recreation development. Generally, they have no limitations.

Landtype Limitations for Recreation Development

This indicates the major soil limitations to recreation development.

Treatment to Increase Suitability

This indicates, when applicable, the treatment necessary to increase the suitability for recreation development.

Soil and Site Damage Susceptibility

This interpretation applies to recreational areas after development. Each soil that is suitable or can be made suitable for campground development is rated for its susceptibility to damage of soil and/or site by normal recreation use. Site includes vegetation as well as soil conditions. Factors used in determining ratings include erosion potential, soil compactibility, and vegetative growth potential.

Low - These soils resist compaction and have low erosion potential. The native vegetation is hardy and not readily destroyed. These soils will withstand and hold up well under continual use.

Moderate - These soils are not readily compacted or eroded and vegetative types are somewhat hardy. In general, these soils and site can sustain continual use but require some rehabilitation.

High - These soils are fragile and easily damaged and have vegetation that is not hardy, easily damaged, and generally herbaceous. Under normal use, the vegetation will very likely be destroyed, the soil compacted and/or eroded to such a degree that periodic nonuse and major rehabilitation will be required.

Susceptibility to Dustiness

This interpretation pertains only to the soils suitable for recreation development, and applies primarily to unsurfaced roads within recreation areas.

Low - Factors indicate dust will not be a problem.

Moderate - Under normal conditions dust will not be a problem but under heavy use and droughty conditions dust very likely will be a problem.

High - Factors indicate dust will be a problem. Dust abatement measures are necessary under normal conditions and use.

Susceptibility to Muddiness

This interpretation pertains only to the soils suitable, or those that can be made suitable, for recreation development. This interpretation rates each soil as to its susceptibility to becoming muddy. The rating is limited to the surface soil under normal conditions. Factors include soil characteristics, climate, and drainage.

Low - Muddiness is not likely to be a problem. Factors indicate soils are not susceptible to muddiness.

Moderate - Soils become muddy at times for short periods, occasionally causing problems. Road rock is usually necessary.

High - Soils are very likely to become muddy and stay muddy for long periods. Road rock is necessary. Campground closure may be necessary during wet periods.

Trail Suitability

This interpretation indicates the suitability of each soil for trails. Factors include soil and bedrock characteristics, drainage, climate, and slope.

Poor - These soils have properties which severely limit their use for trails. Extensive treatment measures are required.

Moderate - These soils have some limitations for trail development. Certain treatment measures may be required.

Well - These soils have no limitations for trail development.

Limitations for Trails

This indicates the limitations for trails.

Considerations for Trail Improvements and Protection

This indicates some treatment measures to be considered in improving suitability and protecting trails.

Suitability for Sewage Filter Field

This interpretation evaluates the soil as to its suitability as a sewage filter field. Ratings are based on soil depth, texture, permeability, drainage, and slope. Only those soils suitable for recreation development are rated. Onsite investigation is recommended before design or installation of filter system.

Poor - These soils have properties which make them poorly suited as sewage filter fields. Sewage filter disposal in these soils would be ineffective and create major problems.

Moderate - These soils have properties which limit their use as sewage filter field. They require a large filter area for adequate drainage which limits the capacity of the campground.

Well - These soils are well suited to sewage filter use and offer only minor limitations, if any.

Soil Limitation to Sewage Filter Field Use

This indicates the major limitations to sewage filter field use.

TIMBER MANAGEMENT

Interpretations for Timber Management are of two types. One type includes some interpretations that directly affect timber management such as "Potential for Regeneration." The other type indicates the effect on soils and other resources from timber harvest activities.

Susceptibility to Brush Revegetation

This indicates the susceptibility of mapping units to revegetate naturally by brush following timber harvest. These ratings are based on soil characteristics, field observation, slope, aspect, climate, and elevation.

Low - Indicates brush revegetation is insignificant.

Moderate - Indicates that some brush revegetation will occur.

High - Indicates brush revegetation is very dense.

Potential for Regeneration

This interpretation indicates the potential for each landtype unit to regenerate at a minimum level of stocking as set by the Forest Service. Factors included in this interpretation are soil characteristics, climate, aspect, elevation, frost potential, brush competition, and tree species. Includes planted stock and natural regeneration.

Low - This rating indicates the potential for regeneration is low. Probability of success is very limited. Major regeneration problems can be expected, and reseeding or replanting may be required throughout the area. Several years may elapse before an adequate stocking level is achieved.

Moderate - This rating indicates that some problems will be encountered in attaining a satisfactory stocking level. Usually regeneration is spotty and some replanting will be necessary.

High - This rating indicates that regeneration has a high probability of success. Few problems should be encountered in attaining good stocking levels.

Limitations to Regeneration

This indicates the major soil limitations to regeneration of planted stock and naturals.

Suggested Tree Planting Species

This column lists the tree species that the soil, climate, and topographic factors indicate may be best suited for planting.

