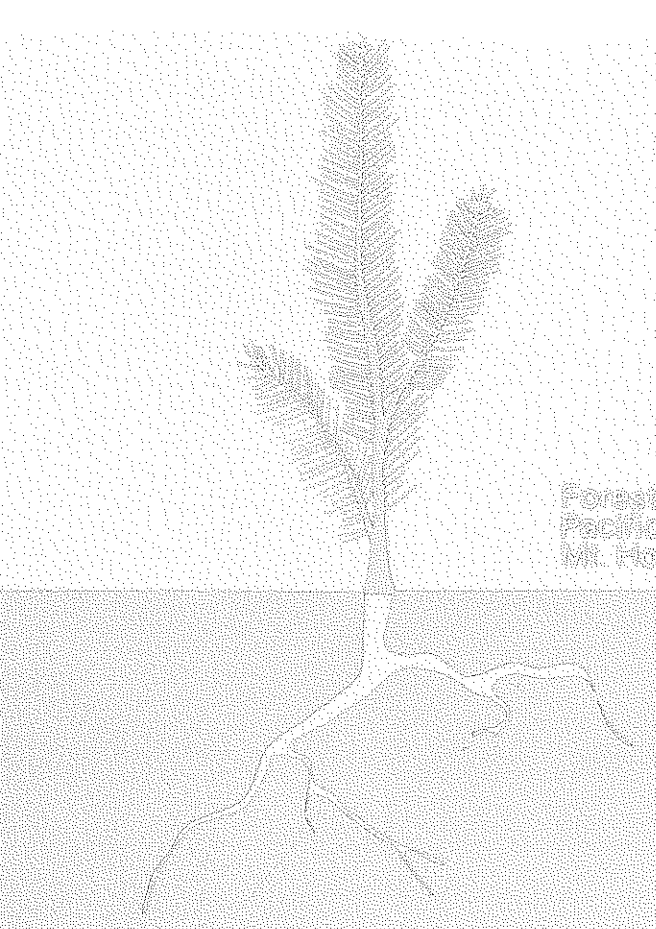
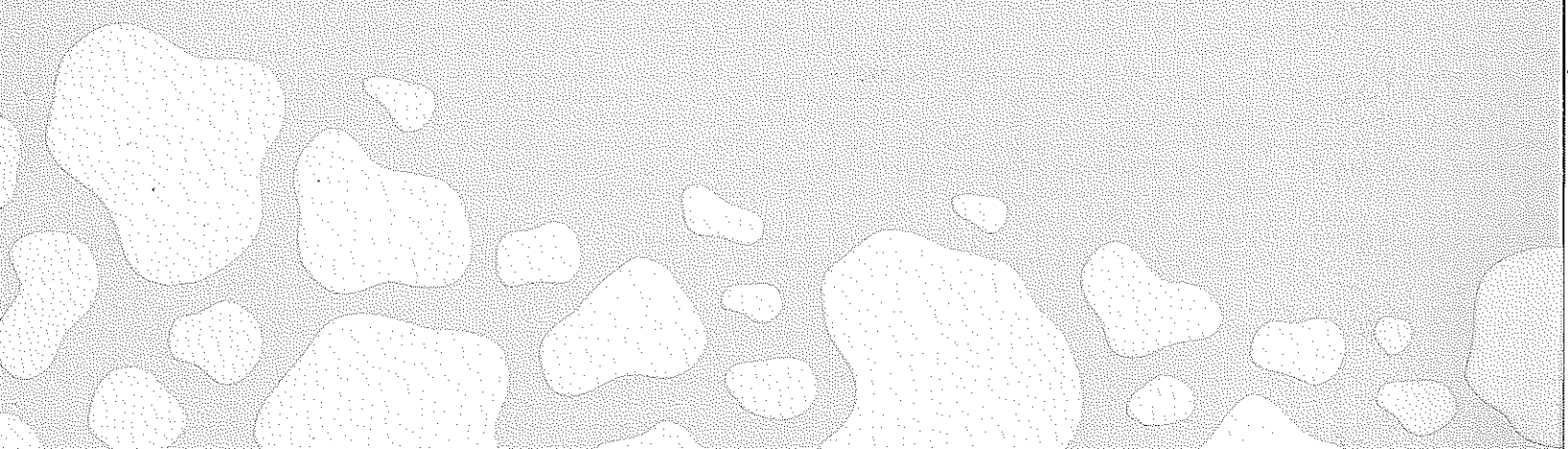


Forest Service, USDA
Pacific Northwest Region
Mt. Hood National Forest

# SOIL RESOURCE INVENTORY



# PREFACE

The Soil Resource Inventory (SRI) is a report containing soil survey information that includes soil maps, soil mapping unit descriptions, laboratory data, and interpretation of soil information for use in forest land management decision making. The report also contains some general information on geology, topography, climate, and vegetation of the survey area.

The field work for the soil survey was completed by the author during the period between April, 1976, to November, 1977. Technical supervision was provided by Jack Parcell, Forest Soil Scientist, Mt. Hood National Forest; and Loren Herman, Soil Scientist, Regional Office. Fred Brovold, Materials Engineer, Mt. Hood National Forest, provided valuable assistance in the preparation of the geology section of the report. The assistance of Carolyn Carr, Visual Information Specialist, Mt. Hood National Forest, in the layout and design of this report is also gratefully appreciated.

The Mt. Hood National Forest is located along the Cascade Mountains in North Central Oregon. It extends from the Columbia River Gorge south to Mt. Jefferson and from near Estacada east to near Dufur, Oregon. The survey area includes approximately 1.1 million acres of National Forest System lands (Figure 1).

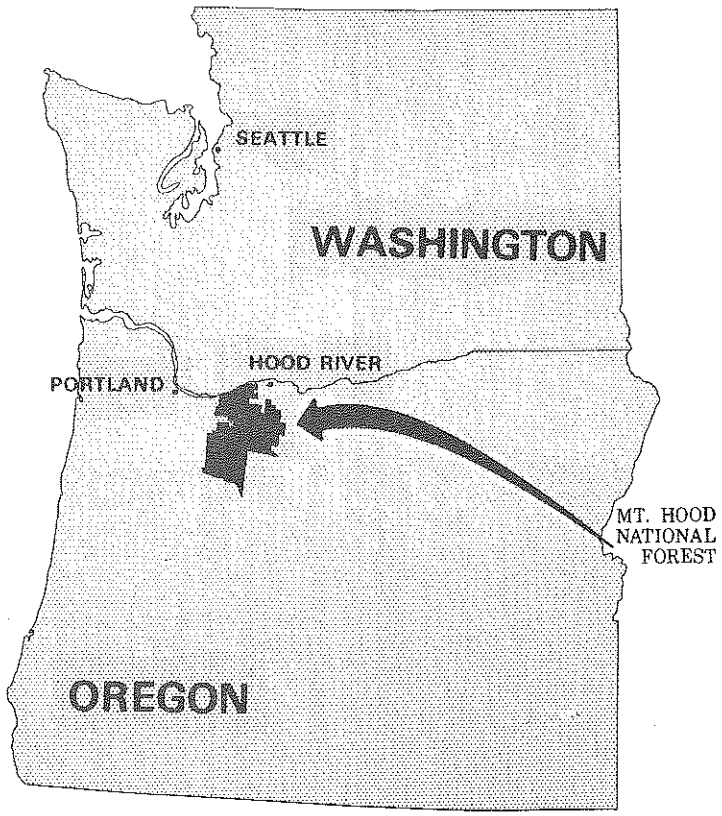



FIGURE 1 Locator Map

The Mt. Hood National Forest contains a wide variety of topographic, vegetative, geologic, and climatic features. Elevations range from approximately 500 feet to over 11,000 feet at the summit of Mt. Hood. Average precipitation ranges from 20 inches at the extreme eastern Forest boundary to over 130 inches in the vicinity of Bull Run and Olallie Lakes. Rainfall distribution patterns are influenced by the presence of the Cascade Mountains. West of the Cascade Crest, a Mediterranean climate prevails with cold, wet winters and cool, dry summers. East of the Cascade Crest, most precipitation occurs during winter in the form of snow and summers are hot and dry. Because of extreme climatic differences, vegetation is highly variable. East of the Cascade Mountains, vegetative community types range from low elevation bunchgrass and sagebrush types through high elevation alpine meadows. West of the Cascades, vegetative community types range from western hemlock vegetative types through subalpine forests.

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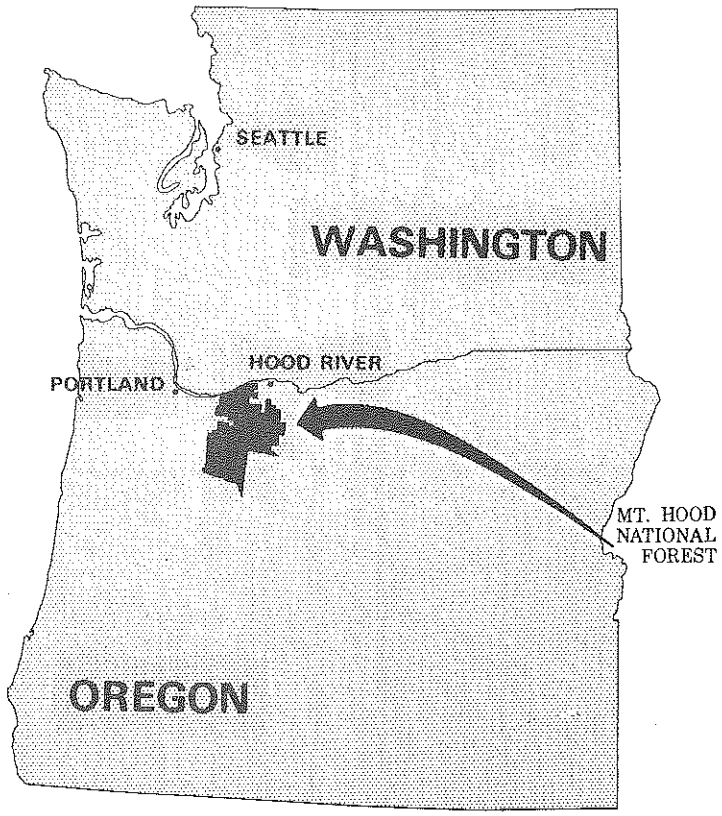



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# E R R A T A

P.1: last line, "soil moisture rates" should read "soil moisture depletion rates

P.13: Landforms - third line should read "but also includes landforms due to sedimentation"

P.65: Aspect should read South and West

P.66: Aspect should read North and East

P.72: Aspect should read North and East

P.73: Aspect should read South and West

P.187: Soil units 370, 371, and 372 should be numbered 333, 335, and 334 respectively

FOREST SERVICE • USDA
Pacific Northwest Region
Mt. Hood National Forest

Inventory and Report by
Steve Howes, Soil Scientist
January 1979

# SOIL RESOURCE INVENTORY

The Soil Resource Inventory (SRI) of the Mt. Hood National Forest was made to provide some basic soil and landform information and interpretations for use in land management planning. This inventory is part of the Regional Soils Program developed by the Soils Group of the Division of Watershed Management to assist forest land managers in applying multiple use principles.

All renewable natural resources are dependent upon soil, which is basically a non-renewable resource. Soil is a product of the interaction of parent materials, vegetation, climate, and relief over time. Soil development takes place over extremely long periods. This fact necessitates sound land management practices in order to produce high level sustained yields of renewable resources. It is necessary to have basic soils information in order to make sound land management decisions.

# OBJECTIVES AND USES OF SOIL RESOURCE INVENTORY INFORMATION

An objective of this Soil Resource Inventory is to provide soils information in a form useful to the forest 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 outputs of the various renewable resources of the national forest without impairment of the productivity of the land.

Another objective of the Soil Resource Inventory is to stimulate an interest in and a concern for the soil resource by persons involved in forest land management. A great deal of information about the soils of the Mt. Hood National Forest is contained in this report. It is hoped that this information is just a starting point and that we all can learn more in the future.

Most mapping units range from 50 to 400 acres in size. The map base is a set of 1″=1 mile aerial photographs.

The Soil Resource Inventory is a valuable tool in that it defines soil and landform properties and describes mapping units; and displays them on maps. It also predicts soil and landform behavior when subjected to specific management activities.

Information of the scale presented on the soil map sheets is of sufficient intensity to help develop resource management policies and sound land management procedures. Because of the level of mapping of the SRI, 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.

## LAND MANAGEMENT PLANNING

The information contained in this report can serve as the basis for land management planning. Activities can be selected for areas where they are most suited to the soil and other resources. Responses to management activities can be predicted for each mapping unit.

## TRANSPORTATION PLAN

This report identifies on a broad scale, areas where road construction will be difficult and expensive. Landslides, avalanche chutes, and steep, highly-dissected areas are identified for easy reference.

## TIMBER RESOURCE PLAN

The soils information contained in this report 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 locations, harvest 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.

## PLANTATION MANAGEMENT AND PLANNING

Information on soil moisture tensions, soil moisture rates, slopes, and aspects can aid the silviculturist in determining proper planting time and probability of plantation success.

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## WATER RESOURCE PLANNING

Information found in this report regarding soil detention storage potential, hydrologic group, infiltration rates, bedrock hydrologic characteristics, sediment yield potential, and soil mantle stability may prove useful in developing watershed management plans and timber harvest activities within watersheds.

## RANGE RESOURCE PLANNING

Vegetation data, as well as information on soil compaction and revegetation potential can be useful in range resource planning. Areas which may be suitable for water developments can also be located.

## RECREATION RESOURCE PLANNING

Information contained in this report on campground suitability, suitability for septic tank filter fields, trail suitability, and soil coarse fragment content will prove useful in developing recreation area plans.

## ENVIRONMENTAL ANALYSIS AND REPORTS

Any report involving the effects of a management activity requires soils input. Whether it is ski area, campsite, or geothermal development, there are soil factors that must be considered to make the report complete.

Soils are not merely profiles. They are three-dimensional segments of the landscape, each with distinct observable properties.

Differences in soils are the result of five major soil forming factors: parent materials, climate, vegetation, relief, and time. Soils that have like characteristics usually develop where the soil forming factors are similar. Similar soils respond to management practices in much the same way.

Soils are dynamic. They have properties such as temperature and moisture that are constantly changing. In terms of management, these properties must be considered when making decisions and interpretations. Processes are constantly occurring in and acting upon soils. These processes include addition of rock, changing vegetation to organic matter, transferring clay, and releasing nutrients.

Each individual soil has an inherent capability to produce given amounts of vegetation. This productive potential can either be increased or decreased by various management activities.

# WHAT IS SOIL?[1]

The land on which we live and grow our crops is studied by soil scientists, geologists and soil engineers. Each of these professions is concerned with a different aspect of the earth's surface and each profession has a slightly different interpretation of the word "soil."

The soil scientist has been primarily concerned with the mapping of the uppermost layer, or profile, of the land surface in which plants anchor their roots and derive nutrients and water necessary for growth. The profile consists of layers of weathered minerals with varying amounts of organic matter. The geologist is concerned with the mapping of rocks and unconsolidated sediments. The origin and age relationships of geologic materials and the processes that have formed and modified them are emphasized. Many geologists now restrict their use of the term "soil" to the thin weathered part of rock or unconsolidated sediment that forms the surface of the earth, which is the result of the result of climatic and biologic processes acting upon rock or unconsolidated sediment.

Engineers use the term soil to refer to sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks, and which may or may not contain organic matter.

The term soil as used in this report will generally follow the definition as given in Agriculture Handbook 436 (1975).

> "Soil is the collection of natural bodies on the earth's surface, in places modified or even made by man, of earthly materials containing living matter and supporting or capable of supporting plants out-of-doors. Its upper limit is air or shallow water. At its margin, it grades to deep water or to barren areas of rock or ice. Its lower limit to the nonsoil beneath is perhaps, the most difficult to define. Soil includes the horizons near the surface that differ from the underlying rock material as a result of interactions through time, of climate, living organisms, parent materials and relief. Usually, soil grades at its lower margin to hard or to earthy materials virtually devoid of roots, animals or other marks of biologic activity. The lower limit of biologic activity which generally coincides with the common rooting depth of native perennial plants. However, in defining mapping units for soil surveys, lower layers that influence the movement and content of water and air in the soil of the root zone must also be considered."

[1] Parts of this section taken from Curt Othberg, Department of Natural Resources, Division of Geology and Earth Resources, Olympia, WA 98504.

Soils are independent natural bodies each with a unique morphology, resulting from a unique combination of climate, living matter, earthy parent materials, relief, age and landform.

It is important to realize that soil is a natural thing out-of-doors. It has many properties that fluctuate with the seasons such as temperature and moisture content. Biologic activity is slowed or stopped if the soil becomes too cold or too dry. Flushes or organic matter come when leaves fall or grasses die.

Soil is not a static thing. It is a dynamic, three-phase system consisting of solids, liquids and gasses. The pH, the soluable salts, the amount of organic matter, the carbon-nitrogen ratio, the numbers of micro-organisms, the temperature, and the moisture all vary with the seasons as well as extended periods of time.

It is also important to realize that a soil is not simply a profile with certain observable characteristics, it is also a landscape with an observable size and shape.

Differences in soils are the result of five major soil forming factors: parent materials, climate, vegetation, relief, and time. Soils that have like characteristics usually develop where the soil forming factors are similar or where the net effects are similar. Similar soils respond to management practices in much the same way.

Each individual soil has an inherent capability to produce given amounts of vegetation. This productive potential can either be increased or decreased by various management activities.

## HOW SOIL SURVEYS ARE MADE

The conduct of a soil survey is as much an art as it is a science. Since soils form a continuum on the earth's surface and can vary abruptly over short distances or subtly over very long distances, the soil scientist must rely on an accurate sense of observation in order to make soil delineations.

The first requirement in a soil survey project is to have a well-defined set of objectives. Once this has been accomplished, the soil scientist can determine which soil properties are most important in making desired interpretations.

Before beginning field work, the soil scientist must assemble available information pertaining to the survey area. This includes information on geology, climate, topography, vegetation, crop (timber) yields, etc. Also, he secures aerial photographs of the survey area and studies landforms and drainage patterns. This information and study provides the basis for future soil delineations.

After this initial work has been completed, the soil scientist begins field work. Through observations made in roadcuts and transects, he begins to form a picture of the major kinds of soils found in the survey area. He then develops a legend which describes these soils.

The soil scientist then delineates these soils on aerial photographs and rechecks his mapping in the field. He also samples each major soil to determine chemical and physical properties as well as external properties such as vegetative type and slope.

Once the fieldwork has been completed, the maps are transferred from the field map sheets to the map base to be published.

## HOW TO USE THE SOIL RESOURCE INVENTORY

This report is intended for use by anyone seeking basic information on soils and landforms of the Mt. Hood National Forest. There are many uses for this information although it is not intended to answer detailed questions relating to soils. It is a basic inventory document containing information about the nature and distribution of soils. It should serve as a communications link between the Forest Soil Scientists and other Forest personnel as well as a working tool for land managers. It is also hoped this document will serve as a learning device for those individuals who wish to improve their knowledge of soils in general.

This report was designed to be easy for the user to extract information from several tables to obtain the specific information and interpretations desired.

The three-ring binder enables the user to lift the map of the desired area and place it to the side for reference. He can easily refer to the mapping unit descriptions and appropriate interpretations. The three-ring binder will also enable the user to make copies of soil maps and pertinent sections of the text, eliminating the need to carry an entire report to the field. Map sheets can be extracted from the binder and viewed stereoscopically using the high altitude stereo pairs. By observing the maps in this manner, the user can easily see important land features.

The soil maps show the location and extent of the soils on the Mt. Hood National Forest. The user can locate a particular area on the Forest by using the index map at the beginning of the soil map section. Reference should then be made to mapping unit descriptions found in this report, and then proceed to the tables which give basic soils information and interpretations for various management activities.

The reader should be familiar with the Table of Contents. Only by knowing what information is provided can the full value of this report be realized.

Many of the terms used in this report may be new to the reader. A glossary is provided in the Appendix which gives definitions for many of the terms found in this report.

# ENVIRONMENTAL SETTING

The Mt. Hood National Forest contains a wide variety of landscape features, climatic conditions, geologic rock types, vegetative communities, and complex soil patterns. Landforms vary from flat, rolling plains to steep, dissected mountain slideslopes. Temperature and precipitation patterns vary widely on the Forest. Eastside, low elevation, south exposure slopes, experience long, hot and dry summers, with an annual precipitation of 15 to 20 inches occurring generally as winter snows. High elevations along the Cascade Crest experience short growing seasons with cool summers and cold winters. Annual precipitation is 80 to 120 inches, with most falling as snow.

# TOPOGRAPHY

Topography is the detailed description of the relief features or surface configuration of the earth's surface. Topographic features are developed by erosional processes, both chemical and physical, acting on the underlying geologic material. Geologic material refers to both the bedrock type and the framework or structure in which the bedrock is found. Landscape formation takes a very long time and the rate of formation is governed by the geologic history of an area and the intensity of erosional processes.

On the Mt. Hood National Forest, water and ice have been the primary erosion agents. They have sculpted the surface into a variety of topographic features. Mapping units have been designed to correspond with this variety.

Generally, mapping units have been divided into three major slope categories.

0–30 percent slopes.....gently sloping.
30–60 percent slopes.....moderate to steeply sloping non-dissected to slightly dissected.
60–90 percent slopes.....steeply sloping—slightly dissected to highly dissected.

Some of the alluvial deposits have slope ranges of 0 to 10 percent.

Mapping units in areas dominated by aeolian soils have been divided into two major slope groups:

0–30 percent slopes.....gently sloping.
30–60 percent slopes.....moderate to steeply sloping.

Slopes of miscellaneous land types vary widely both between and within each unit.

# CLIMATE

The Mt. Hood National Forest includes both the eastern and western slopes of the Cascade Mountains. The climatic conditions vary from very arid near Friend, to cool, moist, alpine conditions at the crest of the Cascades. This is because the high ridges of the Cascades intercept prevailing westerly winds and disrupt the paths of Pacific storm systems. Topography and distance from the ocean influences the local climatic regime. Precipitation is greatest and temperatures are more moderate west of the Cascade Crest. Average annual precipitation on the west slopes ranges from 60 inches near Estacada, to over 170 inches in the Bull Run Watershed. Precipitation on the east slopes ranges from 20 inches near Rock Creek Reservoir, to 80 inches at Lookout Mountain.

The primary airflow is easterly. Normally warm, moist air moves eastward toward the Cascade Crest. As it is forced to higher elevations, it cools and drops rain along the windward slopes. Air descending along the leeward slope is warmed by compression. This causes a sharp decrease in precipitation eastward (Figure 2).

## WINTER CLIMATIC REGIME

During an average winter, snowfall ranges from near zero at lower elevations to over 300 to 500 inches near the crest. Snow usually covers the ground from mid-December until late February or March at lower elevations. At high elevations, snow can be expected to remain on the ground from October to June. Density of the snowpack usually starts out at approximately 25 percent and increases to 45 percent in the spring.

Average maximum temperatures range from 25 to 35°F. Minimum temperatures are from 5 to 15°F. Below freezing temperatures, −15 to −20°F, are not uncommon.

Occasionally when high pressure conditions exist in the Columbia Basin, strong east winds prevail through the Columbia Gorge. These warm east winds tend to modify the climate in the Gorge, causing it to be milder than the surrounding mountains.

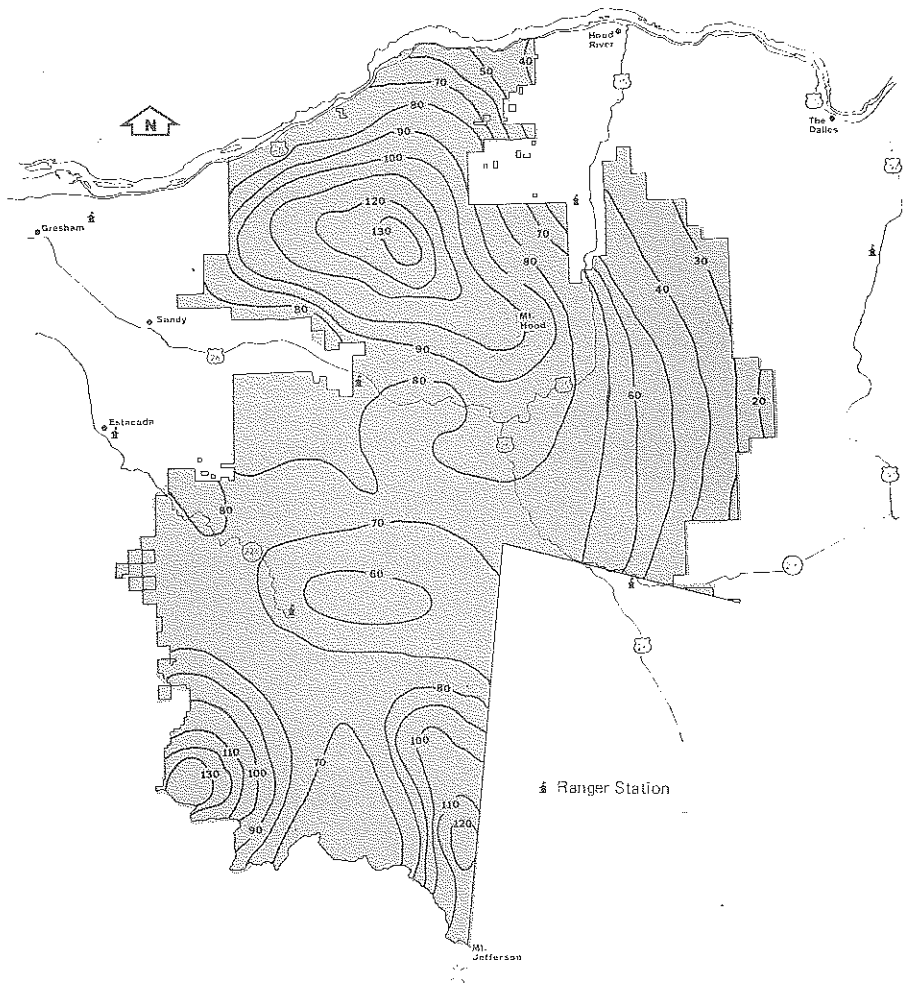



FIGURE 2 Mean Annual Precipitation shown in inches

## SPRING, SUMMER, AND FALL CLIMATES

During these periods, prevailing air flow is from the northwest and west. Warmer and drier air masses generally begin in May, peak in July and August, and continue until late August and early September. Thunderstorms can be expected throughout the period. Rainfall frequently accompanies the thunderstorms.

Average maximum temperatures are in the 60's and 70's with occasional 80+ days at higher elevations. At lower elevations, temperatures range from 70 to 80°F. Occasionally, temperatures over 100°F are recorded. Minimums at higher elevations are in the mid 40's and 50's and at lower elevations, minimums are in the 50's and 60's.

Table 1 shows precipitation distribution for nine recording stations on or near the Mt. Hood National Forest. This data is from the U.S. Weather Bureau and was recorded during the period of 1967 to 1977.

## VEGETATION[1]

The extreme variation in climate and topography within the Mt. Hood National Forest has combined to create a large variety of vegetative communities. Because the Forest straddles the Cascade Mountains, plant communities ranging from old-growth cedar-hemlock forests through sagebrush-bunchgrass rangelands can be observed.

[1] From Franklin, J.F., and C.T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. U.S.D.A. Forest Service General Technical Report PNW-8. 417p.

Several major vegetation zones as described by Franklin and Dyrness (1973) are found on the Mt. Hood National Forest (Figure 3). These include: the Tsuga heterophylla Zone, the Abies amabilis Zone, the Tsuga mertensiana Zone, the Pseudotsuga menziesii-Abies grandis Zone, the Pinus ponderosa Zone, the shrub-steppe Zone, and the alpine-timberline Zone.

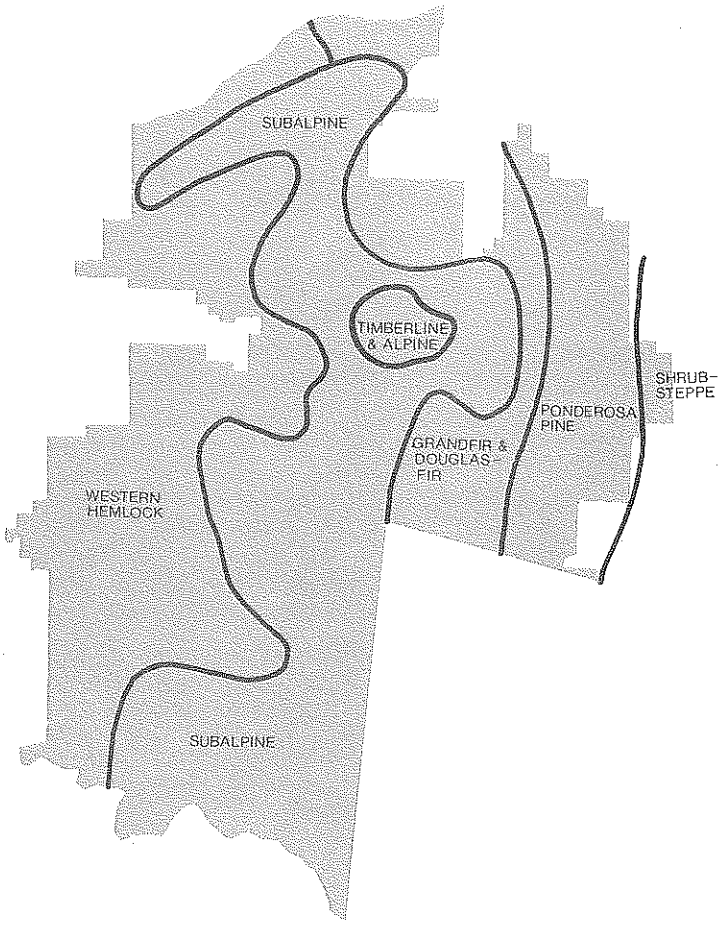



FIGURE 3 Major Vegetation Zones

Each of these major vegetation zones is representative of a set of broad set of climatic conditions. Variations in vegetative composition within these zones is generally a reflection of microclimatic or specialized soil conditions.

Most of the westside of the Forest is within the western hemlock zone. Although western hemlock is considered to be the major climax species, Douglas-fir is clearly the overstory dominant in many areas. This seral condition is the result of fire and other past disturbances. Western hemlock reproduction is found extensively in the understory. Other major forest trees in this zone include western redcedar, grand fir, sitka spruce, and some western white pine. Hardwoods do not generally occur in this zone excpect on disturbed sites and specialized habitats with red alder, big-leaf maple, and golden chinkapin being the most common. Black cottonwood, Oregon ash, and big-leaf maple are generally found along watercourses.

Understory vegetation in the western hemlock zone is often indicative of relative site productivity. Along a moisture gradient from driest to wettest, dominant understory species would include oceanspray, salal, rhododendron, Oregon grape, swordfern, and oxalis.

Most of the Cascade Crest area above 300 feet is included in the pacific silver fir zone. Most precipitation falls in the form of snow, with snow packs up to 10 feet in depth being common.

Forest composition in the pacific silver fir zone varies widely depending on stand age, history, and locale. Typical tree species are pacific silver fir, western hemlock, noble fir, Douglas-fir, western redcedar, and western white pine. Engelmann spruce, lodgepole pine, and western larch may also occur in this zone.

Understory vegetation is usually dominated by various species of huckleberry, salal, prince's pine, rhododendron, and pyrola. Bunchberry dogwood, queencup beadlily, dwarf bramble, trailing twinflower, beargrass, and wild violet are also common species. Understory vegetation in the pacific silver fir zone is often a function of the soil moisture regime. Drier sites are occupied by salal, Oregon grape, and rhododendron. Lithosolic (shallow, rocky) sites are often dominated by beargrass. Intermediate sites are occupied by western coolwort, solomonplume, vanilla leaf, and inside-out flower. Devil's club is a common inhabitant of wet areas.

The mountain hemlock zone is the highest forested vegetative zone along the eastern slope of the Cascade Range. Elevations range between 4000 to 6000 feet. This zone is the coolest and wettest of the forested zones in Western Oregon. Major tree species include mountain hemlock in old growth stands, and subalpine fir and lodgepole pine in seral stands. Other important species include pacific silver fir, Douglas-fir, and western white pine.

Understory vegetation is dominated by several species of huckleberry, especially red huckleberry, beargrass, pyrola, dwarf bramble, and rhododendron. In areas of shallow soils, the understory is almost completely dominated by beargrass.

Forest development in this zone is slow because of the harsh environment. On sites that have been burned, early successional stages are dominated by fire tolerant species.

The ponderosa pine zone is found in a narrow band at the extreme eastern edge of the Forest. This zone is characterized by a short growing season, minimal summer precipitation, and large diurnal temperature fluctuations.

Ponderosa pine occurs on the driest sites on the Forest and its distribution is closely correlated with moisture availability. Vegetative composition within ponderosa pine stands varies widely with geographic location, soils, elevation, aspect, and successional status.

Ponderosa pine is the major tree species in this zone. It is generally found in association with Oregon oak, as well as quaking aspen. Understory vegetation is variable with major species being bitterbrush, snowberry, spirea, and wild rose. Common groundcover species include pine grass, elk sedge, bluebunch wheatgrass, Idaho fescue, heartleaf arnica, and arrow-leaf balsamroot.

The Douglas-fir zone is not nearly as dry as the ponderosa pine zone. Temperatures are milder and annual precipitation is higher.

Major tree species in this zone include Douglas-fir, ponderosa pine, lodgepole pine, and western larch. Oregon oak may also occur in minor amounts. Understory dominants include bitter-brush, serviceberry, snowberry, oceanspray, spirea, and ninebark. Major groundcover species include pinegrass, bluebunch wheatgrass, elk sedge, and heart-leaf arnica.

The grand fir zone is the most extensive midslope forest zone in the Oregon Cascade Range. This zone is found between 3000 and 4500 feet elevation and provides the most moderate environmental conditions of any eastside forest zone. Neither moisture nor temperature are extreme and precipitation is generally higher and temperature lower than in lower forested zones.

Major tree species in this zone are grand fir, ponderosa pine, lodgepole pine, western larch, and Douglas-fir. Understory dominants include wild rose, myrtle boxwood, wild currant, and huckleberry. Ground cover consists of bedstraw, arnica, hawksbeard, trailing twinflower, anenome, trillium, and lupine.

# GEOLOGY

Most of the Mt. Hood National Forest is located within the Cascade Mountain Range. The Cascade Range is a north/south chain of volcanic peaks sloping west to the Willamette River Valley and east to the Deschutes River Valley. The most prominent peak on the Forest is Mt. Hood with a summit of 11,235 feet. The width of the Cascade Range at Mt. Hood is about 60 miles. In other areas of the State, the width varies from 30 to 70 miles.

The topography of the Mt. Hood National Forest has been formed by a sequence of volcanic eruptions, uplifting, bedrock deformations, weathering and erosion; more volcanic eruptions, glaciation, and finally, more weathering and erosion. These geologic processes have left behind a mixed and highly varied combination of bedrock covered by equally varied surficial materials.

The Cascade Range is divided into two major geologic provinces: the geologically young High Cascades Province and the older Western Cascades Province. Figure 4 shows the Forest boundary and the approximate limits of the High Cascades and Western Cascades Provinces. About 70 percent of the Forest is represented by High Cascades geology. A small area, about 20 percent, in the southwest corner of the Forest, is represented by Western Cascades geology. Another small area in the northeast corner of the Forest along the Columbia Gorge, is represented by Columbia River Basalts and associated sedimentary deposits. Figure 5 is an east/west cross-section through the Forest showing the major bedrock formations and the division between the High and Western Cascades.

## COMMON GEOLOGIC MATERIALS

All of the many geologic materials on the Forest can be placed into two main groups: surficial materials or bedrock. Bedrock is the naturally occurring undisturbed rock which is either exposed at the surface or covered by surficial materials. Surficial materials can either be transported to a site from some other area, or they may be formed in place from the products of physical and chemical rock weathering.

TABLE 1 Precipitation Distribution for Nine Recording Stations on or Near the Mt. Hood National Forest

| Station | Mean An Precip (") | Ele-vation | Precipitation Distribution* Percent of Mean Annual Precipitation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep | Oct | Nov | Dec |
| Government Camp | 86.24 | 3980 | 14 | 12 | 12 | 9 | 7 | 6 | 1 | 2 | 4 | 9 | 11 | 13 |
| Friend | 15.76 | 2440 | 17 | 13 | 9 | 4 | 6 | 5 | 1 | 1 | 4 | 8 | 15 | 17 |
| Parkdale | 45.01 | 1940 | 21 | 12 | 12 | 6 | 4 | 3 | 0 | 1 | 2 | 8 | 14 | 17 |
| Dufur | 12.47 | 1330 | 22 | 12 | 11 | 4 | 8 | 7 | 1 | 2 | 4 | 7 | 11 | 13 |
| Detroit | 87.86 | 1300 | 16 | 11 | 11 | 8 | 5 | 3 | 1 | 2 | 4 | 8 | 15 | 16 |
| Three Lynx | 72.93 | 1120 | 17 | 11 | 12 | 7 | 6 | 4 | 1 | 1 | 3 | 9 | 13 | 16 |
| Portlnd Hdwrks | 83.05 | 748 | 16 | 9 | 12 | 7 | 7 | 6 | 1 | 2 | 4 | 9 | 12 | 14 |
| Oregon City | 48.0 | 167 | 19 | 11 | 11 | 6 | 6 | 4 | 1 | 2 | 4 | 9 | 13 | 15 |
| Bonneville Dam | 78.85 | 60 | 17 | 10 | 12 | 7 | 5 | 4 | 1 | 2 | 3 | 10 | 13 | 16 |

*This chart was compiled from data collected during the period from 1967 to 1977.

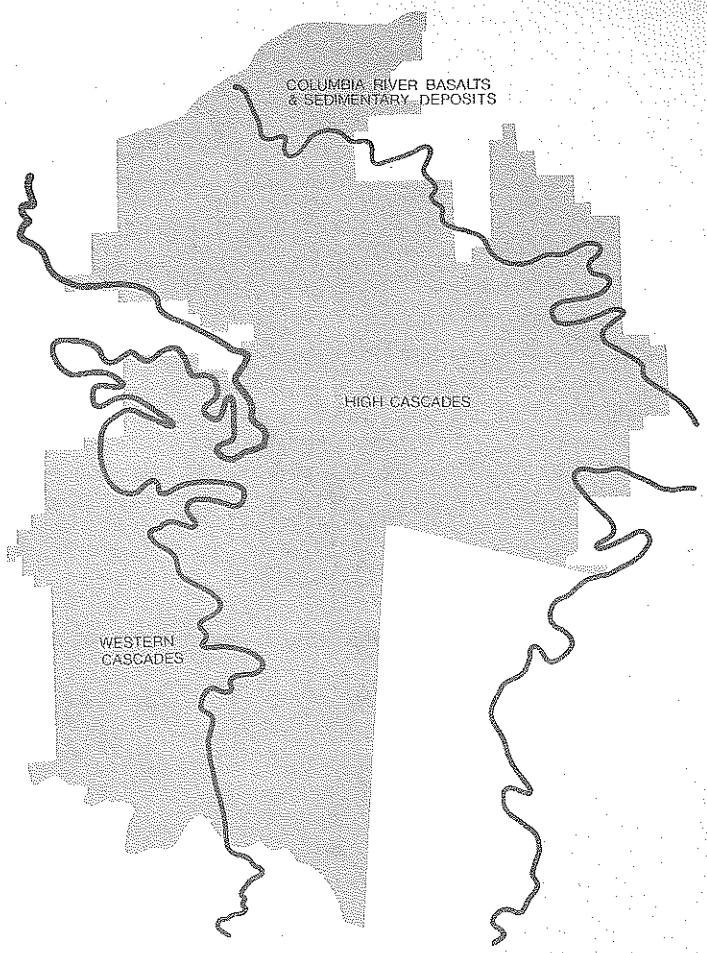



FIGURE 4 Forest/Geologic Boundaries

## BEDROCK

The predominant rock types are volcanics and their weathered or altered products. Lava flows and pyroclastic rocks make up most of the bedrock in the Forest. These rocks include andesites, basalts, tuffs, tuff breccia and breccias. Other less common formations of rock are sills, dikes and bedded sediments.

Tuffs and Breccias: Tuffs and breccias are pyroclastic rocks formed from volcanic material that has been explosively or aerially ejected from a volcanic vent. The thickness of these deposits is highly variable, ranging from a few inches to tens of feet. They commonly occur interbedded with flow rocks. If the rock is formed from compacted ash particles which are less than 4 millimeters in diameter, it is called a tuff. Breccias are composed of a mixture of larger, more angular rock fragments in a matrix of fine-grained ash.

The tuffs and breccias weather more rapidly and more completely than do the flow type rocks. Tuffs and breccias weather into residual soils which have textures of silt loams, silty clay loams, clay loams, and silty clays. These are some of the more troublesome subsurface materials on the Forest in terms of construction activities. Many of the larger landslide areas are underlain by weak and unstable residual soils weathered from tuff and breccia. Figure 6 shows an exposure of weathered flow breccia on the Estacada Ranger District.

Andesites and Basalts: Andesites and basalts are extrusive igneous rock formed from cooling molten lava as it flowed over the land surface. These rocks comprise a major portion of the Forest bedrock and weathered overburden.

The andesites and basalts are more fine-grained and more resistant to weathering than tuffs and breccias. Landsliding and unstable ground is much less common in the andesites and basalts. Andesites and basalts generally make good sources for crushed rock. Fresh, unweathered andesites and basalts range in color from lighter gray to very dark gray. Soils weathered from andesites and basalts vary in color from a light tan or yellow tan to brown. Figures 7 and 8 show typical exposures of andesites and basalts.