Potential Soil and Water Impacts from Various Timber Harvest Methods

This interpretation indicates the susceptibility of soil and water resources to incur damage from various timber harvest methods. Each landtype is evaluated as to the potential impact from each of the following harvest methods: *Tractor logging, cable (no suspension), cable (partial suspension), cable (full suspension), and aerial logging. The evaluation of potential impact includes soil and water resource damages from timber removal, spur roads, landings, and other activities that may be associated with the harvest method being evaluated. The evaluations are based on a full operating season. Damage is caused to soils by creating soil disturbance which may destroy soil structure, cause compaction, and increase erosion. This may affect other resources through loss of production, lower water quality and yield, and loss of fisheries. Field observations indicate the most important factors to consider in making these ratings are wetness of soil, soil texture and structure, percentage of coarse fragments, slope, drainage, climate, and field observations.

Low - This rating indicates that the impacts to the soil and water resources are minor. Little or no soil damage is expected.

Moderate - This rating indicates that the impacts to the soil and water resources are moderate. Soil and water resources are expected to incur moderate damage.

High - This rating indicates that the impacts to the soil and water resources are major. Excessive damage to soil and water resources is likely to occur.

Thpe of Damage Expected During and Subsequent to Timber Harvest Operations

This indicates the type of soil and water resource damage expected on each soil from various harvest methods.

*See Glossary for definition of methods.

ENGINEERING

Interpretations for engineering include characteristics for roads, foundations, bedrock, and some miscellaneous interpretations. These are presented in two tables: one table, "Characteristics Pertinent to Roads and Airfields," is a standard engineering table for road construction based on the Unified Soil Classification System. The other table, "General Engineering Interpretation," gives other engineering interpretations which will be useful to engineers and other resource managers. These interpretations are explained and defined in this section. Generally, the following interpretations and ratings are based on the entire landtype unit including soil, bedrock, and landform. Some interpretations are based only on the soil material or bedrock The interpretations pertaining to roads are based on standard Forest Service regulations and construction methods presently used.

Unified and ASSHO Classification

Each soil is classified as to its Unified and AASHO Classification. Most soils will be classified into one class. Those soils with significant layers of different soil materials will have a classification for each layer designated. The classification will be made for some representative soils by laboratory testing. Those soils not tested will be classified by comparing their properties to those tested.

Suitability for Use as Topsoil Source

This rating evaluates each soil as to its suitability for use as topsoil. It does not specify any particular use of the topsoil. Ratings are based on soil characteristics.

Suited - Soil texture ranges from sandy loam to clay loam; gravel content is less than 35 percent and soil layer is at least 3 feet thick.

Unsuited - This rating indicates the soils do not satisfy the requirements specified under "Suited." However, soils rated "Unsuited" may still satisfy a particular requirement. See the "Table of Soil Characteristics" for soil texture, thickness, and gravel content.

Suitability of Soil as Sand and/or Gravel Source

This interpretation indicates the suitability of each soil as a possible source of sand and/or gravel. It does not indicate the kind or quality of sand or gravel, or refer to any specific use of the sand and/or gravel.

Suited - This rating indicates that sand and/or gravel is present and the following conditions are satisfied: There is a layer present which is composed of 80 percent, by volume, of sand and/or gravel. This layer is at least 4 feet.

Unsuited - This rating indicates that sand and/or gravel is generally not present in amounts which satisfy the requirements under "Suited." However, soils rated "Unsuited" may still satisfy a particular requirement. See the Table of Soil Characteristics for soil depth and gravel content.

Suitability of Soil as a Possible Clay Source

This rating indicates the suitability of each soil as a possible source of clay. It does not indicate the kind or quality of clay or refer to any specific use of the clay.

Suited - This rating indicates that the soil is a possible source of clay. Soils with this rating have the following: Texture ranges from clay loam to clay. Gravel content is less than 35 percent. This layer is at least 2 feet thick.

Unsuited - Soils with this rating generally are not possible sources for clay.

Suitability of Bedrock for Road Rock

This interpretation indicates the general suitability of rock when used as road rock for base course or wearing surface. These ratings are based on rock hardness, density, and susceptibility to weathering and breakdown. Soils are not rated when depth to bedrock is greater than 12 feet. (Cautionary note: This information is for broad planning purposes only. Specific onsite characterization data are required to accurately determine rock suitability.)

Unsuited - Rock is soft and breaks down rapidly under logging traffic.

Poor - Rock is only moderately hard and breaks down easily under logging traffic, usually in one or two years' time.

Fair - Rock is hard and dense but tends to break down under logging traffic after about two to four years' use.

Good - Rock is hard, dense, and resists breakdown under logging traffic.

Limitations of Bedrock for Road Rock

This column indicates the major limitation of the bedrock for road rock use.

Estimate of Road Rock Thickness

This interpretation refers to estimated amount of road rock (base course and wearing surface) generally needed on heavy-vehicle, all-weather-use roads constructed on each soil. Factors involved in making this interpretation include field observations, texture, and plasticity of soil, depth

of bedrock, drainage, and kind of subgrade the road generally will have--common material or bedrock. Ratings are based on uncompacted fills and on the use of high quality rock. (Cautionary note: This information is for broad planning purposes only. Specific onsite characterization data are required to accurately determine thickness needs.)

Very thin - Generally less than 10 inches.

Thin - Approximately 10 to 22 inches.

Thick - Approximately 22 to 36 inches.

Very thick - Generally over 36 inches.