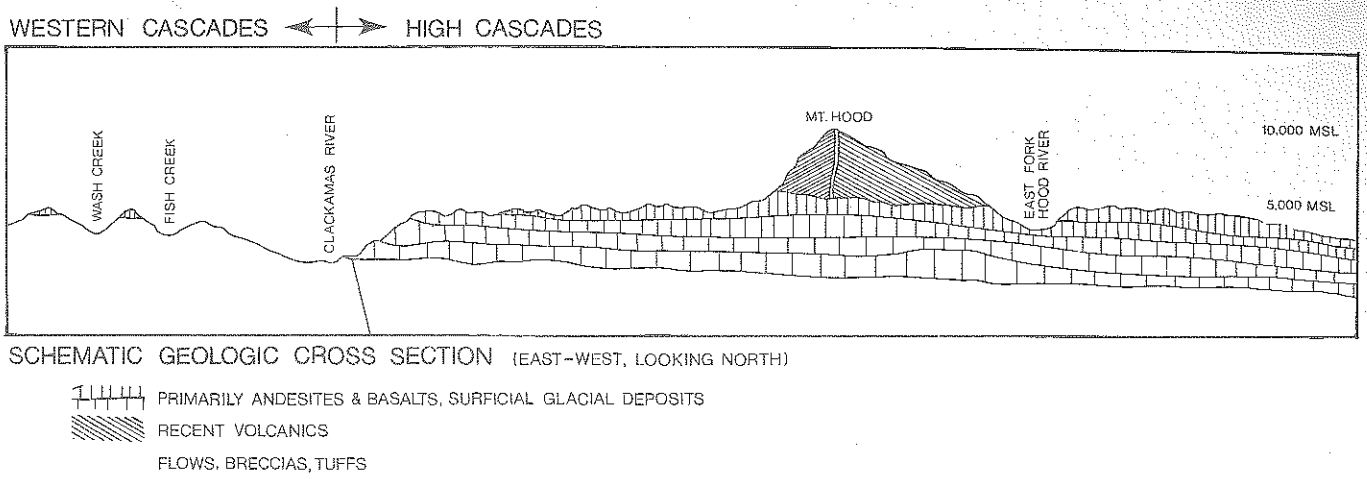



FIGURE 5 East-West Geologic Cross Section

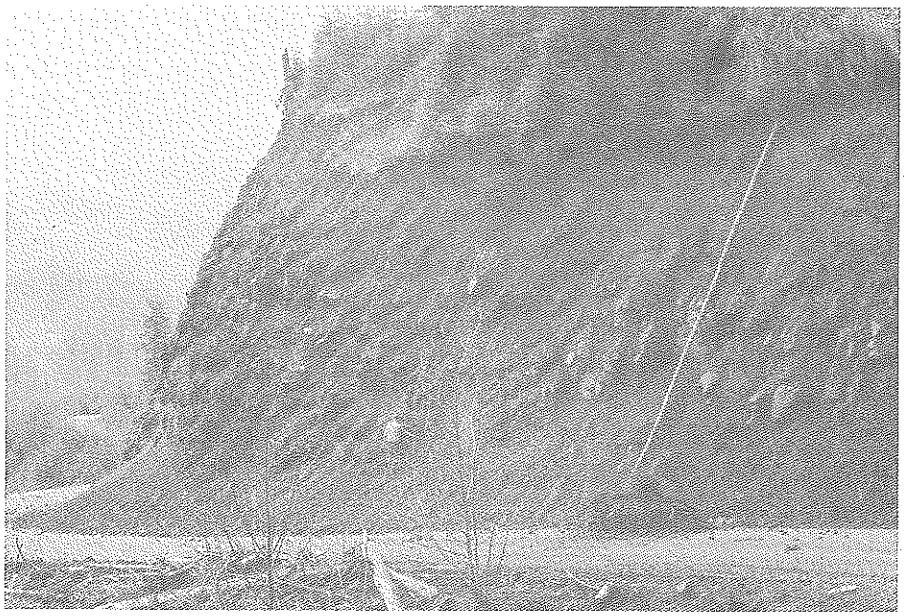


FIGURE 6 Weathered Flow Breccia (Along S-562, Fish Creek Drainage, Estacada Ranger District)

Intrusive Igneous Rocks: Intrusive igneous rocks are formed when molten rock cools below the surface of the earth. The chemical composition of the intrusive rocks can be very similar to the surface volcanics as they are both formed from the same molten rock. Exposures of these rock types are limited mainly to the Western Cascade Province where they have been exposed by erosion.

Dikes are intrusive rock injected across other rock layers or formations. Although these formations may be small in areal extent, they may have significant impacts on terrain stability.

Bedded Sediments: Bedded sediments are uncommon on the Forest but can be found in the Bull Run area of the Columbia Gorge Ranger District. This rock type was formed by the deposition of windblown silts in old glacial lakes. Figure 9 shows a typical exposure of bedded sediments composed of fine-grained silty clays.

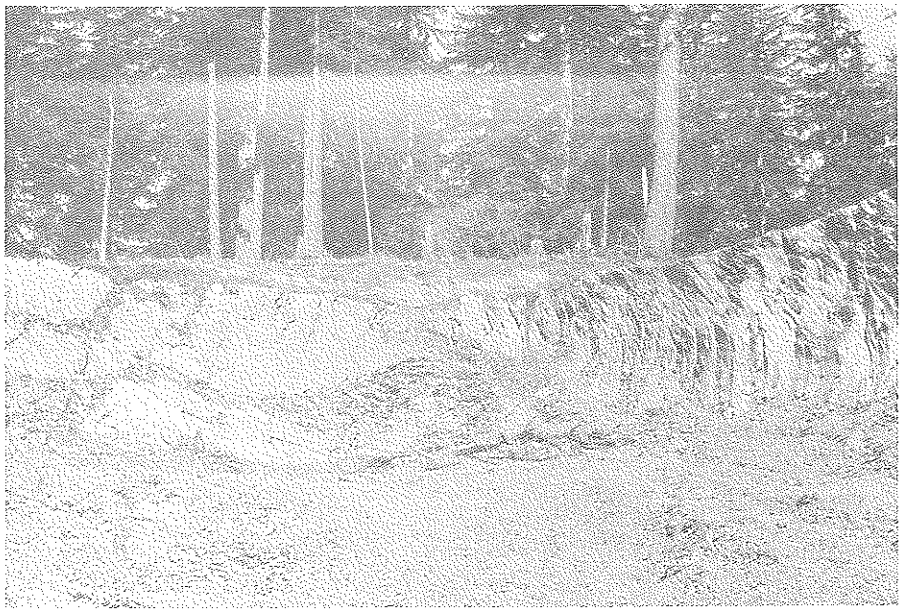


FIGURE 7 Andesite Rock Pit (Columbia Gorge Ranger District)

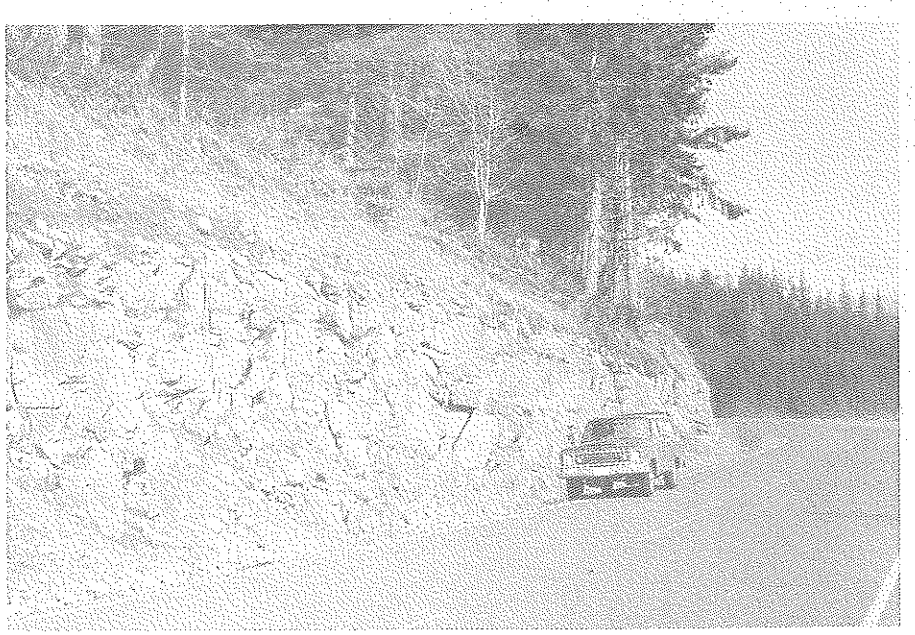


FIGURE 8 Columbia River Basalt (Along S-10 in Bull Run Watershed, Columbia Gorge Ranger District)

## SURFICIAL MATERIALS

The thickness of unconsolidated surficial material varies from nothing in areas of exposed bedrock to as much as 100 feet. Surficial materials are generally characterized by their origin. Major groups of surficial materials on the Forest include residuum, glacial deposits, alluvium, colluvium, and eolian deposits.

Residuum: Residuum is material that is formed in place by the physical and chemical weathering of bedrock. Residual soils formed in materials weathered from andesites and basalts are usually medium to coarse-textured and well drained. Soils formed from materials weathered from tuffs and breccias are usually more fine-grained and may be poorly drained in places.

Glacial Deposits: Glacial deposits are those materials that have been transported to their present location either directly by glacial ice or by the melt-water from glaciers. Glacial deposits are classified according to the method of their deposition. Figure 10 shows a glacial deposit along Highway 35 on the Hood River Ranger District.

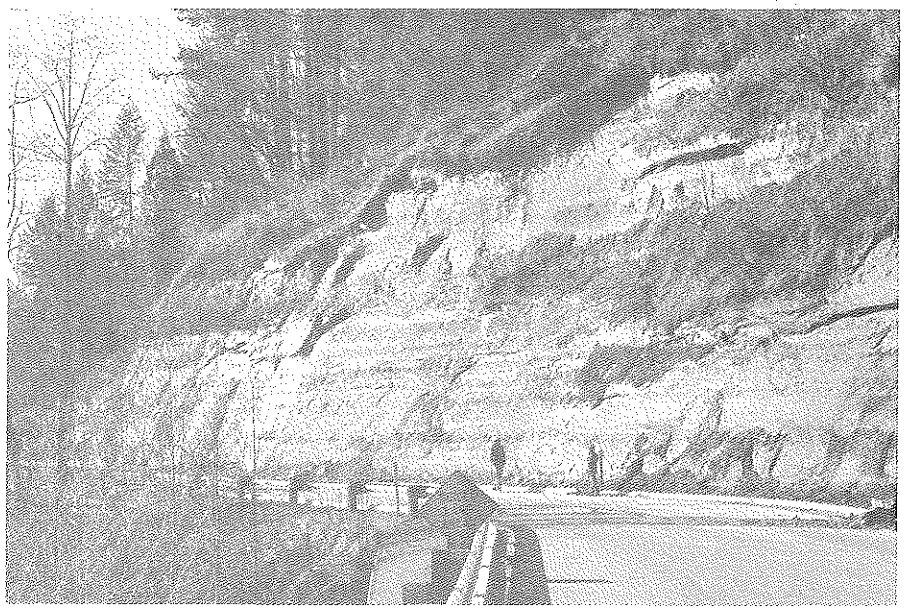


FIGURE 9 Lacustrine Bedded Sediments (Along S-10 in Bull Run Watershed, Columbia Gorge Ranger District)

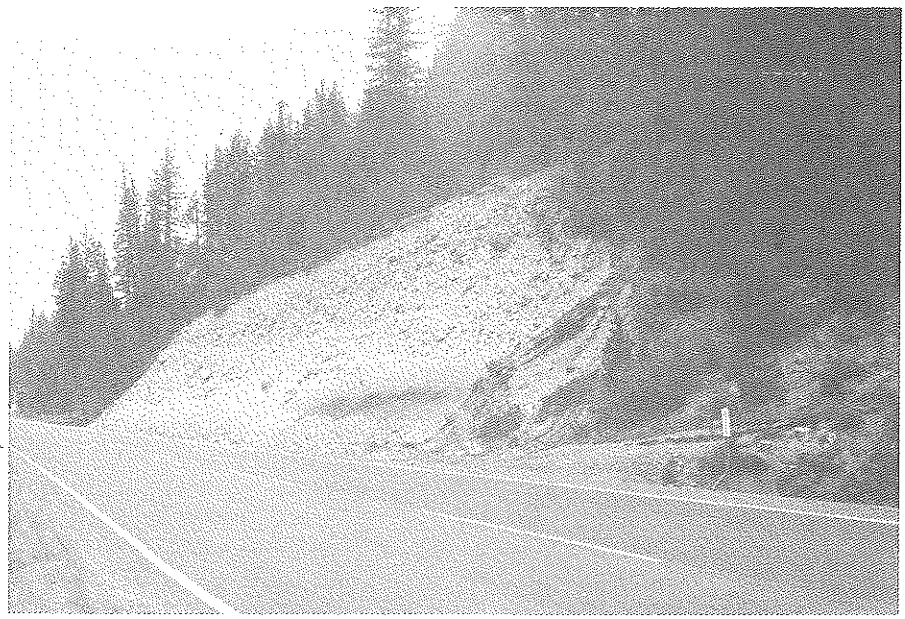


FIGURE 10 Glacial Deposit (Along Highway 35, Hood River Ranger District)

Glacial till refers to materials deposited directly by ice with little or no transportation by water. It is generally an unconsolidated, unstratified, compact mixture of clay, silt, sand, gravel, stones, and boulders.

Glacial outwash refers to materials swept out, sorted, and redeposited by water that originated from the melting of glacial ice. These deposits differ from till, in that they are stratified or have variations in texture throughout their profiles.

Moraines are deposits of unsorted materials that have been pushed ahead of glacial ice and redeposited in other locations.

Alluvium: Alluvium is material that has been deposited or is being transported by streams. Alluvium consists of gravel, sand, silt, clay, and all variations and mixtures of these. This material is often very similar to outwash, in that, it is also stratified.

Colluvium: Colluvium is material that has been moved downslope by gravitational forces in the form of soil creep and slides. Colluvium generally consists of large percentages of coarse rock fragments in a finer-textured matrix.

Eolian Deposits: Eolian deposits consist of materials that have been transported and redeposited by wind. Loess is an example of an eolian deposit. Soils formed in eolian deposits are commonly fine to medium-textured.

## DRAINAGE AND RIVERS

Because of the complex geology and surficial materials, there are a wide variety of drainage patterns on the different Ranger Districts. These patterns are controlled more by the structural geology than the surficial materials as varied drainage patterns are found in geologically similar materials.

## GROUNDWATER

The young volcanic rocks of the Cascades are some of the better water-storing formations in the state. Groundwater occurs just about everywhere at depths ranging from the ground surface to more than 100 feet. Even so, yields from wells in the volcanic rocks are not usually very high unless the rock is highly jointed and fractured. Higher yields are generally found in the gravel deposits found in stream and river valleys.

## LANDFORMS

Landform refers to the structural configuration of the earth's surface as a result of past and present geologic activity as modified by erosional processes. Landforms include broad features such as mountains, plains, and plateaus and also minor features such as hills, valleys, slopes, canyons, and alluvial fans. These features are generally the products of erosion, including glaciation, but also include forms due to sedimentation and movement of the earth's surface.

Knowledge of landforms is important as it gives an insight as to how soils have been formed. Landforms also dictate to a great extent the kinds of management activities that can be carried out in a given area.

Westside Ranger Districts are characterized by moderately steep to steep slopes. Areas underlain by andesites and basalts are not so intensely dissected by drainages as are areas underlain by tuffs and breccias.

On the eastside of the Forest, slopes are more gentle and drainage dissection is not so intense. This feature is a result of the uniform nature of the underlying bedrock.

This section is the first of several which constitute the main body of the Soil Resource Inventory Report. Arrangement of the section is in the following order:

Explanation of mapping unit description page arrangement
List of mapping unit complexes and their composition
Miscellaneous landtype descriptions
Mapping unit descriptions

The description of each mapping unit has been placed on a single page to make reference simple and quick. On each page, similar types of information are arranged in the same location.

The box opposite the mapping unit number stresses the importance of recognizing that each mapping unit represents a unique soil-site relationship. This box also contains a statement defining the most common inclusions in the mapping unit.

The four small boxes grouped together give the environmental setting characteristics of the mapping unit. The vegetation box contains examples, by common name, of the major constituents in the overstory, understory, and ground cover vegetative layers. The vegetative zone heading is based on the climax communities identified in natural vegetation of Oregon and Washington by Jerry F. Franklin and C. T. Dyrness, 1973.

The Geology box contains a heading naming the major rock or parent material type. A brief description of the geology is found under this heading. A list of sources of geologic information is found in the list of selected references.

The Climate box contains three types of information, average annual precipitation, soil temperature class, and mean annual soil temperature. Source of precipitation data is in isohyetal map prepared by Gene Tomlin, Hydrologist, Mt. Hood National Forest.

Soil temperature is based on temperature measurements made by Jack Parcell, Soil Scientist, Mt. Hood National Forest in 1974 through 1977.

The Topography box describes the range of slopes that characterize the mapping unit. Relative amount of dissection, if important, appears below the slope range. Aspect or exposure relative to compass directions are given if relevant. Range of elevation above mean sea level in which the mapping unit occurs is given in both English and Metric Units.

The Management box gives a short general statement concerning the proper use and management of the mapping unit.

The large box at the bottom contains the range of soil profile characteristics. At least two profile descriptions were used to develop the range.

The litter or duff layer is the mat of plant residues lying on the mineral soil surface. It consists of decomposed, partly decomposed, and fresh organic matter. Its major constituents and range of thickness are noted.

The surface layers are the uppermost mineral layers or soil horizons ranges of the most important properties are given. Dominant moist soil color is given first. It is followed by texture, structure, rock fragment content (if observed), consistence, pH, and thickness of the layer or layers.

The subsoil layers occur below the surface soil layers. Ranges of subsoil characteristics are given in the same order as for the surface soil layers.

One profile is selected as a model site. Its location is noted below the range of soil profile depth. The classification of each soil based on Soil Taxonomy Ag. Handbook 436, 1975. Due to the extensive nature of this inventory, definitive soil series designations have not been made.

The following is a list of standard terms used in soil profile descriptions and their definitions. It is hoped that these will prove useful as the reader uses the mapping unit descriptions.

Figure 11 is a graph showing the percentages of sand, silt, and clay in the various soil textural classes.

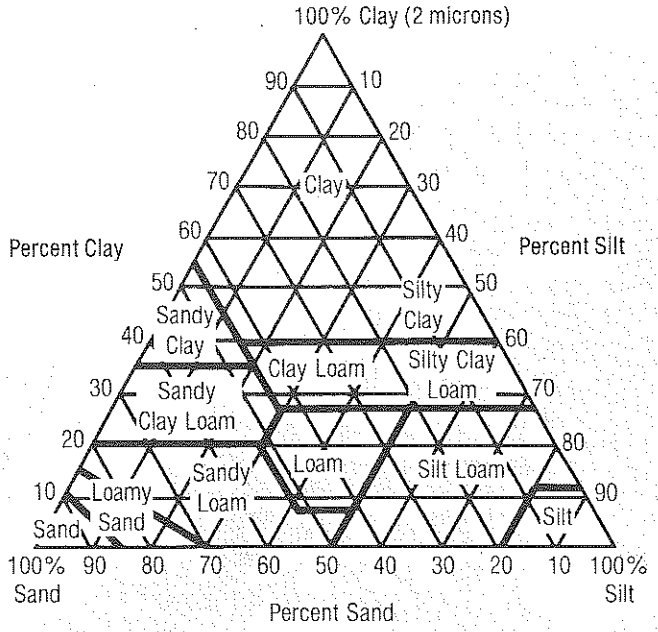



FIGURE 11 Graph showing the percentages of sand, silt, and clay in the soil classes.

## TEXTURE

Soil texture refers to the relative proportions of sand (2.0 mm–0.05 mm), silt (0.05 mm–.002 mm) and clay (less than .002 mm). Standard USDA textural classes are used for each soil layer.

Textural Classes

| | |
|---|---|
| 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 |

Each of these textural classes can be further modified to reflect the amount of coarse fragments (greater than 2.0 mm) present in the soil. For instance a silt loam soil with 20 percent gravel content would be termed a gravelly silt loam.

## STRUCTURE

Structure is described by grade or distinctness, size and type. Terms are used to describe natural aggregates in the soil called peds, in contrast to clods caused by disturbance, fragments caused by rupture of peds and concretions by local concentrations of compounds that irreversibly cement the soil particles together.

## GRADE

| | |
|---|---|
| Massive | no aggregation |
| Single grain | no aggregation |
| Weak | peds barely observable in place, and when disturbed, few entire peds are observed, much of the soil material being unaggregated |
| Moderate | peds easily observable but not distinct in place, and when disturbed, many entire peds are observed and little unaggregated material |
| Strong | peds are distinctly visible in place, and when disturbed, nearly the entire mass consists of entire peds |

## TYPE

There are six types of structure each with its own distinctive shape and arrangement.

| | |
|---|---|
| Granular | approximately spherical with no accommodation of faces to surrounding peds |
| Platy | vertical dimension small with respect to horizontal dimensions, faces accommodate with those of adjacent peds |
| Prismatic | vertical faces well defined and with angular vertices, vertical length relatively long with respect to horizontal dimensions, without rounded tops, faces accommodate with adjacent peds |
| Columnar | similar to prismatic but with rounded tops |
| Angular blocky | blocklike with all three dimensions of the same magnitude, faces flattened, most vertices sharply angular, faces accommodate with those of adjacent peds |
| Subangular blocky | similar to angular blocky but both rounded and flattened faces occur with many rounded vertices |

## CONSISTENCE

Consistence is a measure of the property of a soil to adhere to cohere to resist deformation or rupture. This property varies with moisture content and is measured when the soil is dry, moist, and wet.

Dry Consistence

Loose ..... no adherence of individual soil particles
Soft ..... peds crush under gentle pressure
Slightly hard ..... peds crush easily under gentle to moderate pressure between thumb and forefinger
Hard ..... peds can be broken in the hands without difficulty but difficult to break between thumb and forefinger
Very hard ..... peds can be broken in hands with difficulty
Extremely hard ..... peds cannot be broken in hands

Moist Consistence

Loose ..... no adherence of individual soil particles
Very friable ..... peds crush under gentle pressure
Friable ..... peds crush easily under gentle to moderate pressure between thumb and forefinger
Firm ..... peds crush under moderate pressure between thumb and forefinger but resistance is distinctly noticeable
Very firm ..... peds crush under strong pressure, barely crushable between thumb and forefinger
Extremely firm ..... peds crush under very strong pressure, cannot be crushed between thumb and forefinger

Wet Consistence

Stickiness is measured by pressing the wet soil between the thumb and forefinger and noting its adherence.

Nonsticky ..... practically no adherence when pressure is released
Slightly sticky ..... after pressure, soil adheres to both thumb and finger but comes off one rather cleanly; does not appreciably stretch
Sticky ..... after pressure, soil adheres to both thumb and finger 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 the wet soil between the thumb and finger and observing whether or not a wire or a thin rod can be formed.

Nonplastic ..... no wire is formed
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

# MAPPING UNITS 1-15

Mapping Units 1 through 15 are referred to as miscellaneous landtypes because they are limited in extent or variable in composition. The concept of each unit is described by a short statement in the boxes on the following pages.

## FRESH SANDS AND GRAVELS 1

This mapping unit consists of fresh, unweathered or nearly unweathered sands and gravels. Most of these deposits are found on the flanks of Mt. Hood but they can also be found in some of the major river drainages.

## UNSTABLE SIDESLOPES ADJACENT TO MAJOR DRAINAGEWAYS 2

This mapping unit consists of steep, unstable to very unstable sideslopes along some of the major streamcourses on the Forest. Soils are extremely variable but textures are usually clay loams, silty clay loams, and clays. Soil horizons are not well defined as a result of continuous soil movement. This soil unit, although plagued by stability problems, does produce high quality timber.

## WET MEADOWS 3

This mapping unit consists of depressional areas that are seasonally or permanently ponded. The soils are slowly permeable and imperfectly to poorly drained. Vegetation consists of rushes, sedges, grasses, willows, and western redcedar.

## POORLY DRAINED FORESTED BOTTOMLANDS 4

This mapping unit also consists of depressional areas that have permanent or seasonally high water tables. The soils are slowly permeable and imperfectly to poorly drained. Vegetation consists of western redcedar, lodgepole pine, Engelmann spruce, western hemlock, willows, sedges, and rushes.

## PYROCLASTIC ROCK OUTCROP 5

This mapping unit consists of large exposed outcrops of tuffs and breccias. The rock is generally soft and incompetent. This unit may also include some areas of shallow soils.

## UNVEGETATED TALUS AND RUBBLELAND 6

This mapping unit consists of fallen rock fragments of all sizes which occur at the foot of steep rock slopes and headwalls. The unit is devoid of vegetation except for mosses and lichens.

IGNEOUS ROCK OUTCROP 7

This mapping unit consists of large exposed outcrops of basalts and andesites. The rock is generally hard and competent. This unit may also include some areas of shallow soils.

DRY MEADOWS 8

This mapping unit consists of areas of shallow loamy soils on convex slopes which are devoid of trees. Vegetation consists of sagebrush, rabbitbrush, bluebunch wheatgrass, Idaho fescue, and cheatgrass. Slopes range between 5 and 60 percent.

HIGH ELEVATION CIRQUES AND GLACIALLY SCOURED AREAS 9

This mapping unit consists of vegetated and unvegetated talus, shallow stony soils, marshy areas, and rock outcrop found in old glacial cirques. Ponds and small lakes may also be present.

RECENT, NEARLY UNVEGETATED LAVA FLOWS 10

This mapping unit consists of recent lava flows. Most of this unit is composed of large angular rock fragments with little or no soil material being present. Some scattered Douglas-fir may be found.

ALLUVIAL BOTTOMLANDS 11

This mapping unit is highly variable. It is usually dominated by boulders, stones, and gravels with minor amount of fines. Some areas may be relatively fine-textured, dominated by large amounts of silts.

WET TALUS 12

This mapping unit consists of fallen rock fragments of all sizes wich occur at the foot of steep rock slopes and headwalls. Because of water moving through this material, it does support some shrubby vegetation. Vegetation consists primarily of sitka alder, devils' club, mosses, and lichens.

FELSENMEER SLOPES 13

This mapping unit consists of 1 to 2 feet of talus material overlying deep gravelly and sandy loam soil material. Although these areas presently support trees, regeneration potential is extremely low. Vegetation consists of Douglas-fir, mountain hemlock, noble fir, rhododendron, and huckleberry.

PERPETUAL SNOW AND ICE 14

This mapping unit consists of areas of perpetual snow and ice such as glaciers on the flanks of Mt. Hood and Mt. Jefferson.

STEEP TO VERY STEEP, UNSTABLE DRAINAGEWAYS 15

This mapping unit consists of extremely variable soils as a result of active landslides and debris avalanches. In some areas, soil may be wholly lacking. This soil unit may produce Site Class 1 and 2 Douglas-fir.

## MAPPING UNIT

This Mapping Unit consists of Soil 100 and inclusions of Soils 2, 4, 15, 101 and 102. It is mapped on nearly level to gently sloping, slightly uneven benches along the Clackamas and Collawash Rivers.

## 100

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas fir, western hemlock, western redcedar
Understory: Vine maple, Oregon grape, salal, wild rose
Groundcover: Swordfern, vanilla leaf, mosses

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from hard to very soft and weathers rapidly to fine-textured soil material.

## CLIMATE

Precipitation: 60 to 80 inches, 1524 to 2032 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 500 to 1800 feet, 167 to 600 meters

## MANAGEMENT

Soil 100 is one of the more productive soils on the Forest. It has a relatively high fertility level and retains moisture throughout the growing season. This soil type is highly susceptible to compaction so ground skidding should be avoided if possible. This unit produces Site Class 2 and 3 Douglas-fir.

## SOIL 100

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed conifer needles and twigs. Totally decomposed, black organic matter. 1 to 3 inches thick.
Surface Layers: Dark yellowish brown to dark brown heavy loam to silty clay loam; weak, fine subangular blocky structure parting to strong, very fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; 5 percent coarse fragments; pH ranges between 5.0 and 6.0. 18 to 14 inches thick.
Subsoil Layers: Dark grayish brown to pale brown silty clay; moderate, medium to coarse subangular blocky structure; hard to very hard, friable to very firm, sticky and plastic; 10 percent coarse fragments; pH ranges between 5.0 and 5.5. 30 to 36 inches thick.
Substrata: Yellowish brown to pale brown and brownish red silty clay; some unweathered breccia chips; hard to very hard, friable to very firm, sticky and plastic, 35 percent coarse fragments.
Range of Soil Depth: 55 to 70 inches. Depth to bedrock is 8 to 20 feet.
Modal Site Location: SW 1/4, SE 1/4 Sec. 14 T. 6S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, fine-silty, mixed, mesic. Andic Haplumbrepts, fine-silty, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 101 and inclusions of Soils 2, 5, 15, 100 and 102. This unit is mapped on steep, slightly uneven to dissected slopes along the Clackamas and Collawash Rivers.

## 101

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas fir, western hemlock, western redcedar
Understory: Vine maple, Oregon grape, salal, wild rose
Groundcover: Swordfern, vanilla leaf, mosses

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from hard to very soft and weathers rapidly to fine-textured soil material.

## CLIMATE

Precipitation: 60 to 80 inches, 1524 to 2032 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 30 to 60 percent, moderately dissected
Aspect: North and East
Elevation: 500 to 1800 feet, 167 to 600 meters

## MANAGEMENT

Soil 101 is also a very productive soil because of a high moisture holding capacity and relatively high fertility level. Because of steep slopes, stability problems, and high erosion hazard, log-to-ground contact should be avoided during timber harvest operations if possible. This unit produces Site Class 2 Douglas-fir.

## SOIL 101

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed conifer needles and twigs. 1/2 to 2 inches thick.
Surface Layers: Dark yellowish brown to dark brown heavy loam to silty clay loam; weak, fine, subangular blocky structure parting to strong very fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; 10 to 15 percent coarse fragments; pH ranges between 5.5 and 6.0. 12 to 17 inches thick.
Subsoil Layers: Dark grayish brown to dark reddish brown silty clay; moderate, medium to coarse subangular blocky structure; hard to very hard, friable to very firm, sticky and plastic; 10 to 15 percent coarse fragments; pH ranges between 5.5 to 6.0. 21 to 30 inches thick.
Range of Soil Depth: 41 to 65 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 14 T. 9S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, fine-silty, mixed, mesic. Andic Haplumbrepts, fine-silty, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 102 and inclusions of Soils 2, 5, 15, 100 and 101. This unit is mapped on steep, slightly uneven to dissected slopes along the Clackamas and Collawash Rivers.

## 102

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas fir, western hemlock, western redcedar
Understory: Vine maple, Oregon grape, salal, wild rose
Groundcover: Swordfern, vanilla leaf, mosses

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from hard to very soft and weathers rapidly to fine-textured soil material.

## CLIMATE

Precipitation: 60 to 80 inches, 1524 to 2032 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 30 to 60 percent, moderately dissected
Aspect: South and West
Elevation: 500 to 1800 feet, 167 to 600 meters

## MANAGEMENT

Soil 102 is also a very productive soil because of a high moisture holding capacity and relatively high fertility level. Because of steep slopes, stability problems, and high erosion hazard, log-to-ground contact should be avoided during timber harvest operations if possible. This unit produces Site Class 3 and 4 Douglas-fir.

## SOIL 102

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed conifer needles and twigs. 0–2 inches thick.
Surface Layers: Dark yellowish brown to dark brown heavy loam to silty clay loam, weak, fine, subangular blocky structure parting to strong, very-fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; 15 to 20 percent coarse fragments; pH ranges between 5.0 and 5.5. 11 to 18 inches thick.
Subsoil Layers: Dark grayish brown to dark reddish silty clay, moderate, medium to coarse subangular blocky structure; hard to very hard, friable to very firm, sticky and plastic; 10 to 15 percent coarse fragments; pH ranges between 5.5 to 6.0. 20 to 30 inches thick.
Range of Soil Depth: 41 to 65 inches. Depth to bedrock is 5 to 7 feet.
Modal Site Location: NE 1/4, NE 1/4 Sec. 22 T. 6S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, fine-silty, mixed, mesic. Andic Haplumbrepts, fine-silty, mixed, mesic. Andic Haplumbrepts, coarse-silty, mixed, mesic. Andic Dystrochrepts, fine-silty, mixed, mesic.

## MAPPING UNIT

103

This Mapping Unit consists of Soil 103 and inclusions of Soils 2, 3, 5, 15, 101 and 102. This unit is mapped on nearly level to steep, uneven to dissected slopes along the Clackamas River.

## VEGETATION

WESTERN HEMLOCK ZONE

Overstory: Douglas fir, western hemlock, noble fir.
Understory: Vine maple, huckleberry, service berry, blackberry, California hazel.
Groundcover: Bracken fern, inside-out flower, trailing twinflower.

## GEOLOGY

PYROCLASTIC ROCK FORMATION

Bedrock for this mapping unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from hard to very soft and weathers rapidly to fine-textured soil material.

## CLIMATE

Precipitation: 90 to 110 inches, 2286 to 2794 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 10 to 60 percent
Aspect: All aspects
Elevation: 500 to 2000 feet, 167 to 666 meters

## MANAGEMENT

Soil 103 is highly productive. However, this soil unit is extremely unstable so care should be taken in all management activities. This unit is also adjacent to major streamcourses and can contribute heavily to suspended sediment loads. This unit produces Site Class 2 and 3 Douglas-fir.

## SOIL 103

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially decomposed Douglas-fir and western hemlock needles, twigs, and cones. 1/2 to 1-1/2 inches thick.
Surface Soil Layers: Grayish brown to very dark grayish brown silty clay loams and silty clays; strong, fine and very fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; pH ranges between 4.5 to 5.5. 10 to 18 inches thick.
Subsoil Layers: Brown to dark yellowish brown silty clay loams and silty clays; massive parting to weak, medium subangular blocky structure; hard to very hard, firm to very firm, sticky and plastic; pH ranges between 4.5 and 5.5. 40 to 60 inches thick.
Range of Soil Depth: 55 to 80 inches. Depth to bedrock is 8 to 20 feet.
Modal Site Location: NE 1/4, NW 1/4 Sec. 11 T. 5S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, clayey, mixed, mesic. Typic Eutrochrepts, clayey, montmorillonitic, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 104 and inclusions of Soils 3, 15, 105 and 106. This unit is mapped on nearly level to sloping, smooth to slightly uneven mountain slopes in the upper Clackamas and Collawash River Basins.

## 104

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas fir, noble fir, western hemlock, western redcedar.
Understory: Rhododendron, Oregon grape.
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive deposits of tuffs and tuffaceous breccias. This rock formation ranges from moderately hard to hard and weathers rapidly to fine-textured soil material.

## CLIMATE

Precipitation: 90 to 110 inches, 2286 to 2794 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 1800 to 3300 feet, 600 to 1100 meters

## MANAGEMENT

This mapping unit produces an average amount of timber. Because of cooler soil temperatures, it has a shorter growing season than previously described mapping units. Although the topography of this unit is suitable for ground skidding, a high compaction hazard does exist. This unit produces Site Class 4 and 5 Douglas-fir.

## SOIL 104

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles of Douglas-fir and noble fir: 2 to 3 inches thick.
Surface Soil Layers: Very dark gray to dark grayish brown cobbly sandy loams to cobbly silt loams; weak, fine subangular blocky structure parting to strong, fine granular structure; soft, friable, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 5.0 and 5.5. 8 to 15 inches thick.
Subsoil Layers: Brown to yellowish brown cobbly clay loams and cobbly silty clay loams; moderate to fine to medium subangular blocky stucture, slightly hard, firm, slightly sticky, slightly plastic; 20 to 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 38 inches thick.
Range of Soil Depth: 60 to 70 inches.
Modal Site Location: SE 1/4, NE 1/4 Sec. 36, T. 6S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, loamy, mixed, frigid. Andic Dystrochrepts, loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 105 and inclusions of Soils 5, 15, 104 and 106. This unit is mapped on steep, uneven to dissected slopes and along the upper Clackamas and Collawash Rivers.

## 105

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas fir, western hemlock, western redcedar.
Understory: Rhododendron, salal, huckleberry, Oregon grape.
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from moderately hard to hard and weathers rapidly to fine-textured soil material. Parent material for soil 105 is colluvium from this bedrock.

## CLIMATE

Precipitation: 90 to 110 inches, 2286 to 2794 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: North and East
Elevation: 1800 to 3300 feet, 600 to 1100 meters

## MANAGEMENT

This mapping unit is a fair producer of timber. Because of steep slopes log-to-ground contact should be avoided during harvest operations. Care should be taken not to create gouges parallel to the slope as these will channel water and form gullies. This unit produces Site Class 4 Douglas-fir.

## SOIL 105

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles of Douglas-fir and noble fir: 1/2 to 1-1/2 inches thick.
Surface Soil Layers: Very dark grayish brown to pale brown gravelly loams and cobbly silt loams; medium, fine, subangular blocky parting to medium very fine granular structure; soft, loose, non-sticky, non-plastic; 30 to 35 percent coarse fragments; pH ranges between 5.0 to 6.0. 25 to 30 inches thick.
Subsoil Layers: Yellowish brown to very pale brown gravelly loams and gravelly silt loams; massive parting to weak medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 35 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 28 inches thick.
Range of Soil Depth: 50 to 65 inches.
Modal Site Location: NE 1/4, NW 1/4 Sec. 31, T. 6S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, loamy, mixed, frigid. Andic Dystrochrepts, loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 106 and inclusions of Soils 5, 15, 104 and 105. This unit is mapped on steep, uneven to dissected slopes and along the upper Clackamas and Collawash Rivers.

## 106

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas fir, western hemlock, western redcedar, noble fir.
Understory: Rhododendron, salal, huckleberry, Oregon grape.
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from moderately hard to hard and weathers rapidly to fine-textured soil material. Parent material for soil 106 is colluvium from this bedrock.

## CLIMATE

Precipitation: 90 to 110 inches, 2285 to 2790 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: South and West
Elevation: 1800 to 3300 feet, 600 to 1100 meters

## MANAGEMENT

This mapping unit is a fair producer of timber. Because of steep slopes and stability problems, log-to-ground contact should be minimized during timber harvest operations. Care should be taken not to create gouges parallel to the slope as these will channel water and form gullies. Regeneration may also be a problem in this unit.

## SOIL 106

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles of Douglas-fir and western hemlock. 1-1/2 to 3 inches thick.
Surface Soil Layers: Very dark grayish brown to pale brown gravelly loams and cobbly silt loams; medium, fine, subangular blocky parting to medium, very fine subangular blocky structure; soft, loose, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 to 6.0. 20 to 25 inches thick.
Subsoil Layers: Yellowish brown to very pale brown gravelly loams and gravelly silt loams, massive parting to weak medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 30 to 40 percent coarse fragments; pH ranges between 5.5 and 6.0. 25 to 32 inches thick.
Range of Soil Depth: 50 to 65 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 19, T. 6S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, loamy, mixed, frigid. Andic Dystrochrepts, loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 107 and inclusions of Soils 3 and 4. This unit is mapped on the nearly level slopes of Ladee Flat.

## 107

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock
Understory: Vine maple, salal, oceanspray, snowberry, huckleberry, trailing blackberry, cascara, wild rose
Groundcover: Sword fern, wild violets

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from hard to very soft and weathers rapidly to fine-textured soil material. In this particular area, the pyroclastic rocks are underlain by hard Columbia River Basalt.

## CLIMATE

Precipitation: 70 to 90 inches, 1175 to 2285 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 48°F, 9°C

## TOPOGRAPHY

Slope: 0 to 20 percent
Aspect: All aspects
Elevation: 1000 to 2000 feet, 330 to 660 meters

## MANAGEMENT

This soil unit is a good producer of timber. The topography is suitable for tractor yarding but a high compaction hazard exists. Some areas with seasonally high water tables may also be subject to damage.

## SOIL 107

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing Douglas-fir needles and twigs. 1/2 to 1-1/2 inches. thick.
Surface Soil Layers: Dark grayish brown to dark yellowish brown loams and silt loams; weak to moderate, medium subangular blocky structure; soft, very friable, non-sticky, non-plastic to slightly hard, firm, slightly sticky, slightly plastic; 10 to 15 percent coarse fragments; pH ranges between 5.5 and 6.0. 13 to 17 inches thick.
Subsoil Layers: Dark yellowish brown to yellowish brown loams and silt loams; moderate, fine to medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 15 to 20 percent coarse fragments; pH ranges between 6.0 and 6.5. 25 to 32 inches thick.
Range of Soil Depth: 45 to 60 inches. Depth to bedrock is 4 to 5 feet.
Modal Site Location: SW 1/4, NW 1/4 Sec. 21, T. 4S., R. 5E.
Estimated U.S.D.A. Soil Classification: Andic Dystrochrepts, loamy, mixed, mesic. Typic Dystrochrepts, loamy, mixed, mesic. Typic Haplumbrepts, fine-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 108 and inclusions of Soils 5, 15, 105 and 106. This unit is mapped on very steep slopes along the Clackamas and Collawash Rivers, and Fish Creek.

## 108

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, noble fir, red alder
Understory: Rhododendron, salal, huckleberry
Groundcover: Trailing twinflower, vanilla leaf

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from moderately-hard to hard and weathers rapidly to fine-textured soil material. Parent material for Soil 108 is colluvium from this bedrock.

## CLIMATE

Precipitation: 70 to 100 inches, 1770 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: South and West
Elevation: 2500 to 4000 feet, 800 to 1300 meters

## MANAGEMENT

This soil unit is characterized by many areas of mass wasting including debris avalanches and debris torrents. Because of this instability, long-span skyline and helicopter yarding would be the least destructive harvest alternatives. Road building in this mapping unit is difficult.

## SOIL 108

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles of Douglas-fir, western hemlock and western redcedar. Some red alder leaves also present. 1/2 to 1-1/2 inches thick.
Surface Soil Layers: Dark grayish brown to brown gravelly silt loams and silt loams; medium, fine subangular blocky, parting to medium, very fine subangular blocky structure; soft, loose, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 to 6.0; 11 to 17 inches thick.
Subsoil Layers: Yellowish brown to very pale brown very gravelly loams and gravelly silt loams; massive, parting to weak, medium, subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 50 to 70 percent coarse fragments; pH ranges between 5.5 and 6.0; 15 to 30 inches thick.
Range of Soil Depth: 35 to 45 inches.
Modal Site Location: NW 1/4, NE 1/4 Sec. 32, T. 6S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, loamy, mixed, frigid. Andic Dystrochrepts, loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 109 and inclusions of Soils 5, 15, 105, 106 and 108. This unit is mapped on very steep slopes along the Clackamas and Collawash Rivers, and Fish Creek.

## 109

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, noble fir, red alder
Understory: Rhododendron, salal, huckleberry
Groundcover: Trailing twinflower, vanilla leaf

## GEOLOGY

PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive deposits of tuffaceous breccia. This rock formation ranges from moderately-hard to hard and weathers rapidly to fine-textured soil material. Parent material for Soil 109 is colluvium from this bedrock.

## CLIMATE

Precipitation: 70 to 100 inches, 1770 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: North and East
Elevation: 2500 to 4000 feet, 800 to 1300 meters

## MANAGEMENT

This soil unit is characterized by many areas of mass wasting including debris avalanches and debris torrents. Because of this instability, long-span skyline and helicopter yarding would be the least destructive harvest alternatives. Road building in this mapping unit is difficult.

## SOIL 109

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles of Douglas-fir, western hemlock and western redcedar. Some red alder leaves also present. 2 to 3 inches thick.
Surface Soil Layers: Dark grayish brown to brown gravelly silt loams and silt loams; medium, fine subangular blocky parting to medium, very fine subangular blocky structure; soft, loose, non-sticky, non-plastic; 35 to 45 percent coarse fragments; pH ranges between 5.0 to 6.0; 11 to 17 inches thick.
Subsoil Layers: Yellowish brown to very pale brown, very gravelly loams and gravelly silt loams; massive parting to weak medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 50 to 70 percent coarse fragments; pH ranges between 5.5 and 6.0; 15 to 30 inches thick.
Range of Soil Depth: 35 to 45 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 3, T. 6S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, loamy, mixed, frigid. Andic Dystrochrepts, loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 110 and inclusions of Soils 5, 12, 13, 15 and 111. This unit is mapped on very steep slopes along Salmon River and Still Creek.

## 110

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, noble fir, western hemlock, western redcedar
Understory: Vine maple, salal, rhododendron
Groundcover: Sword fern, oxalis, beargrass

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive and stratified deposits of tuffaceous breccia. This rock formation ranges from hard to very hard and weathers rapidly on exposure to fine-textured soil material. Parent material for Soil 110 is colluvium from this bedrock.

## CLIMATE

Precipitation: 60 to 80 inches, 1520 to 2039 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: North and East
Elevation: 2000 to 4000 feet, 660 to 1300 meters

## MANAGEMENT

This mapping unit contains some areas of mass wasting including debris avalanches. Because of the steep slopes and instability, long-span skylines and helicopters would be the least destructive yarding methods. Road building in this mapping unit is difficult.

## SOIL 110

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles of Douglas-fir, noble fir and western hemlock. 1 to 2 inches thick.
Surface Soil Layers: Grayish brown to light brownish gray very gravelly loams and gravelly silt loams; medium, fine subangular blocky parting to medium, very fine subangular blocky structure; soft, loose, non-sticky, non-plastic; 20 to 25 percent coarse fragments; pH ranges between 5.5 to 6.5; 8 to 15 inches thick.
Subsoil Layers: Light gray to very pale brown very gravelly loams and gravelly silt loams; massive parting to moderate, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0; 10 to 25 inches thick.
Range of Soil Depth: 10 to 40 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 19, T. 3S., R. 7E.
Estimated U.S.D.A. Soil Classification: Andic Dystrochrepts, loamy, mixed, frigid. Umbric Dystrochrepts, coarse-loamy, mixed frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 111 and inclusions of Soils 5, 12, 13, 15 and 110. This unit is mapped on very steep slopes along Salmon River and Still Creek.

## 111

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, western redcedar
Understory: Vine maple, salal, rhododendron
Groundcover: Sword fern, oxalis, beargrass

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive and stratified deposits of tuffaceous breccia. This rock formation ranges from hard to very hard and weathers rapidly on exposure to fine-textured soil material. Parent material for Soil 111 is colluvium from this bedrock.

## CLIMATE

Precipitation: 60 to 80 inches, 1520 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: South and West
Elevation: 2000 to 4000 feet, 660 to 1300 meters

## MANAGEMENT

This mapping unit contains some areas of mass wasting including debris avalanches. Because of the steep slopes and instability, long-span skylines and helicopters would be the most appropriate yarding methods. Road building in this mapping unit is difficult.

## SOIL 111

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles of Douglas-fir, noble fir and western hemlock. 1 to 2 inches thick.
Surface Soil Layers: Grayish brown to light brownish gray very gravelly loams and gravelly silt loams; medium, fine subangular blocky, parting to medium, very fine, subangular blocky structure; soft, loose, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 to 6.5; 8 to 15 inches thick.
Subsoil Layers: Light gray to very pale brown very gravelly loams and gravelly silt loams; massive parting to moderate, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0; 10 to 25 inches thick.
Range of Soil Depth: 10 to 40 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 29, T. 3S., R. 7E.
Estimated U.S.D.A. Soil Classification: Andic Dystrochrepts, loamy, mixed, frigid. Andic Dystrochrepts, coarse-loamy, mixed, frigid. Umbric Dystrochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 112 and inclusions of Soils 5, 15, 110 and 111. This unit is mapped on very steep slopes along Still Creek and Zigzag River.

## 112

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, noble fir, red alder
Understory: Vine maple, rhododendron
Groundcover: Sword fern, oxalis

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive and stratified deposits of tuffaceous breccia. This rock formation ranges from moderately-hard to hard and weathers rapidly on exposure to fine-textured soil material. Parent material for Soil 112 is colluvium from this bedrock.

## CLIMATE

Precipitation: 70 to 100 inches, 1770 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 48°F, 9°C

## TOPOGRAPHY

Slope: 60 to 90 percent, highly dissected
Aspect: South and West
Elevation: 1200 to 2800 feet, 400 to 930 meters

## MANAGEMENT

Because of steep slopes and stability problems, log-to-ground contact should be avoided during timber harvest operations. Some failures may occur in the drainageways. Road building in this mapping unit would be difficult.

## SOIL 112

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. Some red alder leaves also present. 1 to 2 inches thick.
Surface Soil Layers: Dark brown to brown cobbly loams and gravelly sandy loams; weak, fine subangular blocky parting to very fine granular structure; soft, loose, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 5.0 and 5.5; 15 to 23 inches thick.
Subsoil Layers: Brown to very pale brown cobbly loams and gravelly sandy loams; weak, fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 50 to 70 percent coarse fragments; pH ranges between 5.5 and 6.0; 15 to 32 inches thick.
Range of Soil Depth: 10 to 40 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 3, T. 3S., R. 7E.
Estimated U.S.D.A. Soil Classification: Umbric Dystrochrepts, sandy-skeletal, mixed, mesic. Andic Dystrochrepts, sandy-skeletal, mixed, mesic. Typic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 113 and inclusions of Soils 5, 15, 108 and 109. This unit is mapped on very steep slopes along Fish Creek and the South Fork of the Clackamas River.

## 113

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, western redcedar
Understory: Vine maple, rhododendron
Groundcover: Swordfern, oxalis

## GEOLOGY

PYROCLASTIC ROCK FORMATIONS

Bedrock for this mapping unit consists of massive and stratified deposits of tuffaceous breccia. This rock formation ranges from moderately-hard to hard and weathers rapidly to fine-textured soil material. Parent material for Soil 113 is colluvium from this bedrock.

## CLIMATE

Precipitation: 70 to 100 inches, 1770 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 60 to 90 percent, dissected, uneven
Aspect: All aspects
Elevation: 2000 to 4000 feet, 660 to 1300 meters

## MANAGEMENT

Because of this soil's shallow depth and steep slopes, it is often prone to translational failures following harvest activities. Road building is difficult, often requiring large cuts and fills. Fully-suspended cable or other suitable aerial yarding systems should be used in this mapping unit.

## SOIL 113

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles of Douglas-fir, western hemlock and western redcedar. 1 to 2 inches thick.
Surface Soil Layers: Dark grayish brown to brown gravelly loams and silt loams; medium, fine subangular blocky structure; soft, loose, non-sticky, non-plastic; pH ranges between 5.0 and 6.5; 8 to 12 inches thick.
Subsoil Layers: Light brownish gray to yellowish brown gravelly silt loams; massive parting to weak, medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; pH ranges between 5.5 and 6.0; 10 to 16 inches thick.
Range of Soil Depth: 10 to 35 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 14, T.S., R. 5E.
Estimated U.S.D.A. Soil Classification: Umbric Dystrochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 115 and inclusions of Soils 116, 117 and 118. This unit is mapped on nearly level to gently sloping areas in the upper West Fork, Hood River Drainage.

**115**

## VEGETATION

DOUGLAS-FIR—GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, grand fir
Understory: Vine maple, dogwood, California hazel, Oregon grape, wild rose, prince's pine, honeysuckle
Groundcover: Western starflower, trailing twinflower

## GEOLOGY

PYROCLASTIC ROCK FORMATIONS

Soils in this unit have formed in deep residual material derived from tuffs and breccias. The soil profile is characteristically devoid of large coarse fragments.

## CLIMATE

Precipitation: 80 to 100 inches, 2020 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 49°F, 9.5°C

## TOPOGRAPHY

Slope: 1 to 30 percent
Aspect: All aspects
Elevation: 2000 to 3200 feet, 660 to 1070 meters

## MANAGEMENT

This soil unit produces Site Class 3 and 4 Douglas-fir. The terrain is suitable for tractor yarding but the compaction hazard is moderate to high. Surface erosion may be a problem in areas of exposed mineral soils and roadcuts may be subject to failures and sloughing.

## SOIL 115

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir. Totally decomposed black organic matter. 1 to 1-1/2 inches thick.
Surface Layers: Very dark grayish brown to dark brown gravelly loams; single grain to moderate fine and very fine granular structure; slightly hard, friable, non-sticky, non-plastic; 15 to 20 percent coarse fragments; pH ranges between 5.5 and 6.5; 10 to 15 inches thick.
Subsoil Layers: Dark brown to very pale brown gravelly loams and stony loams; weak, fine to coarse subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 15 to 50 percent coarse fragments; pH ranges between 6.0 and 7.0; 40 to 45 inches thick.
Range of Soil Depth: 50 to 60 inches.
Modal Site Location: NE 1/4, NW 1/4 Sec. 28, T. 2N., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy, mixed, mesic. Andic Haplumbrepts, loamy, mixed, mesic. Typic Eutrochrepts, loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 116 and inclusions of Soils 115, 117 and 118. This unit is mapped on sloping to steep areas in the upper Hood River Valley.

## 116

## VEGETATION

### DOUGLAS-FIR—GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, grand fir
Understory: Vine maple, dogwood, California hazel, Oregon grape, wild rose, prince's pine, honeysuckle
Groundcover: Western starflower, trailing twinflower

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Soils in this unit have formed in deep residual material derived from tuffs and breccias. The soil profile is characteristically devoid of large coarse fragments.

## CLIMATE

Precipitation: 80 to 100 inches, 2020 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2000 to 3200 feet, 660 to 1070 meters

## MANAGEMENT

This soil unit produces Site Class 3 and 4 Douglas-fir. Because of slope limitations, this unit is not suitable for tractor yarding operations. Surface erosion may be a problem in areas of exposed mineral soils and roadcuts may be subject to failures and sloughing.

## SOIL 116

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir. Totally decomposed black organic matter. 1/2 to 1 inch thick.
Surface Layers: Very dark grayish brown to dark brown gravelly loams; single grain to moderate, fine and very fine granular structure; slightly hard, friable, non-sticky, non-plastic; 15 to 20 percent coarse fragments; pH ranges between 6.0 and 6.5; 5 to 10 inches thick.
Subsoil Layers: Dark brown to very pale brown gravelly loams and stony loams; weak, fine to coarse subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 15 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0; 25 to 30 inches thick.
Range of Soil Depth: 30 to 40 inches.
Modal Site Location: NE 1/4, NW 1/4 Sec. 28, T. 2N., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy, mixed, mesic. Andic Haplumbrepts, loamy, mixed, mesic. Typic Eutrochrepts, loamy, mixed, mesic.

## MAPPING UNIT

117

This Mapping Unit consists of Soil 117 and inclusions of Soils 5, 115, 116 and 118. This unit is mapped on nearly level to gently sloping areas in the upper Hood River Valley.

## VEGETATION

### DOUGLAS-FIR—GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, grand fir
Understory: Vine maple, dogwood, California hazel, Oregon grape, wild rose, prince's pine, honeysuckle
Groundcover: Western starflower, trailing twinflower

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Soils in this unit have formed in deep residual material derived from tuffs and breccias. The soil profile is characteristically devoid of large coarse fragments.

## CLIMATE

Precipitation: 80 to 100 inches, 2020 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: All aspects
Elevation: 2000 to 3200 feet, 660 to 1070 meters

## MANAGEMENT

This soil unit produces Site Class 4 and 5 Douglas-fir. Because of slope limitations, this soil unit is not suitable for tractor yarding operations. Surface erosion may be a problem in areas of exposed mineral soils and roadcuts may be subject to failures and sloughing.

## SOIL 117

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir. Totally decomposed black organic matter. 1/2 to 1 inch thick.
Surface Layers: Very dark grayish brown to dark brown gravelly loams; single grain to moderate, fine and very fine granular structure; slightly hard, friable, non-sticky, non-plastic; 15 to 20 percent coarse fragments; pH ranges between 6.0 and 6.5; 5 to 8 inches thick.
Subsoil Layers: Dark brown to very pale brown gravelly loams and stony loams; weak, fine to coarse subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 15 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0; 20 to 35 inches thick.
Range of Soil Depth: 25 to 43 inches.
Modal Site Location: NE 1/4, NW 1/4 Sec. 28, T. 2N., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, coarse-loamy, mixed, frigid. Andic Haplumbrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 120 and inclusions of Soils 5, 7, and 113. This unit is mapped on steep to very steep slopes along lower Fish Creek.

## 120

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western hemlock
Understory: Vine maple, salal, Oregon grape, pacific yew
Groundcover: Oxalis, trailing twinflower

## GEOLOGY

### PYROCLASTIC ROCK FORMATIONS

Soils in this mapping unit have formed in mixed colluvium from surrounding rock formations. These are predominantly tuffs and breccias but may include some basalts and andesites. Soil profiles are characterized by large amounts of angular rock fragments.

## CLIMATE

Precipitation: 60 to 80 inches, 1525 to 2030 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: All aspects
Elevation: 1500 to 2500 feet, 500 to 830 meters

## MANAGEMENT

Soils in this unit produce Site Class 2 and 3 Douglas-fir. Because of slope limitations, this unit is is not suitable for tractor yarding operations. Some failures may occur along road cutbanks and some surface erosion may occur in areas of exposed mineral soils.

## SOIL 120

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and western hemlock. Totally decomposed black organic matter 2 to 3 inches thick.
Surface Layers: Very dark gray to very dark grayish brown cobbly and gravelly loams; weak, fine granular structure; loose, friable, non-sticky, non-plastic; 30 percent coarse fragments; pH ranges between 5.0 and 5.5; 10 to 12 inches thick.
Subsoil Layers: Gray to light yellowish brown cobbly loams and cobbly silt loams; weak, fine and medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 5.0 and 5.5; 30 to 45 inches thick.
Range of Soil Depth: 40 to 57 inches.
Modal Site Location: NW 1/4, NE 1/4 Sec. 23, T. 5S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 152 and inclusions of Soils 7, 8, 153, 156 and 158. This unit is mapped on nearly level flats in the vicinity of Rock Creek Reservoir.

## 152

## VEGETATION

PONDEROSA PINE ZONE

Overstory: Ponderosa pine, Oregon oak
Understory: Bitterbrush
Groundcover: Bluebunch wheatgrass, cheatgrass, western yarrow, arrowleaf balsamroot

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some areas water-laid volcanic material. The bedrock is hard and is overlain by a mantle of wind deposited volcanic ash.

## CLIMATE

Precipitation: 15 to 25 inches, 380 to 630 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 52°F, 11°C

## TOPOGRAPHY

Slope: 3 to 15 percent
Aspect: All aspects
Elevation: 1800 to 2300 feet, 600 to 750 meters

## MANAGEMENT

This mapping unit is very stable and may be tractor logged during periods when soils are dry. Although this unit produces good stands of ponderosa pine, it is used primarily for livestock grazing and wildlife production. Because the soils are very dry during summer, regeneration is a problem.

## SOIL 152

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially decomposed needles and cones of ponderosa pine. 1/2 to 3/4 inches thick.
Surface Layers: Yellowish brown to dark grayish brown fine sandy loams and silt loams; very fine granular structure; soft, loose, non-sticky, non-plastic; pH ranges between 6.5 to 7.0; 15 to 21 inches thick.
Subsoil Layers: Pale brown to brown fine sandy loams and silt loams; moderate, medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 10 percent coarse fragments; pH ranges between 6.5 and 7.0; 35 to 45 inches thick.
Range of Soil Depth: 55 to 70 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 26, T. 4S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, fine-loamy, mixed, mesic. Andic Dystric Eutrochrepts, fine-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 153 and inclusions of Soils 7, 8, 152, 154 and 158. This unit is mapped on nearly level to gently sloping areas near Rock Creek Reservoir and the town of Friend.

## 153

## VEGETATION

### PONDEROSA PINE ZONE

Overstory: Ponderosa pine, Oregon oak
Understory: Bitterbrush
Groundcover: Lupine, western yarrow, wild buckwheat, delphinium, arrowleaf balsamroot

## GEOLOGY

### LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some small areas, water-laid volcanic material. The bedrock is hard and is overlain by a mantle of wind-deposited volcanic ash.

## CLIMATE

Precipitation: 15 to 25 inches, 380 to 630 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 52°F, 11°C

## TOPOGRAPHY

Slope: 2 to 30 percent
Aspect: All aspects
Elevation: 1900 to 2400 feet, 630 to 800 meters

## MANAGEMENT

This mapping unit is very stable and may be tractor logged when the soils are dry. Because this unit produces only poor stands of ponderosa pine, it is used primarily for livestock grazing and wildlife production. High soil temperatures during summer make regeneration difficult.

## SOIL 153

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially decomposed ponderosa pine needles and oak leaves 1/2 to 1 inch thick.
Surface Soil Layers: Light brownish gray to very dark grayish brown fine sandy loams and loams; weak, very fine granular to weak, fine and medium subangular blocky structure; soft to slightly hard, very friable to firm, non-sticky, non-plastic; 10 percent coarse fragments; pH ranges between 6.5 and 7.0; 18 to 24 inches thick.
Subsoil Layers: Very pale brown to dark brown loams and silt loams; weak, medium and coarse subangular blocky structure; hard, very firm, slightly sticky, slightly plastic; 30 percent coarse fragments; pH ranges between 6.5 and 7.0; 35 to 45 inches thick.
Range of Soil Depth: 55 to 65 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 28, T. 3S., R. 12E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, coarse-loamy, mixed, mesic. Andic Dystric Eutrochrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 154 and inclusions of Soils 7, 8, 153 and 155. This unit is mapped on steep south slopes in the eastern part of the Forest.

## 154

## VEGETATION

### PONDEROSA PINE ZONE

Overstory: Ponderosa pine, Oregon oak
Understory: Bitterbrush, manzanita
Groundcover: Bluebunch wheatgrass, Idaho fescue, cheatgrass, junegrass, balsamroot, yarrow

## GEOLOGY

### LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some areas water-laid volcanic material. The bedrock is hard and is overlain by a mantle of wind deposited volcanic ash.

## CLIMATE

Precipitation: 15 to 25 inches, 380 to 630 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 54°F, 12°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 1900 to 2400 feet, 630 to 800 meters

## MANAGEMENT

This mapping unit is very stable but because of steep slopes only cable yarding systems should be employed. This unit produces poor stands of ponderosa pine and is used primarily for livestock grazing and wildlife production. High soil temperatures during summer cause regeneration problems.

## SOIL 154

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially decomposed ponderosa pine needles and oak leaves 1/2 to 1 inch thick.
Surface Soil Layers: Light brownish gray to very dark grayish brown fine sandy loams and loams; weak, very fine granular to weak, fine and medium subangular blocky structure; soft to slightly hard, very friable to firm, non-sticky, non-plastic; 10 to 20 percent coarse fragments; pH ranges between 6.0 and 7.0; 9 to 13 inches thick.
Subsoil Layers: Very pale brown to dark brown loams and silt loams; weak, medium to coarse subangular blocky structure; hard, very firm, slightly sticky, slightly plastic; 35 to 45 percent coarse fragments; pH ranges between 4.5 and 5.0; 25 to 30 inches thick.
Range of Soil Depth: 30 to 55 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 16, T. 3S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, coarse-loamy, mixed, mesic. Andic Dystric Eutrochrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 155 and inclusions of Soils 7, 8, 153 and 158. This unit is mapped on steep north slopes along drainageways in the extreme eastern part of the Forest.

## 155

## VEGETATION

### PONDEROSA PINE ZONE

Overstory: Douglas-fir, ponderosa pine, grand fir, Oregon oak
Understory: Boxwood, prince's pine, vine maple, wild rose, wild blackberry
Groundcover: Elk sedge, pinegrass

## GEOLOGY

### LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some small areas water-laid volcanic material. The bedrock is hard and is overlain by a mantle of wind deposited volcanic ash.

## CLIMATE

Precipitation: 20 to 30 inches, 500 to 760 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North
Elevation: 1900 to 2400 feet, 630 to 800 meters

## MANAGEMENT

This soil unit generally supports a mixed conifer stand of low to moderate productivity. Because of steep slopes cable yarding systems should be employed during harvest operations. Low precipitation and high soil temperatures may inhibit regeneration.

## SOIL 155

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from Douglas-fir, grand fir, and ponderosa pine. 1 to 1-1/2 inches thick.
Surface Soil Layers: Dark brown to pale brown gravelly loams and very gravelly loams; very fine granular to weak, fine and medium subangular blocky structure; soft, loose, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 6.0 and 6.5; 8 to 15 inches thick.
Subsoil Layers: Brown to pale brown gravelly silt loams and silt loams; weak, fine and medium to strong, medium and coarse subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 30 to 45 percent coarse fragments; pH ranges between 6.0 and 6.5; 40 to 55 inches thick.
Range of Soil Depth: 55 to 75 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 18, T. 3S., R. 12E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, loamy-skeletal, mixed, mesic

## MAPPING UNIT

This Mapping Unit consists of Soil 156 and inclusions of Soils 7, 8, 153 and 158. This unit is mapped on nearly level slopes in the Badger-Jordan Area.

## 156

## VEGETATION

PONDEROSA PINE ZONE

Overstory: Ponderosa pine, Douglas-fir, Oregon oak
Understory: Snowberry, spiraea, serviceberry, chokecherry
Groundcover: Hawksbeard, wild sweet pea, wild lilly, cheatgrass, Idaho fescue

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some small areas water-laid volcanic material. The bedrock is hard and is overlain by a mantle of wind deposited volcanic ash.

## CLIMATE

Precipitation: 25 to 40 inches, 635 to 1000 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 52°F, 11°C

## TOPOGRAPHY

Slope: 1 to 30 percent
Aspect: All aspects
Elevation: 1900 to 2600 feet, 630 to 860 meters

## MANAGEMENT

This unit has nearly level to gently undulating slopes and produces Site Class 4 ponderosa pine. Tractor logging is permissable when soils are dry. High soil temperatures during summer may cause problems in regeneration.

## SOIL 156

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from ponderosa pine and Douglas-fir. 1 to 2 inches thick.
Surface Soil Layers: Brown to pale brown loams and silt loams; weak, fine subangular blocky parting to weak, very fine granular structure; soft, very friable, non-sticky, non-plastic; pH ranges between 6.0 and 6.5; 11 to 17 inches thick.
Subsoil Layers: Dark yellowish brown to pale brown loams to gravelly silt loams, moderate to strong, coarse subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; pH ranges between 6.0 and 6.5; 40 to 50 inches thick.
Range of Soil Depth: 45 to 65 inches.
Modal Site Location: SE 1/4, SW 1/4 Sec. 23, T. 3S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, fine-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 157 and inclusions of Soils 7, 153, 154, 155, 156 and 158. This unit is mapped on steep slopes along drainageways in the eastern part of the Forest.

## 157

## VEGETATION

PONDEROSA PINE ZONE

Overstory: Douglas-fir, grand fir
Understory: Serviceberry, snowberry, rose, oceanspray, Oregon grape
Groundcover: Arnica, anenome, wild strawberry, elk sedge, sweetroot

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some small areas water-laid volcanic material. The bedrock is hard and is overlain by a mantle of wind deposited volcanic ash.

## CLIMATE

Precipitation: 20 to 40 inches, 500 to 1000 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North
Elevation: 2000 to 3000 feet, 660 to 1000 meters

## MANAGEMENT

This mapping unit is sloping to steep and produces Site Class 3 ponderosa pine. Soil compaction is not a major problem in this unit but soils in disturbed areas are often easily displaced. Fully suspended cable and aerial logging systems would be the least destructive to the site.

## SOIL 157

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from ponderosa pine and Douglas-fir. 1/2 to 1-1/2 inches thick.
Surface Soil Layers: Brown to pale brown loams and silt loams; weak, fine subangular blocky parting to weak, very fine granular structure; soft, very friable, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 6.0 and 6.5; 8 to 13 inches thick.
Subsoil Layers: Dark yellowish brown to pale brown loams and gravelly silt loams; moderate, fine to strong, coarse subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 30 to 45 percent coarse fragments; pH ranges between 6.0 and 6.5; 35 to 40 inches thick.
Range of Soil Depth: 40 to 50 inches.
Modal Site Location: SW 1/4, NW 1/4 Sec. 23, T. 3S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, coarse-loamy, mixed, mesic. Andic Dystric Eutrochrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

158

This Mapping Unit consists of Soil 158 and inclusions of Soils 7, 153 and 154. This unit is mapped on all slopes and aspects which support open grassland vegetation in the eastern part of the Forest.

## VEGETATION

SHRUB-STEPPE ZONE

Overstory: Occasional ponderosa pine
Understory: Sagebrush, bitterbrush, rabbitbrush
Groundcover: Wild buckwheat, balsamroot, lupine, Sandberg bluegrass, bulbous bluegrass, Idaho fescue, larkspur, cheatgrass

## GEOLOGY

VARIABLE PARENT MATERIAL

Bedrock for this mapping unit consists of Columbia River Basalt and in some areas water-laid volcanic material. The bedrock is generally hard and may or may not be overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 20 to 40 inches, 500 to 1000 mm
Soil Temperature Class: Frigid-Mesic
Mean Annual Soil Temperature: 43-52°F, 6-11°C

## TOPOGRAPHY

Slope: 1 to 60 percent
Aspect: All aspects
Elevation: 1800 to 2500 feet, 600 to 835 meters

## MANAGEMENT

This mapping unit is used primarily for wildlife and livestock production. Some old-growth ponderosa pine may be present but stands are generally non-commercial. Some surface erosion and puddling occurs in this unit.

## SOIL 158

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing leaves of forbs and grasses with some needles of ponderosa pine. 0 to 1/2 inches thick.
Surface Layers: Dark yellowish brown to dark brown fine sandy loams and loams; weak, very fine platy parting to weak, very fine granular structure; very friable, non-sticky, non-plastic; 30 to 40 percent angular rock fragments; pH ranges between 6.0 and 6.5. 3 to 6 inches thick.
Subsoil Layers: Brown to grayish brown stony and cobbly silt loams; moderate, medium subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 50 to 60 percent coarse fragments; pH ranges between 5.0 and 6.0. 10 to 20 inches thick.
Range of Soil Depth: 15 to 30 inches.
Modal Site Location: SE 1/4, NW 1/4 Sec. 34, T. 5S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 159 and inclusions of Soils 156, 157 and 158. This unit is mapped on steep south slopes along drainageways in the eastern part of the Forest.

## 159

## VEGETATION

PONDEROSA PINE ZONE

Overstory: Ponderosa pine, Douglas-fir
Understory: Snowberry, service berry, rose, oceanspray, Oregon grape.
Groundcover: Heartleaf arnica, anenome, wild strawberry, elk sedge, sweetroot.

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in small areas water-laid volcanic material. The bedrock is very hard and competent, and is overlain in most areas by a mantle of wind deposited volcanic ash.

## CLIMATE

Precipitation: 30 to 40 inches, 750 to 1000 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 51°F, 10.5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 2000 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

This mapping unit is sloping to steep and produces Site Class 4 ponderosa pine. Soil compaction is not a major problem in this unit but soils in disturbed areas are often easily displaced. Fully suspended cable or other aerial yarding systems would be least destructive to the site.

## SOIL 159

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from ponderosa pine and Douglas-fir. 1/2 to 1-1/2 inches thick.
Surface Soil Layers: Brown to pale brown loams and silt loams; weak fine subangular blocky parting to weak, very fine granular structure; soft, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.5 and 6.0. 6 to 12 inches thick.
Subsoil Layers: Dark yellowish brown to pale brown loams and gravelly silt loams; moderate, fine to coarse subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 40 to 55 percent coarse fragments; pH ranges between 5.0 and 5.5. 20 to 32 inches thick.
Range of Soil Depth: 25 to 60 inches.
Modal Site Location: SW 1/4, NE 1/4 Sec. 15, T. 4S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy, mixed, mesic. Andic Haplumbrepts, loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 160 and inclusions of Soils 7, 158, 161 and 162. This unit is mapped on gentle slopes with shallow, stony soils in the eastern part of the Forest.

## 160

## VEGETATION

PONDEROSA PINE ZONE

Overstory: Ponderosa pine, Oregon oak, Douglas-fir
Understory: Bitterbrush, sagebrush, rabbitbrush
Groundcover: Cheatgrass, sandberg bluegrass

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some small areas water-laid volcanic material. The bedrock is very hard and the volcanic ash mantle is almost wholly lacking.

## CLIMATE

Precipitation: 20 to 40 inches, 500 to 1000 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 54°F, 12°C

## TOPOGRAPHY

Slope: 1 to 20 percent
Aspect: All aspects
Elevation: 3000 to 3800 feet, 1000 to 1260 meters

## MANAGEMENT

This mapping unit is used primarily for livestock and wildlife production. Because of the extremely shallow soils and high amount of rock outcrop, tree productivity is low. There are some areas within this unit that remain wet into the summer.

## SOIL 160

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing grass leaves with ponderosa pine needles and oak leaves.
Surface Layers: Dark yellowish brown to dark grayish brown very fine sandy loam; weak, very fine granular structure; soft, loose, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 6.0 and 6.5. 1 to 3 inches thick.
Subsoil Layers: Light yellowish brown to pale brown fine sandy loams and loams; weak, very fine subangular blocky structure; soft, friable, non-sticky, non-plastic; 50 to 70 percent coarse fragments; pH ranges between 5.5 and 6.0. 4 to 6 inches thick.
Range of Soil Depth: 5 to 10 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 2, T. 2S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, mesic. Typic Eutrochrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 161 and inclusions of Soils 7, 158, 162 and 163. This unit is mapped on gentle slopes in the eastern part of the Forest.

## 161

## VEGETATION

PONDEROSA PINE ZONE

Overstory: Douglas-fir, ponderosa pine, grand fir
Understory: Serviceberry, snowberry, rose, oceanspray, Oregon grape
Groundcover: Elk sedge, Idaho fescue, pinegrass, heart-leaf arnica, anenome, beadlilly, bedstraw, dwarf bramble

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some small areas water-laid volcanic material. The bedrock is hard and is overlain by a mantle of wind-deposited volcanic ash.

## CLIMATE

Precipitation: 30 to 50 inches, 760 to 1270 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 51°F, 10°C

## TOPOGRAPHY

Slope: 1 to 30 percent
Aspect: All aspects
Elevation: 2500 to 3500 feet, 800 to 1160 meters

## MANAGEMENT

This mapping unit is nearly level to gently sloping and produces Site Class 3 ponderosa pine. Soil compaction is not a major problem in this unit but soils in disturbed areas are often easily displaced and are often difficult to regenerate. For this reason skid trails should be kept to a minimum.

## SOIL 161

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from ponderosa pine and Douglas-fir. 1-1/2 to 3 inches thick.
Surface Layers: Very dark grayish brown to dark brown fine sandy loams and loams; weak, very fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 20 to 25 percent coarse fragments; pH ranges between 6.0 and 6.5. 6 to 17 inches thick.
Subsoil Layers: Dark grayish brown to dark yellowish brown silt loams and gravelly silt loams; moderate, fine to coarse subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 30 to 35 percent coarse fragments; pH ranges between 5.5 and 6.0. 35 to 50 inches thick.
Range of Soil Depth: 40 to 70 inches.
Modal Site Location: NE 1/4, SW 1/4 Sec. 16, T. 1S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, coarse-loamy, mixed, mesic. Andic Dystric Eutrochrepts, coarse-loamy, mixed, mesic. Andic Haplumbrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 162 and inclusions of Soils 7, 154, 158, 161 and 163. This unit is mapped on steep slopes along drainageways in the eastern part of the Forest.

## 162

## VEGETATION

### PONDEROSA PINE ZONE

Overstory: Douglas-fir, ponderosa pine, grand fir
Understory: Serviceberry, snowberry, wild rose, oceanspray, Oregon grape
Groundcover: Elk sedge, fescue, pinegrass, heart-leaf arnica, anenome, queencup beadlilly

## GEOLOGY

### LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some areas water-laid volcanic materials. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 30 to 50 inches, 760 to 1270 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2500 to 3500 feet, 800 to 1160 meters

## MANAGEMENT

This mapping unit is sloping to steep and produces Site Class 2 ponderosa pine. Soil compaction is not a major problem in this unit but soils in disturbed areas are often easily displaced. Cable logging systems should be employed because of the steep slopes.

## SOIL 162

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir, ponderosa pine and grand fir. 1 to 2 inches thick.
Surface Layers: Very dark grayish brown to dark brown fine sandy loams and loams; weak, very fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 to 35 percent coarse fragments; pH ranges between 5.5 and 6.0. 4 to 8 inches thick.
Subsoil Layers: Dark grayish brown to dark yellowish brown silt loams and gravelly silt loams; moderate, fine to coarse subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 35 to 45 percent coarse fragments; pH ranges between 5.5 and 6.0. 25 to 30 inches thick.
Range of Soil Depth: 35 to 55 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 21, T. 1S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, coarse-loamy, mixed, mesic. Typic Haplumbrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 163 and inclusions of Soils 7, 154, 158, 161 and 162. This unit is mapped on steep slopes, along drainageways in the eastern part of the Forest.

## 163

## VEGETATION

PONDEROSA PINE ZONE

Overstory: Ponderosa pine, Douglas-fir, grand fir, Oregon oak
Understory: Serviceberry, oceanspray, manzanita
Groundcover: Elk sedge, fescue, pinegrass, heart-leaf arnica, anenome

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit consists of Columbia River Basalt and in some areas water-laid volcanic materials. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 30 to 50 inches, 760 to 1270 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 51°F, 11°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 2500 to 3500 feet, 800 to 1160 meters

## MANAGEMENT

This mapping unit is sloping to steep and produces Site Class 3 Ponderosa pine. Soil compaction is not a major problem in this unit but soils in disturbed areas can often be easily displaced. Cable logging systems should be employed because of slope limitations.

## SOIL 163

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from ponderosa pine and Douglas-fir. 1-2 inches thick.
Surface Layers: Dark grayish brown to dark brown fine sandy loams and loams; weak, very fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 6.0 and 6.5. 3 to 7 inches thick.
Subsoil Layers: Grayish brown to brown silt loams and gravelly silt loams; moderate, fine to coarse subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 30 to 40 percent coarse fragments; pH ranges between 6.0 and 6.5. 20 to 30 inches thick.
Range of Soil Depth: 30 to 45 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 4, T. 2S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 164 and inclusions of Soils 7, 161, 162, 163, 165 and 166. This unit is mapped on nearly level to gently sloping areas in the eastern part of the Forest.

## 164

## VEGETATION

DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Ponderosa pine, lodgepole pine, western larch, grand fir, Engelmann Spruce
Understory: Myrtle boxwood, prince's pine
Groundcover: Pyrola, trailing twinflower, wild strawberry, rattlesnake orchid

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit generally consists of basalt and andesite with some small areas of water-laid volcanic materials. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 40 to 60 inches, 1000 to 1500 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 4000 to 5000 feet, 1300 to 1700 meters

## MANAGEMENT

This unit occurs on nearly level to gently sloping uplands in the eastern part of the Forest. Because of slope this unit is suitable for tractor yarding. Achieving adequate regeneration may be a problem on this unit. The surface soil erosion hazard is minimal but soils are easily displaced when disturbed.

## SOIL 164

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from ponderosa pine and lodgepole pine. 2 to 3 inches thick.
Surface Layers: Very dark grayish brown to dark grayish brown fine sandy loams; weak, very fine granular to weak, fine and medium subangular blocky structure; soft, very friable, non-sticky, non-plastic; 5 to 15 percent coarse fragments; pH ranges between 6.0 and 6.5. 10 to 13 inches thick.
Subsoil Layers: Grayish brown to brown silt loams; moderate, fine to coarse subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 20 to 30 percent coarse fragments; pH ranges between 6.0 and 6.5. 30 to 40 inches thick.
Range of Soil Depth: 40 to 60 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 18, T. 2S., R. 11E.
Estimated U.S.D.A. Soil Classification: Andic Dystrochrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 165 and inclusions of Soils 7, 161, 162, 164 and 166. This unit is mapped on nearly level to gently sloping mountain side slopes in the eastern part of the Forest.

## 165

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Ponderosa pine, lodgepole pine, Douglas-fir, western larch, grand fir, Engelmann Spruce
Understory: Myrtle boxwood, prince's pine
Groundcover: Pyrola, trailing twinflower, wild strawberry, rattlesnake orchid

## GEOLOGY

### LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit generally consists of basalt and andesite with some small areas of water-laid volcanic materials. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 40 to 60 inches, 1000 to 1500 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 4000 to 5000 feet, 1300 to 1700 meters

## MANAGEMENT

This unit occurs on nearly level to gently sloping uplands in the eastern part of the Forest. Because of slope and low compaction hazard, this unit is suitable for tractor yarding. Achieving adequate regeneration may be a problem on this unit.

## SOIL 165

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from ponderosa pine and Douglas-fir. 2 to 3 inches thick.
Surface Layers: Very dark brown to very dark grayish brown cobbly loams; weak, very fine granular to weak, fine to medium subangular blocky structure; soft, very friable, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 6.0 and 6.5. 11 to 14 inches thick.
Subsoil Layers: Grayish brown to brown cobbly loams; moderate, fine to coarse subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 30 to 45 percent coarse fragments; pH ranges between 6.0 and 6.5. 30 to 40 inches thick.
Range of Soil Depth: 40 to 60 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 30, T. 2S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

166

This Mapping Unit consists of Soil 166 and inclusions of Soils 7, 161, 162, 164 and 165. This unit is mapped on steep north slopes in the eastern part of the Forest.

## VEGETATION

DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Lodgepole pine, western white pine, ponderosa pine, western larch, Englemann spruce
Understory: Myrtle boxwood, prince's pine
Groundcover: Pyrola, trailing twinflower, wild strawberry, rattlesnake orchid

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit generally consists of basalt and andesite with some small areas of water-laid volcanic material. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 40 to 60 inches, 1000 to 1500 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 4000 to 5000 feet, 1300 to 1700 meters

## MANAGEMENT

This unit occurs on sloping to steep north facing mountain slopes in the eastern part of the Forest. Because of slope limitations, this unit is unsuitable for tractor yarding. Care should be taken during harvest operations as these soils are easily displaced.

## SOIL 166

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs of ponderosa pine and lodgepole pine. 1 to 2 inches thick.
Surface Layers: Very dark gray to very dark grayish brown cobbly and gravelly loams; weak, fine granular to weak, fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 10 to 15 percent coarse fragments; pH ranges between 6.5 and 7.0. 7 to 10 inches thick.
Subsoil Layers: Very dark brown to dark grayish brown cobbly and gravelly loams and silt loams; moderate, fine to coarse subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 20 to 25 percent coarse fragments; pH ranges between 6.0 and 6.5. 25 to 30 inches thick.
Range of Soil Depth: 35 to 55 inches.
Modal Site Location: SE 1/4, NE 1/4 Sec. 7, T. 2S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, fine-loamy, mixed, frigid. Typic Haplumbrepts, fine-loamy, mixed, frigid.

## MAPPING UNIT

## 167

This Mapping Unit consists of Soil 167 and inclusions of Soils 6, 7, 158, 165 and 166. This unit is mapped on sloping to steep, south facing mountain slopes in the eastern part of the Forest.

## VEGETATION

DOUGLAS-FIR-GRAND FIR ZONE

Overstory: Lodgepole pine, western larch, western white pine, Douglas-fir, ponderosa pine
Understory: Myrtle boxwood, prince's pine
Groundcover: Pyrola, trailing twinflower, wild strawberry

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit generally consists of basalt and andesite with some small areas of water-laid volcanic material. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 40 to 60 inches, 1000 to 1500 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 4000 to 5000 feet, 1300 to 1700 meters

## MANAGEMENT

This unit occurs on sloping to steep south facing mountain slopes in the eastern part of the Forest. Because of slope limitations, this unit is unsuitable for tractor yarding. Care should be taken during harvest operations as these soils are easily displaced.

## SOIL 167

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs of ponderosa pine and lodgepole pine. 1/2 to 2 inches thick.
Surface Layers: Very dark grayish brown to dark brown cobbly and gravelly loams; weak, fine granular to weak, fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 35 to 45 percent coarse fragments; pH ranges between 6.0 and 6.5. 6 to 8 inches thick.
Subsoil Layers: Very dark brown to dark brown cobbly and gravelly loams and silt loams; moderate, fine to coarse subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 6.0 and 6.5. 20 to 30 inches thick.
Range of Soil Depth: 35 to 55 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 31, T. 1S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, coarse-loamy, mixed, frigid. Typic Haplumbrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

168

This Mapping Unit consists of Soil 168 and inclusions of Soils 166, 167 and 169. This unit is mapped on nearly level to sloping mountainsides in the eastern part of the Forest.

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Grand fir, lodgepole pine, Engelmann spruce, Douglas-fir
Understory: Blue huckleberry, wild currant
Groundcover: Vanilla leaf, queen cup, beadlilly, anenome, bedstraw, rattlesnake orchid

## GEOLOGY

### LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit generally consists of basalt and andesite with some small areas of water-laid volcanic material. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 40 to 60 inches, 1000 to 1500 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 3500 to 5000 feet, 1200 to 1700 meters

## MANAGEMENT

This unit occurs on nearly level to gently sloping mountainsides in the eastern part of the Forest. Tractor yarding is permissable on this mapping unit as the compaction hazard is moderate to low. Care should be taken during harvest operations as these soils are easily displaced. Regeneration may be a problem in this unit.

## SOIL 168

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs of grand fir, Douglas-fir, and lodgepole pine. 2 to 3 inches thick.
Surface Layers: Very dark grayish brown to dark brown gravelly and cobbly fine sandy loams; weak, fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 35 to 45 percent coarse fragments; pH ranges between 6.5 and 7.0. 8 to 10 inches thick.
Subsoil Layers: Dark brown to dark yellowish brown gravelly and cobbly fine sandy loams and silt loams; weak, fine to medium subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 6.5 and 7.0. 30 to 50 inches thick.
Range of Soil Depth: 40 to 60 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 31, T. 1S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Eutrochrepts, coarse-loamy, mixed, frigid. Typic Haplumbrepts, coarse-loamy, mixed, frigid. Andic Haplumbrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

169

This Mapping Unit consists of Soil 169 and inclusions of Soils 7, 13, 167, 168 and 170. This unit is mapped on steep to very steep north and east facing slopes in the eastern part of the Forest.

## VEGETATION

DOUGLAS-FIR-GRAND FIR ZONE

Overstory: Grand fir, lodgepole pine, Engelmann spruce, Douglas-fir
Understory: Blue huckleberry, wild currant.
Groundcover: Vanilla leaf, queen cup beadlilly, anenome, bedstraw, rattlesnake orchid

## GEOLOGY

LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit generally consists of basalt and andesite with some small areas of water-laid volcanic material. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 30 to 60 inches, 760 to 1500 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 3500 to 5000 feet, 1200 to 1700 meters

## MANAGEMENT

This mapping unit occurs on steep to very steep mountain slopes in the eastern part of the Forest. Because of slope limitations, this unit is unsuitable for tractor yarding. Care should be taken during harvest operations as these soils are easily displaced.

## SOIL 169

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs of grand fir, Douglas-fir, and lodgepole pine. 2 to 3 inches thick.
Surface Layers: Very dark grayish brown to brown gravelly and cobbly fine sandy loams; weak, fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 6.5 and 7.0. 6 to 8 inches thick.
Subsoil Layers: Dark brown to dark yellowish brown gravelly and cobbly fine sandy loams and silt loams; weak, fine to medium subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 40 to 60 percent coarse fragments; pH range between 6.5 and 7.0. to 45 inches thick.
Range of Soil Depth: 35 to 55 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 23, T. 2S., R. 10E.
Estimated U.S.D.A. Soil Classification: Andic Dystrochrepts, fine-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 170 and inclusions of Soils 7, 13, 167, 168 and 169. This unit is mapped on steep to very steep south and west facing slopes in the eastern part of the Forest.

## 170

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Grand fir, lodgepole pine, Engelmann spruce, Douglas-fir
Understory: Blue huckleberry, wild currant.
Groundcover: Vanilla leaf, queencup beadlilly, anenome, bedstraw, rattlesnake orchid

## GEOLOGY

### LOESS AND VOLCANIC ASH DEPOSITS

Bedrock for this mapping unit generally consists of basalt and andesite with some small areas of water-laid volcanic material. The bedrock is hard and is overlain by a mantle of volcanic ash.

## CLIMATE

Precipitation: 30 to 60 inches, 760 to 1500 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 3500 to 5000 feet, 1200 to 1700 meters

## MANAGEMENT

This mapping unit occurs on steep to very steep mountain slopes in the eastern part of the Forest. Because of slope limitations, this unit is unsuitable for tractor yarding. Care should be taken during harvest operations as these soils are easily displaced.

## SOIL 170

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs of grand fir, Douglas-fir, and lodgepole pine. 1 to 2 inches thick.
Surface Layers: Very dark grayish brown to brown gravelly and cobbly fine sandy loams; weak, fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 35 to 45 percent coarse fragments; pH ranges between 6.0 and 7.0. 6 to 8 inches thick.
Subsoil Layers: Dark brown to dark yellowish brown gravelly and cobbly fine sandy loams and silt loams; weak, fine to medium subangular blocky structure; firm, friable, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH range between 6.0 and 7.0. 25 to 45 inches thick.
Range of Soil Depth: 35 to 55 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 26, T. 1S., R. 10E.
Estimated U.S.D.A. Soil Classification: Andic Dystrochrepts, fine-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 171 and inclusions of Soils 3, 4, 172 and 173. This unit is mapped on nearly level to gently sloping benches in the lower Bull Run Watershed.