Consideration for Road Location and Construction

This column indicates the major considerations for road location and construction through each soil. The rating evaluates the impact of road construction on other resources and/or road construction problems likely to be encountered.

Method of Excavation

This interpretation refers to excavation methods most commonly used and required for each soil. This includes soil, bedrock, and cemented and/or compacted layers in the soil. Methods are blading, ripping, and/or blasting. (Cautionary note: These appraisals are subject to change as machinery capabilities change.)

Cutbank and Ditch Erosion Potential

This interpretation indicates the potential for subsoil erosion by running water on each soil. Subsoil refers to that material from approximately the 5-foot depth extending to bedrock. It includes erosion which takes place along road ditches and on cutslopes. Rating is of soil material only and does not apply when cutbank or ditch is in bedrock. Factors considered in making ratings are field observations, texture and structure of subsoil materials, permeability, compaction, and climate.

Low - Factors indicate that little or no subsoil erosion is likely to occur.

Moderate - Factors indicate that the subsoils have moderate erosion potential.

High - Factors indicate that the subsoils are likely to erode severely.

Susceptibility to Cutbank Sloughing and Raveling

This rating evaluates each unit for its susceptibility to sloughing or raveling after excavation. Ratings are based on cutbanks at least 10 feet high. Factors include field observations, soil and bedrock characteristics, backslope ratio, frost action, climate, and potential for revegetation.

Low - Sloughing and/or raveling is a minor problem requiring occasional road maintenance.

Moderate - Sloughing and/or raveling cause some damage. Annual road maintenance is usually adequate.

High - Sloughing and raveling occur at a rate that often plugs culverts and fills inside ditches. Frequent road maintenance with heavy equipment such as front-end loader is required.

Estimated Cutslope Ratio

This interpretation estimates the cutslope ratio which generally will result in the most stable cutbank condition. Ratings made are for cutbanks at least 10 feet high and pertain both to soil and bedrock material. Ratings are based on soil and bedrock factors and on observations. (Specific onsite characterization data is needed to determine the proper ratio.)

Steep - Cutbank ratio from vertical to ½:1

Moderate - Cutbank ratio from about 1:1 to 1½:1

Flat - Cutbank ratio flatter than 1½;1

Probability of Cutbank Failures

This interpretation indicates the probability of failures in cutbanks following road construction or excavations for buildings. Failures are considered to be at least 10 cubic yards of material in volume. Ratings are based on cutbanks of at least 10 feet in height and refer to more than a 50 percent chance for failures. These ratings are the same as in the Mantle Stability Surveys.

I. Very stable - practically no probability of chance of cutbank failures.

II. Stable - probability of more more than 3 failures per mile of road cutbank.

III. Moderately stable - probability of 4 to 8 failures per mile of road cutbank.

IV. Unstable - probability of 9 to 15 failures per mile of road cutbank.

V. Very unstable - probability of more than 15 failures per mile of road cutbank.

Suggestions for Cutbank Stability Problems

This rating gives suggestions, when applicable, to increase stability of cutbanks or reduce damage from raveling and sloughing.

Failure Potential on Road Waste and Fills

This interpretation rates the soil units as to the susceptibility of failure occurring on fill and sidecast waste material and related damage to resources. Failures are defined as a loss or partial loss of road fill or sidecast material on the fillslope. Considered are initial and subsequent failures caused by construction, erosion, and additional sidecast during maintenance. Failures result in damage to various resources. Stream sedimentation levels are increased, resulting in an adverse effect on both water quality and fisheries. Timber growth potential is affected as fillslope areas no longer contribute to production. Occasionally the failures do damage to the road itself. The ratings are based on current road construction practices and procedures and on type of soil materials, natural drainage of the site, landform, slope of the fill, and field observation.

Low - Failure on road waste and fills is sufficiently low to result in only minor damage to resource values.

Moderate - Failures on road waste and fills occur with sufficient frequency to cause moderate damage to resource values.

High - Failures on road waste and fills occur at a rate and magnitude sufficient to cause major damage to resource values.

Erosion Potential on Road Waste and Fills

This interpretation rates the soil units as to the susceptibility of erosion occurring on fill and sidecast waste material and related damage to resources. Erosion is a loss of surface soil from fill or sidecast.

This erosion contributes sedimentation to streams. Timber growth potential is affected as fillslope areas no longer contribute to production. The ratings are based on current road construction practices and procedures, and on type of soil materials, natural drainage of the site, landform, slope of the fill, and field observation.

Low - Erosion on road waste and fills is sufficiently low to result in only minor damage to resource values.

Moderate - Erosion on road waste and fills occurs with sufficient magnitude to cause moderate damage to resource values.

High - Erosion on road waste and fills occurs at a magnitude sufficient to cause major damage to resource values.

Suitability of Road Waste and Fillslopes to Seeding

This interpretation indicates the probable success of fillslope seeding. Factors considered in making ratings are soil characteristics, elevation, slope, climate, snowpack, and frost hazard. Ratings are based on current methods and practices of seeding, grass species, fertilizer application and time of seeding.

Poor - Probability of success is low. Seeding, generally, is not successful and requires three or more reseedings and special treatments.

Fair - Success is likely on about 50 percent of area treated. Requires one or two followup treatments. Seeding usually becomes well established within two years. Little followup seeding necessary.