## 171

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal, Oregon grape
Groundcover: Sword fern, oxalis

## GEOLOGY

### WATER-LAID SEDIMENTARY DEPOSITS

Bedrock for this mapping unit generally consists of stratified water-laid sedimentary material derived from basic igneous rocks with a mixture of volcanic ash. The bedrock is soft and incompetent.

## CLIMATE

Precipitation: 65 to 100 inches, 1650 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 50 to 2000 feet, 17 to 660 meters

## MANAGEMENT

This mapping unit produces Site Class 1 and 2 Douglas-fir. Although slopes are suitable for tractor yarding, soils in this unit have a moderate to high compaction hazard. Achieving adequate stocking in this unit does not appear to be a problem.

## SOIL 171

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Needle, twigs, cones, and leaves from Douglas-fir, western hemlock and red alder. 1 to 2 inches thick.
Surface Layers: Very dark brown to dark yellowish brown silt loams; moderate to strong, very fine to medium subangular blocky and very fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; 5 percent coarse fragments; pH ranges between 5.5 and 6.0. 8 to 15 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown silt loams; weak, fine and medium subangular blocky structure to massive; soft, friable, slightly sticky, slightly plastic; 5 percent coarse fragments; pH ranges between 5.5 and 6.0. 40 to 55 inches thick.
Range of Soil Depth: 40 to 50 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 36, T. 1S., R. 5E.
Estimated U.S.D.A. Soil Classification: Andic Cumulic Haplumbrepts, coarse-silty, mixed, non-acid, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 172 and inclusions of Soils 171 and 173. This unit is mapped on steep north slopes and east facing slopes in the lower Bull Run Watershed.

## 172

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal, Oregon grape
Groundcover: Sword fern, oxalis

## GEOLOGY

### WATER-LAID SEDIMENTARY DEPOSITS

Bedrock for this mapping unit generally consists of stratified water-laid sedimentary material derived from basic igneous rocks with a mixture of volcanic ash. The bedrock is soft and incompetent.

## CLIMATE

Precipitation: 65 to 100 inches, 1650 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 50 to 2000 feet, 17 to 660 meters

## MANAGEMENT

This mapping unit produces Site Class 1 and 2 Douglas-fir. Because of slope limitations, only cable yarding systems should be used. Surface soil erosion can be a problem in areas of exposed mineral soils.

## SOIL 172

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Needles, twigs, cones, and leaves from Douglas-fir, western hemlock and red alder. 1 to 1-1/2 inches thick.
Surface Layers: Very dark brown to dark yellowish brown silt loams; moderate to strong, very fine to medium subangular blocky and very fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; 10 percent coarse fragments; pH ranges between 5.5 and 6.0. 5 to 9 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown silt loams; weak, fine and medium subangular blocky structure to massive; soft, friable, slightly sticky, slightly plastic; 10 percent coarse fragments; pH ranges between 5.5 and 6.0. 30 to 40 inches thick.
Range of Soil Depth: 40 to 50 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 36, T. 1S., R. 5E.
Estimated U.S.D.A. Soil Classification: Andic Haplumbrepts, coarse-silty, mixed, non-acid, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 173 and inclusions of Soils 171 and 172. This unit is mapped on steep south and west facing slopes in the lower Bull Run Watershed.

## 173

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal, Oregon grape
Groundcover: Sword fern, oxalis

## GEOLOGY

### WATER-LAID SEDIMENTARY DEPOSITS

Bedrock for this mapping unit generally consists of stratified water-laid sedimentary material derived from basic igneous rocks with a mixture of volcanic ash. The bedrock is soft and incompetent.

## CLIMATE

Precipitation: 65 to 100 inches, 1650 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 55°F, 12°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 50 to 2000 feet, 17 to 660 meters

## MANAGEMENT

This mapping unit produces Site Class 2 and 3 Douglas-fir. Because of slope limitations, only cable yarding systems should be used. Surface soil erosion can be a problem in areas of exposed mineral soils.

## SOIL 173

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Needles, twigs, cones, and leaves from Douglas-fir, western hemlock, western redcedar, and red alder 1 to 1-1/2 inches thick.
Surface Layers: Very dark brown to dark yellowish brown silt loams; moderate to strong, very fine to medium subangular blocky and very fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; 10 to 15 percent coarse fragments; pH ranges between 5.5 and 6.0. 4 to 8 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown silt loams; weak; fine and medium subangular blocky structure to massive; soft, friable, slightly plastic; 15 to 20 percent coarse fragments; pH ranges between 5.5 and 6.0. 30 to 40 inches thick.
Range of Soil Depth: 40 to 50 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 36, T. 1S., R. 5E.
Estimated U.S.D.A. Soil Classification: Andic Haplumbrepts, coarse-silty, mixed, non-acid, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 200 and inclusions of Soils 6, 7, 13 and 201. This unit is mapped on steep north and east facing slopes along the Clackamas River.

## 200

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal, Oregon grape
Groundcover: Sword fern, mosses, lichens

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of flows of Columbia River Basalts which are generally jointed and columnar. The rock is very hard and competent. Soils have formed in residuum from this rock.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2280 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: North and East
Elevation: 500 to 2000 feet, 160 to 660 meters

## MANAGEMENT

This mapping unit has very shallow soils and very steep slopes which can make timber management difficult. When areas are harvested, the erosion hazard and soil mantle failure potential are high. Road building in this soil unit is very difficult.

## SOIL 200

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and western hemlock. Some dried grass and fern leaves. 1/2 to 1 inch thick.
Surface Layers: Very dark brown to dark brown cobbly and gravelly loams; weak to medium, fine granular structure parting to single grain; soft, very friable, non-sticky, non-plastic; 45 to 60 percent coarse fragments; pH ranges between 5.0 and 6.0. 3 to 6 inches thick.
Subsoil Layers: Dark brown to dark yellowish brown gravelly loams and silt loams; weak, fine and medium subangular blocky structure; soft, friable, non-sticky, non-plastic; 60 to 70 percent coarse fragments; pH ranges between 5.5 and 6.0. 12 to 18 inches thick.
Range of Soil Depth: 15 to 25 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 33, T. 4S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, coarse-silty, mixed, mesic. Typic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 201 and inclusions of Soils 6, 7, 13 and 200. This unit is mapped on steep south and west facing slopes along the Clackamas River.

## 201

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal, Oregon grape
Groundcover: Sword fern, mosses, lichens, grasses

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of flows of Columbia River Basalts which are generally jointed and columnar. The rock is very hard and competent. Soils have formed in residuum from this rock.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2280 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 55°F, 12°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: South and West
Elevation: 500 to 2000 feet, 160 to 660 meters

## MANAGEMENT

This mapping unit has very shallow soils, a southerly aspect, and very steep slopes which tend to make timber management very difficult. When areas are harvested, the erosion hazard and soil mantle failure potential are high. Road-building in this soil unit is difficult.

## SOIL 201

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and western hemlock. Some dried grass and fern leaves. 1/2 inch thick.
Surface Layers: Very dark brown to dark brown cobbly and gravelly loams; weak to medium, fine granular structure parting to single grain; soft, very friable, non-sticky, non-plastic; 50 to 60 percent coarse fragments; pH ranges between 5.0 and 6.0. 3 to 5 inches thick.
Subsoil Layers: Dark brown to dark yellowish brown gravelly loams and silt loams; weak, fine and medium subangular blocky structure; soft, friable, non-sticky, non-plastic; 70 to 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 10 to 12 inches thick.
Range of Soil Depth: 13 to 17 inches.
Modal Site Location: SE 1/4, SW 1/4 Sec. 28, T. 4S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 202 and inclusions of Soils 6, 7, 13 and 204. This unit is mapped on steep north facing slopes along the Columbia River Gorge.

## 202

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, big leaf maple
Understory: Vine maple, hazel, Indian plum
Groundcover: Sword fern, salal

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of flows of Columbia River Basalts which are generally jointed and columnar. The rock is very hard and competent. Soils have formed in residuum and colluvium from this rock.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2280 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: North
Elevation: 50 to 3000 feet, 17 to 1000 meters

## MANAGEMENT

This mapping unit has extremely stony soils and very steep slopes which tend to make timber management difficult. When areas are harvested, the erosion hazard and soil mantle failure potential are high.

## SOIL 202

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from Douglas-fir and western hemlock. 1/2 to 1 inch thick.
Surface Layers: Very dark brown cobbly clay loams; strong, very fine subangular blocky and strong, very fine and fine granular structure; slightly hard, friable, sticky, plastic; 40 percent angular basalt fragments; pH ranges between 6.0 and 7.0. 12 to 16 inches thick.
Subsoil Layers: Dark brown to brown very stony clay loams; moderate, very fine and fine subangular blocky structure; slightly hard, friable, sticky, plastic; 80 percent angular basalt fragments; pH ranges between 6.5 and 7.0. 30 to 50 inches thick.
Range of Soil Depth: 35 to 60 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 13, T. 1N., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 204 and inclusions of Soils 6, 7, 12, 13 and 202. This unit is mapped on nearly level to steep toeslopes in the Columbia River Gorge.

204

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, bigleaf maple red alder
Understory: Vine maple, hazel, Indian plum
Groundcover: Swordfern, salal, Oregon grape

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of flows of Columbia River Basalts. The rock is hard and competent. Soils have formed in residuum and colluvium from this rock.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2280 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 52°F, 11°C

## TOPOGRAPHY

Slope: 10 to 60 percent
Aspect: West, North and East
Elevation: 20 to 1000 feet, 6 to 330 meters

## MANAGEMENT

Certain segments of this mapping unit on slopes less than 30 percent are suitable for tractor yarding. The compaction hazard is high to moderate and the erosion hazard is also moderate. Regeneration does not appear to be a problem in this unit.

## SOIL 204

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs of Douglas-fir and western hemlock. Some leaves of bigleaf maple. 1 to 2 inches thick.
Surface Layers: Dark grayish brown to brown cobbly loams and cobbly clay loams; moderate, very fine subangular blocky and strong, fine granular structure; slightly hard, friable, sticky, plastic; 50 percent coarse angular basalt fragments; pH ranges between 6.5 and 7.0. 10 to 14 inches thick.
Subsoil Layers: Dark brown to brown very stony clay loams; moderate, very fine and fine subangular blocky structure; slightly hard, friable, sticky, plastic; 80 percent angular basalt fragments; pH ranges between 6.5 and 7.0. 30 to 50 inches thick.
Range of Soil Depth: 50 to 70 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 13, T. 2N., R. 7E.
Estimated U.S.D.A. Soil Classification: Umbric Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

205

This Mapping Unit consists of Soil 205 and inclusions of Soils 6, 7, 13, 202, 203 and 204. This unit is mapped on precipitous slopes along drainageways in the Columbia River Gorge.

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, noble fir
Understory: Huckleberry, vine maple
Groundcover: Salal, Oregon grape

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of flows of Columbia River Basalts. The rock is hard and competent. Soils have formed in residuum and colluvium from this rock.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: North and East
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

Because of the extremely steep slopes, only fully-suspended cable yarding systems should be employed during harvest operations. Surface erosion may be a problem in areas of exposed mineral soils.

## SOIL 205

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs of Douglas-fir, western hemlock and noble fir. 1 to 2 inches thick.
Surface Layers: Dark grayish brown to brown cobbly loams and cobbly sandy loams; strong, fine granular structure parting to single grain; loose, friable, non-sticky, non-plastic; 40 percent angular basalt fragments; pH ranges between 6.0 and 6.5. 9 to 12 inches thick.
Subsoil Layers: Dark brown to brown very stony clay loams; moderate, very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 80 percent angular basalt fragments; pH ranges between 6.5 and 7.0. 20 to 30 inches thick.
Range of Soil Depth: 40 to 60 inches.
Modal Site Location: SW 1/4, NW 1/4 Sec. 10, T. 1N., R. 7E.
Estimated U.S.D.A. Soil Classification: Umbric Dystrochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 206 and inclusions of Soils 6, 7, 13, 204 and 205. This unit is mapped on precipitous slopes along drainageways in the Columbia River Gorge.

## 206

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, noble fir
Understory: Huckleberry, vine maple
Groundcover: Salal, Oregon grape

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of flows of Columbia River Basalts. The rock is hard and competent. Soils have formed in residuum and colluvium from this rock.

## CLIMATE

Precipitation: 60 to 90 inches, 1520 to 2280 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: South and West
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

Because of the extremely steep slopes, fully-suspended cable or aerial yarding systems should be employed during harvest operations. Surface erosion may be a problem in areas of exposed mineral soils. Regeneration may also be a problem.

## SOIL 206

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs of Douglas-fir, western hemlock and noble fir. 1/2 to 1-1/2 inches thick.
Surface Layers: Dark grayish brown to brown cobbly loams and cobbly sandy loams; strong, fine granular structure parting to single grain; loose, friable, non-sticky, non-plastic; 40 percent angular basalt fragments; pH ranges between 6.0 and 6.5. 8 to 12 inches thick.
Subsoil Layers: Dark brown to brown very stony loams; moderate, very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 80 percent angular basalt fragments; pH ranges between 6.5 and 7.0. 20 to 30 inches thick.
Range of Soil Depth: 40 to 60 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 3, T. 1N., R. 7E.
Estimated U.S.D.A. Soil Classification: Umbric Dystrochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 207 and inclusions of Soils 6, 7, 13, 154 and 158. This unit is mapped on steep north slopes along drainageways in the eastern part of the Forest.

## 207

## VEGETATION

PONDEROSA PINE ZONE

Overstory: Douglas-fir, ponderosa pine, grand fir, Oregon oak
Understory: Ocean spray, snowberry, ceanothus
Groundcover: Elk sedge, pine grass

## GEOLOGY

IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of flows of Columbia River Basalts. The rock is hard and competent. Some areas of water-laid volcanic material may also be present. The soil has formed in colluvium from this rock and some mixed volcanic ash.

## CLIMATE

Precipitation: 20 to 30 inches, 500 to 760 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: North and East
Elevation: 1900 to 2400 feet, 630 to 800 meters

## MANAGEMENT

Surface erosion may be a problem in areas of exposed mineral soils. Regeneration potential is low because of low moisture and high summer temperatures.

## SOIL 207

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and cones of Douglas-fir, grand fir, and ponderosa pine. 1 to 2 inches thick.
Surface Layers: Pale brown to dark brown gravelly loams and very gravelly loams; weak, very fine granular to weak, fine to medium subangular blocky structure; loose, very friable, non-sticky, non-plastic; 35 percent coarse fragments; pH ranges between 6.0 and 6.5. 9 to 13 inches thick.
Subsoil Layers: Pale brown to brown gravelly silt loams to silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 6.0 and 6.5. 40 to 50 inches thick.
Range of Soil Depth: 50 to 70 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 18, R. 3S., R. 12E.
Estimated U.S.D.A. Soil Classification: Andic Dystrochrepts, loamy-skeletal, mixed, mesic. Andic Dystrochrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 208 and inclusions of Soils 7, 13, 158 and 209. This unit is mapped on steep south and west facing slopes in the eastern part of the Forest.

208

## VEGETATION

### GRAND FIR—DOUGLAS-FIR ZONES

Overstory: Douglas-fir, ponderosa pine, grand fir
Understory: Hazel, snowberry, ocean spray, ceanothus
Groundcover: Elk sedge, pinegrass

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of hard basalt and andesite. Soils have formed in residuum and colluvium from this bedrock. Some volcanic ash may be mixed in the soil profile.

## CLIMATE

Precipitation: 20 to 30 inches, 500 to 760 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: South and West
Elevation: 1900 to 2400 feet, 630 to 800 meters

## MANAGEMENT

Because of high soil temperatures and low soil moisture during warm seasons, regeneration may be a problem in this mapping unit.

## SOIL 208

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones of Douglas-fir, grand fir, and ponderosa pine. 1-1/2 to 2 inches thick.
Surface Layers: Pale brown to dark brown gravelly loams and very gravelly loams; weak, very fine granular to weak, fine to medium subangular blocky structure; loose, very friable, non-sticky, non-plastic; 25 to 35 percent coarse fragments; pH ranges between 6.0 and 6.5. 10 to 15 inches thick.
Subsoil Layers: Pale brown to brown gravelly silt loams to silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 5.0 and 6.0. 40 to 50 inches thick.
Range of Soil Depth: 50 to 70 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 36, T. 2S., R. 11E.
Estimated U.S.D.A. Soil Classification: Andic Dystrochrepts, loamy-skeletal, mixed, mesic. Andic Dystrochrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

209

This Mapping Unit consists of Soil 209 and inclusions of Soils 7, 208 and 210. This unit is mapped on steep, smooth, north facing mountain slopes in the eastern part of the Forest.

## VEGETATION

### GRAND FIR—DOUGLAS-FIR ZONES

Overstory: Douglas-fir, grand fir, ponderosa pine
Understory: Vine maple, myrtle boxwood
Groundcover: Prince's pine, pyrola

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of hard basalt and andesite. Soils have formed in residuum and colluvium from this bedrock. Some volcanic ash may be mixed in the soil profile.

## CLIMATE

Precipitation: 30 to 60 inches, 760 to 1520 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2500 to 4000 feet, 830 to 1300 meters

## MANAGEMENT

Because of steep slopes, only fully suspended cable or other aerial yarding systems should be employed on this mapping unit. Surface soil erosion may also be a problem in areas of exposed mineral soil.

## SOIL 209

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones of Douglas-fir, grand fir, and ponderosa pine. 1 to 2 inches thick.
Surface Layers: Dark brown to brown gravelly loams and cobbly loams; weak, fine granular to weak, fine to medium subangular blocky structure; loose, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 6.0 and 6.5. 9 to 13 inches thick.
Subsoil Layers: Pale brown to brown gravelly silt loams and cobbly silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 50 percent coarse fragments; pH ranges between 5.0 and 6.0. 35 to 40 inches thick.
Range of Soil Depth: 45 to 53 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 36, T. 2S., R. 11E.
Estimated U.S.D.A. Soil Classification: Andic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 210 and inclusions of Soils 7, 13, 208 and 209. This unit is mapped on steep north slopes in the upper Hood River Valley.

## 210

## VEGETATION

### PONDEROSA PINE ZONE

Overstory: Douglas-fir, ponderosa pine, grand fir
Understory: Oceanspray, snowberry, deerbrush
Groundcover: Heart-leaf arnica, queencup beadlllly

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this mapping unit consists of hard basalt and andesite. Soils have formed in residuum and colluvium from this bedrock. Some volcanic ash may be mixed in the soil profile.

## CLIMATE

Precipitation: 80 to 90 inches, 2000 to 2300 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 52°F, 11°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2500 to 4000 feet, 833 to 1300 meters

## MANAGEMENT

Although this unit is mapped on cool aspects, it produces low site class timber. These units have shallow soils with low moisture holding capacities. Management activities should be designed so as to conserve the soil that is present.

## SOIL 210

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from ponderosa pine and grand fir. Some grass leaves present. 1/2 to 1 inch thick.
Surface Layers: Dark brown to pale brown gravelly and cobbly loams; weak, very fine granular to weak, very fine and fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 4 to 7 inches thick.
Subsoil Layers: Pale brown to light yellowish brown gravelly silt loams and cobbly silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 60 to 70 percent coarse fragments; pH ranges between 5.0 and 6.0. 10 to 15 inches thick.
Range of Soil Depth: 15 to 20 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 3, T. 1S., R. 10E.
Estimated U.S.D.A. Soil Classification: Andic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 211 and inclusions of Soils 7, 158 and 210. This unit is mapped on steep south facing slopes in the upper Hood River Valley.

## 211

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, ponderosa pine, grand fir
Understory: Snowberry, deerbrush
Groundcover: Elk sedge, fescue, balsam root

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this unit consists of hard basalt and andesite. Soils have formed in residuum and colluvium from this bedrock. Some volcanic ash may be mixed in the soil profile.

## CLIMATE

Precipitation: 80 to 90 inches, 2000 to 2300 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 55°F, 10°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: South and West
Elevation: 2500 to 4000 feet, 830 to 1300 meters

## MANAGEMENT

Because of steep south slopes and relatively shallow soils, regeneration is a problem in this mapping unit. The unit produces low quality–low volume timber and should be low priority in harvest planning. Surface erosion is also a problem in this unit.

## SOIL 211

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from ponderosa pine and Douglas-fir. Dried grass and sedge leaves. 1/2 to 3/4 inch thick.
Surface Layers: Dark brown to pale brown gravelly and cobbly loams; weak, very fine granular to weak, very fine and fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 50 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 3 to 5 inches thick.
Subsoil Layers: Pale brown to light yellowish brown gravelly silt loams and cobbly silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 60 to 70 percent coarse fragments; pH ranges between 5.0 and 6.0. 8 to 12 inches thick.
Range of Soil Depth: 15 to 20 inches.
Modal Site Location: SE 1/4, SW 1/4 Sec. 10, T. 1S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 212 and inclusions of Soils 7, 158, 210 and 211. This unit is mapped on steep north facing slopes in the upper Hood River Valley.

## 212

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, grand fir, western hemlock
Understory: Hazel, vine maple, rhododendron, Oregon grape
Groundcover: Pinegrass, elk sedge, pyrola, prince's pine

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this unit consists of hard basalt and andesite. Soils have formed in residuum and colluvium from this bedrock. Some volcanic ash may be mixed in the soil profile.

## CLIMATE

Precipitation: 80 to 90 inches, 2000 to 2300 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 48°F, 9°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: North and East
Elevation: 3000 to 5000 feet, 1000 to 1660 meters

## MANAGEMENT

Because of steep slopes, only fully suspended cable or other aerial yarding systems should be employed during harvest operations. Timber productivity is Site Class 3 and 4. Surface soil erosion is a problem in areas of exposed mineral soils. Regeneration may also be a problem.

## SOIL 212

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from Douglas-fir and western hemlock. 1 to 2 inches thick.
Surface Layers: Very dark gray to very dark grayish brown cobbly and gravelly loams; very fine granular to weak, very fine and fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 6.0 and 6.5. 8 to 12 inches thick.
Subsoil Layers: Dark brown to light yellowish brown cobbly silt loams and gravelly silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 60 to 65 percent coarse fragments; pH ranges between 5.0 and 6.0. 25 to 40 inches thick.
Range of Soil Depth: 35 to 60 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 21, T. 2S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, coarse-loamy, mixed, mesic. Typic Dystrochrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 213 and inclusions of Soils 7, 13, 211 and 212. This unit is mapped on steep south facing slopes in the upper Hood River Valley.

## 213

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, grand fir, western hemlock
Understory: Hazel, vine maple, rhododendron, Oregon grape
Groundcover: Pinegrass, elk sedge, pyrola, prince's pine

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this unit consists of hard basalt and andesite. Soils have formed in residuum and colluvium from this bedrock. Some volcanic ash may be mixed in the soil profile.

## CLIMATE

Precipitation: 80 to 90 inches, 2000 to 2300 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 6°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: South and West
Elevation: 3000 to 5000 feet, 1000 to 1660 meters

## MANAGEMENT

Because of steep slopes, only fully suspended cable or other aerial yarding systems should be employed during harvest operations. Timber productivity is Site Class 4 and 5. Because of the southerly aspect and high elevations, regeneration is a problem in this unit.

## SOIL 213

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and western Hemlock. 1/2 to 1-1/2 inches thick.
Surface Layers: Very dark grayish brown to dark brown cobbly and gravelly loams; very fine granular to weak, very fine and fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 35 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 7 to 11 inches thick.
Subsoil Layers: Brown to dark yellowish brown cobbly silt loams and gravelly silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 60 to 80 percent coarse fragments; pH ranges between 5.5 and 6.5. 25 to 35 inches thick.
Range of Soil Depth: 35 to 50 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 28, T. 2S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, coarse-loamy, mixed, frigid. Typic Dystrochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 214 and inclusions of Soils 6, 7 and 215. This unit is mapped on steep south facing slopes in the eastern part of the Forest.

## 214

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Ponderosa pine, Douglas-fir, grand fir
Understory: Ocean spray, snowberry, ceanothus, manzanita
Groundcover: Prince's pine, beadlilly, arnica

## GEOLOGY

### IGNEOUS ROCK FORMATIONS

Bedrock for this unit consists of hard basalts and andesites. Soils have formed in residuum and colluvium from this bedrock. Some volcanic ash may be mixed in the soil profile.

## CLIMATE

Precipitation: 30 to 60 inches, 760 to 1520 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: South and West
Elevation: 2500 to 4000 feet, 830 to 1300 meters

## MANAGEMENT

Because of steep slopes, only fully suspended cable or other aerial yarding systems should be employed during harvest operations. Timber productivity is Site Class 4 and 5. Because of the southerly aspect and high elevations, regeneration is a problem in this unit.

## SOIL 214

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and ponderosa pine. 1/2 to 2 inches thick.
Surface Layers: Grayish brown to brown cobbly and gravelly very fine sandy loams; moderate to strong, very fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 40 to 60 percent coarse fragments; pH ranges between 6.0 and 6.5. 8 to 10 inches thick.
Subsoil Layers: Brown to pale brown cobbly and gravelly silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 60 to 70 percent coarse fragments; pH ranges between 6.0 and 6.5. 20 to 30 inches thick.
Range of Soil Depth: 28 to 40 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 22, T. 3S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, coarse-loamy, mixed, frigid. Typic Dystrochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

215

This Mapping Unit consists of Soil 215 and inclusions of Soils 6, 7 and 214. This unit is mapped on steep north facing slopes in the eastern part of the Forest.

## VEGETATION

DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Ponderosa pine, Douglas-fir, grand fir
Understory: Oceanspray, snowberry, ceanothus, manzanita
Groundcover: Prince's pine, beadlilly, arnica

## GEOLOGY

IGNEOUS ROCK FORMATIONS

Bedrock for this unit consists of hard basalts and andesites. Soils have formed in residuum and colluvium from this bedrock. Some volcanic ash may be mixed in the soil profile.

## CLIMATE

Precipitation: 30 to 60 inches, 760 to 1520 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: North and East
Elevation: 2500 to 4000 feet, 830 to 1300 meters

## MANAGEMENT

Because of steep slopes, only fully suspended cable or other aerial yarding systems should be employed during harvest operations. Timber productivity is Site Class 4. Surface soil erosion may be a problem in areas of exposed mineral soils.

## SOIL 215

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and ponderosa pine. 1 to 2 inches thick.
Surface Layers: Grayish brown to brown cobbly and gravelly very fine sandy loams; moderate to strong, very fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.5 and 6.0. 8 to 10 inches thick.
Subsoil Layers: Brown to pale brown cobbly and gravelly silt loams; moderate to strong, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 6.0 and 6.5. 20 to 30 inches thick.
Range of Soil Depth: 28 to 40 inches.
Modal Site Location: SE 1/4, NE 1/4 Sec. 17, T. 3S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, coarse-loamy, mixed, frigid. Typic Dystrochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 300 and inclusions of Soils 6, 7, 12, 13, 301 and 302. This unit is mapped on nearly level to gently sloping mountain slopes near Olallie Lake.

## 300

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Mountain hemlock, lodgepole pine, western white pine, noble fir
Understory: Blue huckleberry, grouse huckleberry
Groundcover: Beargrass, wild violet

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in coarse-textured glacial till deposits. Bedrock consists of very hard, highly-fractured andesites. This material was originally deposited at the base of alpine glaciers and may be somewhat compacted.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 40°F, 5°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 3500 to 5000 feet, 1150 to 1660 meters

## MANAGEMENT

Because of the elevation, extreme temperatures, and high coarse fragment content of the soil profile, this unit represents an extremely harsh site especially in terms of regeneration. Surface soil erosion and compaction are not serious problems in this unit.

## SOIL 300

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from lodgepole pine and noble fir. Some huckleberry leaves present. 2 to 3 inches thick.
Surface Layers: Dark yellowish brown to yellowish brown cobbly and gravelly fine sandy loams; weak, very fine subangular blocky parting to weak, very fine granular structure; soft, loose, non-sticky, non-plastic; 60 to 80 percent coarse fragments; pH ranges between 5.0 and 5.5. 6 to 9 inches thick.
Subsoil Layers: Dark grayish brown to light yellowish brown gravelly loams; massive to weak, medium subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 70 to 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 8 to 10 inches thick.
Range of Soil Depth: 14 to 20 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 14, T. 9S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 301 and inclusions of Soils 6, 7, 12, 13, 300 and 302. This unit is mapped on steep mountain slopes near Olallie Lake.

## 301

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Mountain hemlock, lodgepole pine, western white pine, noble fir
Understory: Blue huckleberry, grouse huckleberry
Groundcover: Beargrass, wild violet

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in coarse-textured glacial till deposits. This material was originally deposited at the base of alpine glaciers and may be somewhat compacted. Bedrock consists of very hard, highly fractured andesites.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 40°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: All aspects
Elevation: 3500 to 5000 feet, 1150 to 1660 meters

## MANAGEMENT

Because of high elevations, extreme temperatures, and a high coarse fragment content of the soil profile, this unit represents an extremely harsh site especially in terms of regeneration. Surface soil erosion and compaction are not serious problems in this unit.

## SOIL 301

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from lodgepole pine and noble fir. Some huckleberry leaves present. 1 to 2 inches thick.
Surface Layers: Dark yellowish brown to yellowish brown cobbly and gravelly fine sandy loams; weak, very fine subangular blocky parting to weak, very fine granular structure; soft, loose, non-sticky, non-plastic; 70 to 80 percent coarse fragments; pH ranges between 5.0 and 6.0. 4 to 7 inches thick.
Subsoil Layers: Dark grayish brown to light yellowish brown gravelly loams; massive to weak, medium subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 5 to 9 inches thick.
Range of Soil Depth: 9 to 16 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 24, T. 9S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts, loamy-skeletal, mixed.

## MAPPING UNIT

302

This Mapping Unit consists of Soil 302 and inclusions of Soils 6, 7 and 303. This unit is mapped on nearly level to sloping benches near Olallie Lake.

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Noble fir, mountain hemlock, lodgepole pine, western white pine, Douglas-fir
Understory: Bearberry, blue huckleberry, chinkapin, myrtle boxwood
Groundcover: Beargrass

## GEOLOGY

GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. This material was originally deposited at the base of alpine glaciers and may be somewhat compacted. Bedrock consists of very hard, highly fractured andesites.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 40°F, 5°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 3000 to 4500 feet, 1000 to 1500 meters

## MANAGEMENT

Because of high elevations, extreme temperatures, and a high coarse fragment content of the soil profile, this unit represents an extremely harsh site especially in terms of regeneration. Surface soil erosion and compaction are not serious problems in this unit.

## SOIL 302

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from mountain hemlock and Douglas-fir. 1 to 2 inches.
Surface Layers: Dark brown to yellowish brown cobbly sandy loams; weak, very fine granular structure; soft, very friable, non-sticky, non-plastic; 50 to 60 percent coarse fragments; pH ranges between 5.0 and 5.5. 10 to 15 inches thick.
Subsoil Layers: Dark yellowish to light gray cobbly loams; weak, fine and medium subangular blocky structure to massive; hard, firm, non-sticky, non-plastic; 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 40 to 50 inches thick.
Range of Soil Depth: 50 to 70 inches.
Modal Site Location: SE 1/4, NW 1/4 Sec. 16, T. 9S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts, loamy-skeletal, mixed. Typic Cryumbrepts, coarse-loamy, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 303 and inclusions of Soils 6, 7, 13 and 302. This unit is mapped on steep slopes near Olallie Lake.

## 303

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Noble fir, mountain hemlock, lodgepole pine, western white pine, Douglas-fir
Understory: Bearberry, blue huckleberry, chinkapin, myrtle boxwood
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. This material was originally deposited at the base and sides of alpine glaciers and may be somewhat compacted. Bedrock consists of very hard, highly fractured andesites.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 42°F, 6°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: All aspects
Elevation: 3000 to 4500 feet, 1000 to 1500 meters

## MANAGEMENT

Because of high elevations, extreme temperature differences, and a high coarse fragment content in the soil profile, this unit has a low capability to produce timber. Regeneration may be a problem, especially on south and west aspects. Surface soil erosion and compaction are not serious problems in this unit.

## SOIL 303

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from mountain hemlock and Douglas-fir. 1/2 inch thick.
Surface Layers: Dark brown to yellowish brown cobbly sandy loams; weak, very fine granular structure; soft, very friable, non-sticky, non-plastic; 50 to 70 percent coarse fragments; pH ranges between 5.0 and 5.5. 8 to 15 inches thick.
Subsoil Layers: Dark yellowish to light gray cobbly loams; weak, fine and medium subangular blocky structure to massive; hard, firm, non-sticky, non-plastic; 60 to 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 25 to 40 inches thick.
Range of Soil Depth: 33 to 50 inches.
Modal Site Location: SE 1/4, SW 1/4 Sec. 1, T. 9S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 304 and inclusions of Soils 4, 6, 7, 305 and 337. This unit is mapped on nearly level to undulating mountain slopes in the upper Clackamas River Drainage.

304

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Noble fir, Douglas-fir, western hemlock, lodgepole pine, mountain hemlock
Understory: Vine maple, blue huckleberry, Oregon grape
Groundcover: Beadlilly, trillium, beargrass, prince's pine, trailing twinflower

## GEOLOGY

GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. Although the till is deep, it may be compacted in places, thus reducing effective rooting depth. Bedrock in this unit consists of very hard, highly fractured andesites and basalts.

## CLIMATE

Precipitation: 70 to 90 inches, 1776 to 2280 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 2500 to 4000 feet, 830 to 1300 meters

## MANAGEMENT

This mapping unit is suitable for tractor yarding operations because of its low slope and low compaction hazard. However the site quality is also low and the unit has a high seedling mortality and brush hazard. Achieving adequate stocking may be a problem in harvest units.

## SOIL 304

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from lodgepole pine and mountain hemlock. 2 to 3 inches thick.
Surface Layers: Dark brown to yellowish brown gravelly and cobbly loams; weak, very fine granular structure; loose, very friable, non-sticky, non-plastic; 40 to 60 percent coarse fragments; pH ranges between 5.0 and 5.5. 6 to 9 inches thick.
Subsoil Layers: Dark yellowish brown to very pale brown gravelly silt loams to gravelly very fine sandy loams; weak, fine and medium subangular blocky structure to massive; slightly hard, firm, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.0 and 6.0. 35 to 50 inches thick.
Range of Soil Depth: 43 to 59 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 3, T. 8S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid. Typic Cryumbrepts, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 305 and inclusions of Soils 6, 7, 304 and 337. This unit is mapped on steep slopes in the upper Clackamas River Drainage.

## 305

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Noble fir, Douglas-fir, western hemlock, lodgepole pine, mountain hemlock
Understory: Rhododendron, vine maple, Oregon grape, blue huckleberry, prince's pine, chinkapin
Groundcover: Beargrass, vanilla leaf, trailing twinflower, western star flower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. Although the till is deep, it may be compacted in places, thus reducing effective rooting depth. Bedrock in this unit consists of very hard, fractured andesites and basalts.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2280 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2500 to 4000 feet, 830 to 1300 meters

## MANAGEMENT

Because of slope limitations, this mapping unit is unsuitable for tractor yarding operations. These soils have a rapid permeability in the surface layers and surface erosion should not be a problem.

## SOIL 305

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from lodgepole pine and mountain hemlock. 1 to 2 inches thick.
Surface Layers: Dark brown to yellowish brown gravelly and cobbly loams; weak, very fine granular structure; loose, very friable, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 5 to 7 inches thick.
Subsoil Layers: Dark yellowish brown to very pale brown gravelly silt loams to gravelly very fine sandy loams; weak, fine to medium subangular blocky structure to massive; slightly hard, firm, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.0 and 6.0. 25 to 35 inches thick.
Range of Soil Depth: 31 to 44 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 3, T. 7S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

306

This Mapping Unit consists of Soil 306 and inclusions of Soils 7, 307 and 308. This unit is mapped on gentle mountain slopes in the upper Clackamas River Drainage.

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Western hemlock, western redcedar, Douglas-fir
Understory: Blue huckleberry, Oregon grape, vine maple
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. Bedrock in this unit consists of hard fractured andesites, basalts, and in some areas hard weathered breccia.

## CLIMATE

Precipitation: 60 to 90 inches, 1520 to 2280 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

This unit is suitable for tractor yarding operations although a moderate compaction hazard exists. In areas of exposed mineral soils on steeper slopes, surface erosion can be a minor problem. This soil unit has low to moderate potential to produce timber.

## SOIL 306

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 2 to 3 inches thick.
Surface Layers: Dark brown to yellowish brown loams; weak, very fine granular to weak, fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 20 percent coarse fragments; pH ranges between 5.0 and 5.5. 10 to 15 inches thick.
Subsoil Layers: Yellowish brown to yellow gravelly and very gravelly loams; weak, fine and medium subangular blocky structure to massive; slightly hard, firm, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 25 to 25 inches thick.
Range of Soil Depth: 35 to 50 inches.
Modal Site Location: SW 1/4, NW 1/4 Sec. 28, T. 6S., R. 7E.
Estimated U.S.D.A. Soil Classification: Cumulic Haplumbrepts, coarse-loamy, mixed, frigid. Typic Haplumbrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 307 and inclusions of Soils 7, 306 and 308. This unit is mapped on steep, north and east facing slopes in the upper Clackamas River Drainage.

## 307

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Western hemlock, western redcedar, Douglas-fir
Understory: Blue huckleberry, Oregon grape, vine maple
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep uncompacted glacial till deposits. Bedrock in this unit consists of hard fractured andesites, basalts, and in some areas weathered breccia.

## CLIMATE

Precipitation: 60 to 90 inches, 1520 to 2280 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

This soil unit has few problems in terms of soil management. Steep slopes make cable yarding systems the best feasible harvest alternative. In areas of exposed mineral soils on steeper slopes, surface erosion may be a minor problem. This soil unit has a moderate capability to produce timber.

## SOIL 307

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1 to 2 inches thick.
Surface Layers: Dark brown to yellowish brown loams; weak, very fine granular to weak, fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 15 percent coarse fragments; pH ranges between 5.0 and 5.5. 10 to 15 inches thick.
Subsoil Layers: Yellowish brown to yellow gravelly and very gravelly loams; weak, fine and medium subangular blocky structure to massive; slightly hard, firm, non-sticky, non-plastic; 25 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 30 inches thick.
Range of Soil Depth: 20 to 45 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 12, T. 6S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 308 and inclusions of Soils 7, 13, 307 and 309. This unit is mapped on steep south and east facing slopes in the upper Clackamas River Drainage.

## 308

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Western hemlock, western redcedar, Douglas-fir
Understory: Blue huckleberry, Oregon grape, vine maple
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep, uncompacted glacial till deposits. Bedrock in this unit consists of hard fractured andesites, basalts, and in some areas, weathered breccia.

## CLIMATE

Precipitation: 60 to 90 inches, 1520 to 2280 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 44°F, 6.5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

This soil unit has few problems in terms of soil management. Steep slopes make cable yarding systems the best feasible harvest alternative. In areas of exposed mineral soils on steeper slopes, surface erosion may be a minor problem. Achieving adequate regeneration may also be a problem.

## SOIL 308

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1/2 to 1-1/2 inches thick.
Surface Layers: Dark brown to yellowish brown loams; weak, very fine granular to weak, fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 15 to 20 percent coarse fragments; pH ranges between 5.0 and 5.5. 8 to 12 inches thick.
Subsoil Layers: Yellowish brown to yellow gravelly and very gravelly loams; weak, fine and medium subangular blocky structure to massive; slightly hard, firm, non-sticky, non-plastic; 20 to 25 percent coarse fragments; pH ranges between 5.5 and 6.0. 14 to 26 inches thick.
Range of Soil Depth: 22 to 38 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 25, T. 6S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 309 and inclusions of Soils 7, 13, 310 and 311. This unit is mapped on nearly level to undulating slopes in the upper Clackamas River Drainage.

## 309

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Mountain hemlock, western hemlock, Douglas-fir, lodgepole pine, western white pine, noble fir
Understory: Rhododendron, Oregon grape, huckleberry, chinkapin
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep, compacted glacial till deposits. The hard compacted till, which acts as a barrier to drainage, is found at approximately 20 inches in depth. Bedrock consists of hard fractured andesites.

## CLIMATE

Precipitation: 80 to 110 inches, 2030 to 2790 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 40°F, 5°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 3000 to 4000 feet, 1000 to 1300 meters

## MANAGEMENT

Achieving adequate regeneration may be a problem in this unit because of the high elevations and cool temperatures. The effective soil depth is less than 20 inches because of the compacted layer and high coarse fragment content of the soil profile. Windthrow hazard is very high in this unit.

## SOIL 309

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock and noble fir overlying humified organic matter. 2 to 3 inches thick.
Surface Layers: Dark brown to brown gravelly loams to very cobbly sandy loams; weak to moderate fine and medium subangular blocky to weak, very fine granular structure; loose, very friable, non-sticky, non-plastic; 50 to 60 percent coarse fragments; pH ranges between 5.0 and 6.0. 18 to 22 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown very cobbly loams; weak to moderate fine and medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 60 percent coarse fragments; pH ranges between 5.0 and 6.0. 20 to 40 inches thick.
Range of Soil Depth: 38 to 62 inches.
Modal Site Location: SW 1/4, SE 1/4 Sec. 22, T. 8S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Cryochrepts, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 310 and inclusions of Soils 7, 13, 309 and 311. This unit is mapped on steep glaciated sideslopes in the upper Clackamas River Drainage.

## 310

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Mountain hemlock, western hemlock, Douglas-fir, lodgepole pine, western white pine, noble fir
Understory: Rhododendron, Oregon grape, huckleberry, chinkapin
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep, compacted glacial till deposits. The hard compacted till, which acts as a barrier to drainage, is found at approximately 20 inches in depth. Bedrock consists of hard fractured andesites.

## CLIMATE

Precipitation: 80 to 110 inches, 2030 to 2790 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 40°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: All aspects
Elevation: 3000 to 4000 feet, 1000 to 1300 meters

## MANAGEMENT

Achieving adequate regeneration may be a problem in this unit because of the high elevations and cool temperatures. The effective soil depth is less than 20 inches because of the compacted layer and high coarse fragment content of the soil profile. Windthrow hazard is very high in this unit.

## SOIL 310

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock and noble fir overlying humified organic matter. 1 to 2 inches thick.
Surface Layers: Dark brown to brown gravelly sandy loams to very cobbly sandy loams; weak to moderate fine and medium subangular blocky to weak, very fine granular structure; loose, very friable, non-sticky, non-plastic; 40 to 60 percent coarse fragments; pH ranges between 5.0 and 6.0. 12 to 15 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown very cobbly loams; weak to moderate fine and medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 18 to 35 inches thick.
Range of Soil Depth: 30 to 50 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 21, T. 8S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Cryochrepts, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 311 and inclusions of Soils 6, 7, 13, 309 and 310. This unit is mapped on nearly level to sloping, smooth to slightly undulating, glaciated uplands.

311

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, noble fir, western hemlock
Understory: Rhododendron, vine maple, Oregon grape, blue huckleberry, prince's pine, wild rose, chinkapin
Groundcover: Beargrass, vanilla leaf, trailing twinflower, western starflower, rattlesnake orchid

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep, compacted glacial till deposits. The till is dense and compacted at approximately 40 to 60 inches. This compacted layer acts as a restriction to downward water movement and may cause wet spots to form.

## CLIMATE

Precipitation: 60 to 80 inches, 1520 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 2000 to 3500 feet, 660 to 1160 meters

## MANAGEMENT

This unit produces Site Class 4 and 5 Douglas-fir and is also suitable for tractor yarding because of low slope and low compaction hazard. Because of rapid permeability, surface erosion is also not a major problem.