Good - Probability of high success. Seeding usually becomes well established within two years. Little followup seeding is necessary.

Limitations to Road Waste and Fillslope Seeding

This indicates the major limitations to success of fillslope seeding.

Suggestions for Road Waste and Fillslope Seeding

This indicates special treatment to be given, when applicable, to increase the chance of success of fillslope seeding. A statement indicates the necessary requirements other than normal fillslope seeding practices carried on by the Forest.

Suitability of Cutbanks to Seeding

This interpretation indicates the probable success of cutbank seeding. Factors considered in making ratings are soil characteristics, elevation, slope, climate, snowpack, and frost hazard. Ratings are based on current methods and practices of seeding, grass species, fertilizer application, and time of seeding.

Poor - Probability of success is low. Seeding generally is not successful and requires three or more reseedings and special treatments.

Fair - Success is likely on about 50 percent of area treated. Requires one or two followup treatments. Seeding is usually spotty; some areas become easily established, while others fail completely.

Good - Probability of high success. Seeding usually becomes well established within two years. Little followup seeding necessary.

Limitations to Cutbank Seeding

This indicates the major limitations to success of cutbank seeding.

Suggestions for cutbank Seeding

This indicates special treatment to be given, when applicable, to increas the chance of success of cutbank seeding.

APPENDIX VI

TERMS AND DEFINITIONS OF MAPPING UNIT CRITERIA [1/]

This appendix contains the terms and definitions used in Soil Resource Inventories. These terms and definitions are used in compiling information for the Table of Soil Characteristics of Modal Sites; Table of Some Mapping Unit Characteristics, Features, and Qualities; Table of Bedrock Characteristics of Mapping Units; and the Mapping Unit Descriptions.

1/ Unless otherwise noted, the following definitions were developed for use in Soil Resource Inventories, R-6.

SOIL CHARACTERISTICS

Soil - Any and all loose, unconsolidated, weathered material on the earth's surface resting on solid, consolidated, unweathered bedrock, regardless of origin, mode of formation, or type of weathering or deposition. Generally includes any material that may be manipulated by hand tools or heavy equipment without the need of blasting except soft, unweathered bedrock. In soil horizon designation, soil materials include "A", "B", and "C" horizons.

Depth of Soil to Bedrock - Distance from soil surface to consolidated, unweathered bedrock. Depth is in feet or inches.

Shallow - less than 3 feet.

Moderately deep - 3 to 6 feet

Deep - 6 to 12 feet.

Very deep - greater than 12 feet.

Depth to Restrictive Layer in the Soil - Distance from soil surface to a layer in the soil that is highly restrictive to drainage, water transmission or root growth. Usually this is a discontinuity or stratification layer, but it may be bedrock. If it is bedrock, depth must be the same as recorded under depth to bedrock. A restrictive layer is generally not a genetic soil horizon, except in old soils that have developed claypan, hardpan, or cemented horizons. Depth is in feet.

Litter - Total depth in inches of decomposed and undecomposed organic matter.

Soil Layer - Each soil layer is a homogeneous layer of soil material. Soil layers are described when soil characteristics change significantly and have definite effects on management. Each layer may result from stratification or soil formation processes.

Soil Layer Thickness - Thickness of each soil layer in inches.

Soil Layer Thickness Classes - Thickness is in feet or inches.

Thin - less than 3 feet.

Moderately thick - 3 to 6 feet.

Thick - 6 to 10 feet.

Very thick - greater than 10 feet.

Color - Stated in narrative Munsel notations for each soil layer. Colors are taken of moist crushed soil. Mottling is noted, if present, especially in subsoil layers.

Texture - Relative proportions of sand (2.0mm.-0.05mm.), silt (.05mm.-.002mm.), and clay (less than .002mm.), Standard USDA textural classes are used for each soil layer.

Textural Classes * - These classes apply when general textural terms are used for the profile sketch in the mapping unit descriptions.

Coarse-textured soils - Sands, loamy sands.

Moderately coarse-textured soils - Sandy loam, fine sandy loam.

Medium-textured soils - Very fine sandy loam, loam, silt loam, silt.

Moderately fine-textured soils - Clay loam, sandy clay loam, silty clay loam.

Fine textured soils - Sandy clay, silty clay, clay.

Rock Fragment Quantity, Size, and Shape* - Percent by volume occupied by consolidated fragments larger than sand size (larger 2mm.).

Size Classes - gravel, 2mm. - 3 inches; cobbles, 3 inches to 10 inches; Stones, greater than 10 inches.

Shape Classes - round, thin, flat, subangular, subround, angular, blocky, etc.

Rock Fragment Classes - Used as an adjective to textural classes. Includes gravel, cobble, and stone sizes.

0-35 percent - not noted.
35-50 percent - gravelly, cobbly or stony.
50-80 percent - very gravelly, very cobbly or very stony.
80 percent + - extremely gravelly, extremely cobbly or extremely stony.

Soil Structure * - Includes grade, size, and type of structure for each soil layer. If no structure exists, then the soil is massive or single grained. Concretions or shot are recorded, if present. Applies to aggregate structural units (aggregates and peds).