## SOIL 311

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Totally and partially decomposed needles and twigs from Douglas-fir and noble fir. 1 to 2 inches thick.
Surface Layers: Very dark gray to dark grayish brown cobbly sandy loams and gravelly sandy loams; weak, very fine granular and weak, very fine subangular blocky structure; loose, very friable, non-sticky, non-plastic; 50 to 60 percent coarse fragments; pH ranges between 5.0 and 5.5. 15 to 21 inches thick.
Subsoil Layers: Dark yellowish brown to pale brown cobbly and very cobbly sandy loams; weak to moderate, medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 35 inches thick.
Range of Soil Depth: 35 to 56 inches.
Modal Site Location: SW 1/4, NW 1/4 Sec. 26, T. 8S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Cryochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 312 and inclusions of Soils 3, 4, 5, 313 and 314. This unit is mapped on nearly level to sloping, smooth to slightly undulating, glaciated slopes near Fanton.

## 312

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, noble fir, western hemlock, western redcedar
Understory: Huckleberry, salal
Groundcover: Oxalis, anenome, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. These till deposits are uncompacted and overly hard massive breccia formations. Soil profiles characteristically have high contents of large rounded stones and boulders.

## CLIMATE

Precipitation: 70 to 90 inches, 1700 to 2280 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 48°F, 9°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 500 to 1800 feet, 160 to 600 meters

## MANAGEMENT

Soil Unit 312 is a good producer of timber. Stands of Site Class 2 and 3 Douglas-fir are not uncommon. The terrain is suitable for tractor yarding but the compaction hazard is moderate. The potential for subsoil erosion is high and road cut and fill slopes should be revegetated promptly.

## SOIL 312

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 3 to 4 inches thick.
Surface Layers: Very dark grayish brown to brown, stony and cobbly silt loams and light clay loams; moderate, very fine and fine granular and weak, very fine and fine subangular blocky structure; soft to slightly hard, very friable to friable, slightly sticky, slightly plastic; 30 to 45 percent coarse fragments; pH ranges between 5.0 and 5.5. 11 to 15 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown cobbly and very gravelly light clay loams; weak and moderate medium to coarse subangular block structure; slightly hard, friable, slightly sticky, slightly plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 38 to 45 inches thick.
Range of Soil Depth: 49 to 60 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 17, T. 3S., R. 6E.
Estimated U.S.D.A. Soil Classification: Andic Cumulic Haplumbrepts,loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 313 and inclusions of Soils 5, 312 and 314. This unit is mapped on steep north and east facing slopes along drainageways near Fanton.

## 313

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar
Understory: Huckleberry, salal
Groundcover: Oxalis, anenome, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. These till deposits are uncompacted and overly hard massive breccia formations. Soil profiles characteristically have high contents of large rounded stones and boulders.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2280 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 48°F, 9°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 500 to 1800 feet, 160 to 600 meters

## MANAGEMENT

Soil Unit 313 is a good producer of timber. Stands of Site Class 3 Douglas-fir are common. The terrain is not suitable for tractor yarding and the surface erosion potential is high. The potential for subsoil erosion is also high and road cut and fill slopes should be revegetated promptly.

## SOIL 313

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1 to 2 inches thick.
Surface Layers: Very dark grayish brown to brown, stony and cobbly silt loams and light clay loams; moderate, very fine and fine granular and weak, very fine subangular blocky structure; soft to slightly hard, very friable, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 8 to 10 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown cobbly and gravelly clay loams and silt loams; weak to moderate, medium to coarse subangular blocky structure; slightly hard friable, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 20 to 34 inches thick.
Range of Soil Depth: 37 to 44 inches.
Modal Site Location: SW 1/4, NW 1/4 Sec. 8, T. 4S., R. 5E.
Estimated U.S.D.A. Soil Classification: Andic Cumulic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 314 and inclusions of Soils 5, 312 and 313. This unit is mapped on steep south and west facing slopes along drainages near Fanton.

## 314

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar
Understory: Huckleberry, salal
Groundcover: Oxalis, anenome, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. These till deposits are uncompacted and overly hard massive breccia formations. Soil profiles characteristically have high contents of large rounded stones and boulders.

## CLIMATE

Precipitation: 70 to 90 inches, 1700 to 2280 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 49°F, 8.5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 500 to 1800 feet, 160 to 600 meters

## MANAGEMENT

Soil Unit 314 is an average producer of timber. Stands of Site Class 4 Douglas-fir are common. The terrain is not suitable for tractor yarding and the surface erosion potential is high. The potential for subsoil erosion is also high and road cut and fill slopes should be revegetated promptly.

## SOIL 314

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1 to 2 inches thick.
Surface Layers: Very dark grayish brown to brown, stony and cobbly silt loams and light clay loams; moderate, very fine granular and weak, very fine subangular blocky structure; soft to slightly hard, very friable, slightly sticky, slightly plastic; 30 to 40 percent coarse fragments; pH ranges between 5.5 and 6.0. 6 to 9 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown cobbly and gravelly clay loams and silt loams; weak to moderate, medium to coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 25 to 30 inches thick.
Range of Soil Depth: 31 to 43 inches.
Modal Site Location: SW 1/4, NW 1/4 Sec. 24, T. 4S., R. 5E.
Estimated U.S.D.A. Soil Classification: Andic Cumulic Haplumbrepts, coarse-loamy, mixed, mesic. Andic Cumulic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 315 and inclusions of Soils 5, 316 and 317. This unit is mapped on nearly level to sloping, smooth to slightly undulating slopes in the Wildcat Area.

## 315

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, noble fir, western hemlock
Understory: Huckleberry, rhododendron
Groundcover: Beargrass, bunchberry, clintonia

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. These till deposits are uncompacted and overly hard massive breccia formations. Soil profiles characteristically have high contents of large rounded stones and boulders.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

Soil Unit 315 produces Site Class 4 Douglas-fir. The terrain is suitable for tractor yarding but the soils have a moderate compaction hazard. Surface soil erosion should not be a major problem, however exposed road cut and fill slopes may erode rapidly.

## SOIL 315

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1 to 2 inches thick.
Surface Layers: Dark brown to yellowish brown gravelly loams; weak very fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 11 to 14 inches thick.
Subsoil Layers: Yellowish brown to yellow gravelly and very gravelly loams; weak, fine and medium subangular blocky structure to massive; slightly hard to hard, firm, slightly sticky, slightly plastic; 35 percent coarse fragments; pH ranges between 5.5 and 6.0. 27 to 30 inches thick.
Range of Soil Depth: 38 to 44 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 15, T. 3S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Dystrochrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

316

This Mapping Unit consists of Soil 316 and inclusions of Soils 5, 6, 315 and 317. This unit is mapped on steep, smooth to slightly undulating slopes in the Wildcat Area and near High Rock.

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, noble fir, western hemlock, red alder
Understory: Huckleberry, rhododendron
Groundcover: Beargrass, bunchberry, clintonia

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. These till deposits are uncompacted and overly hard massive breccia formations. Soil profiles characteristically have high contents of large rounded stones and boulders.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 42°F, 5.5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

Soil Unit 316 produces Site Class 3 and 4 Douglas-fir. Fully-suspended cable yarding systems should be employed during harvest operations to help preserve the soil resource. Surface erosion is a moderate hazard while areas of exposed subsoils such as skidtrails and roadcuts can erode rapidly.

## SOIL 316

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1/2 to 1-1/2 inches thick.
Surface Layers: Dark brown to yellowish brown cobbly loams; weak, very fine granular, to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 8 to 10 inches thick.
Subsoil Layers: Yellowish brown to yellow gravelly and very gravelly loams; weak, fine and medium subangular blocky structure to massive; slightly hard, firm, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 24 inches thick.
Range of Soil Depth: 28 to 34 inches.
Modal Site Location: SE 1/4, NW 1/4 Sec. 10, T. 3S., R. 6E.
Estimated U.S.D.A. Soil Classification: Umbric Vitrandepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 317 and inclusions of Soils 5, 6, 315 and 316. This unit is mapped on steep, smooth to slightly undulating slopes in the Wildcat Area and near High Rock.

## 317

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, noble fir, western hemlock, red alder
Understory: Huckleberry, rhododendron
Groundcover: Beargrass, bunchberry, clintonia

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. These till deposits are uncompacted and overly hard massive breccia formations. Soil profiles characteristically have high contents of large rounded stones and boulders.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

Soil Unit 317 produces Site Class 4 Douglas-fir. Fully-suspended cable yarding systems should be employed during harvest operations to help preserve the soil resource. Surface erosion is a moderate hazard while areas of exposed subsoils such as skidtrails and roadcuts can erode rapidly.

## SOIL 317

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1/2 to 3/4 inches thick.
Surface Layers: Dark brown to yellowish brown cobbly loams; weak, very fine granular to weak, very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 7 to 9 inches thick.
Subsoil Layers: Yellowish brown to yellow gravelly and very gravelly loams; weak, fine and medium subangular blocky structure to massive; slightly hard, firm, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 18 to 20 inches thick.
Range of Soil Depth: 25 to 29 inches.
Modal Site Location: NE 1/4, NW 1/4 Sec. 15, T. 3S., R. 6E.
Estimated U.S.D.A. Soil Classification: Umbric Vitrandepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 318 and inclusions of Soils 5, and 6. This unit is mapped on steep dissected slopes near Eagle Creek.

## 318

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock
Understory: Rhododendron, salal
Groundcover: Bunchberry

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in shallow glacial till deposits on steep sideslopes. In many areas the till has been eroded exposing the massive breccia bedrock and forming deep dissections.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2280 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 20 to 70 percent
Aspect: All aspects
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

Soil Unit 318 is a poor producer of timber yielding only low Site Class 5 Douglas-fir. The terrain is extremely rough making tractor yarding unfeasible. The subsoil erosion potential is high. Achieving adequate regeneration in this unit will probably be difficult because of the shallow, cobbly soils.

## SOIL 318

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. Salal leaves also present. 0 to 1/2 inch thick.
Surface Layers: Grayish brown to light gray cobbly and gravelly loams; weak, very fine granular to weak, fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 60 to 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 3 to 4 inches thick.
Subsoil Layers: Light brownish gray to very pale brown cobbly and gravelly loams; weak, fine and medium subangular blocky structure to massive; slightly hard, friable, slightly sticky, slightly plastic; 70 percent coarse fragments; pH ranges between 5.0 and 5.5. 8 to 14 inches thick.
Range of Soil Depth: 11 to 18 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 8, T. 4S., R. 6E.
Estimated U.S.D.A. Soil Classification: Andic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 319 and inclusions of Soils 5, 6, 312, 316 and 371. This unit is mapped on gently sloping to steep slopes near High Rock.

## 319

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar
Understory: Rhododendron, devil's club, vine maple, salal
Groundcover: Sword fern

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. These till deposits are not compacted and are characterized by many large rounded stones and boulders in the soil profile. Bedrock in this soil unit consists of hard massive breccia.

## CLIMATE

Precipitation: 60 to 90 inches, 1520 to 2290 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 20 to 70 percent
Aspect: All aspects
Elevation: 2000 to 4000 feet, 660 to 1330 meters

## MANAGEMENT

Soil Unit 319 produces Site Class 3 and 4 Douglas-fir. Because of wetness problems, the compaction hazard is high. Windthrow hazard is also high because the water table is within two feet of the soil surface. Regeneration should not be a problem in this unit.

## SOIL 319

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 2 to 3 inches thick.
Surface Layers: Very dark grayish brown to dark gray cobbly and gravelly sandy loams; weak, very fine granular structure to single grain; loose, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.5 and 6.0. 8 to 10 inches thick.
Subsoil Layers: Brown to light yellowish brown cobbly and gravelly silt loams; weak, fine subangular blocky to weak, fine granular structure; slightly hard, firm, slightly sticky, slightly plastic; 20 to 30 percent coarse fragments; pH ranges between 5.0 and 6.0. 35 to 45 inches thick.
Range of Soil Depth: 43 to 55 inches.
Modal Site Location: SE 1/4, NE 1/4 Sec. 35, T. 3S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 320 and inclusions of Soils 7, 312 and 322. This unit is mapped on nearly level to steep smooth slopes on the Estacada and Clackamas Ranger Districts.

## 320

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, noble fir
Understory: Rhododendron, Oregon grape, thimbleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. These deposits may vary in thickness over short distances. Bedrock for this unit consists of hard basalts and andesites.

## CLIMATE

Precipitation: 70 to 80 inches, 1770 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 3000 to 4000 feet, 1000 to 1200 meters

## MANAGEMENT

This mapping unit includes terrain that is suitable for tractor yarding operations. The compaction hazard is low to moderate and the surface erosion hazard is low. Regeneration may be difficult in areas of deep soil gouging.

## SOIL 320

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and noble fir. 2 to 3 inches thick.
Surface Layers: Dark brown to light yellowish brown gravelly loams and gravelly silt loams; moderate, very fine and fine granular to strong, fine and medium subangular blocky structure; soft, very friable, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 6.0 and 6.5. 25 to 32 inches thick.
Subsoil Layers: Dark yellowish brown to very pale brown, very gravelly and very cobbly silt loams; strong, fine subangular blocky structure to massive; slightly hard, friable, slightly sticky, slightly plastic; 50 to 70 percent coarse fragments; pH ranges between 6.0 and 6.5. 28 to 33 inches thick.
Range of Soil Depth: 53 to 65 inches.
Modal Site Location: NE 1/4, NW 1/4 Sec. 17, T. 5S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

321

This Mapping Unit consists of Soil 321 and inclusions of Soils 6, 7, 320 and 322. This unit is mapped on steep north and east facing slopes on the Estacada and Clackamas Ranger Districts.

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, noble fir
Understory: Rhododendron, Oregon grape
Groundcover: Beargrass

## GEOLOGY

GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. These deposits may vary in thickness over short distances. Bedrock for this unit consists of hard basalt and andesites.

## CLIMATE

Precipitation: 70 to 80 inches, 1770 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 3000 to 4000 feet, 1000 to 1330 meters

## MANAGEMENT

This mapping unit is not suitable for tractor yarding operations because of slope limitations. Because of the rapid permeability of the surface soil, erosion should not be a major problem.

## SOIL 321

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and noble fir. 1 to 2 inches thick.
Surface Layers: Dark brown to yellowish brown gravelly loams and gravelly silt loams; moderate, very fine and fine granular to strong, fine and medium subangular blocky structure, soft, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 6.0 and 6.5. 14 to 18 inches thick.
Subsoil Layers: Dark yellowish brown to very pale brown, very gravelly and very cobbly silt loams; strong, fine subangular blocky structure to massive; slightly hard, friable, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 15 to 21 inches thick.
Range of Soil Depth: 20 to 39 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 16, T. 5S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 322 and inclusions of Soils 6, 7, 320, 321 and 323. This unit is mapped on steep north and east facing slopes on the Estacada and Clackamas Ranger Districts.

## 322

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, noble fir
Understory: Rhododendron, Oregon grape
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. These deposits may vary in thickness over short distances. Bedrock for this unit consists of hard basalt and andesites.

## CLIMATE

Precipitation: 70 to 80 inches, 1770 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 44°F, 6.5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 3000 to 4000 feet, 1000 to 1300 meters

## MANAGEMENT

This mapping unit is not suitable for tractor yarding operations because of slope limitations. Because of the rapid permeability of the surface soil, erosion should not be a major problem.

## SOIL 322

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and noble fir. 3/4 to 1 inch thick.
Surface Layers: Dark brown to yellowish brown gravelly loams and gravelly silt loams; moderate, very fine and fine granular to strong, fine and medium subangular blocky structure; soft, very friable, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 12 to 15 inches thick.
Subsoil Layers: Dark yellowish brown to very pale brown, very gravelly and very cobbly silt loams; strong, fine subangular blocky structure to massive; slightly hard, friable, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 15 to 18 inches thick.
Range of Soil Depth: 27 to 33 inches.
Modal Site Location: SE 1/4, NW 1/4 Sec. 6, T. 6S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 323 and inclusions of Soils 6, 7, 13, 324 and 325. This unit is mapped on nearly level to sloping, smooth glaciated uplands.

## 323

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, noble fir, western redcedar
Understory: Rhododendron, thimbleberry, Oregon grape
Groundcover: Western starflower, oxalis, twinflower, vanilla leaf

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. Bedrock for this unit consists of hard basalts and andesites.

## CLIMATE

Precipitation: 50 to 70 inches, 1270 to 1770 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

This mapping unit produces Site Class 3 Douglas-fir. The terrain is suitable for tractor yarding but the compaction hazard is moderate. Achieving adequate regeneration should not be a problem in this mapping unit.

## SOIL 323

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir, noble fir, and western hemlock. 1/2 to 1 inch thick.
Surface Layers: Very dark grayish brown to brown gravelly silt loams; moderate, fine granular to moderate fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.5 and 6.0. 17 to 20 inches thick.
Subsoil Layers: Dark brown to yellowish brown very cobbly silty clay loams; massive, hard, firm, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 18 to 23 inches thick.
Range of Soil Depth: 35 to 43 inches.
Modal Site Location: SE 1/4, NW 1/4 Sec. 21, T. 6S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 324 and inclusions of Soils 6, 7, 13, 323 and 325. This unit is mapped on sloping to steep, south and west facing, smooth glaciated uplands.

## 324

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, noble fir, western redcedar
Understory: Rhododendron, thimbleberry, Oregon grape
Groundcover: Western starflower, oxalis, twinflower, vanilla leaf

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. Bedrock for this unit consists of hard basalts and andesites.

## CLIMATE

Precipitation: 50 to 70 inches, 1270 to 1770 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

This mapping unit produces Site Class 2 and 3 Douglas-fir. The terrain is not suitable for tractor yarding but the area could be easily harvested using conventional cable systems. Surface soil erosion should not be a problem in this unit.

## SOIL 324

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir, noble fir, and western hemlock. 1/2 to 3/4 inches thick.
Surface Layers: Very dark grayish brown to brown gravelly silt loams; moderate, fine granular to moderate fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 20 to 40 percent coarse fragments; pH ranges between 5.0 and 6.0. 12 to 14 inches thick.
Subsoil Layers: Dark brown to yellowish brown very cobbly silty clay loams; massive, hard, firm, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5.5 and 6.0. 18 to 20 inches thick.
Range of Soil Depth: 30 to 34 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 3, T. 5S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, mesic. Typic Haplumbrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 325 and inclusions of Soils 6, 7, 323 and 324. This unit is mapped on sloping to steep, north and east facing, smooth glaciated uplands.

## 325

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, noble fir, western redcedar
Understory: Rhododendron, thimbleberry, Oregon grape
Groundcover: Western starflower, oxalis, twinflower, vanilla leaf

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. Bedrock for this unit consists of hard basalts and andesites.

## CLIMATE

Precipitation: 50 to 70 inches, 1270 to 1770 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 51°F, 10.5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 1800 to 3000 feet, 600 to 1000 meters

## MANAGEMENT

This mapping unit produces Site Class 3 and 4 Douglas-fir. The terrain is not suitable for tractor yarding but the area could easily be harvested using conventional cable systems. Surface soil erosion should not be a problem in this unit.

## SOIL 325

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and western hemlock. 1/2 to 3/4 inch thick.
Surface Layers: Very dark brown to brown gravelly silt loams; moderate, fine granular to moderate, fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 percent coarse fragments; pH ranges between 5.0 and 6.0. 14 to 15 inches thick.
Subsoil Layers: Dark brown to yellowish brown very cobbly silty clay loams; massive, firm, slightly sticky, slightly plastic; 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 22 to 26 inches thick.
Range of Soil Depth: 36 to 41 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 2, T. 5S., R. 5E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, coarse-loamy over loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 326 and inclusions of Soils 6, 7 and 13. This unit is mapped on nearly level to sloping, smooth glaciated uplands.

## 326

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: None
Understory: Huckleberry
Groundcover: Beargrass

## GEOLOGY

GLACIAL DEPOSITS

Soils in this mapping unit have formed in extremely coarse-textured glacial deposits. In many areas, soil material is wholly lacking leaving the basalt and andesite bedrock exposed.

## CLIMATE

Precipitation: 80 to 120 inches, 2030 to 3040 mm
Soil Temperature Class: Frigid to Cryic
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 3500 to 5500 feet, 1160 to 1840 meters

## MANAGEMENT

This soil unit is not suitable for timber management. It is used primarily for forage production and recreational activities such as hiking and huckleberry picking.

## SOIL 326

RANGE IN SOIL PROFILE CHARACTERISTICS

Litter: Decomposing huckleberry leaves and twigs. 1/2 inch thick.
Surface Layers: Dark gray to dark grayish brown stony and cobbly sandy loams; moderate to strong, fine granular structure; loose, friable, non-sticky, non-plastic; 70 to 80 percent coarse fragments; pH ranges between 5.0 and 5.5. 3 to 5 inches thick.
Subsoil Layers: Dark brown to brown cobbly sandy loams; moderate fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 80 percent coarse fragments; pH ranges between 5.0 and 5.5. 6 to 8 inches thick.
Range of Soil Depth: 9 to 13 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 14, T. 1N., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthents, fragmental, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 327 and inclusions of Soils 5 and 28. This unit is mapped on nearly level to sloping, smooth glaciated uplands.

## 327

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Western hemlock, Douglas-fir
Understory: Rhododendron, bearberry, Oregon grape, chinkapin, princes pine, blueberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. Bedrock for this mapping unit consists of hard massive tuffs and breccias.

## CLIMATE

Precipitation: 60 to 80 inches, 1520 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 2000 to 3500 feet, 666 to 1160 meters

## MANAGEMENT

This unit produces Site Class 4 Douglas-fir and is suitable for tractor yarding operations. Surface soil erosion and soil compaction are not major problems in this unit.

## SOIL 327

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1 to 1-1/2 inches thick.
Surface Layers: Dark brown to light yellowish brown loams and gravelly silt loams; weak, very fine granular to moderate, fine subangular blocky structure; soft to slightly hard, very friable to firm, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 9 to 13 inches thick.
Subsoil Layers: Yellowish brown to very pale brown gravelly silt loams; weak, medium subangular blocky structure to massive; slightly hard, firm, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 17 to 27 inches thick.
Range of Soil Depth: 26 to 40 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 19, R. 7S., R. 7E.
Estimated U.S.D.A. Soil Classification: Umbric Dystrochrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

328

This Mapping Unit consists of Soil 328 and inclusions of Soils 5 and 327. This unit is mapped on sloping to steep, smooth to slightly dissected glaciated uplands.

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Western hemlock, Douglas-fir
Understory: Rhododendron, bearberry, Oregon grape, chinkapin, princes pine, blue huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. Bedrock for this mapping unit consists of hard massive tuffs and breccias.

## CLIMATE

Precipitation: 60 to 80 inches, 1520 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2000 to 3500 feet, 666 to 1160 meters

## MANAGEMENT

This unit produces Site Class 4 Douglas-fir. Timber harvesting with conventional cable systems is suitable for existing soil conditions. Surface soil erosion and soil compaction are not major problems in this unit.

## SOIL 328

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1 to 1-1/2 inches thick.
Surface Layers: Dark brown to light yellowish brown loams and gravelly silt loams; weak, very fine granular to moderate, fine subangular blocky structure; soft to slightly hard, very friable to firm, non-sticky, non-plastic; 30 percent coarse fragments; pH ranges between 5.0 and 5.5. 7 to 10 inches thick.
Subsoil Layers: Yellowish brown to very pale brown gravelly silt loams; weak; medium subangular blocky structure to massive; slightly hard, firm, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 15 to 24 inches thick.
Range of Soil Depth: 22 to 34 inches.
Modal Site Location: SE 1/4, SW 1/4 Sec. 18, T. 7S., R. 7E.
Estimated U.S.D.A. Soil Classification: Umbric Dystrochrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 329 and inclusions of Soils 5, 327 and 328. This unit is mapped on sloping to steep smooth slightly dissected glaciated uplands.

## 329

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Western hemlock, Douglas-fir
Understory: Rhododendron, bearberry, Oregon grape, chinkapin, prince's pine, blue huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. Bedrock for this mapping unit consists of hard massive tuffs and breccias.

## CLIMATE

Precipitation: 60 to 80 inches, 1520 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 2000 to 3500 feet, 666 to 1160 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. Timber harvesting with conventional cable systems is suitable to existing soil conditions. Surface soil erosion and soil compaction are not major problems in this unit.

## SOIL 329

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock. 1 to 1-1/2 inches thick.
Surface Layers: Dark brown to light yellowish brown loams and gravelly silt loams; weak, very fine granular to moderate, fine subangular blocky structure; soft to slightly hard, very friable to firm, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 5.0 and 5.5. 0 to 10 inches thick.
Subsoil Layers: Yellowish brown to very pale brown gravelly silt loams; weak, medium subangular blocky structure to massive; slightly hard, firm, slightly sticky, slightly plastic; 20 percent coarse fragments; pH ranges between 5.0 and 5.5. 14 to 24 inches thick.
Range of Soil Depth: 22 to 34 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 6, T. 6S., R. 8E.
Estimated U.S.D.A. Soil Classification: Umbric Dystrochrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

## 330

This Mapping Unit consists of Soil 330 and inclusions of Soils 3, 4, 6, 7, 327, 328 and 329. This unit is mapped in glaciated valley bottoms

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar
Understory: Vine maple, blue huckleberry, Rhododendron, Oregon grape, snowberry, boxwood
Groundcover: Western starflower, trailing twinflower, inside-out flower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this unit have formed in unconsolidated medium textured glacial till. Most of the rocks have been derived from Cascade Andesites with a mixture of basalts and pyroclastic rocks.

## CLIMATE

Precipitation: 70 to 100 inches, 1770 to 2540 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 1800 to 3500 feet, 600 to 1160 meters

## MANAGEMENT

This soil unit produces Site Class 3 and 4 Douglas-fir and is suitable for tractor yarding operations. The soil mantle is very stable, however some sloughing may occur in roadcuts. Because of rapid permeability, surface erosion is not a problem in this unit.

## SOIL 330

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially decomposed needles and twigs from Douglas-fir. Decomposed organic matter with many roots. 1 to 2 inches thick.
Surface Layers: Dusky red to dark brown stony loams; weak, very fine granular to weak very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 10 to 15 inches thick.
Subsoil Layers: Brown to dark brown to stony gravelly loam; massive, soft, very friable, non-sticky, slightly plastic; 40 to 60 percent coarse fragments; pH ranges between 5.0 and 5.5. 24 to 50 inches thick.
Range of Soil Depth: 34 to 65 inches.
Modal Site Location: SE 1/4, SW 1/4 Sec. 10, T. 1S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, loamy skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 331 and inclusions of Soils 6, 7, 332 and 333. This unit is mapped on sloping to moderately steep smooth glaciated mountain slopes.

## 331

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Noble fir, Douglas-fir, western hemlock
Understory: Rhododendron, blue huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated medium-textured glacial till. Materials are of mixed geologic origin. Bedrock for this mapping unit consists of hard andesites and basalts.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 4000 to 5500 feet

## MANAGEMENT

This soil unit produces Site Class 4 and 5 Douglas-fir and is suitable for tractor yarding operations. The soil mantle is very stable and little or no sloughing in roadcuts should occur. Some problems may be encountered in achieving adequate regeneration.

## SOIL 331

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and noble fir. Decomposed organic matter with many fine roots. 2 to 3 inches thick.
Surface Layers: Very dark to grayish brown to dark brown gravelly loams; weak, fine granular to weak, very fine subangular blocky structure; loose, very friable, non-sticky, non-plastic; 30 percent coarse fragments; pH ranges between 5.0 and 5.5. 9 to 14 inches thick.
Subsoil Layers: Brown to yellowish brown gravelly sandy loams; weak, very fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 9 to 14 inches thick. Overlies hard compacted till.
Range of Soil Depth: 30 to 50 inches.
Modal Site Location: SW 1/4, NE 1/4 Sec. 33, T. 5S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, coarse-loamy, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 332 and inclusions of Soils 6, 7, 331 and 333. This unit is mapped on moderately steep to steep, smooth glaciated mountain slopes.

## 332

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Noble fir, Douglas-fir, western hemlock
Understory: Rhododendron, blue huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated medium-textured glacial till. Materials are of mixed geologic origin. Bedrock for this unit consists of hard andesites and basalts.

## CLIMATE

Precipitation: 80 to 100 inches, 2020 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: All aspects
Elevation: 4000 to 5500 feet

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. The terrain dictates the use of conventional cable yarding systems during harvest activities. The soil mantle is stable and only minor failures should occur in fill slopes. Brush invasion may be a problem in harvest units.

## SOIL 332

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and noble fir. Decomposed organic matter with many fine roots. 1 to 2 inches thick.
Surface Layers: Very dark grayish brown to dark brown gravelly loams; weak, fine granular to weak, very fine subangular blocky structure;loose, very friable, non-sticky, non-plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 7 to 12 inches thick.
Subsoil Layers: Brown to yellowish brown gravelly sandy loams; weak, very fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 40 to 60 percent coarse fragments; pH ranges between 5.0 and 5.5. 18 to 30 inches thick.
Range of Soil Depth: 25 to 47 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 28, T. 5S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 333 and inclusions of Soils 6, 7, 334 and 335. This unit is mapped on nearly level to sloping smooth to slightly uneven glaciated uplands.

## 333

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Mountain hemlock, western redcedar, engelmann spruce, noble fir, western larch, western hemlock
Understory: Blue huckleberry, prince's pine, service-berry, rhododendron
Groundcover: Pyrola, trailing twinflower, bunchberry, beargrass, bedstraw

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in unconsolidated medium-textured glacial till. Materials are of mixed geologic origin. Bedrock for this unit consists of hard andesites and basalts.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2290 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 3000 to 5000 feet, 1000 to 1660 meters

## MANAGEMENT

This soil unit produces Site Class 4 and 5 Douglas-fir and is suitable for tractor yarding operations. The compaction hazard is low to moderate. The soil mantle is very stable and few problems should be encountered in roadcuts and fills.

## SOIL 333

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from mountain hemlock and noble fir. Decomposed organic matter with many fine roots and fungal mycelia. 4 to 5 inches thick.
Surface Layers: Dark gray and gray to dark yellowish brown sandy loams and silt loams; single grain and weak, fine granular to moderate, medium, subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 percent coarse fragments; pH ranges between 4.4 and 5.5. 12 to 15 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown gravelly silt loams; moderate, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 45 to 50 inches thick.
Range of Soil Depth: 57 to 65 inches.
Modal Site Location: SE 1/4, NW 1/4 Sec. 15, T. 3S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 334 and inclusions of Soils 6, 7, 12, 13, 333 and 324. This unit is mapped on very steep, smooth to slightly uneven, glaciated mountain slopes.

334

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, noble fir
Understory: Rhododendron, blue huckleberry, serviceberry
Groundcover: Trailing twinflower, beargrass, bunchgrass

## GEOLOGY

GLACIAL DEPOSITS

Soils in this mapping unit have formed in colluvium and unconsolidated medium-textured glacial till. Materials are of mixed geologic origin. Bedrock for this unit consists of hard andesites and basalts.

## CLIMATE

Precipitation: 100 to 130 inches, 2540 to 3300 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 42°F, 5.5°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: North and East
Elevation: 3000 to 5000 feet, 1000 to 1660 meters

## MANAGEMENT

Because of the extremely steep slopes found in this unit, only fully suspended cable or other aerial yarding systems should be used in order to prevent surface soil damage and erosion. Care should be taken during road building operations not to overload slopes.

## SOIL 334

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and western hemlock. Decomposed organic matter with many fine roots and fungal mycelia. 1 to 2 inches thick.
Surface Layers: Dark gray and gray to dark yellowish brown sandy loams and silt loams; single grain and weak, fine granular to moderate, medium, subangular blocky structure; soft, very friable, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 4.5 and 5.0. 8 to 10 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown gravelly silt loams; moderate, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 30 percent coarse fragments; pH ranges between 5.0 and 5.5. 10 to 15 inches thick.
Range of Soil Depth: 18 to 25 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 7, T. 8S., R. 6E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, coarse-loamy, mixed. Typic Haplumbrepts, coarse-loamy, mixed cryic.

## MAPPING UNIT

This Mapping Unit consists of Soil 335 and inclusions of Soils 6, 7, 12, 13, 333 and 334. This unit is mapped on very steep, smooth to slightly uneven, glaciated mountain slopes.

## 335

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, western hemlock, noble fir
Understory: Rhododendron, blue huckleberry, serviceberry
Groundcover: Trailing twinflower, beargrass, bunchberry

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in colluvium and unconsolidated medium-textured glacial till. Materials are of mixed geologic origin. Bedrock for this unit consists of hard andesites and basalts.

## CLIMATE

Precipitation: 100 to 130 inches, 2540 to 3300 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 60 to 90 percent
Aspect: South and West
Elevation: 3000 to 5000 feet, 1000 to 1660 meters

## MANAGEMENT

Because of the extremely steep slopes found in this unit, only fully suspended cable or other aerial yarding systems should be used in order to prevent surface soil damage and erosion. Care should be taken during road building operations not to overload slopes.

## SOIL 335

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and western hemlock. Decomposed organic matter with many fine roots and fungal mycelia. 1 to 2 inches thick.
Surface Layers: Dark gray to dark yellowish brown sandy loams and silt loams; single grain and weak, fine granular to moderate, medium, subangular blocky structure; soft, friable, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 4.5 and 5.5. 7 to 10 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown gravelly silt loams; moderate, medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.0 and 5.5. 9 to 15 inches thick.
Range of Soil Depth: 16 to 25 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 20, T. 4S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, loamy-skeletal, mixed. Typic Cryorthents, loamy-skeletal, mixed.

## Mapping Unit 336

This mapping unit consists of soil 336 and inclusions of soils 6, 7, 330, 334 and 335. This unit is mapped on moderately steep to steep colluvial sideslopes and toeslopes on the Estacada and Clackamas Ranger Districts.

## Vegetation

Pacific silver fir zone.
Overstory: Douglas-fir, western hemlock, western redcedar, noble fir
Understory: Rhododendron, Oregon grape
Groundcover: Beargrass, trailing twinflower

## Geology

Glacial deposits
Soils in this mapping unit have formed in unconsolidated silt to boulder-sized materials deposited by alpine glaciers. Materials are of mixed geologic origin. These deposits vary in thickness and may be modified in places by colluvial material. Bedrock for this unit consists of hard basalts and andesites.

## Climate

Precipitation: 80-100 inches
2030-2540 mm
Soil temperature class: Frigid
Mean annual soil temperature: 44°F, 6°C

## Topography

Slope: 20-50 percent
Aspect: All aspects
Elevation: 200-4000 feet
670-1330 meters

## Management

This mapping unit is stable to moderately stable and has a relatively low compaction hazard. Regeneration should not be a major problem.

## Soil 336

Range of Soil Profile Characteristics
Litter: Partially and totally decomposed needles and twigs from Douglas-fir and western hemlock.

Surface Soil Layers: Dark grayish brown to very dark grayish brown cobbly and gravelly fine sandy loams and loams; weak fine and very fine granular structure; soft to slightly hard; friable; 50 to 60 percent coarse fragments; pH ranges between 5 and 6, 10 to 15 inches thick.

Subsoil Layers: Dark reddish brown to brown cobbly and gravelly loams; weak medium and coarse subangular block structure, slightly hard, friable, slightly sticky, slightly plastic; 40 percent coarse fragments; pH ranges between 5 and 6. 15 to 35 inches thick.

Range of Soil Depth: 25 to 50 inches.

Modal Site Location: NE¼, SW¼, Sec. 28, T. 6 S, R. 6 E.

Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, coarse-loamy mixed, frigid.

Interpretations

Surface soil erosion potential: Low-moderate
Subsoil erosion potential: Moderate
Natural soil mantle stability: Stable
Compaction hazard: Low-moderate
Susceptibility to soil displacement: Moderate
Soil and Watershed impacts from tractor timber harvesting: Moderate
Soil and watershed impacts from cable timber harvesting
Partial suspension: Moderate
Full suspension: Low
Sedimentation yield potential: Moderate
Expected mass movement as a result of mass activities: Increased
Hydrologic group: B
Cutbank and ditch erosion potential: Moderate
Cutbank sloughing: Low-moderate
Cutbank failure: Stable to moderately stable
Regeneration potential: Moderate

## MAPPING UNIT

337

This Mapping Unit consists of Soil 337 and inclusions of Soils 6, 7, 304 and 305. This unit is mapped on steep slopes in the upper Clackamas River Drainage.

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Noble fir, Douglas-fir, western hemlock, lodgepole pine, mountain hemlock
Understory: Rhododendron, vine maple, Oregon grape, blue huckleberry, prince's pine, chinkapin
Groundcover: Beargrass, vanilla leaf, trailing twinflower, western starflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep glacial till deposits. Although the till is deep, it may be compacted in places, thus reducing effective rooting depth. Bedrock in this unit consists of hard fractured andesites and basalts.

## CLIMATE

Precipitation: 70 to 90 inches, 1770 to 2280 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 45°F, 7°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 890 to 1330 meters

## MANAGEMENT

Because of slope limitations, this mapping unit is unsuitable for tractor yarding operations. These soils have a rapid permeability in the surface layers and surface erosion should not be a problem.

## SOIL 337

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Partially and totally decomposed needles and twigs from lodgepole pine and mountain hemlock. 1/2 to 1 inch thick.
Surface Layers: Dark brown to yellowish brown gravelly and cobbly loams; weak, very fine granular structure; loose very friable, non-sticky, non-plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 4 to 6 inches thick.
Subsoil Layers: Dark yellowish brown to very pale brown gravelly silt loams to gravelly very fine sandy loams; weak, fine to medium, subangular blocky structure to massive; slightly hard, firm, slightly sticky, slightly plastic; 50 percent coarse fragments; pH ranges between 5.0 and 6.0. 23 to 33 inches thick.
Range of Soil Depth: 27 to 39 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 26, T. 7S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 338 and inclusions of Soils 6, 7, 339 and 340. This unit is mapped on nearly level to steep slopes in the Bull Run Watershed.

## 338

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal
Groundcover: Oxalis, swordfern

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this unit have formed in medium-textured glacial till. The till consists of silt to boulder-sized material of mixed geologic origin. Rock fragments are primarily andesites but some tuff and breccias may also be present.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 51°F

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 500 to 2500 feet, 166 to 830 meters

## MANAGEMENT

This soil unit is suitable for tractor yarding operations as the slopes are less than 30 percent and the compaction hazard is moderate. Slopes in this unit are stable and there is little danger of large scale mass failures.

## SOIL 338

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock and Douglas-fir. Totally decomposed organic matter. 1 to 2 inches thick.
Surface Layers: Very dark brown to dark brown stony silt loams; moderate, very fine, fine granular, moderate, medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; pH ranges between 6.0 and 6.5. 6 to 18 inches thick.
Subsoil Layers: Dark brown to brown stony clay loams; moderate, fine medium and coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; pH ranges between 5.5 and 6.5. 20 to 50 inches thick.
Range of Soil Depth: 26 to 70 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 26, T. 1S., R. 5E.
Estimated U.S.D.A. Soil Classification: Cumulic Haplumbrepts, loamy, skeletal, mixed, non-acid, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 339 and inclusions of Soils 3, 7, 338, 340 and 371. This unit is mapped on steep slopes in the lower Bull Run Drainage.

## 339

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal
Groundcover: Swordfern, oxalis

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in medium-textured glacial till. The till consists of silt to boulder-sized material of mixed geologic origin. Rock fragments are primarily andesites but some tuffs and breccias may also be present.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 51°F

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 500 to 2500 feet, 166 to 830 meters

## MANAGEMENT

Because of slope limitations, this unit is not suitable for tractor yarding. The soil mantle is relatively stable but care should be taken during yarding operations not to damage or displace surface soils. The erosion hazard is moderate.

## SOIL 339

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock and Douglas-fir. Totally decomposed organic matter. 1/2 to 2 inches thick.
Surface Layers: Very dark brown to brown stony silt loams; moderate, very fine, fine granular, moderate, medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 50 percent coarse fragments; pH ranges between 6.0 and 6.5. 50 to 15 inches thick.
Subsoil Layers: Dark brown to brown stony clay loams; moderate, fine medium and coarse subangular blocky structure; hard friable, slightly sticky, slightly plastic; 50 to 70 percent coarse fragments; pH ranges between 5.5 and 6.5. 15 to 40 inches thick.
Range of Soil Depth: 20 to 55 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 21, T. 1S., R. 6E.
Estimated U.S.D.A. Soil Classification: Cumulic Haplumbrepts, loamy, skeletal, mixed, non-acid, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 340 and inclusions of Soils 6, 7, 338 and 339. This unit is mapped on steep north slopes in the lower Bull Run Drainage.

## 340

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal
Groundcover: Swordfern, oxalis

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in medium-textured glacial till. The till is comprised of silt to boulder-sized material of mixed geologic origin. Rock fragments are primarily andesites but some tuffs and breccias may also be present.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 51°F

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 500 to 2500 feet, 166 to 830 meters

## MANAGEMENT

Because of slope limitations, this unit is not suitable for tractor yarding. The soil mantle is relatively stable but care should be taken during yarding operations not to damage or displace surface soils. The erosion hazard is moderate.

## SOIL 340

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock and Douglas-fir. Totally decomposed organic matter. 1/2 to 1 inches thick.
Surface Layers: Very dark brown to brown stony silt loams; moderate, very fine, fine granular, moderate, medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 6.0 and 6.5. 4 to 12 inches thick.
Subsoil Layers: Dark brown to brown stony clay loams; moderate, fine medium and coarse subangular blocky structure; hard friable, slightly sticky, slightly plastic; 60 percent coarse fragments; pH ranges between 5.5 and 6.5 15 to 35 inches thick.
Range of Soil Depth: 19 to 47 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 26, T. 1S., R. 6E.
Estimated U.S.D.A. Soil Classification: Cumulic Haplumbrepts, loamy-skeletal, mixed, non-acid, mesic.

## MAPPING UNIT

Mapping Unit 341 consists of Soil 341 and the environmental setting in which it occurs. Both are described in the boxes below. Soil Units 7, 342 and 343 are common inclusions in this mapping unit. This unit is mapped on nearly level to steep, smooth glaciated slopes in the Bull Run Drainage.

## 341

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, noble fir, Pacific silver fir, western hemlock
Understory: Blue huckleberry, rhododendron
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in medium-textured glacial till. The till consists of silt to boulder-sized material of mixed geologic origin. Rock fragments are primarily andesites but some tuffs and breccias may also be present.

## CLIMATE

Precipitation: 85 to 115 inches, 2160 to 2920 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 2000 to 4000 feet, 666 to 1333 meters

## MANAGEMENT

This soil unit is suitable for tractor yarding operations as the slopes are less than 30 percent and the compaction hazard is moderate. Slopes in this unit are stable and there is little danger of large scale mass failures.

## SOIL 341

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and western hemlock. Black amorphous organic matter. 2 to 3 inches thick.
Surface Layers: Very dark brown to dark brown gravelly loams and cobbly gravelly loams; moderate fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 7 to 20 inches thick.
Subsoil Layers: Dark brown to brown cobbly loams and stony silt loams; weak very fine and fine subangular blocky structure to massive; slightly hard, friable, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.5 and 6.5. 30 to 45 inches thick.
Range of Soil Depth: 37 to 65 inches.
Modal Site Location: NW 1/4, NE 1/4 Sec. 17, T. 1S., R. 6E.
Estimated U.S.D.A. Soil Classification: Cumulic Haplumbrepts, loamy-skeletal, mixed, non-acid, frigid.

## MAPPING UNIT

342

This Mapping Unit consists of Soil 342 and inclusions of Soils 7, 341 and 343. This unit is mapped on steep to very steep, smooth glaciated mountain slopes in the Bull Run Drainage.

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, noble fir, Pacific silver fir, western hemlock
Understory: Blue huckleberry, rhododendron
Groundcover: Beargrass

## GEOLOGY

GLACIAL DEPOSITS

Soils in this mapping unit have formed in medium-textured glacial till. The till consists of silt to boulder-sized material of mixed geologic origin. Rock fragments are primarily andesites but some tuffs and breccias may also be present.

## CLIMATE

Precipitation: 85 to 115 inches, 2160 to 2920 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2000 to 4000 feet, 666 to 1333 meters

## MANAGEMENT

This soil unit produces Site Class 4 and 5 Douglas-fir. Because of slope limitations, suspended cable systems should be employed during harvest operations. The soil mantle is stable and there is little danger of large scale mass failures.

## SOIL 342

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and western hemlock. Black amorphous organic matter. 1 to 2 inches thick.
Surface Layers: Very dark brown to dark brown gravelly loams and cobbly gravelly loams; moderate, fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 6 to 15 inches thick.
Subsoil Layers: Dark brown to brown cobbly loams and stony silt loams; weak, very fine and fine subangular blocky structure to massive; slightly hard, friable, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.5 and 6.5. 25 to 40 inches thick.
Range of Soil Depth: 31 to 55 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 13, T. 1S., R. 6E.
Estimated U.S.D.A. Soil Classification: Cumulic Haplumbrepts, loamy-skeletal, mixed, non-acid, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 343 and inclusions of Soils 7, 341 and 342. This unit is mapped on nearly level to steep, smooth, glaciated slopes in the Bull Run Drainage.

## 343

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, noble fir, Pacific silver fir, western hemlock
Understory: Blue huckleberry, rhododendron
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in medium-textured glacial till. The till consists of silt to boulder-sized material of mixed geologic origin. Rock fragments are primarily andesites but some tuffs and breccias may also be present.

## CLIMATE

Precipitation: 85 to 115 inches, 2160 to 2920 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 2000 to 4000 feet, 666 to 1333 meters

## MANAGEMENT

This soil unit produces Site Class 4 and 5 Douglas-fir. Because of slope limitations, suspended cable systems should be employed during harvest operations. The soil mantle is stable and there is little danger of large scale mass failures.

## SOIL 343

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and western hemlock. Black amorphous organic matter. 1 to 2 inches thick.
Surface Layers: Very dark brown to dark brown gravelly loams and cobbly gravelly loams; moderate fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 7 to 20 inches thick.
Subsoil Layers: Dark brown to brown cobbly loams and stony silt loams; weak, very fine and fine subangular blocky structure to massive; slightly hard, friable, slightly sticky, slightly plastic; 50 to 60 percent coarse fragments; pH ranges between 5.5 and 6.5. 28 to 43 inches thick.
Range of Soil Depth: 35 to 63 inches.
Modal Site Location: SE 1/4, SW 1/4 Sec. 28, T. 1N., R. 6E.
Estimated U.S.D.A. Soil Classification: Cumulic Haplumbrepts, loamy-skeletal, mixed, non-acid, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 344 and inclusions of Soils 6, 345 and 346. This unit is mapped on steep, smooth to slightly dissected, glaciated mountain slopes.

344

## VEGETATION

### PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, noble fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal, rhododendron
Groundcover: Swordfern, oxalis

## GEOLOGY

### GLACIAL DEPOSITS

The soils in this unit have developed in colluvium and till from massive tuffs and tuffaceous breccias. Soils have formed in silt to boulder-sized material.

## CLIMATE

Precipitation: 85 to 95 inches, 2160 to 2420 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2000 to 4000 feet, 666 to 1333 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. Because of slope limitations, suspended cable systems should be employed during harvest operations. The soil mantle is stable and there is little danger of large scale mass failures.

## SOIL 344

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and Douglas-fir. Some totally decomposed organic material. 2 to 3 inches thick.
Surface Layers: Very dark brown to dark brown gravelly loams; moderate very fine and fine granular structure, soft, very friable, slightly sticky, slightly plastic; 70 to 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 25 inches thick.
Subsoil Layers: Dark yellowish brown to reddish brown very gravelly loams; massive; soft, very friable, slightly sticky, slightly plastic; 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 30 to 35 inches thick.
Range of Soil Depth: 50 to 60 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 19, T. 3S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

345

This Mapping Unit consists of Soil 345 and inclusions of Soils 6, 344 and 346. This unit is mapped on steep, smooth to slightly dissected, glaciated mountain slopes.

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, noble fir, western hemlock, western redcedar, red alder
Understory: Vine maple, salal, rhododendron
Groundcover: Swordfern, oxalis

## GEOLOGY

GLACIAL DEPOSITS

The soils in this unit have developed in colluvium and till from massive tuffs and tuffaceous breccias. Soils have formed in silt to boulder-sized material.

## CLIMATE

Precipitation: 85 to 95 inches, 2160 to 2420 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 2000 to 4000 feet, 666 to 1333 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. Because of slope limitations, suspended cable systems should be employed during harvest operations. The soil mantle is stable and there is little danger of large scale mass failures.

## SOIL 345

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and Douglas-fir. Some totally decomposed organic material. 1 to 2 inches thick.
Surface Layers: Very dark brown to dark brown very gravelly loams; moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; 70 to 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 10 to 15 inches thick.
Subsoil Layers: Dark yellowish brown to reddish brown very gravelly loams; massive; soft, very friable, slightly sticky, slightly plastic; 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 35 inches thick.
Range of Soil Depth: 30 to 50 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 13, T. 3S., R. 7E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 346 and inclusions of Soils 7, 112, 344 and 345. This unit is mapped on nearly level to sloping glacial outwash plains.

346

## VEGETATION

PACIFIC SILVER FIR ZONE

Overstory: Douglas-fir, lodgepole pine
Understory: Rhododendron, salal
Groundcover: Trailing twinflower

## GEOLOGY

GLACIAL DEPOSITS

The soils in this unit have formed in deep glacial outwash deposits. The soil profile is a mixture of silts, sands, stones and boulders of mixed geologic origin, however, the majority are from the Cascade Andesite Formation.

## CLIMATE

Precipitation: 80 to 110 inches, 2030 to 2795 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 2 to 10 percent
Aspect: All aspects
Elevation: 1000 to 3500 feet, 300 to 1160 meters

## MANAGEMENT

This soil unit produces very poor quality timber. This is probably a result of the low moisture holding capacity of the soil and frost pocket conditions. Road building activities are easily carried out because of low slopes and low soil erodibility.

## SOIL 346

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from lodgepole pine. Decomposed organic matter containing many fine roots and fungal mycelia. 1 to 3 inches thick.
Surface Layers: Dark gray to dark yellowish brown very cobbly loamy coarse sand, single grain; soft, very friable, non-sticky, non-plastic; 40 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 14 to 18 inches thick.
Subsoil Layers: Gray to yellowish brown to very cobbly coarse sand; massive, very hard, very firm, non-sticky, non-plastic; 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 35 to 50 inches thick.
Range of Soil Depth: 49 to 70 inches.
Modal Site Location: SE 1/4, SW 1/4 Sec. 18, T. 3S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Udipsamments; sandy-skeletal, mixed, frigid.

## MAPPING UNIT

Mapping Unit 347 consists of Soil 347 and the environmental setting in which it occurs. Both are described in the boxes below. Soil Units 3, 6, 7, 348 and 349 are common inclusions in this mapping unit. This unit is mapped on smooth to slightly undulating glaciated slopes on Surveyor's Ridge.

## 347

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, grand fir
Understory: Wild rose
Groundcover: Vanilla leaf, bedstraw, pyrola

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this unit have formed in old deep glacial till deposits. These deposits are fine to medium-textured and are of mixed geologic origin. Some volcanic ash may also be present in the soil profile.

## CLIMATE

Precipitation: 30 to 50 inches, 760 to 130 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 2500 to 3500 feet, 830 to 1166 meters

## MANAGEMENT

This soil unit produces Site Class 4 Douglas-fir and is suitable for tractor yarding. The compaction and erosion hazards are moderate. Some minor problems may be encountered in achieving adequate regeneration. This unit is also used extensively for livestock grazing.

## SOIL 347

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and grand fir. Black amorphous organic matter. 2 to 3 inches thick.
Surface Layers: Dark brown to brown gravelly loams; weak, very fine granular to weak fine and medium subangular blocky structure; soft, very friable, non-sticky, non-plastic. 5 to 10 percent coarse fragments; pH ranges between 6.0 and 6.5. 10 to 13 inches thick.
Subsoil Layers: Pale brown to very pale brown gravelly loams; weak to moderate, medium to coarse subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 20 percent coarse fragments; pH ranges between 6.0 and 6.5. 45 to 55 inches thick.
Range of Soil Depth: 55 to 70 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 1, T. 1N., R. 11E.
Estimated U.S.D.A. Soil Classification: Umbric Vitrandepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 348 and inclusions of Soils 3, 6, 7, 347 and 349. This unit is mapped on smooth to slightly undulating glaciated slopes on Surveryor's Ridge.

## 348

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, grand fir
Understory: Wild rose
Groundcover: Vanilla leaf, bedstraw, pyrola

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this unit have formed in old deep glacial till deposits. These deposits are fine to medium-textured and are of mixed geologic origin. Some volcanic ash may also be present in the soil profile.

## CLIMATE

Precipitation: 30 to 50 inches, 760 to 130 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 2500 to 3500 feet, 830 to 1166 meters

## MANAGEMENT

This soil unit produces Site Class 3 and 4 Douglas-fir. Because of slope limitations, only cable yarding systems should be employed during harvest operations. The surface soil erosion hazard is low and there is little danger of large scale mass failures.

## SOIL 348

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and grand fir. Black amorphous organic matter. 1 to 2 inches thick.
Surface Layers: Dark brown to brown gravelly loams; weak, very fine granular to weak fine and medium subangular blocky structure; soft, very friable, non-sticky, non-plastic. 5 to 10 percent coarse fragments; pH ranges between 6.0 and 6.5. 8 to 12 inches thick.
Subsoil Layers: Pale brown to very pale brown gravelly loams; weak to moderate, medium to coarse subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 20 percent coarse fragments; pH ranges between 6.0 and 6.5. 40 to 50 inches thick.
Range of Soil Depth: 48 to 62 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 2, T. 1S., R. 10E.
Estimated U.S.D.A. Soil Classification: Umbric Vitrandepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 349 and inclusions of Soils 3, 6, 7, 347 and 348. This unit is mapped on smooth to slightly undulating glaciated slopes on Surveryor's Ridge.

## 349

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, grand fir
Understory: Wild rose
Groundcover: Vanilla leaf, bedstraw, pyrola

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this unit have formed in old deep glacial till deposits. These deposits are fine to medium-textured and are of mixed geologic origin. Some volcanic ash may also be present in the soil profile.

## CLIMATE

Precipitation: 30 to 50 inches, 760 to 130 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: South and West
Elevation: 2500 to 3500 feet, 830 to 1166 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. Because of slope limitations, only cable yarding systems should be employed during harvest operations. The surface soil erosion hazard is low and there is little danger of large scale mass failures. Regeneration may be a problem in this unit.

## SOIL 349

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and grand fir. Black amorphous organic matter. 1/2 to 1-1/2 inches thick.
Surface Layers: Dark brown to brown gravelly loams; weak very fine granular to weak fine and medium subangular blocky structure; soft, very friable, non-sticky, non-plastic. 5 to 10 percent coarse fragments; pH ranges between 6.0 and 6.5. 7 to 10 inches thick.
Subsoil Layers: Pale brown to very pale brown gravelly loams; weak to moderate, medium to coarse subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 20 percent coarse fragments; pH ranges between 6.0 and 6.5. 35 to 45 inches thick.
Range of Soil Depth: 42 to 55 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 13, T. 1S., R. 10E.
Estimated U.S.D.A. Soil Classification: Umbric Vitrandepts, loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 350 and inclusions of Soils 351, 352 and 353. This unit is mapped on steep to very steep mountain sideslopes in the eastern part of the Forest.

## 350

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, grand fir, ponderosa pine
Understory: Oregon oak, snowbrush
Groundcover: Dogbane

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in old glacial till deposits which have mixed with volcanic ash. Many areas have concentrations of large basalt boulders on the surface.

## CLIMATE

Precipitation: 50 to 80 inches, 1270 to 2030 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 1 to 30 percent
Aspect: North and East
Elevation: 2500 to 3500 feet, 830 to 1166 meters

## MANAGEMENT

This soil unit produces Site Class 4 and 5 Douglas-fir. Regeneration may be a problem as summers are hot and dry. Surface erosion is not a major problem and there is little or no evidence of large scale mass wasting in the past.

## SOIL 350

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs, and cones from Douglas-fir, grand fir and ponderosa pine. 1 to 2 inches thick.
Surface Layers: Dark brown to brown silt loams and heavy silt loams; weak very fine granular to moderate fine and medium subangular blocky structure; loose to slightly hard, very friable to firm, slightly sticky, slightly plastic; 15 to 60 percent coarse fragments; pH ranges between 6.0 and 6.5. 28 to 30 inches thick.
Subsoil Layers: Dark reddish brown silty clay loams; strong medium and coarse subangular blocky structure; hard, firm, sticky, plastic; 10 percent coarse fragments; pH ranges between 6.0 and 6.5. 28 to 34 inches thick.
Range of Soil Depth: 56 to 64 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 22, T. 4S., R. 11E.
Estimated U.S.D.A. Soil Classification: Andic Haplumbrepts, coarse-loamy, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 351 and inclusions of Soils 350, 352 and 353. This unit is mapped on steep to very steep slopes in the eastern part of the Forest.

## 351

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, grand fir, ponderosa pine
Understory: Oregon oak, snowbrush
Groundcover: Dogbane

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in old glacial till deposits which have mixed with volcanic ash. Many areas have concentrations of large basalt boulders on the surface.

## CLIMATE

Precipitation: 50 to 80 inches, 1270 to 2030 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 1 to 30 percent
Aspect: South and West
Elevation: 2500 to 3500 feet, 830 to 1166 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. Because of slope limitations, this area should be cable yarded. Regeneration may be a problem as summers are hot and dry. Surface erosion is not a major problem and there is little or no evidence of large scale mass failures in the past.

## SOIL 351

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs, and cones from Douglas-fir, grand fir and ponderosa pine. 0 to 1 inches thick.
Surface Layers: Dark brown to brown silt loams and heavy silt loams; weak very fine granular to moderate fine and medium subangular blocky structure; loose to slightly hard, very friable to firm, slightly sticky, slightly plastic; 15 to 60 percent coarse fragments; pH ranges between 6.0 and 6.5. 10 to 15 inches thick.
Subsoil Layers: Dark reddish brown silty clay loams; strong medium and coarse subangular blocky structure; hard, firm, sticky, plastic; 10 percent coarse fragments; pH ranges between 6.0 and 6.5. 10 to 20 inches thick.
Range of Soil Depth: 20 to 35 inches.
Modal Site Location: SW 1/4, NW 1/4 Sec. 17, T. 4S., R. 11E.
Estimated U.S.D.A. Soil Classification: Andic Haplumbrepts, coarse-loamy, mixed, mesic. Andic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 352 and inclusions of Soils 350, 351 and 353. This unit is mapped on nearly level to gently sloping benches in the eastern part of the Forest.

352

## VEGETATION

DOUGLAS-FIR-GRAND FIR ZONE

Overstory: Douglas-fir, grand fir, ponderosa pine
Understory: Oregon oak, snowbrush
Groundcover: Dogbane

## GEOLOGY

GLACIAL DEPOSITS

Soils in this mapping unit have formed in old glacial till deposits which have mixed with volcanic ash. Many areas have concentrations of large basalt boulders on the surface.

## CLIMATE

Precipitation: 50 to 80 inches, 1270 to 2030 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 50°F, 10°C

## TOPOGRAPHY

Slope: 1 to 30 percent
Aspect: All aspects
Elevation: 2500 to 3500 feet, 830 to 1166 meters

## MANAGEMENT

This soil unit produces Site Class 4 and 5 Douglas-fir and is suitable for tractor yarding. Regeneration may be a problem as summers are hot and dry. Surface erosion is not a major problem and there is little or no evidence of large scale mass wasting in the past.

## SOIL 352

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs, and cones from Douglas-fir, grand fir and ponderosa pine. 1 to 2 inches thick.
Surface Layers: Dark brown to brown silt loams and heavy silt loams; weak very fine granular to moderate fine and medium subangular blocky structure; loose to slightly hard, very friable to firm, slightly sticky, slightly plastic; 15 to 60 percent coarse fragments; pH ranges between 6.0 and 6.5. 28 to 30 inches thick.
Subsoil Layers: Dark reddish brown silty clay loams; strong medium and coarse subangular blocky structure; hard, firm, sticky, plastic; 10 percent coarse fragments; pH ranges between 6.0 and 6.5. 28 to 34 inches thick.
Range of Soil Depth: 56 to 64 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 22, T. 4S., R. 11E.
Estimated U.S.D.A. Soil Classification: Typic Haplohumults, coarse-loamy over fine-silty, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 353 and inclusions of Soils 350, 351, 352, 354 and 355. This unit is mapped on nearly level to sloping glaciated uplands in the eastern part of the Forest.

353

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, lodgepole pine, grand fir, pacific silver fir, ponderosa pine.
Understory: Chinkapin, buckbrush
Groundcover: Sedge, pinegrass, squawcarpet, beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in old glacial till deposits which have mixed with volcanic ash. Some areas of exposed andesite bedrock may also be present.

## CLIMATE

Precipitation: 50 to 80 inches, 1270 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 3500 to 4500 feet, 1166 to 1500 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir and is suitable for tractor yarding. Because of high elevations and high surface soil temperatures during summer, regeneration of harvest units may be a problem. Surface erosion is not a major problem and there is little or no evidence of large scale mass wasting in the past.

## SOIL 353

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock, Douglas-fir, and grand fir. Decomposed black amorphous organic matter. 2 to 3 inches.
Surface Layers: Pale brown to yellowish brown gravelly loamy fine sands and loamy fine sands; weak, very fine granular to weak to moderate, medium and coarse subangular blocky structure; 5 to 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 12 to 16 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown gravelly sandy loams; moderate medium and coarse subangular blocky structure to massive; 40 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 40 to 50 inches thick.
Range of Soil Depth: 52 to 66 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 7, T. 4S., R. 10E.
Estimated U.S.D.A. Soil Classification: Umbic Vitrandepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 354 and inclusions of Soils 350, 351, 352, 353 and 355. This unit is mapped on nearly level to sloping glaciated mountain slopes in the eastern part of the Forest.

354

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, lodgepole pine, pacific silver fir, ponderosa pine.
Understory: Chinkapin, buckbrush
Groundcover: Sedge, pinegrass, squawcarpet, beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in old glacial till deposits which have mixed with volcanic ash. Some areas of exposed andesite bedrock may also be present.

## CLIMATE

Precipitation: 50 to 80 inches, 1270 to 2030 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: South and West
Elevation: 3500 to 4500 feet, 1166 to 1500 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. Because of high elevations and high surface soil temperatures during summer, regeneration of harvest units may be a problem. Surface erosion is not a major problem and there is little or no evidence of large scale mass wasting in the past.

## SOIL 354

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock, Douglas-fir, and grand fir. Decomposed black amorphous organic matter. 1 to 2 inches.
Surface Layers: Pale brown to yellowish brown gravelly loamy fine sands and loamy fine sands; weak, very fine granular to weak to moderate medium and coarse subangular blocky structure; 5 to 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 8 to 10 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown gravelly sandy loams; moderate medium and coarse subangular blocky structure to massive; 40 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 30 inches thick.
Range of Soil Depth: 28 to 40 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 15, T. 4S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Cryandepts, coarse-loamy, mixed, cryic.

## MAPPING UNIT

This Mapping Unit consists of Soil 355 and inclusions of Soils 350, 351, 352, 353 and 354. This unit is mapped on nearly level to sloping glaciated mountain slopes in the eastern part of the Forest.

## 355

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, lodgepole pine, grand fir,pacific silver fir, ponderosa pine.
Understory: Chinkapin, buckbrush
Groundcover: Sedge, pinegrass, squawcarpet, beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in old glacial till deposits which have mixed with volcanic ash. Some areas of exposed andesite bedrock may also be present.

## CLIMATE

Precipitation: 50 to 80 inches, 1270 to 2030 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: North and East
Elevation: 3500 to 4500 feet, 1166 to 1500 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. Because of high elevations and high surface soil temperatures during summer, regeneration of harvest units may be a problem. Surface erosion is not a major problem and there is little or no evidence of large scale mass wasting in the past.

## SOIL 355

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock, Douglas-fir, and grand fir. Decomposed black amorphous organic matter. 2 to 3 inches.
Surface Layers: Pale brown to yellowish brown gravelly loamy fine sands and loamy fine sands; weak, very fine granular to weak to moderate, medium and coarse subangular blocky structure; 5 to 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 10 to 14 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown gravelly sandy loams; moderate medium and coarse subangular blocky structure to massive; 40 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 10 to 14 inches thick.
Range of Soil Depth: 45 to 64 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 8, T. 4S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Cryandepts, coarse-loamy, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 356 and inclusions of Soils 6, 7, 158, 353, 354, 355 and 357. This unit is mapped on sloping to steep high elevation mountain slopes in the eastern part of the Forest.

## 356

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Mountain hemlock, subalpine fir, western white pine.
Understory: Dwarf huckleberry, blue huckleberry, prince's pine
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in old till deposited by alpine glaciers. In many areas, the till has been scoured away exposing highly fractured andesite bedrock.

## CLIMATE

Precipitation: 50 to 70 inches, 1270 to 1780 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 4500 to 5500 feet, 1500 to 1840 meters

## MANAGEMENT

Because of high elevations, cool temperatures, and shallow soils, this soil unit produces poor quality timber. This soil unit has been used primarily for recreation and wildlife habitat.

## SOIL 356

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from mountain hemlock and subalpine fir. Amorphous organic matter with many fine roots. 3 to 4 inches thick.
Surface Layers: Very dark gray to dark grayish brown cobbly and gravelly loams; weak, very fine granular to moderate fine and medium subangular blocky structure; loose, friable, non-sticky, non-plastic; 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 4 to 10 inches thick.
Subsoil Layers: Dark grayish brown to yellowish brown very cobbly loams and silt loams; weak, medium, and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 10 to 15 inches thick.
Range of Soil Depth: 14 to 25 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 21, T. 3S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Cryandepts, loamy-skeletal, mixed.

## MAPPING UNIT

357

This Mapping Unit consists of Soil 357 and inclusions of Soils 6, 7, 12, 13, 355 and 356. This unit is mapped on steep to very steep glaciated mountain slopes in the Eastern part of the Forest.

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Lodgepole pine, western larch, Engelmann spruce, Douglas-fir, pacific silver fir, subalpine fir.
Understory: Dwarf huckleberry, prince's pine
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this unit have formed in old till deposited by alpine glaciers. In many areas, the till has been scoured away exposing highly fractured andesite bedrock.

## CLIMATE

Precipitation: 60 to 90 inches, 1520 to 2290 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: All aspects
Elevation: 4500 to 5500 feet, 1500 to 1940 meters

## MANAGEMENT

Because of high elevations, cool temperatures, and shallow soils, this soil unit produces poor quality timber. This soil unit has been used primarily for recreation and wildlife habitat.

## SOIL 357

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from mountain hemlock and subalpine fir. Amorphous organic matter with many fine roots. 1 to 2 inches thick.
Surface Layers: Very dark gray to dark grayish brown cobbly and gravelly loams; weak, very fine granular to moderate fine and medium subangular blocky structure; loose, friable, non-sticky, non-plastic; 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 3 to 6 inches thick.
Subsoil Layers: Dark grayish brown to yellowish brown very cobbly loams and silt loams; weak, medium, and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 9 to 13 inches thick.
Range of Soil Depth: 12 to 20 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 30, T. 3S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Cryandepts, coarse-loamy, mixed.

## MAPPING UNIT

358

This Mapping Unit consists of Soil 358 and inclusions of Soils 3, 4 and 11. This unit is mapped on nearly level till plains and outwash deposits in the Hood River Valley.

## VEGETATION

### SUBALPINE FORESTS

Overstory: Douglas-fir, western hemlock, western larch, lodgepole pine
Understory: Chinkapin
Groundcover: Trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

The soils in this unit have formed in old till and glacial outwash deposits. The profile is characterized by large amounts of rounded gravel and boulders. This material is often stratified and can form barriers to downward water movement.

## CLIMATE

Precipitation: 70 to 90 inches, 780 to 2290 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 44°F, 6.5°C

## TOPOGRAPHY

Slope: 1 to 20 percent
Aspect: All aspects
Elevation: 2500 to 4000 feet, 835 to 1335 meters

## MANAGEMENT

The soils in this unit produce Site Class 5 Douglas-fir and are suitable for tractor yarding. The compaction and surface soil erosion hazards are low. Care should be taken during yarding operations to avoid obviously saturated areas.

## SOIL 358

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from Douglas-fir and lodgepole pine. Black amorphous decomposed organic matter with many fine roots. 2 to 3 inches thick.
Surface Layers: Very dark grayish brown to dark brown gravelly sandy loams; single grain, loose, soft non-sticky, non-plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 8 to 10 inches thick.
Subsoil Layers: Pale brown to brownish yellow gravelly sandy loams; single grain to weak, fine granular structure; loose, soft, non-sticky, non-plastic; 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 20 to 40 inches thick.
Range of Soil Depth: 28 to 50 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 10, T. 3S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, coarse-loamy, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 359 and inclusions of Soils 6, 7, 12, 13, 358 and 360. This unit is mapped on steep to very steep valley sideslopes in the eastern part of the Forest.

## 359

## VEGETATION

### SUBALPINE FORESTS

Overstory: Lodgepole pine, Douglas-fir, western larch
Understory: Blue huckleberry, dwarf huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this unit have formed in old till deposited by alpine glaciers mixed with colluvium from slopes above. Soil profiles are characterized by large amounts of angular and rounded andesite fragments.

## CLIMATE

Precipitation: 70 to 90 inches, 1780 to 2290 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 43°F, 6°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: All aspects
Elevation: 2500 to 4000 feet, 830 to 1335 meters

## MANAGEMENT

Soils in this unit produce Site Class 5 Douglas-fir and because of slope limitations, are not suitable for tractor yarding operations. Compaction and surface soil erosion are not major problems in this soil unit.

## SOIL 359

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from lodgepole pine and western larch. Decomposed black organic matter. 1 to 2 inches thick.
Surface Layers: Very dark grayish brown to dark brown cobbly and gravelly loams; weak, very fine granular to weak fine and medium subangular blocky structure; loose, soft, non-sticky, non-plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 7 to 9 inches thick.
Subsoil Layers: Grayish brown to yellowish brown cobbly loams; weak to moderate, fine and medium subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 60 percent coarse fragments; pH ranges between 5.0 and 5.5. 25 to 40 inches thick.
Range of Soil Depth: 32 to 50 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 8, T. 3S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 360 and inclusions of Soils 358 and 359. This unit is mapped on benchlands and gentle mountain slopes in the eastern part of the Forest.

## 360

## VEGETATION

### SUBALPINE FORESTS

Overstory: Subalpine fir, Douglas-fir, lodgepole pine, western larch
Understory: Dwarf huckleberry, blue huckleberry, chinkapin
Groundcover: Beargrass, lupine

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this unit have formed in old till deposited by alpine glaciers mixed with minor amounts of volcanic ash. Soil profiles are characterized by large amounts of angular and rounded andesite and basalt fragments.

## CLIMATE

Precipitation: 60 to 90 inches, 1525 to 2016 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 0 to 30 percent
Aspect: All aspects
Elevation: 5500 to 6200 feet, 1830 to 2070 meters

## MANAGEMENT

Because of high elevations, cool temperatures, and short growing seasons, this soil unit produces poor quality timber. It is used primarily for recreation and wildlife habitat. The compaction and erosion hazards are low.

## SOIL 360

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from lodgepole pine and western larch. Decomposed black organic matter. 2 to 3 inches thick.
Surface Layers: Very dark grayish brown to dark brown cobbly and gravelly loams; weak, very fine granular to weak, fine and medium subangular blocky structure; loose, soft, non-sticky, non-plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 10 to 16 inches thick.
Subsoil Layers: Grayish brown to yellowish brown cobbly loams; weak to moderate, fine and medium subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 60 percent coarse fragments; pH ranges between 5.0 and 5.5. 30 to 40 inches thick.
Range of Soil Depth: 40 to 56 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 21, T. 3S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts,loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 361 and inclusions of Soils 359, 360 and 362. This unit is mapped on old glacial outwash terraces in the eastern part of the Forest.

## 361

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, western larch, lodgepole pine.
Understory: Chinkapin
Groundcover: Trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

The soils in this unit have formed in old till and glacial outwash deposits. The profile is characterized by large amounts of rounded gravel and boulders. This material is often stratified and can form barriers to downward water movement.

## CLIMATE

Precipitation: 70 to 90 inches, 1780 to 2290 mm
Soil Temperature Class: Frigid
Mean Annual Soil Temperature: 48°F, 7°C

## TOPOGRAPHY

Slope: 1 to 20 percent
Aspect: All aspects
Elevation: 2500 to 4000 feet, 835 to 1335 meters

## MANAGEMENT

The soils in this unit produces Site Class 5 Douglas-fir and are suitable for tractor yarding. The compaction and surface soil erosion hazards are low. Care should be taken during yarding operations to avoid obviously saturated areas.

## SOIL 361

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles, twigs and cones from Douglas-fir and lodgepole pine. Black amorphous decomposed organic matter. 2 to 3 inches thick.
Surface Layers: Very dark grayish brown to dark brown gravelly sandy loams; single grain, loose, soft non-sticky, non-plastic; 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 8 to 10 inches thick.
Subsoil Layers: Pale brown to brownish yellow gravelly sandy loams; single grain to weak fine granular structure; loose, soft, non-sticky, non-plastic; 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 20 to 40 inches thick.
Range of Soil Depth: 28 to 50 inches.
Modal Site Location: NE 1/4, NE 1/4 Sec. 7, T. 3S., R. 10E.
Estimated U.S.D.A. Soil Classification: Typic Udipsamments, sandy-skeletal, mixed, frigid.

## MAPPING UNIT

This Mapping Unit consists of Soil 362 and inclusions of Soils 5, 6, 381 and 382. This unit is mapped on steep to very steep till and moraine deposits on the flanks of Mt. Hood.

## 362

## VEGETATION

### SUBALPINE FORESTS

Overstory: None
Understory: None
Groundcover: None

## GEOLOGY

### GLACIAL DEPOSITS

The soils in this unit have formed in deep glacial till and moraine deposits. These soils have also been influenced by volcanic ash deposits from Mt. Hood.

## CLIMATE

Precipitation: 80 to 110 inches
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 20 to 70 percent
Aspect: All aspects
Elevation: 1660 to 2230 meters

## MANAGEMENT

Because of severe environmental conditions, this soil unit supports very little vegetation. Use of this soil unit is limited primarily to recreation. Wind erosion may be a problem.

## SOIL 362

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: None
Surface Layers: Light brownish gray to light gray loamy sands and loamy fine sands; single grain loose, soft, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 10 to 20 inches thick.
Subsoil Layers: Light brownish gray to gray loamy sands, single grain to weak very fine subangular blocky structure; loose, soft, non-sticky, non-plastic; 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 35 to 55 inches thick.
Range of Soil Depth: 45 to 75 inches.
Modal Site Location: NE 1/4, SW 1/4 Sec. 36, T. 2S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, loamy-skeletal, mixed.

## MAPPING UNIT

363

This Mapping Unit consists of Soil 363 and inclusions of Soils 5, 6, 7, 332 and 382. This unit is mapped on benchlands and gentle mountain slopes on the flanks of Mt. Hood.

## VEGETATION

### SUBALPINE FORESTS

Overstory: Noble fir, lodgepole pine, whitebark pine, mountain hemlock, Douglas-fir
Understory: Dwarf huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep deposits of sandy till and moraines on the flanks of Mt. Hood. These deposits are locally influenced by volcanic ash and outcrops of tuffaceous breccia.

## CLIMATE

Precipitation: 70 to 100 inches, 1780 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 1 to 30 percent
Aspect: All aspects
Elevation: 4100 to 4800 feet, 1360 to 1600 meters

## MANAGEMENT

This soil unit, because of severe environmental conditions, produces Site Class 5 Douglas-fir. There is little evidence of mass failures in the past, however surface erosion may be a problem in areas of exposed mineral soils.

## SOIL 363

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and mountain hemlock. Black amorphous organic matter 2 to 3 inches thick.
Surface Layers: Very dark grayish brown to very dark gray gravelly fine sandy loams; single grain to weak, very fine granular structure; soft, very friable, non-sticky, non-plastic; 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 10 to 12 inches thick.
Subsoil Layers: Dark grayish brown to grayish brown gravelly fine sandy loams and gravelly loams; weak, very fine granular and weak, very fine subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 30 to 40 inches thick.
Range of Soil Depth: 40 to 52 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 36, T. 2S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 364 and inclusions of Soils 6, 362 and 363. This unit is mapped on nearly level to steep dissected glaciated mountain slopes.

## 364

## VEGETATION

### SUBALPINE FORESTS

Overstory: Whitebark pine, mountain hemlock
Understory: Dwarf huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in deep deposits of sandy till and moraines on the flanks of Mt. Hood. These deposits are locally influenced by volcanic ash and outcrops of tuffaceous breccia.

## CLIMATE

Precipitation: 80 to 110 inches, 2030 to 2790 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 10 to 60 percent
Aspect: All aspects
Elevation: 4500 to 6500 feet, 1500 to 2170 meters

## MANAGEMENT

This soil unit, because of severe environmental conditions, produces Site Class 5 Douglas-fir. There is little evidence of mass failures in the past, however surface erosion may be a problem in areas of exposed mineral soils.

## SOIL 364

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and mountain hemlock. Black amorphous organic matter 1 to 2 inches thick.
Surface Layers: Very dark grayish brown to very dark gray gravelly fine sandy loams; single grain to weak very fine granular structure, soft, very friable, non-sticky, non-plastic; 50 percent coarse fragments; pH ranges between 5.0 and 5.5. 5 to 8 inches thick.
Subsoil Layers: Dark grayish brown to grayish brown gravelly fine sandy loams and gravelly loams; very fine subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 25 to 30 inches thick.
Range of Soil Depth: 30 to 40 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 13, T. 2S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, loamy-skeletal, mixed.

## MAPPING UNIT

374

This Mapping Unit consists of Soil 374 and inclusions of Soils 6, 375 and 376. This unit is mapped on gently sloping to steep, smooth high elevation slopes.

## VEGETATION

DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, noble fir, grand fir, mountain hemlock
Understory: Blue huckleberry, rhododendron
Groundcover: Western starflower, beargrass

## GEOLOGY

GLACIAL DEPOSITS

Soils in this mapping unit have developed in medium-textured till of mixed geologic origin. The soil profile is dominated by a mixture of silt to boulder-sized fragments with hard compacted till at approximately 20 inches in depth.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 3500 to 4500 feet, 1170 to 1500 meters

## MANAGEMENT

Soils in this mapping unit produce Site Class 4 and 5 Douglas-fir. The terrain is suitable for tractor yarding operations and the compaction hazard is low. Care should be taken when planning harvest activities as this area is highly susceptible to windthrow. Regeneration may also be a problem in this unit.

## SOIL 374

RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock and Douglas-fir. Black, totally decomposed organic matter with many fine roots. 3 to 4 inches thick.
Surface Layers: Pale brown to yellowish brown gravelly and cobbly loams; moderate to strong fine granular structure; loose to slightly hard, soft to friable, non-sticky, non-plastic; 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 12 to 16 inches thick.
Subsoil Layers: Light yellowish brown to brownish yellow very fine sandy loams; weak medium subangular blocky and granular structure to massive; loose to slightly hard, soft to firm, non-sticky, non-plastic; 20 percent coarse fragments; pH ranges between 5.0 and 5.5. 45 to 50 inches thick.
Range of Soil Depth: 57 to 66 inches.
Modal Site Location: NE 1/4, NW 1/4 Sec. 2, T. 1S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts, coarse-loamy, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 375 and inclusions of Soils 6, 374 and 376. This unit is mapped on gently sloping to steep, smooth high elevation mountain slopes.

## 375

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, western hemlock, noble fir, grand fir, mountain hemlock
Understory: Blue huckleberry, rhododendron
Groundcover: Western starflower, beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have developed in medium-textured till of mixed geologic origin. The soil profile is dominated by a mixture of silt to boulder-sized fragments with hard compacted till at approximately 20 inches in depth.

## CLIMATE

Precipitation: 80 to 100 inches, 2030 to 2540 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 40°F, 5°C

## TOPOGRAPHY

Slope: 30 to 60 percent
Aspect: All aspects
Elevation: 3500 to 4500 feet, 1170 to 1500 meters

## MANAGEMENT

Soils in this mapping unit produce Site Class 4 and 5 Douglas-fir. Because of slope limitations, this unit is not suitable for tractor yarding operations. The compaction hazard is low. Care should be taken when planning harvest activities as this area is highly susceptible to windthrow. Regeneration may also be a problem in this unit.

## SOIL 375

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from western hemlock and Douglas-fir. Black, totally decomposed organic matter with many fine roots. 1 to 2 inches thick.
Surface Layers: Pale brown to yellowish brown gravelly and cobbly loams; moderate to strong fine granular structure; loose to slightly hard, soft to friable, non-sticky, non-plastic; 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 8 to 10 inches thick.
Subsoil Layers: Light yellowish brown to brownish yellow very fine sandy loams; weak medium subangular blocky and granular structure to massive; loose to slightly hard, soft to firm, non-sticky, non-plastic; 20 percent coarse fragments; pH ranges between 5.0 and 5.5. 25 to 35 inches thick.
Range of Soil Depth: 33 to 45 inches.
Modal Site Location: NE 1/4, NW 1/4 Sec. 18, T. 1S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 376 and inclusions of Soils 6, 7, 374, 375 and 377. This unit is mapped on gently sloping to steep, smooth high elevation mountain slopes.

## 376

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, mountain hemlock, noble fir
Understory: Chinkapin, manzanita, vine maple, blue huckleberry, salal, rose, Oregon grape
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have developed in medium-textured till of mixed geologic origin. Most of the coarse fragments in the soil profile consist of hard andesites and basalts.

## CLIMATE

Precipitation: 70 to 90 inches, 1780 to 2290 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 2500 to 3500 feet, 830 to 1170 meters

## MANAGEMENT

Soils in this mapping unit produce Site Class 4 and 5 Douglas-fir. The terrain is suitable for tractor yarding operations and the compaction hazard is moderate to low. Regeneration may be a problem in this mapping unit.

## SOIL 376

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and noble fir. Totally decomposed amorphous organic matter. 1 to 2 inches thick.
Surface Layers: Very dark grayish brown to brown loams and gravelly loams; single grain to medium very fine and fine granular structure; slightly hard, friable, non-sticky, non-plastic; 5 to 10 percent coarse fragments; pH ranges between 6.0 and 6.5. 10 to 15 inches thick.
Subsoil Layers: Dark brown to very pale brown gravelly loams and stony loams; weak fine to coarse subangular blocky structure; slightly hard, firm, non-sticky, non-plastic; 5 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 40 to 48 inches thick.
Range of Soil Depth: 50 to 63 inches.
Modal Site Location: NE 1/4, SW 1/4 Sec. 28, T. 2N., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts, coarse-loamy, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 377 and inclusions of Soils 6, 7, 374, 375 and 376. This unit is mapped on steep to very steep, smooth, high elevation mountain slopes.

## 377

## VEGETATION

### DOUGLAS-FIR–GRAND FIR ZONE

Overstory: Douglas-fir, mountain hemlock, noble fir
Understory: Chinkapin, manzanita, vine maple, blue huckleberry, salal, rose, Oregon grape
Groundcover: Beargrass, trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have developed in medium-textured till of mixed geologic origin. Most of the coarse fragments in the soil profile consist of hard andesites and basalts.

## CLIMATE

Precipitation: 70 to 90 inches, 1789 to 2290 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 42°F, 6°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 2500 to 3500 feet, 830 to 1170 meters

## MANAGEMENT

Soils in this mapping unit produce Site Class 4 and 5 Douglas-fir. Because of slope limitations, this unit is not suited for tractor yarding operations. Surface erosion in areas of exposed mineral soils may be a problem.

## SOIL 377

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and noble fir. Totally decomposed amorphous organic matter. 1 to 1-1/2 inches thick.
Surface Layers: Very dark grayish brown to brown loams and gravelly loams; single grain to medium very fine and fine granular structure; slightly hard, friable, non-sticky, non-plastic; 5 to 10 percent coarse fragments; pH ranges between 6.0 and 6.5. 5 to 8 inches thick.
Subsoil Layers: Dark brown to very pale brown gravelly loams and stony loams; weak fine to coarse subangular blocky structure; slightly hard, friable, non-sticky, non-plastic; 5 to 50 percent coarse fragments; pH ranges between 6.0 and 6.5. 20 to 30 inches thick.
Range of Soil Depth: 25 to 30 inches.
Modal Site Location: NE 1/4, SW 1/4 Sec. 28, T. 2N., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryumbrepts, coarse-loamy, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 378 and inclusions of Soils 6, 375, 377 and 379. This unit is mapped on gently sloping to moderately steep slopes.

## 378

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, western hemlock, western redcedar
Understory: Huckleberry, vine maple, salal
Groundcover: Oregon grape,trailing twinflower

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have developed in medium-textured till of mixed geologic origin. Most of the coarse fragments in the soil profile consist of hard andesites and basalts.

## CLIMATE

Precipitation: 90 to 110 inches, 2285 to 2795 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 49°F, 9°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 2000 to 3000 feet, 730 to 1000 meters

## MANAGEMENT

This soil unit produces Site Class 5 Douglas-fir. The terrain is suitable for tractor yarding and the compaction hazard is low. There is little or no evidence of mass failures in the past and roadcuts are stable. Surface soil erosion is not a problem in this unit.

## SOIL 378

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and western hemlock. Black totally decomposed organic matter. 2 to 3 inches thick.
Surface Layers: Dark grayish brown to grayish brown stony loams and cobbly loams; weak very fine granular structure; soft, very friable; non-sticky, non-plastic; 40 to 60 percent coarse fragments; pH ranges between 5.5 and 6.0. 10 to 15 inches thick.
Subsoil Layers: Yellowish brown to light yellowish brown cobbly and gravelly loams; weak very fine and fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 35 to 45 inches thick.
Range of Soil Depth: 45 to 60 inches.
Modal Site Location: NW 1/4, SE 1/4 Sec. 26, T. 1S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Haplumbrepts, loamy-skeletal, mixed, mesic.

## MAPPING UNIT

This Mapping Unit consists of Soil 379 and inclusions of Soils 6, 7, 377 and 378. This unit is mapped on sloping to steep mountain slopes on the flanks of Mt. Hood and Mt. Jefferson.

## 379

## VEGETATION

### SUBALPINE FORESTS

Overstory: Mountain hemlock, whitebark pine
Understory: Grouse huckleberry
Groundcover: Lupine

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in fine to medium-textured glacial till that has been locally influenced by volcanic ash deposits. Outcrops of tuffaceous breccia are also common in this unit.

## CLIMATE

Precipitation: 100 to 120 inches, 2540 to 3050 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 40°F, 4.5°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 5000 to 6000 feet, 1660 to 2000 meters

## MANAGEMENT

Because of harsh environmental conditions, this soil unit does not produce commercial timber stands. It is used primarily for recreational activities.