Grade - Degree of aggregation and expression of the differential between cohesion within aggregates and adhesion between aggregates.

Weak - Indistinct peds, barely observable in place.

Moderate - Distinct peds, moderately durable and evident.

Strong - Distinct peds in place, durable.

Size - Refers to size of aggregates according to five size classes and type of structure:

* Standard USDA Handbook 18 Definitions.

	Platy	Prismatic	Columnar	(Angular) Blocky [1]	Subangular blocky [1]	Granular	Crumb
Very fine or very thin.	Very thin platy; <1 mm.	Very fine prismatic; <10 mm.	Very fine columnar; <10 mm.	Very fine angular blocky; <5 mm.	Very fine subangular blocky; <5 mm.	Very fine granular; <1 mm.	Very fine crumb; <1 mm.
Fine or thin....	Thin platy; 1 to 2 mm.	Fine prismatic; 10 to 20 mm.	Fine columnar; 10 to 20 mm.*	Fine angular blocky; 5 to 10 mm.	Fine subangular blocky; 5 to 10 mm.	Fine granular; 1 to 2 mm.	Fine crumb; 1 to 2 mm.
Medium.....	Medium platy; 2 to 5 mm.	Medium prismatic; 20 to 50 mm.	Medium columnar; 20 to 50 mm.	Medium angular blocky; 10 to 20 mm.	Medium subangular blocky; 10 to 20 mm.	Medium granular; 2 to 5 mm.	Medium crumb; 2 to 5 mm.
Coarse or thick.	Thick platy; 5 to 10 mm.	Coarse prismatic; 50 to 100 mm.	Coarse columnar; 50 to 100 mm.	Coarse angular blocky; 20 to 50 mm.	Coarse subangular blocky; 20 to 50 mm.	Coarse granular; 5 to 10 mm.	
Very coarse or very thick.	Very thick platy; >10 mm.	Very coarse prismatic; >100 mm.	Very coarse columnar; >100 mm.	Very coarse angular blocky; >50 mm.	Very coarse subangular blocky; >50 mm.	Very coarse granular; >10 mm.	

Type - Refers to relative shape of individual aggregates. There are four primary basic shapes.

Platy - Soils particles arranged around a plane, generally horizontal.

Prism-like - Soil particles arranged around a vertical line and bounded by relatively flat surface (Prismatic, Columnar).

Block-like - Soil particles arranged around a point and bounded by flat or rounded surfaces (Angular Blocky, Subangular Blocky).

Spheroidal - Soil particles arranged around a point and bounded by curved or very irregular surface (granular, crumb).

Structureless - No observable aggregation or no definite orderly arrangement of natural lines of weakness.

Massive - the soil material is coherent.

Single-grain - The soil material is incoherent.

Cementation * - Includes degree of cementation and the agent of cementation (Ca, Fe, Al, Si). Cementation is generally caused by a chemical process.

Degree of Cementation:

Weak - Soil aggregates can be easily broken by hand, and usually nonrestrictive to water and roots. Example: fragipan.

Strong - Soil aggregates are difficult to break by hand or hand tools and resist movement and penetration of water and roots. Water may be perched or ponded for short periods. Aggregates can be penetrated by hand tools.

Indurated - Soil aggregates are insoluble in water and cannot be broken by hand tools. Aggregates are totally restrictive to water and roots, and usually require ripping or blasting.

Compaction - Relative increase in bulk density which is caused by natural pedogenic processes.

* Standard USDA Handbook 18 Definitions

Weak - Soil aggregates are easily broken by hand and are usually nonrestrictive to water and roots.

Moderate - Soil aggregates are difficult to break by hand and resist movement and penetration of water and roots. Water may be perched or ponded for short periods of time.

Strong - Soil aggregates cannot be broken by hand. The soil exhibits nearly total restriction to water and root penetration, and usually requires ripping or blasting.

Permeability - Water or air movement in and through the soil material. The classes are based on soil texture, rock fragment content, porosity, and bulk density.

Class:

Very slow - Generally fine textured soils - clay. Less than .05 inch/hr.

Slow - Generally moderately fine textured soils - clay loams and silty clay loams. .05 inch/hr. to 1 inch/hr.

Moderate - Generally medium textured soils - loams, silt loams. 1 inch/hr. to 5 inches/hr.

Rapid - Generally moderately coarse textured soils, sandy loams, gravelly loams. 5 inches/hr. to 20 inches/hr.

Very rapid - Very porous soils. Generally coarse textured soils - sands and gravels. Greater than 20 inches/hr.

Consistence* - degree of cohesion and adhesion as indicated by the resistance of the soil aggregate to deformation or rupture under various moisture conditions.

Dry:

Loose - noncoherent.

Soft - easily crushes to powder or single grain.

Slightly hard - easily broken between thumb and forefinger.

Hard - can be broken in the hands without difficulty but difficult to break between thumb and forefinger.

Very hard - can be broken in hands without difficulty.

Extremely hard - cannot be broken in hands.

* Standard USDA Handbook 18 Definitions.

Moist:

Loose - noncoherent.

Very friable - crushes under gentle pressure.

Friable - crushes easily under gentle to moderate pressure between thumb and forefinger.

Firm - crushes under moderate pressure between thumb and forefinger.

Very firm - crushes under strong pressure; barely crushable between thumb and forefinger.

Extremely firm - crushes under very strong pressure; cannot be crushed between thumb and forefinger.

Wet:

Stickiness is neasured by pressing wet soil between fingers.

Nonsticky - practically no adherence when pressure is released.

Slightly sticky - after pressure soil adheres to both thumb and forefinger but comes off one rather cleanly. Does not stretch appreciably.

Sticky - after pressure soil adheres to both thumb and forefinger, and tends to stretch somewhat before pulling apart from either digit.

Very sticky - after pressure, soil adheres strongly to both digits and is markedly stretched when they are separated.

Plasticity - is measured by rolling wet soil and observing wire:

Nonplastic - no wire is formable.

Slightly plastic - wire forms, but soil mass easily deformed.

Plastic - wire forms, moderate pressure required to deform soil mass.

Very plastic - wire forms; much pressure required to deform soil mass.

Soil pH - intensity of soil acidity or alkalinity expressed on a scale of from 1 to 14:

	pH
Extremely acid	- below 4.5
Strongly acid	- 4.6 - 5.5
Slightly acid	- 5.6 - 6.4

	pH
Neutral	6.5 - 7.3
Slightly alkaline	7.4 - 8.4
Strongly alkaline	8.5 - 9.0
Very strongly alkaline	above 9.0

Classification - estimated taxonomic classification at family level.

Infiltration Rate - Rate of entry of water into soil surface. The rate is dependent upon the type of surface soil texture, rock fragment content, structure, porosity, bulk density, and organic matter content.

Infiltration Rate Classes:

Slow - Water stands on surface for long periods. Soils are fine textured, poorly aggregated and puddle easily.

Moderate - Water enters soil at commensurated rates of normal rainfall or water application. Water may pond for short periods (a few days) following very intensive rainfall. Soils are medium-textured, and well aggregated.

Rapid - Water rarely ponds, enters soil surface very rapidly. Soils are coarse textured, porous, loose, and usually single-grained.

Drainage Class 2/ The rapidity and extent of removal of water from the soil. Based on soil permeability, infiltration, internal drainage, and topographic position.

Poorly drained - Water table at or near the surface a considerable part of the time. Soils of this class usually occupy level or depressed sites and are frequently ponded. Water is removed so slowly that soil remains wet almost all the time.

Somewhat poorly drained - Water removed so slowly that the soil remains wet for significant periods, but not all the time.

Moderately well drained - Soil remains wet for a period somewhat longer (up to one month) than the wet season; may be due in part to a slowly permeable layer, high water table, or lateral seepage.

Well drained - Water is removed from soil readily and these soils are saturated only during the wet season for short periods.

Excessively drained - Water is removed from soil rapidly and these soils are rarely ever saturated. Commonly, these soils are coarse-textured or shallow, stony, and/or occur on steep slopes.

Major Drainage Intensity and Pattern - Number of drainage miles per square mile and dominant drainage pattern.

Intensity Classes:

Few - 0 to 1 drainage mile per square mile.
Common- 1 to 3 drainage miles per square mile.
Many - 3 to 5 drainage miles per square mile.
Abundant - Greater than 5 drainage miles per square mile.

2/ Very poorly drained and somewhat excessively drained classes are not used.

Patterns - (State drainage pattern):

Productivity - Combined evaluation of measured and observed production of timber and forage types. Site classes are to be used for timber types, and range condition ratings for range types.

Timber Site Classes [3/] - Class limits correspond to height (site index) of Douglas-fir at 100 years.

Class I - greater than 185 S.I.

Class II- 185 S.I. to 155 S.I.

Class III - 155 S.I. to 125 S.I.

Class IV - 125 S.I. to 95 S.I.

Class V - less than 95 S.I.

Fertility - Estimated inherent soil fertility and availability of plant nutrients. This rating is derived by correlating measured productivity with soil factors such as texture, pH, color, and organic matter content.

High - These soils generally have medium to fine texture, dark surface colors; are slightly acid to slightly alkaline and have abundant incorporated organic matter. Nutrient quantities are adequate and readily available.

Moderate - These soils generally have one or more soil factors that limit nutrient quantity and/or availability.

Low - These soils generally have several factors that are limiting. They may be coarse textured, strongly acid or strongly alkaline and lacking in sufficient organic matter. Nutrient quantity and/or availability is seriously limiting.

Percent Vegetative Cover - Evaluations of total vegetative cover and the cover of three distinct levels of vegetation above the soil surface. Overstory consists of the timber stand canopy. Understory consists of woody shrubs, and timber regeneration. Ground cover consists of ferns, grasses, sedges, and mosses.

Total Ground Cover - Estimated percent of total vegetative cover with overstory, understory, and ground cover combined. Maximum of 100 percent.

Vegetative Cover by Each Level- Estimated percent vegetative cover according to species composition, with overstory, understory, and ground cover estimated separately. Maximum of 100 percent for each level.

3/McArdle, Technical Bulletin 201. All other Timber Site Classes are from R-6 Timber Inventory Procedures Handbook.

Root Distribution*- Includes root size, abundance and depth to zone of rooting. Note maximum depth of roots and zone of maximum concentration.