## SOIL 379

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from mountain hemlock. Totally decomposed, black organic matter. 1 to 2 inches thick.
Surface Layers: Very dark gray to very dark grayish brown cobbly loams and cobbly sandy loams; single grain to weak, very fine granular structure; loose, soft, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH between 5.0 and 5.5. 8 to 10 inches thick.
Subsoil Layers: Brown to dark yellowish brown gravelly loams; weak very fine subangular blocky structure; soft, very friable, non-sticky, non-plastic; 30 to 40 percent coarse fragments; pH ranges between 5.0 and 5.5. 20 to 30 inches thick.
Range of Soil Depth: 28 to 40 inches.
Modal Site Location: NW 1/4, NW 1/4 Sec. 26, T. 2S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, loamy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 380 and inclusions of Soils 5, 381 and 382. This unit is mapped on gently sloping to moderately steep glaciated mountain slopes on the flanks of Mt. Hood.

## 380

## VEGETATION

### SUBALPINE FORESTS

Overstory: Douglas-fir, subalpine fir, noble fir, western larch
Understory: Grouse huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in fine to medium-textured glacial till that has been locally influenced by volcanic ash deposits. Outcrops of tuffaceous breccia are also common in this unit.

## CLIMATE

Precipitation: 100 to 120 inches, 2540 to 3050 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: All aspects
Elevation: 4500 to 5500 feet, 1500 to 1830 meters

## MANAGEMENT

Because of harsh environmental conditions, this soil unit does not produce commercial timber stands. It is used primarily for recreational activities.

## SOIL 380

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and western larch. Totally decomposed organic matter. 1 to 2 inches thick.
Surface Layers: Dark gray to dark grayish brown gravelly loams; weak very fine granular structure to single grain; loose, soft, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 12 to 14 inches thick.
Subsoil Layers: Grayish brown to yellowish brown gravelly fine sandy loams; weak fine granular and subangular blocky structure; loose, very friable, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 30 to 40 inches thick.
Range of Soil Depth: 42 to 54 inches.
Modal Site Location: NE 1/4, SE 1/4 Sec. 35, T. 2S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, sandy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 381 and inclusions of Soils 5, 380 and 382. This unit is mapped on gently sloping to moderately steep glaciated mountain slopes on the flanks of Mt. Hood.

## 381

## VEGETATION

### SUBALPINE FORESTS

Overstory: Douglas-fir, subalpine fir, noble fir, western larch
Understory: Grouse huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in fine to medium-textured glacial till that has been locally influenced by volcanic ash deposits. Outcrops of tuffaceous breccia are also common in this unit.

## CLIMATE

Precipitation: 100 to 120 inches, 2540 to 3050 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 30 to 70 percent
Aspect: North and East
Elevation: 4500 to 5500 feet, 1500 to 1830 meters

## MANAGEMENT

Because of harsh environmental conditions, this soil unit does not produce commercial timber stands. It is used primarily for recreational activities.

## SOIL 381

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and western larch. Totally decomposed organic matter. 1 to 2 inches thick.
Surface Layers: Dark gray to dark grayish brown gravelly loams; weak very fine granular structure to single grain; loose, soft, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 8 to 10 inches thick.
Subsoil Layers: Grayish brown to yellowish brown gravelly fine sandy loams; weak fine granular and subangular blocky structure; loose, very friable, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 20 to 30 inches thick.
Range of Soil Depth: 28 to 40 inches.
Modal Site Location: SE 1/4, SE 1/4 Sec. 26, T. 2S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, sandy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 382 and inclusions of Soils 5, 380 and 381. This unit is mapped on gently sloping to moderately steep glaciated mountain slopes on the flanks of Mt. Hood.



## VEGETATION

### SUBALPINE FORESTS

Overstory: Douglas-fir, subalpine fir, noble fir, western larch
Understory: Grouse huckleberry
Groundcover: Beargrass

## GEOLOGY

### GLACIAL DEPOSITS

Soils in this mapping unit have formed in fine to medium-textured glacial till that has been locally influenced by volcanic ash deposits. Outcrops of tuffaceous breccia are also common in this unit.

## CLIMATE

Precipitation: 100 to 120 inches, 2540 to 3050 mm
Soil Temperature Class: Cryic
Mean Annual Soil Temperature: 41°F, 5°C

## TOPOGRAPHY

Slope: 5 to 30 percent
Aspect: South and West
Elevation: 4500 to 5500 feet, 1500 to 1830 meters

## MANAGEMENT

Because of harsh environmental conditions, this soil unit does not produce commercial timber stands. It is used primarily for recreational activities.

## SOIL 382

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from noble fir and western larch. Totally decomposed organic matter. 1 to 2 inches thick.
Surface Layers: Dark gray to dark grayish brown gravelly loams; weak very fine granular structure to single grain; loose, soft, non-sticky, non-plastic; 40 to 50 percent coarse fragments; pH ranges between 5.5 and 6.0. 12 to 14 inches thick.
Subsoil Layers: Grayish brown to yellowish brown gravelly fine sandy loams; weak fine granular and subangular blocky structure; loose, very friable, non-sticky, non-plastic; 20 to 30 percent coarse fragments; pH ranges between 5.5 and 6.0. 30 to 40 inches thick.
Range of Soil Depth: 42 to 54 inches.
Modal Site Location: SW 1/4, SW 1/4 Sec. 4, T. 2S., R. 9E.
Estimated U.S.D.A. Soil Classification: Typic Cryorthods, sandy-skeletal, mixed.

## MAPPING UNIT

This Mapping Unit consists of Soil 500 and inclusions of Soils 3, 4 and 11. This unit is mapped on alluvial bottomlands along the upper Clackamas River.

## 500

## VEGETATION

### WESTERN HEMLOCK ZONE

Overstory: Douglas-fir, grand fir, western redcedar
Understory: Pacific yew, California hazel, red huckleberry, serviceberry, golden chinkapin, thimbleberry, vine maple, Oregon grape

## GEOLOGY

### ALLUVIAL DEPOSITS

The parent material for this mapping unit consists of medium to coarse-textured alluvial material deposited in the past by the Clackamas. This material contains large amounts of stones and cobble but also may contain some layers of silts and clays.

## CLIMATE

Precipitation: 70 to 80 inches, 1780 to 2030 mm
Soil Temperature Class: Mesic
Mean Annual Soil Temperature: 47°F, 8°C

## TOPOGRAPHY

Slope: 1 to 10 percent
Aspect: All aspects
Elevation: 1000 to 1800 feet, 333 to 600 meters

## MANAGEMENT

Because of the high content of coarse fragments, this soil unit has relatively low compaction and erosion hazards. However, since this soil is found in close proximity to major streams, care should be taken during harvest operations not to cause unnecessary amounts of ground disturbance.

## SOIL 500

### RANGE OF SOIL PROFILE CHARACTERISTICS

Litter: Decomposing needles and twigs from Douglas-fir and grand fir. Totally decomposed organic matter. 2 to 3 inches thick.
Surface Layers: Dark brown to brown very gravelly loams and very stony silt loams; weak to moderate very fine granular structure; soft, loose, non-sticky, non-plastic; 60 to 80 percent coarse fragments; pH ranges between 5.5 and 6.0. 30 to 35 inches thick.
Subsoil Layers: Dark yellowish brown to light yellowish brown very stony loams; weak medium and coarse subangular blocky structure; soft, very friable, non-sticky, non-plastic; 70 percent coarse fragments; pH ranges 5.5 and 6.0. 30 to 35 inches thick.
Range of Soil Depth: 58 to 69 inches.
Modal Site Location: NW 1/4, SW 1/4 Sec. 31, T. 6S., R. 8E.
Estimated U.S.D.A. Soil Classification: Typic Udifluvents, loamy-skeletal, mixed, mesic.

SOIL MAP

# SOIL MAPS

This section contains the soil map sheets. The base maps are 1 inch equals 1 mile aerial photographs. Mapping was accomplished using aerial photographic interpretation techniques and field checking.

Each delineation on the soil maps is identified by a one, two or three digit number. This number is referred to by the general term "Mapping Unit." Numbers 1 to 15 represent miscellaneous land types. These are mapping units that are non-soil such as perpetual snow and ice, rock outcrops, and talus, or contain highly variable soils such as in subalpine meadows and steep, unstable drainageways. Numbers 100 to 115 represent soils formed in residuum and colluvium derived from pyroclastic rock. Numbers 150 to 173 represent soils formed in volcanic ash and loess. Numbers 200 to 215 represent soils formed in residuum and colluvium derived from igneous rocks. Numbers 300 to 382 represent soils formed in glacial deposits. 500 denotes alluvial soils.

Mapping unit complexes, denoted by a combination of two numbers, represent areas where two soil types are present in an arrangement too complex to separate at the mapping scale used.

Land types represent conceptual units that are defined by specific vegetative, geologic, climatic, topographic and soil criteria. Each unit contains a dominant soil which accounts for at least 70 percent of the delineation. The dominant soil of the mapping unit is described in the mapping unit description section and identified by the same number on the soil maps. Mapping units are often not as pure as described. They contain small areas of other soils and site conditions. These areas are called inclusions. Inclusions account for no more than 30 percent of the delineated land type.

Spot symbols are used to represent important land features which are too small to delineate with a surrounding line, yet are important for management purposes. The following spot symbols are used in this report:

Rock outcrop 

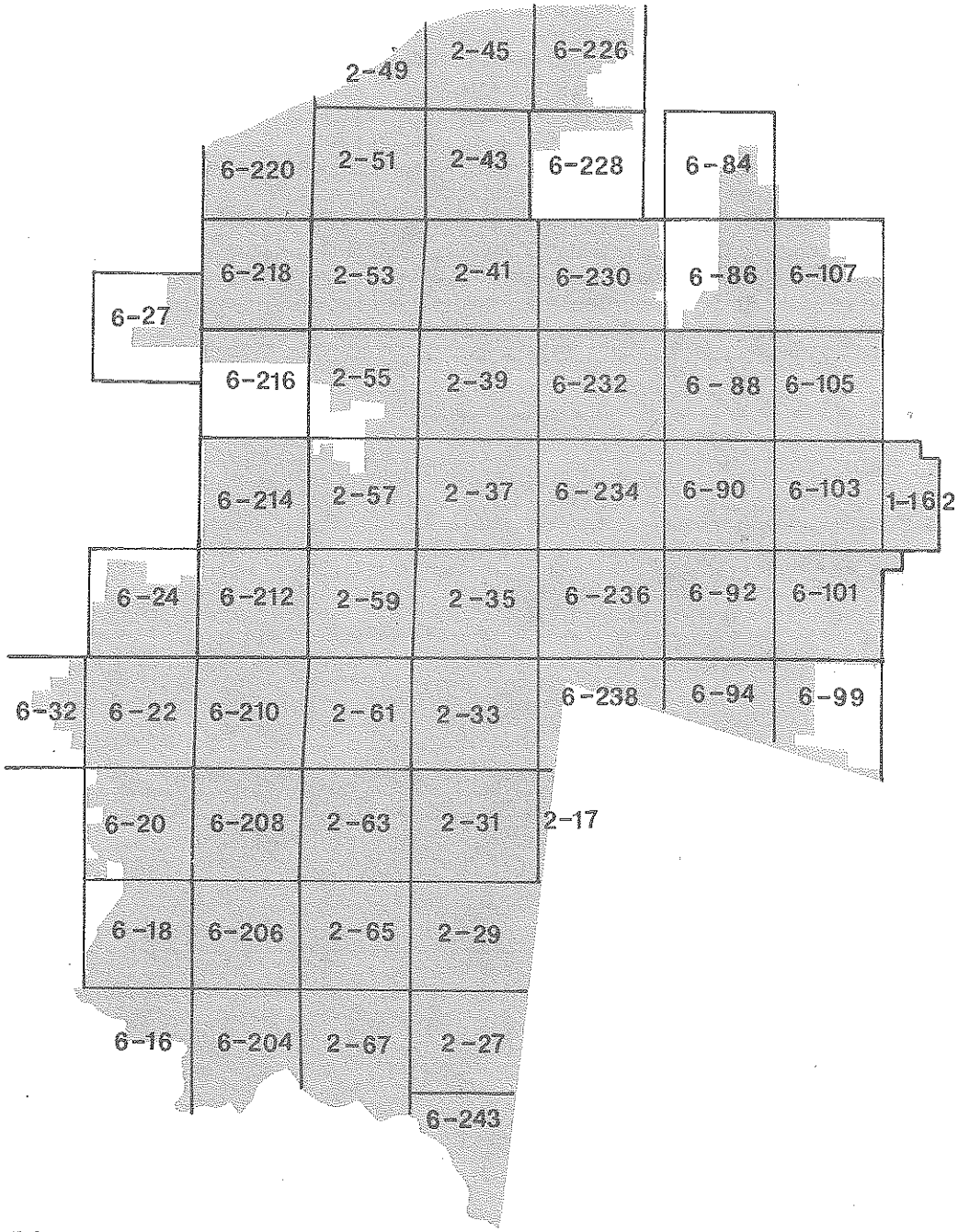
Wetspot or marsh 

Slump or slide scarp 

Avalanche track 

Dry Meadow 

Talus 

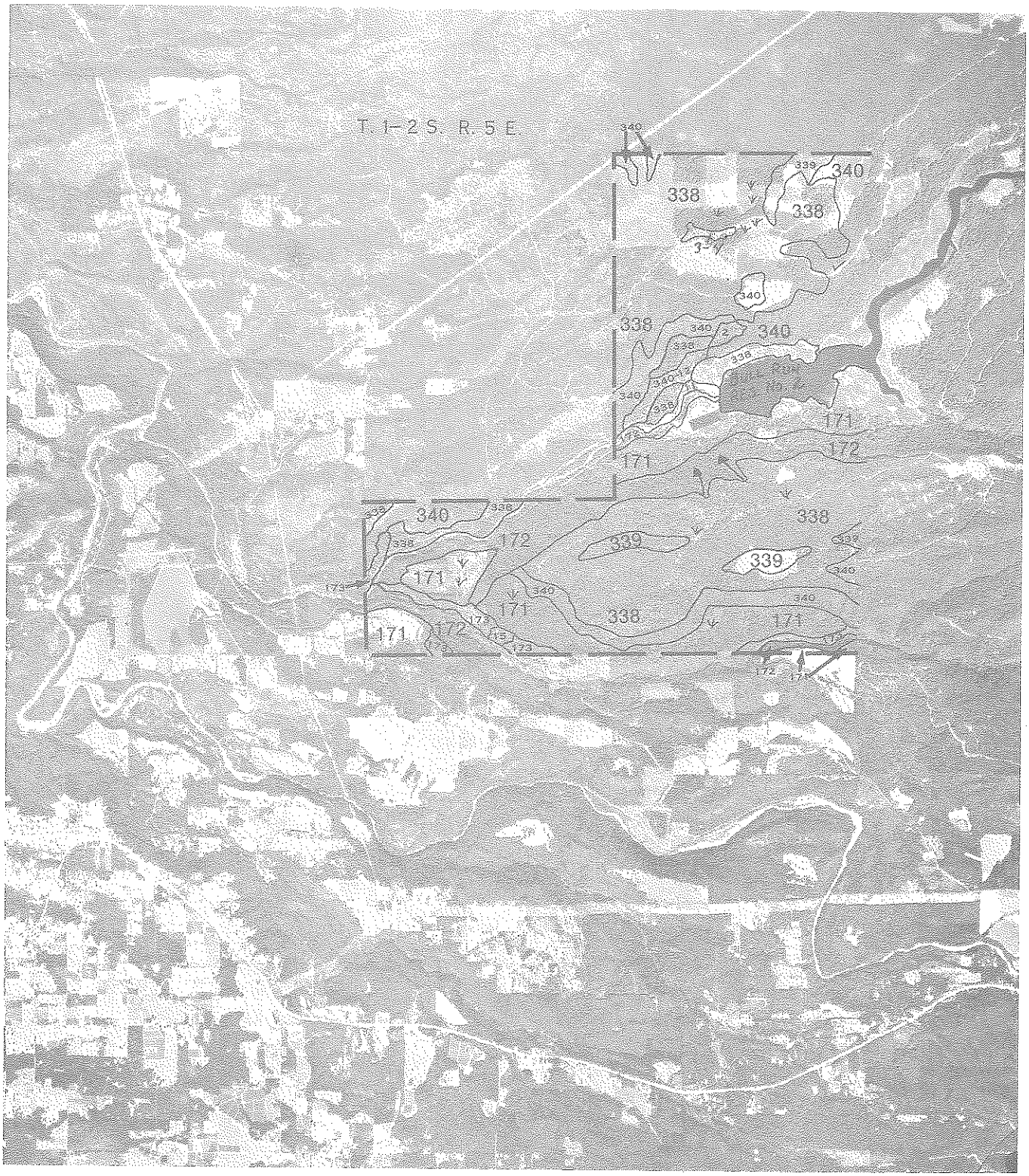


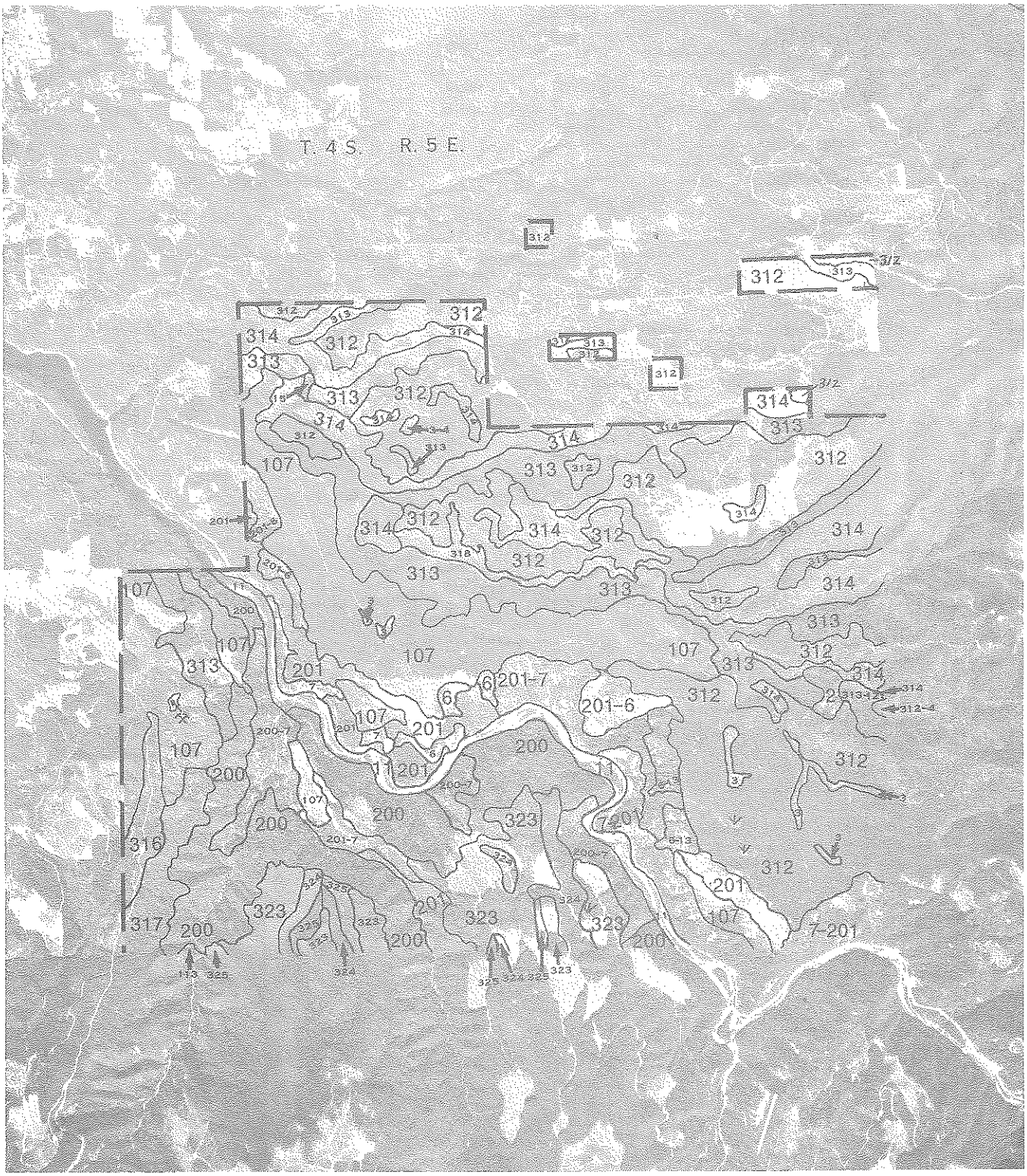

## SOIL MAP SHEET INDEX

The following page numbers correspond to the photograph numbers as shown in the map sheet index:

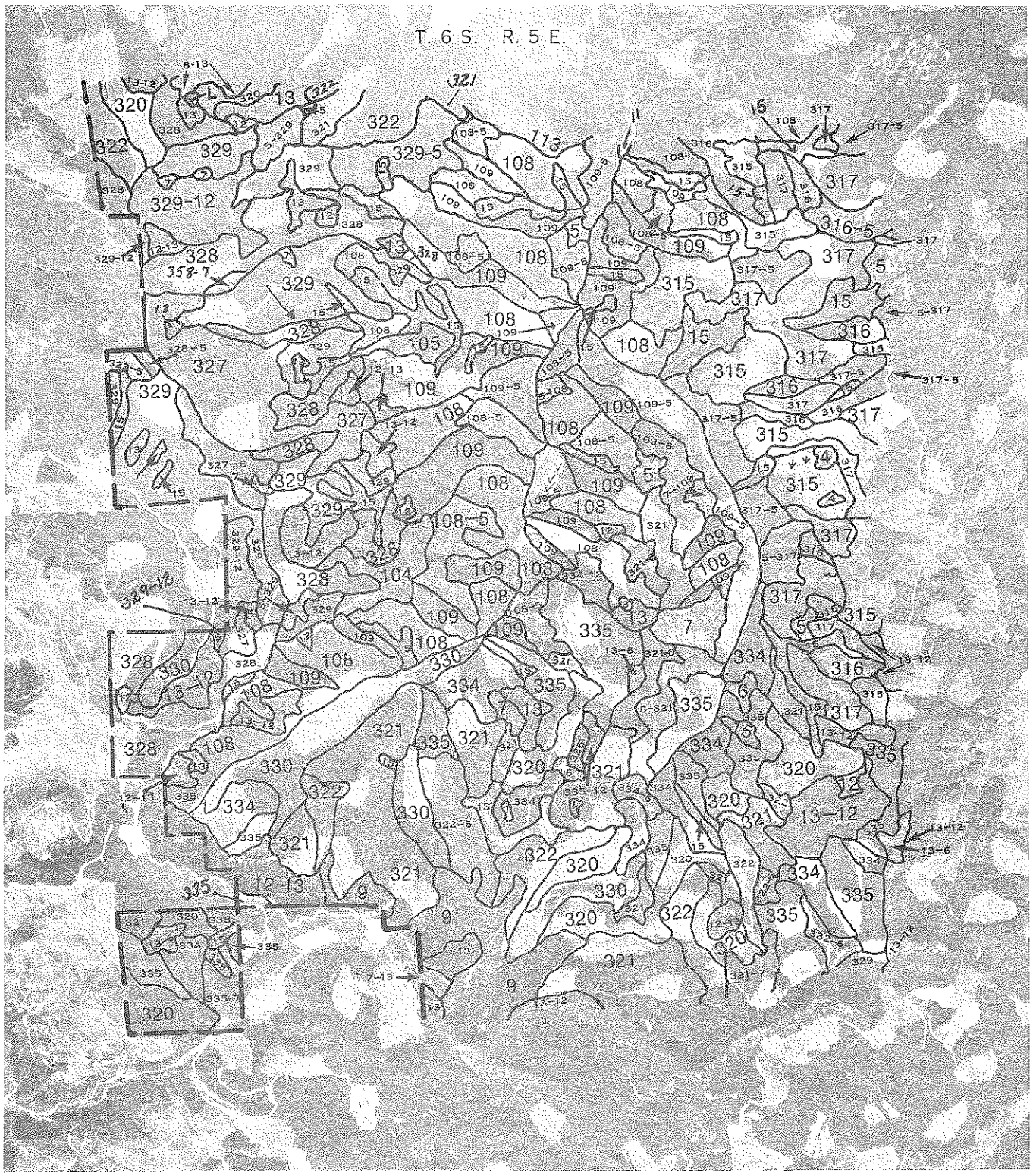
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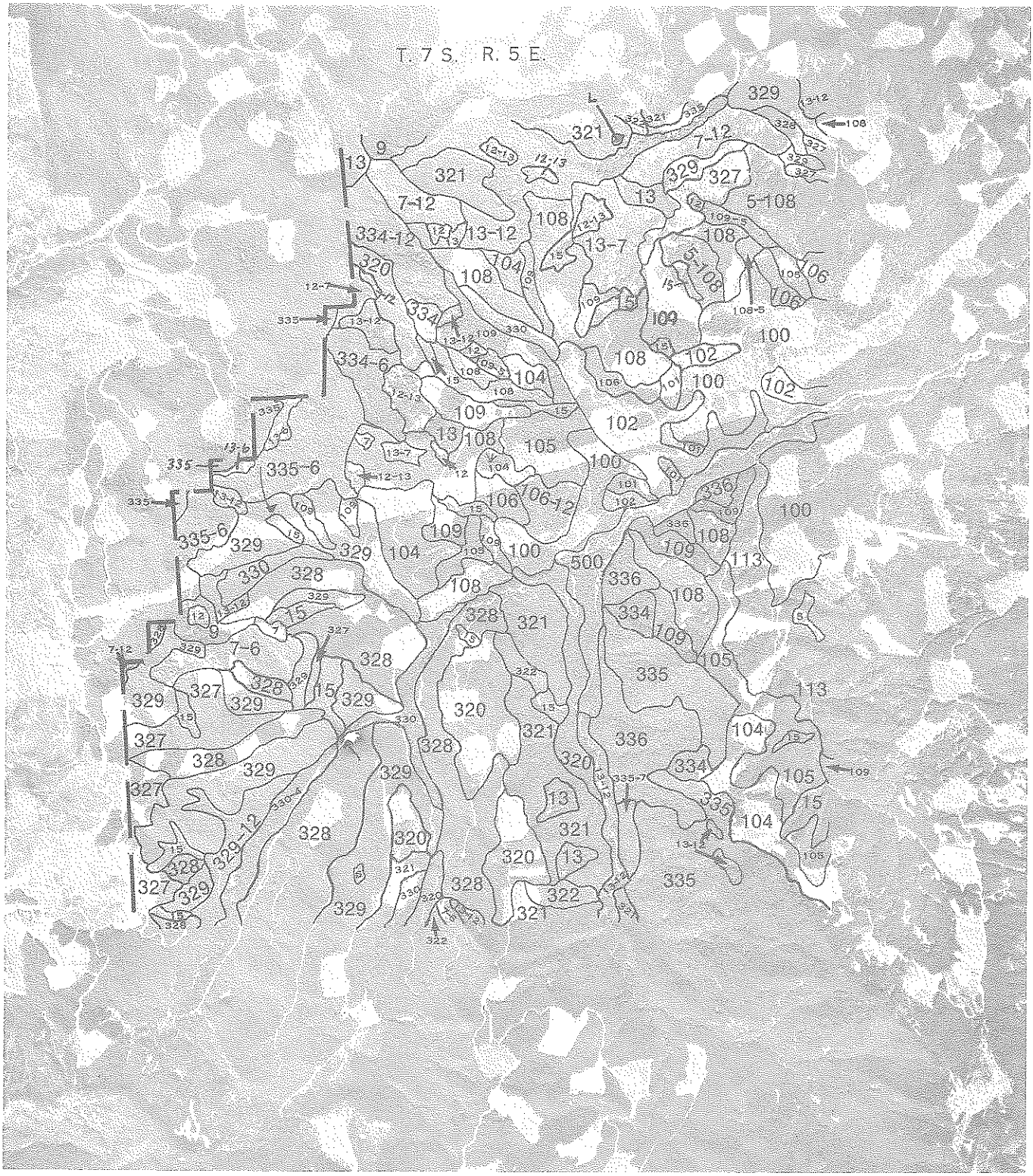

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T. 5 S. R. 5 E.


T. 6 S. R. 5 E.

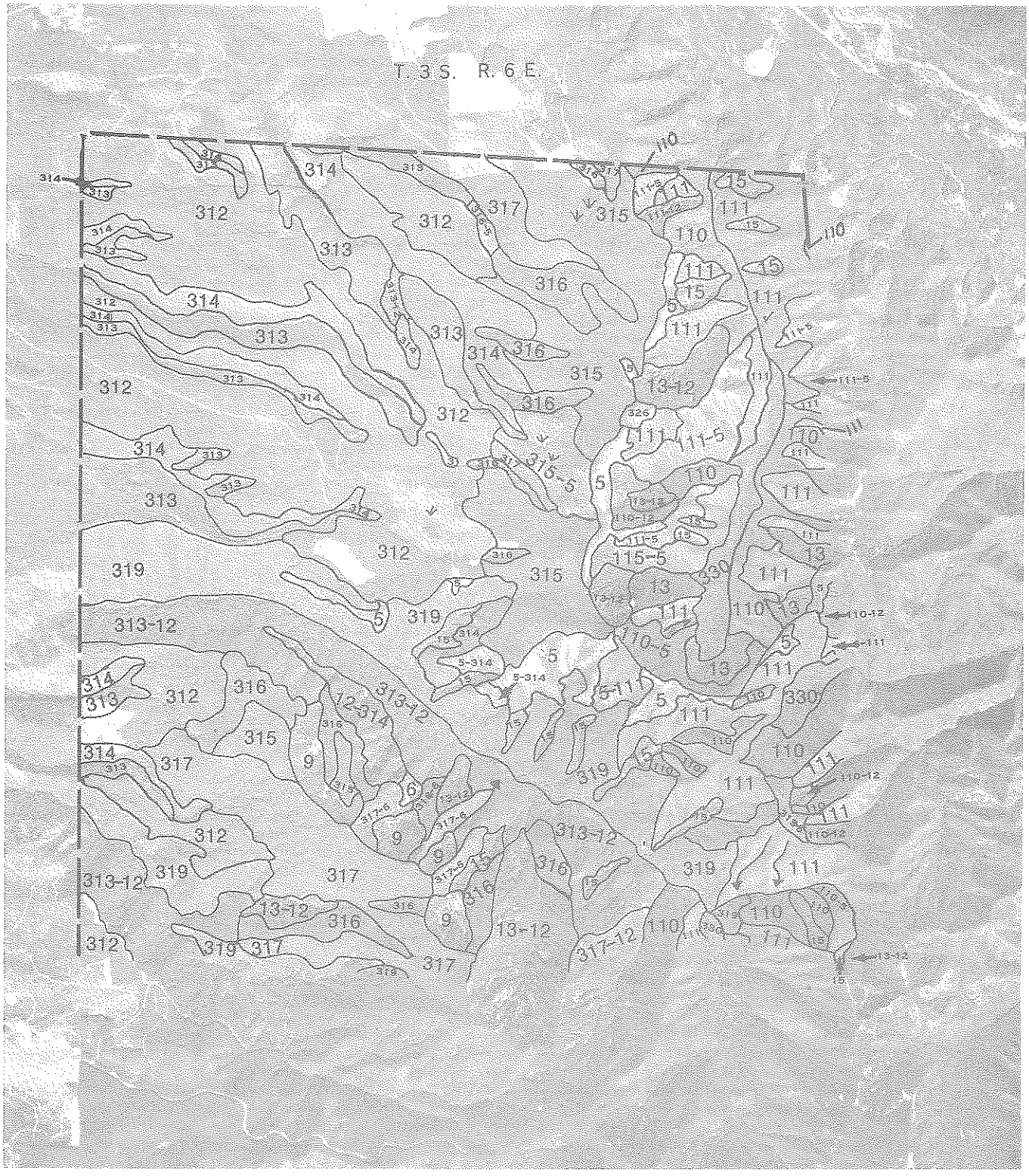

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T. 8 S. R. 5 E.


T. 1 N. R. 6 E.


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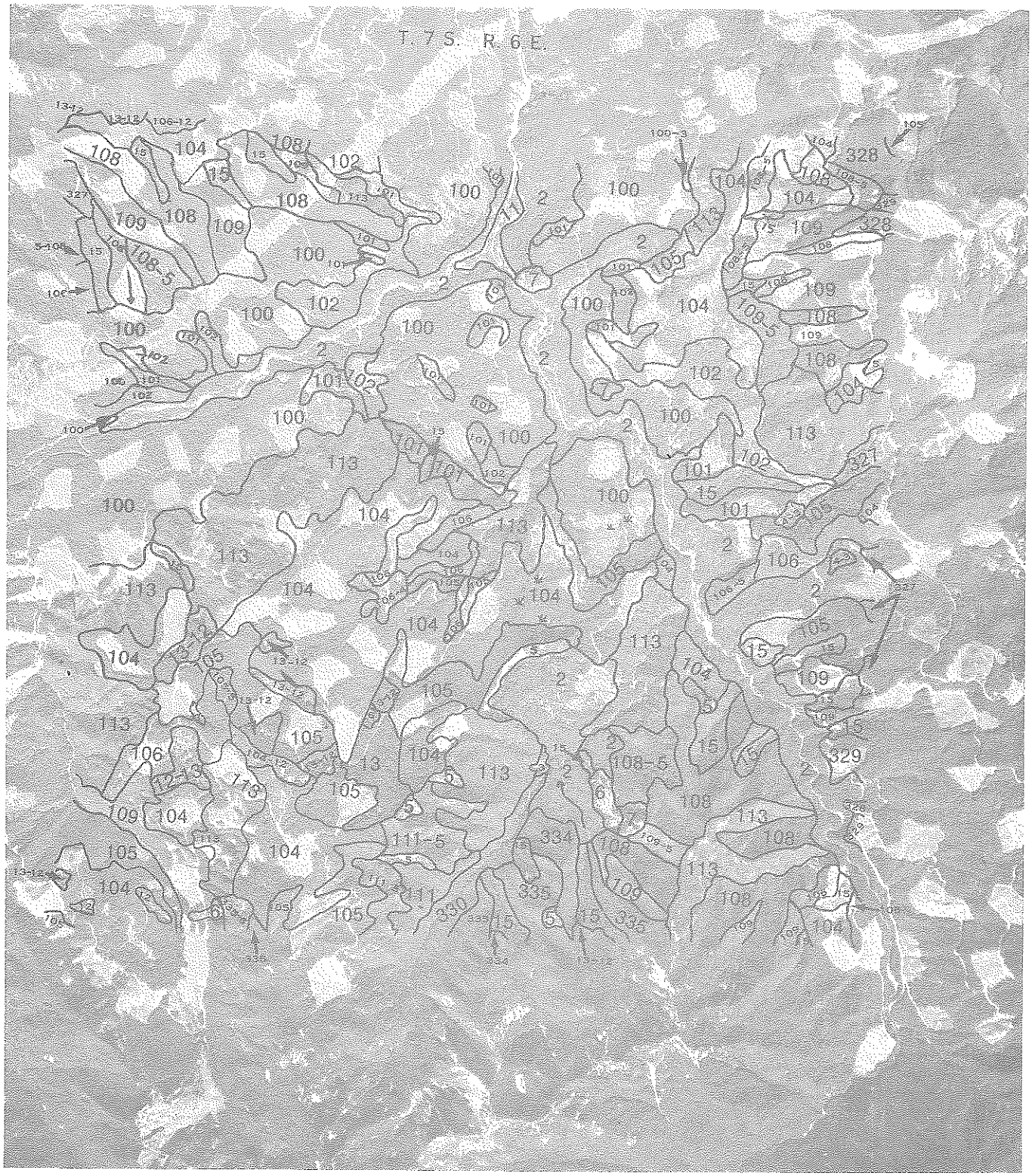

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T. 6 S. R. 6 E.


T. 7 S. R. 6 E.


T 8 S., R 6 E.

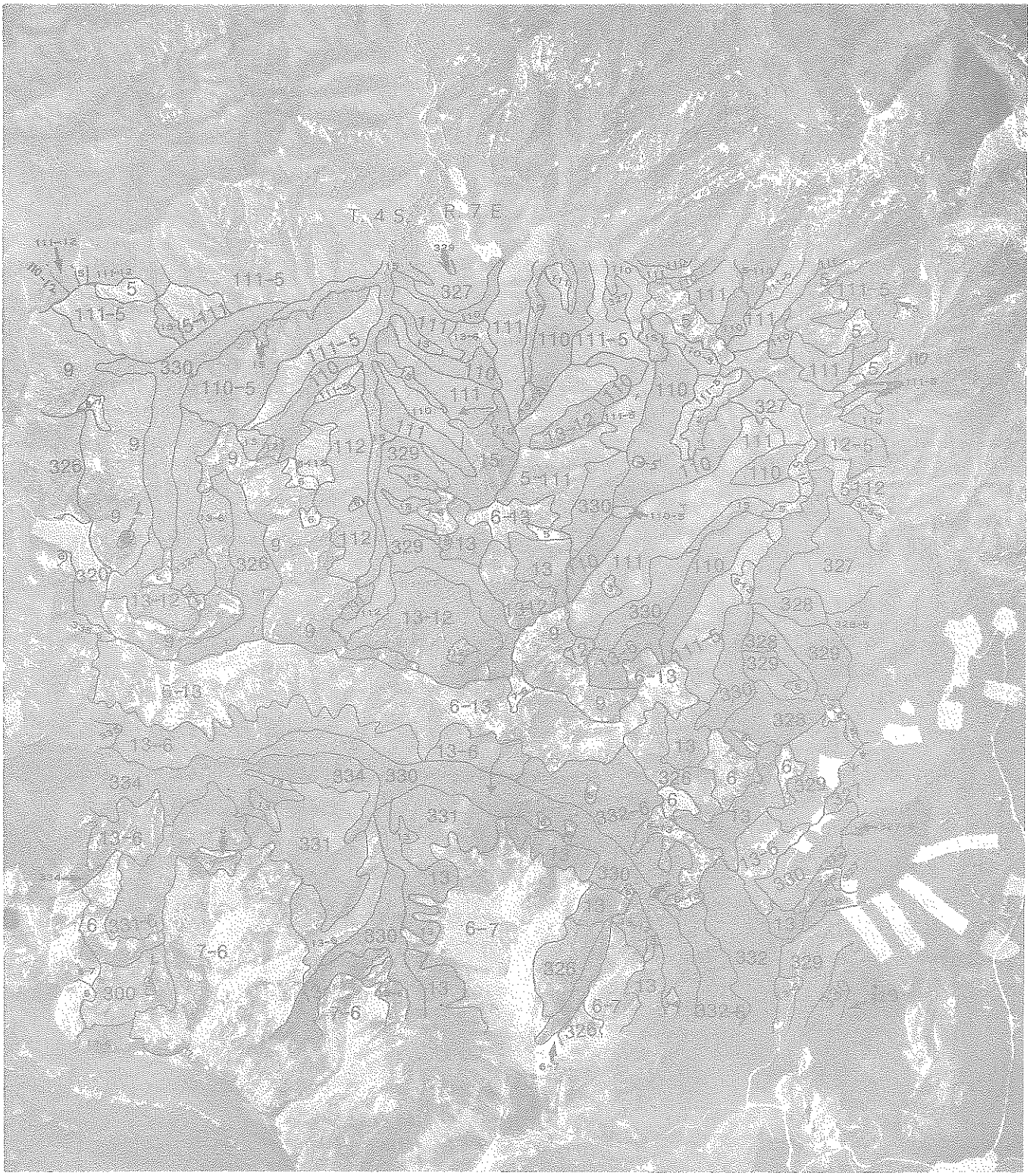

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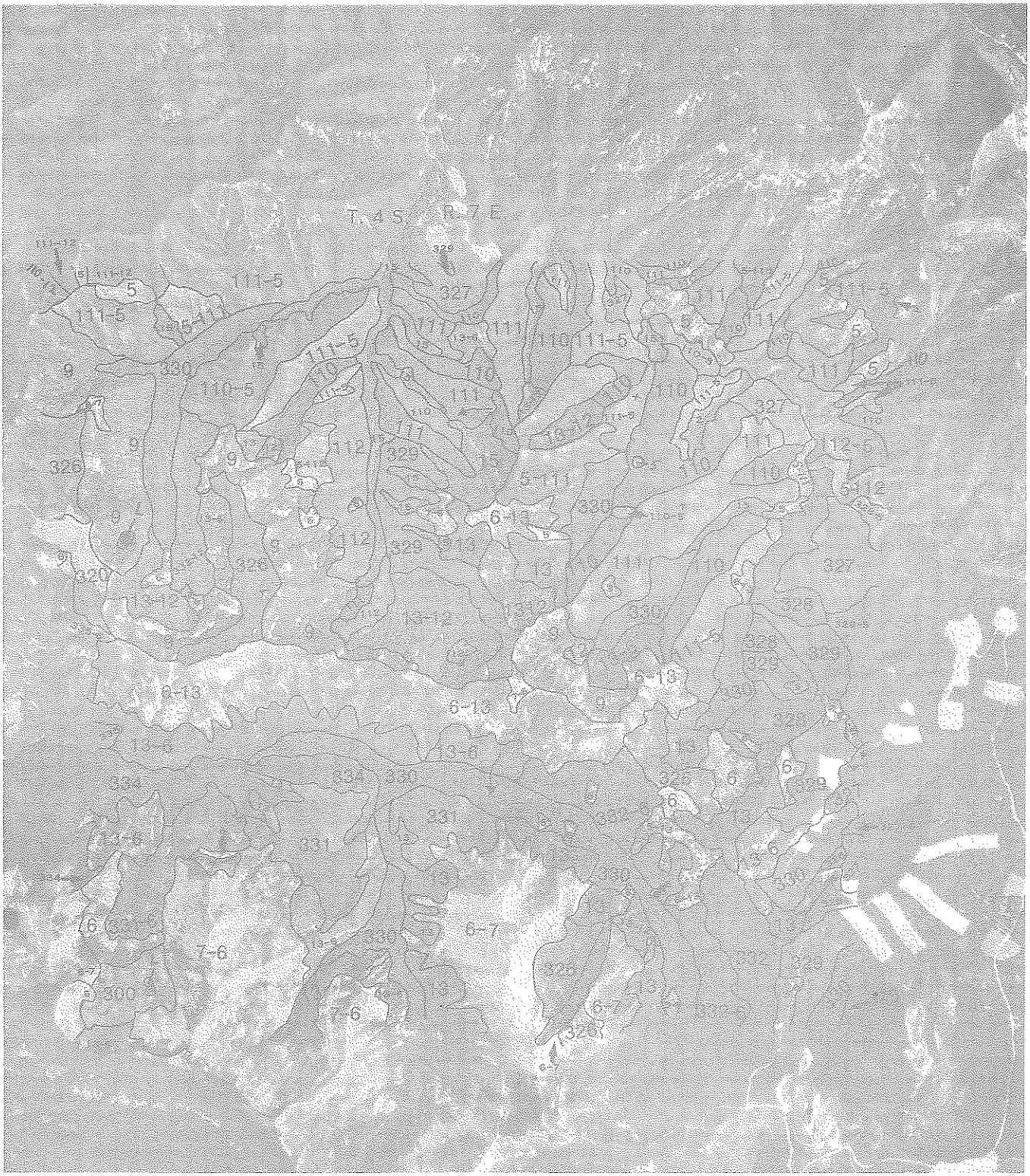