Size:

Very fine - 0.075 mm.

Fine - 1 to 2 mm.

Medium - 2 to 5 mm.

Coarse - over 5 mm.

Abundance:

Very few - less than 1/unit [4/]

Few - - 1 to 3/unit.

Plentiful - 4 to 14/unit.

Abundant - more than 14.

Depth:

Recorded depth in inches of zone of rooting. Distance is measured from soil surface to depth of majority of roots.

Landform - refers to the shape and configuration of a specific, identifiable part of the landscape common to the mapping unit.

Slope - Range of slope of landtype.

Aspect - Direction of slope exposure

Elevation - Altitude above mean sea level expressed in feet.

Slope Dissection - The number of dissections (drainages) cut into the slope and measured by frequency per linear mile.

Smooth - Less than 3 dissections per linear mile.

Moderate - 3 to 5 dissections per linear mile.

High - 5 to 8 dissections per linear mile.

Extreme - greater than 8 dissections per linear mile.

*Standard USDA Handbook 18 Definitions.

4/ Unit is a square inch for fine to very fine; a square yard for medium and coarse roots.

BEDROCK CHARACTERISTICS

These terms are found in the Table of Bedrock Characteristics of Mapping Units.

Bedrock - Consolidated, competent rock which upon weathering produces loose or unconsolidated soil material. In terminology of soil horizon designation, bedrock is designated at the "R" layer. Bedrock material usually requires ripping and/or blasting. Includes soft materials that are unweathered such as some sedimentary rock which can be bladed. (Example: Sandstone.)

Composition - Bedrock components and percentage. (Example: Sandstone (20), Conglomerates (70), Mudstone (10).

Color - Color is in narrative terms for fresh, unweathered surfaces.

Hardness - Relative rating based on ease of breaking rock with geology hammer:

Hard - Rock cannot be broken or only with great difficulty.

Moderately hard - Rock can readily be broken with hammer but not by hand.

Soft - Rock can be broken by hand.

Degree of Fracturing- Based on the number or frequency of fractures and joints in a rock unit:

Highly fractured - Entire rock unit is completely dissected by fractures and joints less than 1 foot apart.

Moderately fractured - Fractures divide rock unit into units or blocks generally from 1 to 5 feet apart.

Slightly fractured - Only occasional fractures noted.

Massive - No fractures or very few fractures noted.

Fracture System- Pattern which the rock fractures follow. Example: horizontal, platy, vertical, blocky, random, etc.

Fracture Surface - Indicates the characteristics of the fracture surface and void space within fractures.

Regular - Smooth, distinct, sharp, clean-fractured surfaces.

Irregular - Rough, irregular, fragmented fracture surfaces.

Competency - Relative inherent strength of rock as it occurs on the landscape, based on degree of weathering, fracturing, hardness, stability and failures observed:

Competent - No failures within rock unit observed. Rocks of unit are stable and have strong resistance to mass movement.

Moderately competent - Some failures are noted. Rocks of the unit are moderately stable and have some resistance to mass movement.

Incompetent - Failures are common to rock unit. Rocks of the unit are soft, deeply weathered and have high potential for mass movement.

APPENDIX VII

GLOSSARY

Aerial Logging - Logging systems using helicopters or balloons where logs are lifted vertically and yarded free and clear of the ground.

Alluvium - Stream deposits of gravelly sand, silt, or clay.

Andesite - A dark gray to black, dense, fine-grained, extrusive igneous rock. Very similar to basalt.

Basalt - A dark gray to black, dense, fine-grained, extrusive igneous rock. Very similar to andesite.

Base Flow - Sustained or fair weather runoff. It is composed of ground water runoff and delayed subsurface runoff.

Bay - A part of a sea or lake indenting the shoreline; a wide inlet.

Bedrock The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Breccia - Rock composed of angular fragments in a finer groundmass.

Cable (Full Suspension) - Logs are yarded free and clear of the ground surface to a landing.

Cable (No Suspension) - Yarding method where logs are dragged on the ground to a landing.

Cable(Partial Suspension) Yarding method where one end of the log is suspended above the ground surface during the yarding operation.

Clastic Sediments - Sediments transported into their place of deposition; i.e., sandstone, siltstone.

Coarse Fragment - Rock fragments ranging from 2 millimeters to greater than 10 inches.

Colluvium - Soil material or rock fragments moved downslope by gravitational force in the form of soil creep, slides, and local wash.

Complex - An association in which two soil units are so intricately mixed that it is not practical to show them separately at the scale of mapping used.

Conglomerate - A cemented clastic rock containing rounded fragments in a finer groundmass.

Critical Soil - The term "critical soil" is frequently used by laymen, but it is a meaningless term unless it is related to a specific function. Many soils may be critical for one reason or another, but different soils may not be critical for the same reasons. For example, a deep, wet, plastic and unstable soil will be critical in relation to road location and stability. This soil is not critical in relation to regeneration problems. Another soil may be very shallow over hard bedrock. This soil is not critical from the standpoint of road stability, but may be critical as to regeneration problems. It may also be critical in relation to surface erosion. From these two samples it becomes obvious that the term "critical soil" must be defined by the user in relation to its intended purpose.

Debris Slide - A rapidly moving slide composed of soil, bedrock, or both.

Dike - An intrusive igneous rock that cuts through pre-existing rock structure or massive rocks.

Diorite - A plutonic rock composed essentially of sodic plagioclase (usually andesine) and hornblende, biotite, or pyroxene. Small amounts of quarts and orthoclase may be present.

Erosion - The wearing away of the land surface by running water, wind, ice or gravitational creep. Accelerated erosion may result from the activities of man or animals.

Estuary - An inlet or arm of the sea; especially the wide mouth of a river, where the tide meets the current.

Extrusive Bedrock - This applies to those igneous rocks derived from volcanic lavas that cooled on the surface of the earth. This lava cools rapidly and forms fine textured rocks such as basalt and andesite.

Gabbro - A plutonic rock consisting of calcic plagioclase (commonly labradorite) and olivine, opatite, and magnetite orilmenite.

Geomorphology - The study of landforms as they relate to geologic composition and history.

Headland or Headwall - A steep, wall-like cliff at the head or upper end of a slope, commonly at the head of a failure.

Hummocky - Hilly, uneven landscape resulting from deep-seated soil movement, usually of a rotational nature.

Inclusion - Soil type found within a mapping unit that is not extensive enough to be mapped separately or as part of a complex.

Intervluves - The areas between adjacent streams flowing in the same general direction.

Intrusive Bedrock - This applied to those rocks derived from magmas that have been injected into older rocks at depth without reaching the surface. These magmas are slow-cooling and form coarse textured rocks, such as granite.

Isohyetal Map - A map with lines along which all points receive the same amount of precipitation.

Landform - Structural configuration of the topography as a result of past and present geological activity.

Landtype Unit - Any delineated area on a soil map that is identified by a number. A mapping unit may be a soil unit, a miscellaneous landtype, or a complex.

Massive - Soil structure or bedrock condition in which there is no observable aggregation or no definite orderly arrangement of natural lines of weakness.

Mass Movement - All movement of soil and bedrock materials occurring below the soil surface such as landslips, landflows, rock slides, slumps, etc.

Mass Wasting - Wearing away of the landscape through the process of mass movement. Geologic erosion.

Micaceous Sandstone - Sandstone containing significant amounts of mica.

Miscellaneous Landtypes - A mapping unit for areas of land that have little or no natural soil or have properties that are too variable and unpredictable for classification.

Peak Flow (Peak Runoff) - The greatest water discharge for any single runoff period.

Peat - A dark brown or black deposit of plant remains produced by partial decomposition and disintegration of mosses, sedges, trees and other plants that grow in marshes and like wet places.

Pillow Lavas - A general term for lavas that exhibit a pillow structure resulting from subaqueous deposition.

Porphyritic - An igneous rock textural term in which larger crystals are set in a finer ground mass.

Puncheons - Piling or split logs laid horizontally across wet areas.

Pyroclastic - A general term applied to rocks formed from volcanic material that has been explosively or aerially ejected from a volcanic vent.

Residuum - Soil material formed by rock weathering in place.

Runoff - That part of the precipitation which appears in surface streams of either perennial or intermittent form.

Sag Ponds - Depressions due to uneven settling of the ground.

Sand Dune - A rounded hill or ridge of sand deposited by the action of the wind.

Sandstone - A rock composed primarily of cemented sand-size grains.

Scarp - (See Headwall).

Sedimentary Rock - Rock formed by deposition of soil and rock particles by water, ice, or wind that later solidifies through cementation, ionic exchange or compression.

Sheet Erosion - Uniform removal of surface soil by water flowing overland or by wind.

Sill - An intrusive igneous rock that lies parallel to bedding in pre-existing rock.

Siltstone - A sedimentary rock consisting primarily of silt-size particles.

Slump - A deep-seated, slow-moving rotational failure occurring in plastic materials resulting in vertical and lateral displacement.

Soil Creep - Slow mass movement of soil material downslope primarily under the influence of gravity, but facilitated by saturation with water and/or by alternating freezing and thawing.

Spot Symbols - Symbols used on soil maps to represent a landscape factor too small to delineate.

Surface Slips - Rapid movement downslope of the surface few feet of soil on steep slopes.

Syenite - A plutonic igneous rock consisting principally of alkalic feldspar with hornblende or biotite. The feldspar may be orthoclase, microline, or perthite. A small amount of quartz may be found, but in some cases nepheline may take its place.

Tideland - Land covered by flood tide.

Tidewater - Water brought into an area by the action of the rising tide or an area in which water is affected by the tide.

Toeslope - That portion of a slope that is transitional between the valley floor and the upper slope.

Topography - The relief features or surface configuration of an area.

Tractor Logging - Timber harvest method whereby logs are dragged by a tractor to a loading site.

Tuffs - Rocks composed of cemented fine textured (ash) volcanic material.

Volcanic Sediments - Consolidated rock material containing abundant volcanic debris.

1/ Webster's New World Dictionary of the American Language, College Edition, World Publishing Company, Cleveland, Ohio & New York, N.Y., 1958

2/ American Geological Institute, Glossary of Geology and Related Sciences, National Academy of Sciences - National Research Council, Washington, D.C., August 1962.