T. 1 S., R. 7 E.

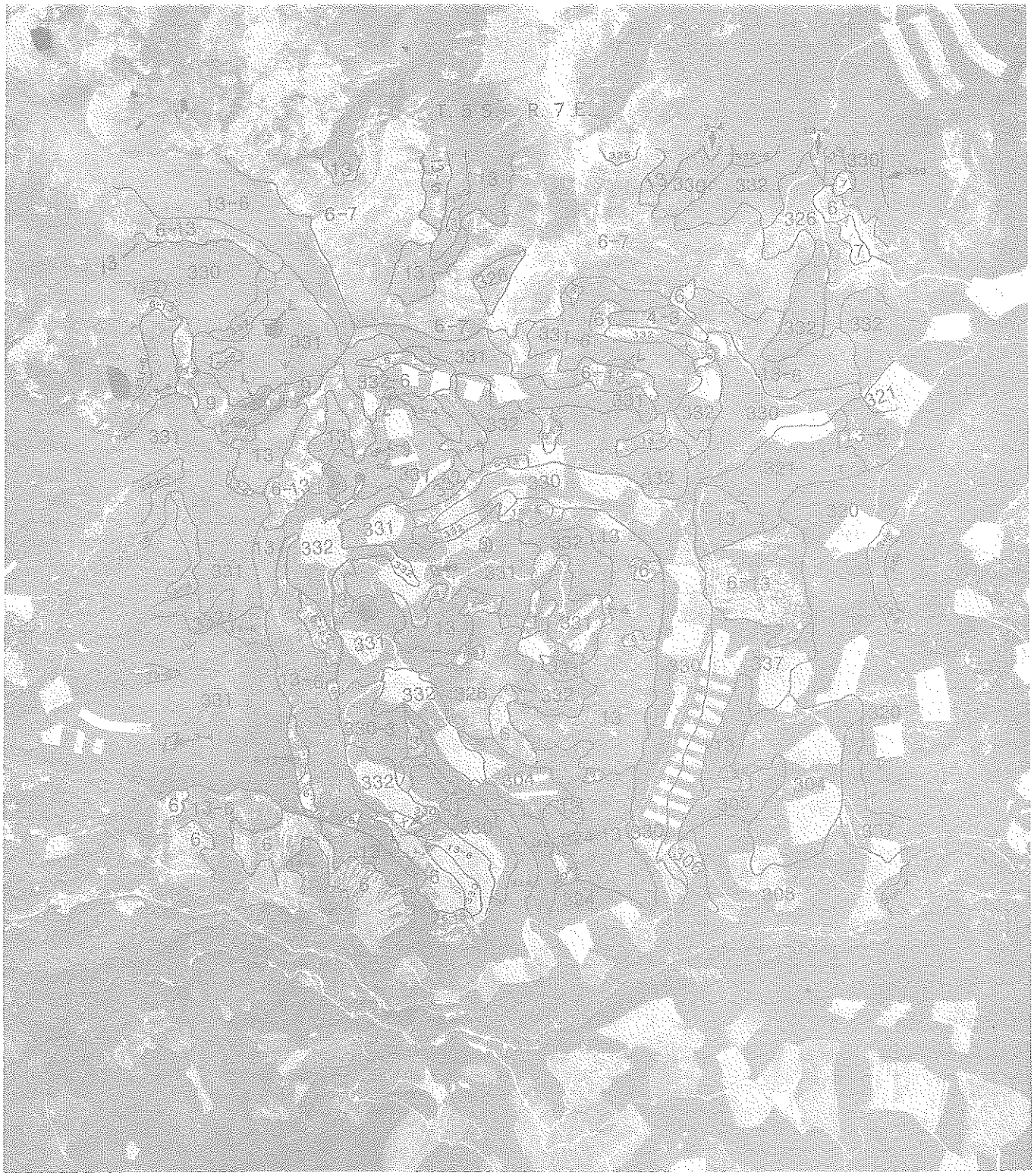

T 2 S. R 7 E.
330
342
343
341
326
345
344
204
338
13-12
6-7
12-13
6-13
345-6
342-6
343-6
341-3
343-12


T. 3 S., R. 7 E.

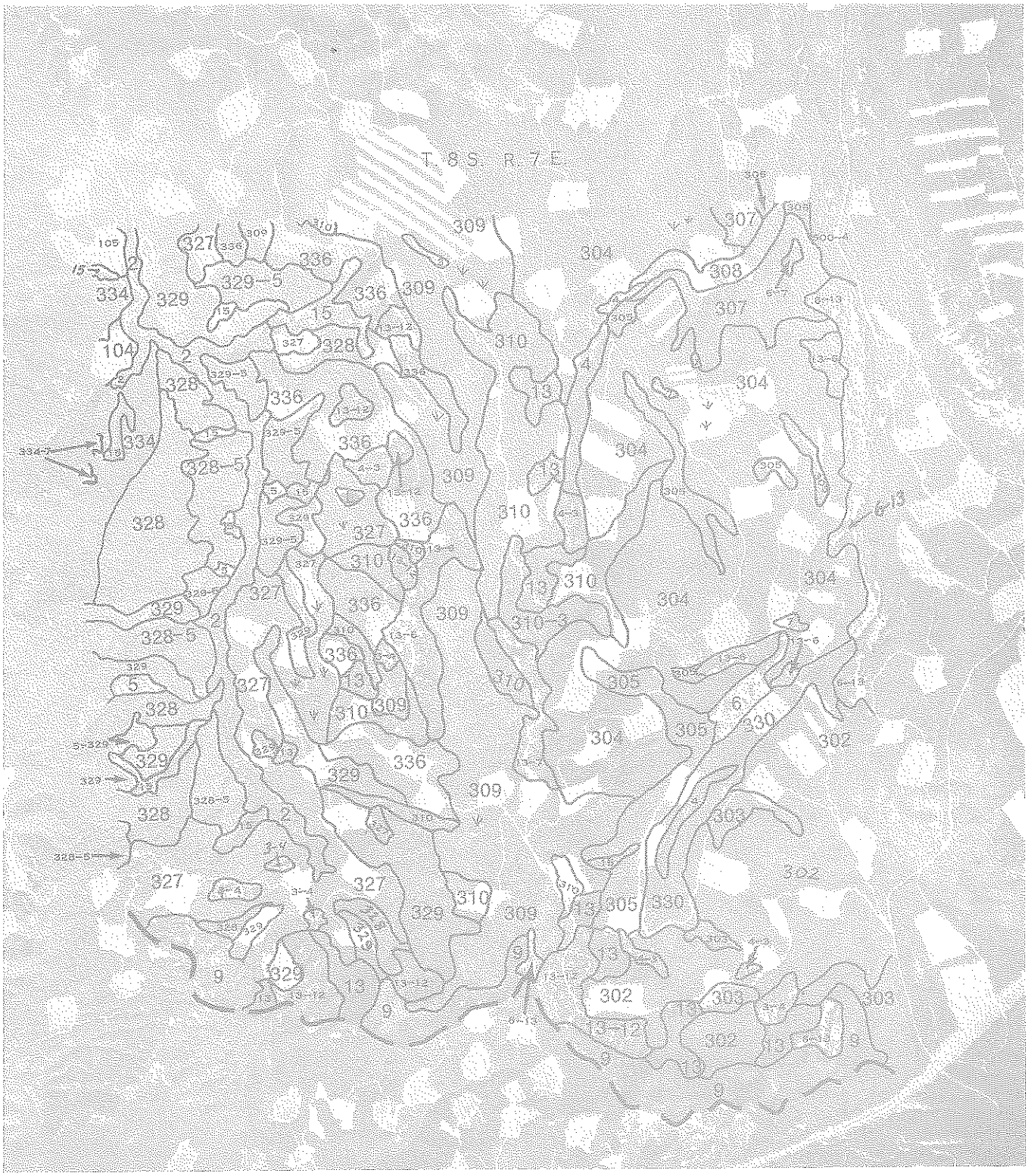

T. 4 S., R. 7 E.


T. 4 S., R. 7 E.


T 3 S R 7 E


T. 5 S.
R. 7 E.

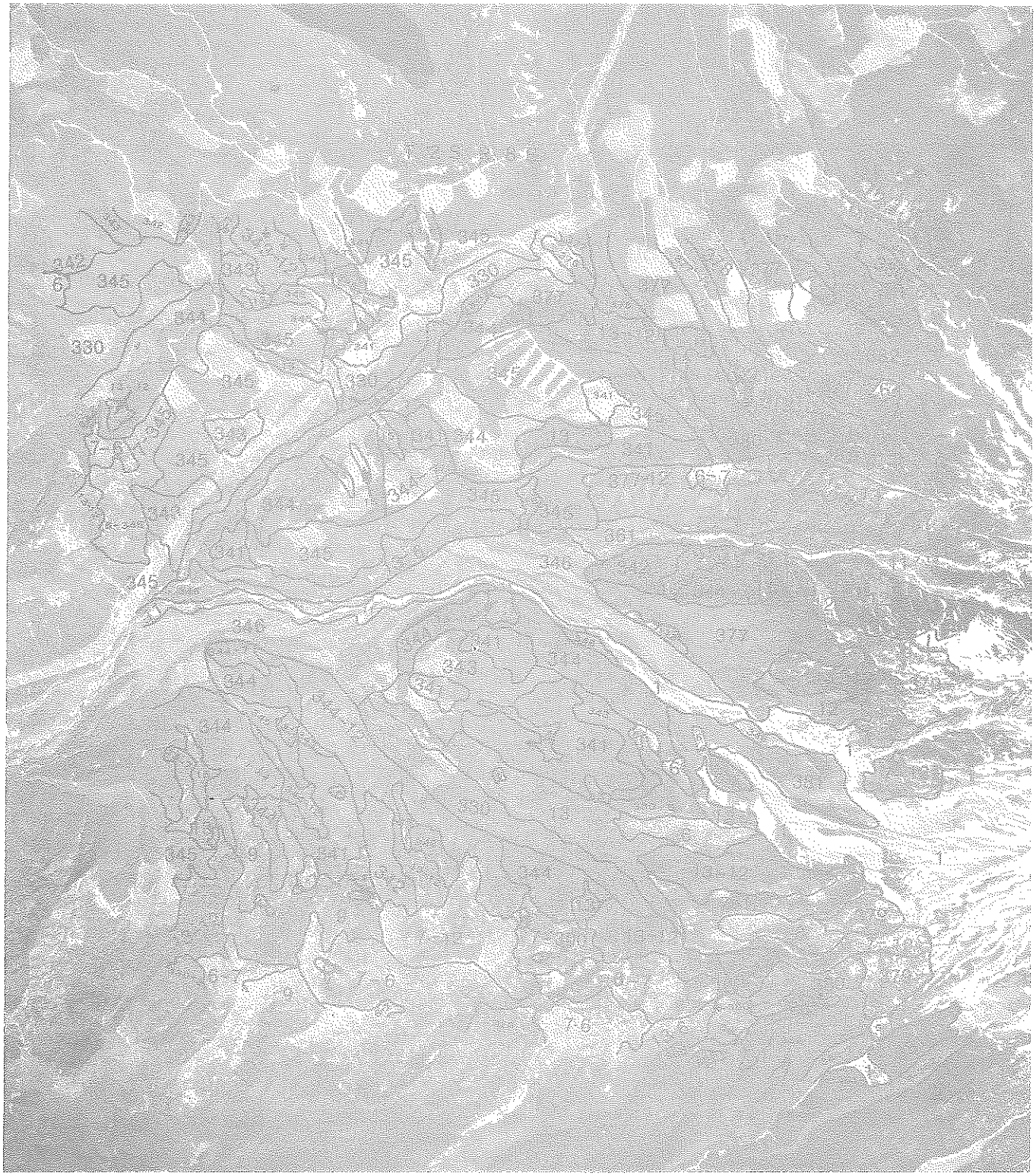

T. 6 S. R. 7 E.


T. 8 S. R. 7 E.


T 2 N R 8 E


T 1 N R 8 E


T 1 S - R 8 E
118
375
376
374
377
343
342
341
340
339
330
333





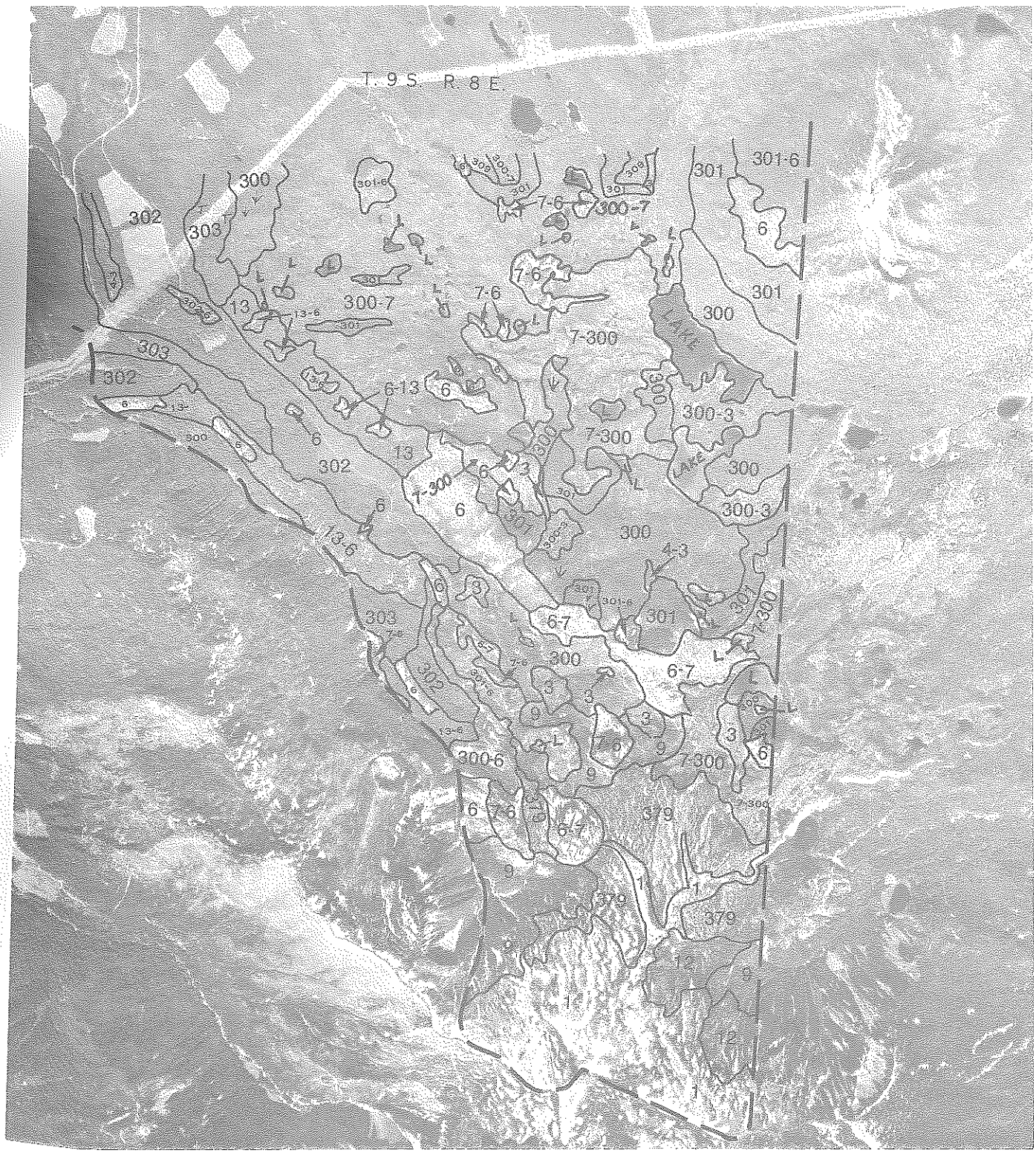



T 3 S R 8 E
TIMOTHY
LAKE


T 6 S R 8 E

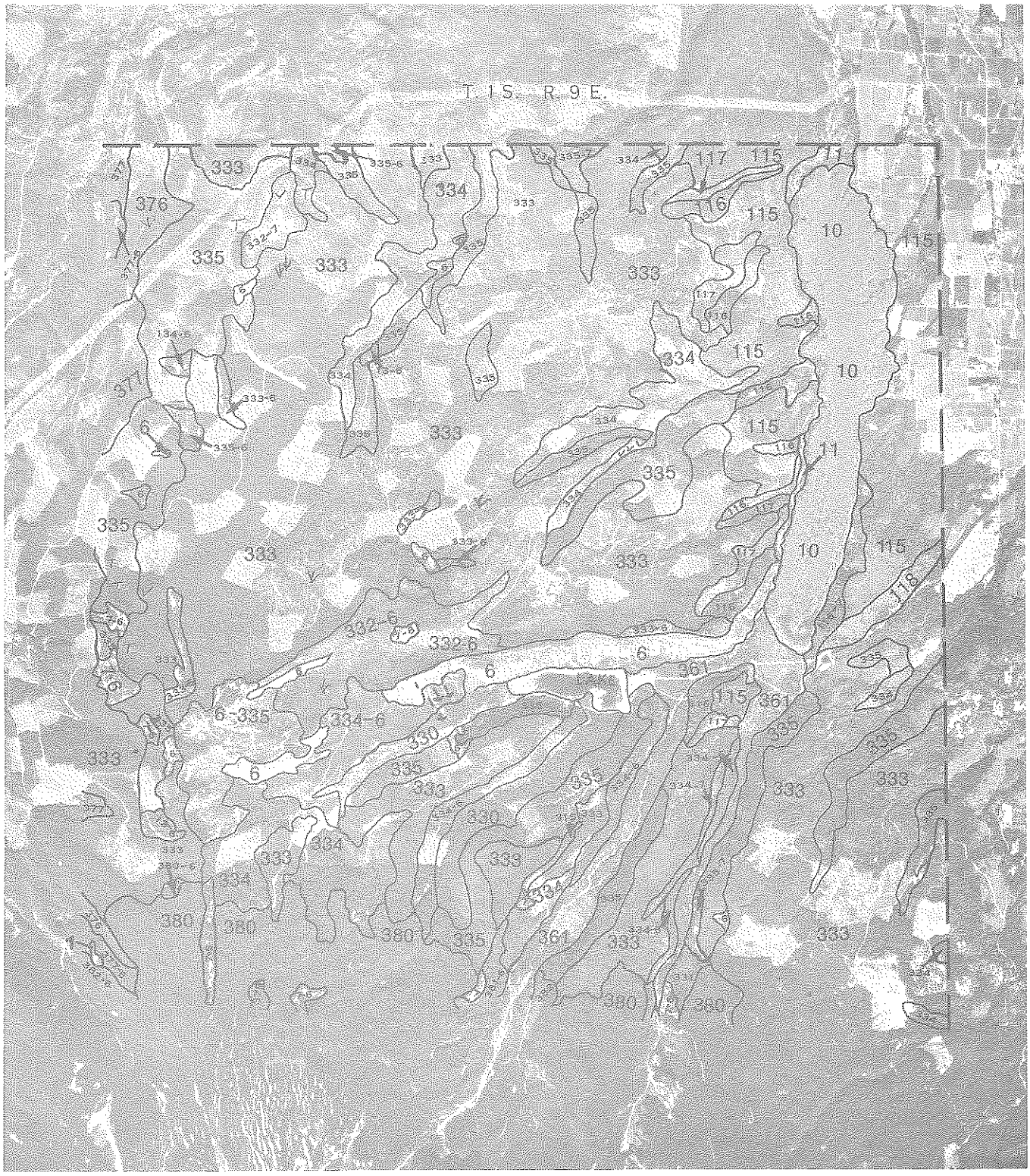

T. 7 S., R. 8 E.
308
306
307
500
304
305
305–6
4–13
6–13
300

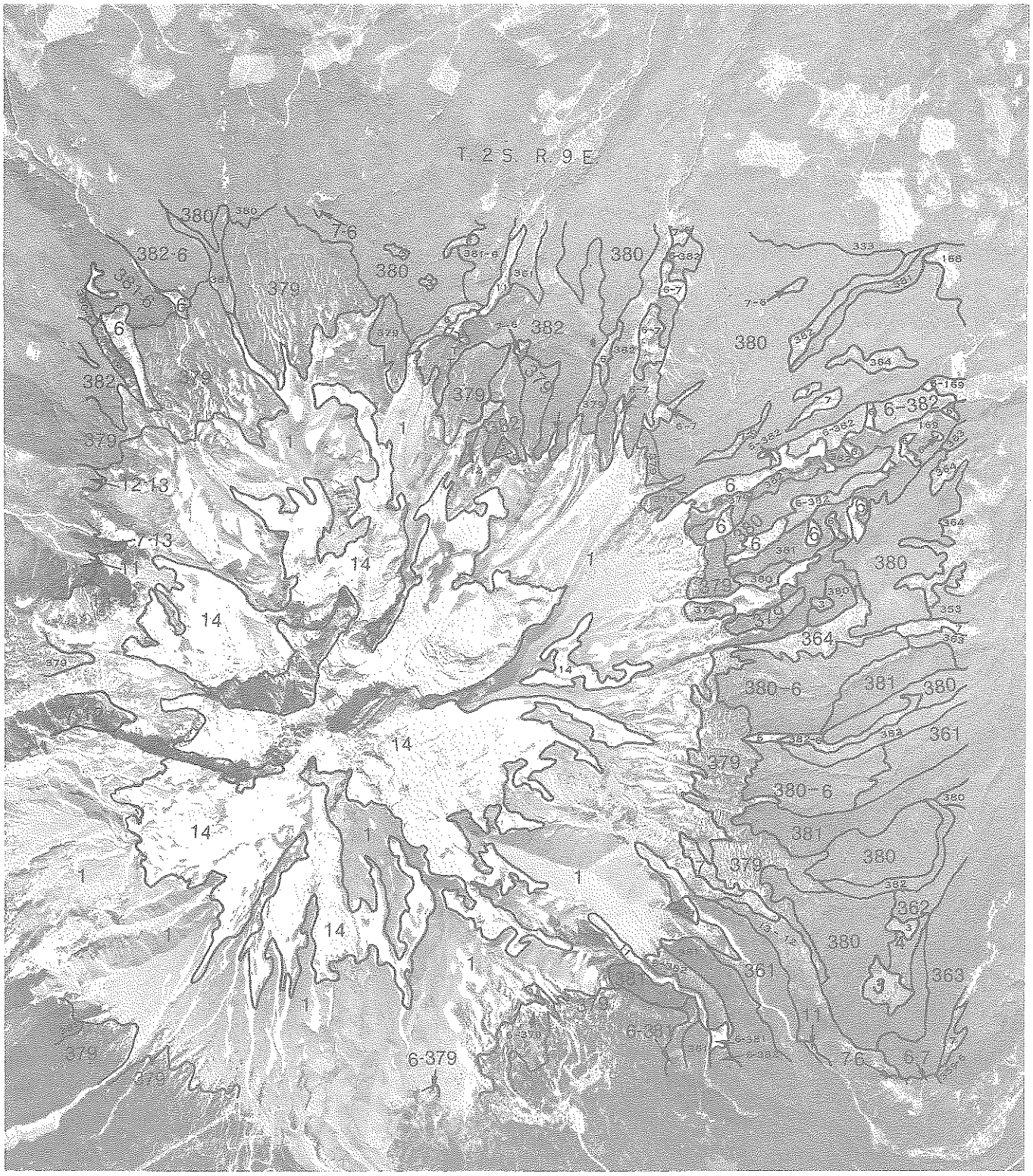

T. 8 S. R. 8 E.


T. 9 S. R. 8 E.


T. 2 N., R. 9 E.
204
202
203
335
334
333
115
118
6-202
6-333
6-335
13-6
335-6


T 1 N R 9 E
6-373
6-373
371
115
330
373
116-7
118
115
117
116
118
330
371
118-7
370
373
330
370
330
371
370
115
118
6-7


T 1S R 9E


T. 2 S., R. 9 E.
380
382-6
379
382
12-13
14
1
6-379
364
380-6
381
361
363
362


T. 3 S., R. 9 E.


T. 4 S. R. 9 E.
CLEAR LAKE

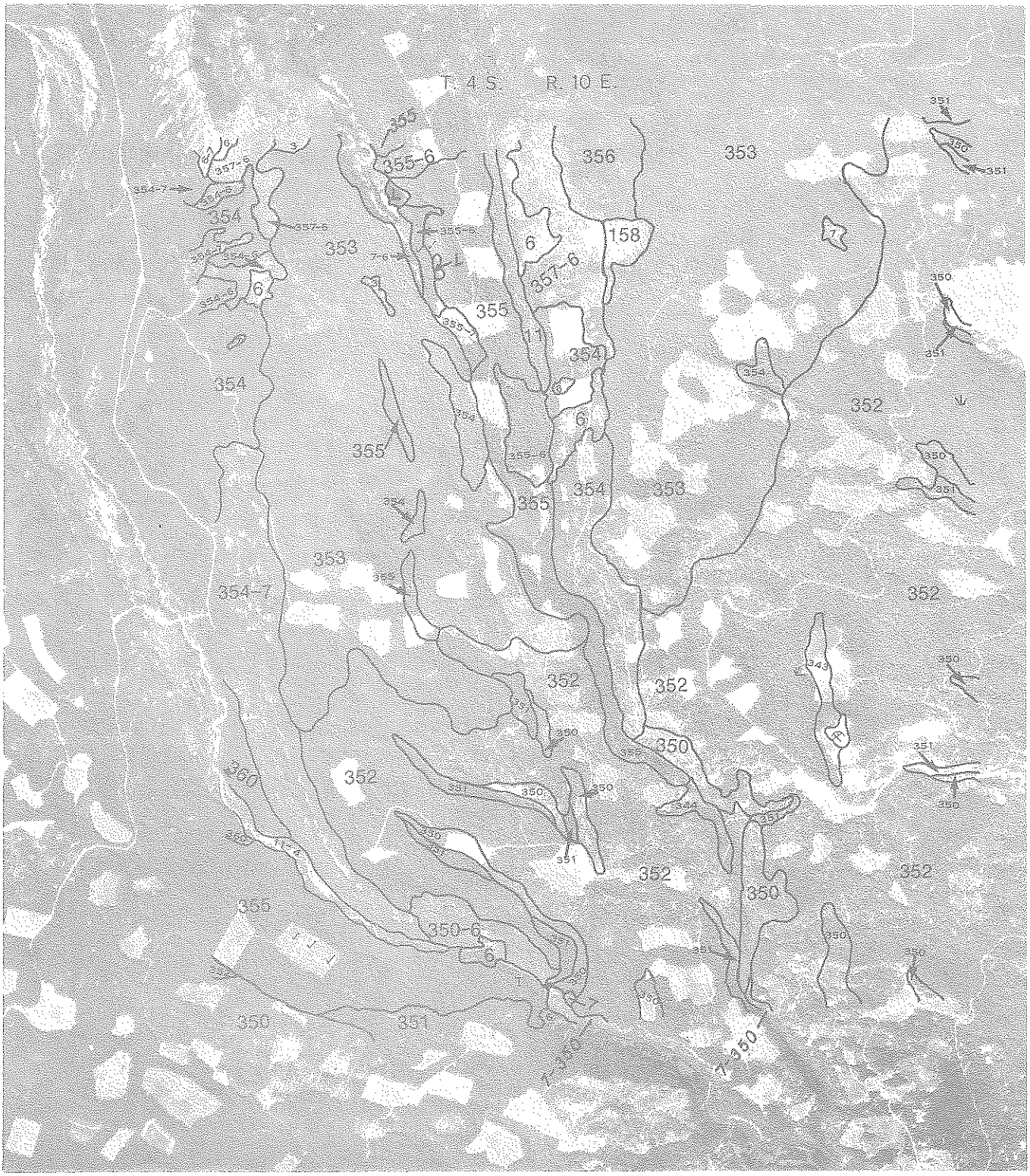

T. 5 S. R. 9 E.
337
304
305
304
337
304
304
305
337
304
304
304
352
352
352
350
350
350
351
351
351


T. 1 S. R. 10 E.
210
211
348
349
347
212
6
3
210
7-6
158-7
347-7
211
210
158
210
211
158
211
3
349
163
210-6
347
210
163
158
211
7-211
163-8
7-6
162
210
161
211-7
210-7
7-6
169-8
163
163-7
210
210
210
169
170
169
161
7-170
163
168
211
210-7
170
163
162
13-6
168
168
168
168

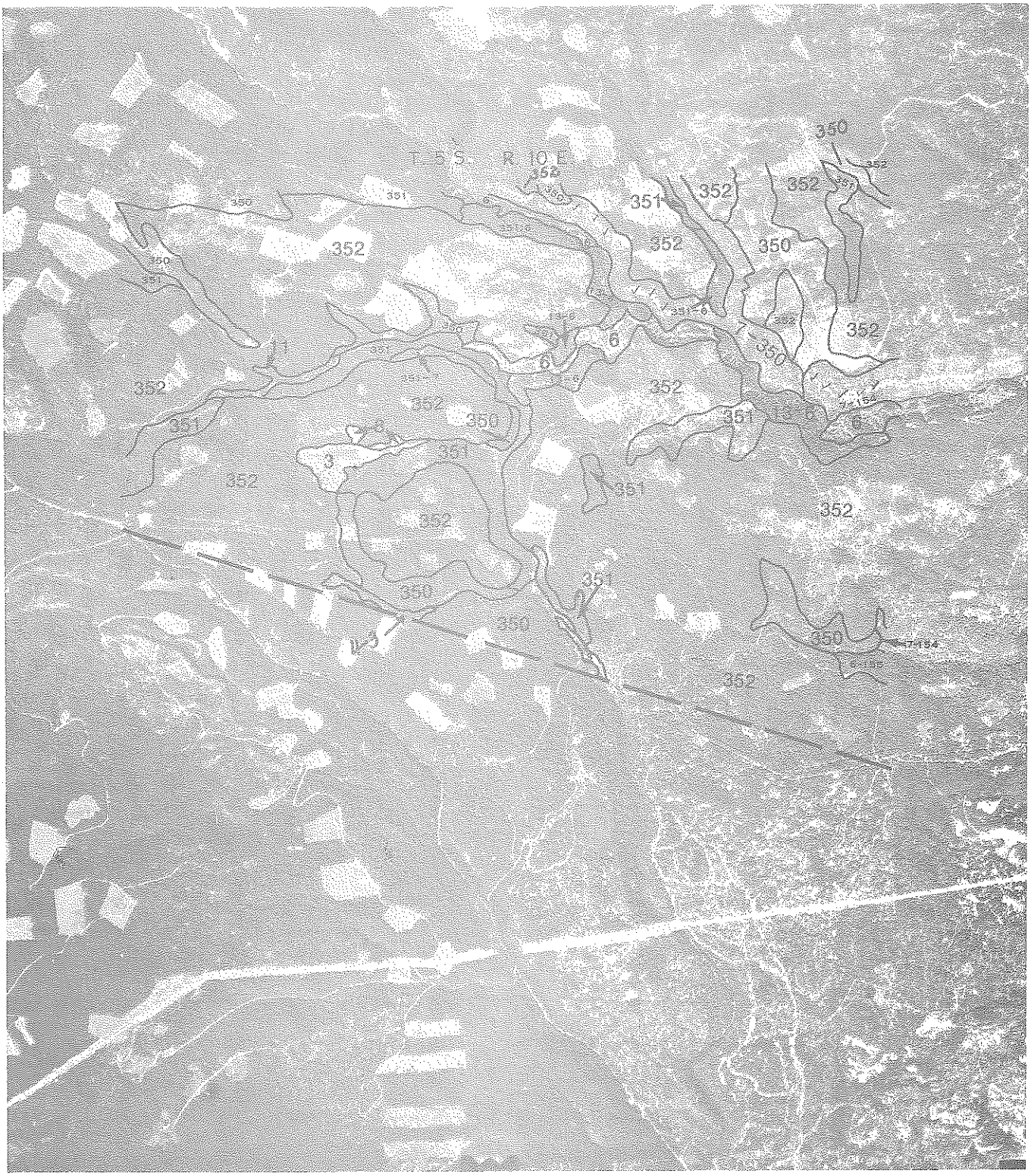

T. 6 S.
R. 8½ E.
304
305
304
304


T 1 N R 10 E


T 2 S R 10 E

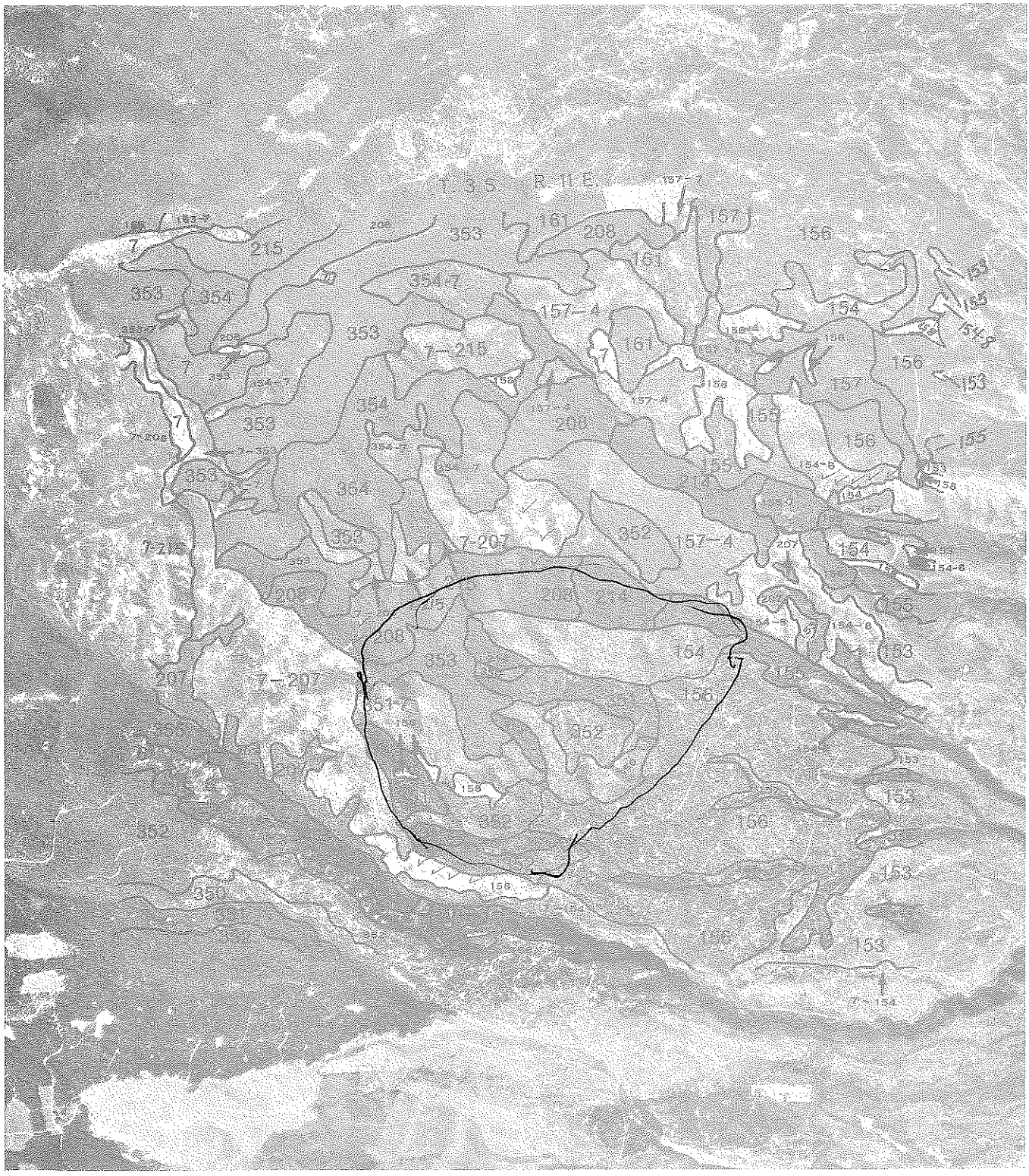

T. 4 S. R. 10 E.


T. 3 S. R. 10 E.
167
165
166
7
6-357
357-6
358-7
358
359-6
359
356
354
361
6-357
7-2/S
360
357
355-6
355
354
353
356
6-356
6-357
6-356
6-7
354-6
355-6
358
354
353
356
355
350
351
3-4


T 5 S - R 10 E
350
351
352

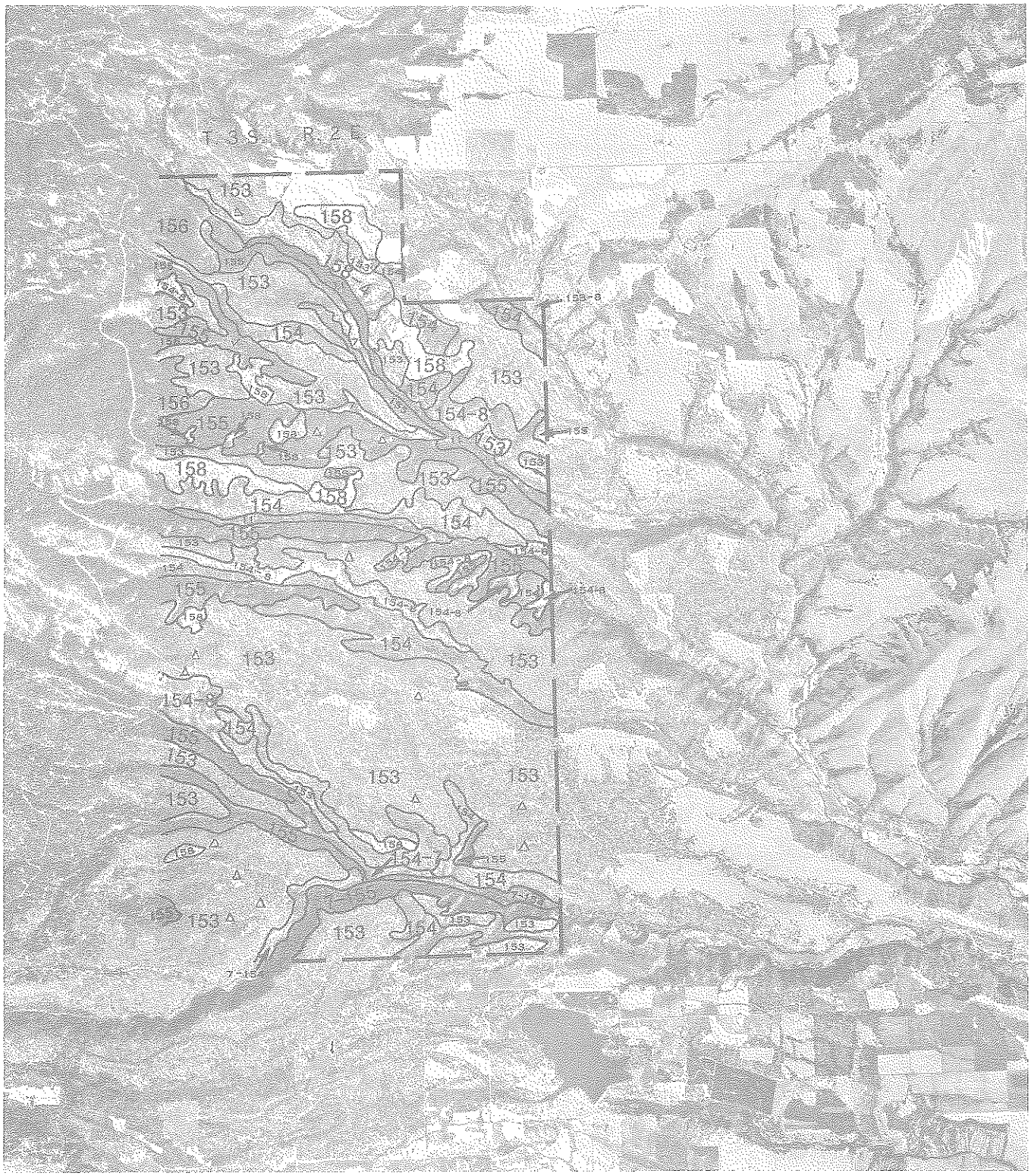

T. 1 S., R. 1 E.


T. 2 S.
R. 11 E.


T 3 S R 11 E
187-7
161
208
157
156
215
353
354-7
157-4
154
153
155
154-7
156
158
7-215
157-4
155
154-8
154
158
7-208
7-207
352
157-4
207
154
154-8
154-8
153
7-207
151-4
152
158
150
153
152
153
350
153
7-154


T 4 S R 11 E
350
351
352
156
157
153
154
152
152-8
153-8
8


T 5 S - R 11 E
352
156
154
158
8
7
6
5


T. 3 S., R. 2 E.


T. 7 S. R. 7 E.

# INTERPRETATIONS

This section contains the third important part of this report. Each page covers one interpretation. In the upper box, a general definition of the interpretation and the factors evaluated in making it are given. These are followed by the ratings and their definitions. The lower box contains a mapping unit list with the interpretative rating opposite the mapping unit number. Complexes are not rated; instead, interpretations for complexes will have to be derived from the rating of each component.

Four types of interpretations are considered:

Erosion and Some Hydrologic Interpretations
Timber Management Interpretations
Engineering Interpretations
Recreation Interpretations

## EROSION AND SOME HYDROLOGIC INTERPRETATIONS

This section contains some interpretations concerning soil erosion and water management. Interpretations for erosion include the two major kinds of erosion: surface soil erosion and mass movements. Surface erosion pertains only to surface and subsurface soil loss by runoff and overland flow. Mass movement pertains to all types of soils and bedrock movement which occurs below the soil surface such as landslips, slumps, slides, rockfall and land flow.

## TIMBER MANAGEMENT

Interpretations for Timber Management are of two types. The first type includes some interpretations that directly affect timber management such as "Potential for Regeneration," the second type indicates the effects on soils and other resources as a result of timber harvest activities.

## RECREATION

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

# SURFACE SOIL EROSION POTENTIAL

This interpretation is based on expected losses of surface soil when all vegetative cover, including litter, is removed. Evaluations of climate; slope gradient and length; soil texture and structure, permeability of the surface soil, and hydrologic characteristics of the soil and bedrock materials of each mapping unit are considered in making interpretations.

Medium to coarse-textured soils with rapid permeability and high porosity generally erode less than finer-textured soils. However, these soils may be easily displaced by the forces of channeled water.

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 considerable 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, numerous 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Severe |
| 2 | Moderately Severe–Severe |
| 3 | Very Slight |
| 4 | Very Slight |
| 5 | — |
| 6 | Very Slight |
| 7 | — |
| 8 | Slight–Moderate |
| 9 | Slight |
| 10 | Very Slight |
| 11 | Slight— Moderate |
| 12 | Slight |
| 13 | Slight |
| 14 | — |
| 15 | Very Severe |
| 100 | Moderate–Severe |
| 101 | Severe |
| 102 | Severe |
| 103 | Moderate |
| 104 | Slight–Moderate |
| 105 | Moderate–Severe |
| 106 | Moderate–Severe |
| 107 | Slight–Moderate |
| 108 | Severe |
| 109 | Severe |
| 110 | Severe |
| 111 | Severe |
| 112 | Severe |
| 113 | Severe |
| 115 | Slight–Moderate |
| 116 | Moderate |
| 117 | Moderate |
| 118 | Severe |
| 119 | Severe |
| 120 | Moderate |
| 152 | Slight |
| 153 | Slight–Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Moderate |
| 155 | Moderate |
| 156 | Slight–Moderate |
| 157 | Moderate |
| 158 | Moderate–Severe |
| 159 | Moderate |
| 160 | Moderate |
| 161 | Slight |
| 162 | Moderate |
| 163 | Moderate |
| 164 | Slight |
| 165 | Slight |
| 166 | Moderate–Severe |
| 167 | Moderate–Severe |
| 168 | Moderate |
| 169 | Moderate–Severe |
| 170 | Moderate–Severe |
| 171 | Slight–Moderate |
| 172 | Severe |
| 173 | Severe |
| 200 | Severe–Very Severe |
| 201 | Severe–Very Severe |
| 202 | Severe–Very Severe |
| 203 | Severe–Very Severe |
| 204 | Slight–Moderate |
| 205 | Severe |
| 206 | Severe |
| 207 | Moderate |
| 208 | Moderate |
| 209 | Moderate–Severe |
| 210 | Severe |
| 211 | Moderate |
| 212 | Moderate |
| 213 | Moderate |
| 214 | Moderate |
| 215 | Moderate |
| 300 | Slight |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Slight–Moderate |
| 302 | Slight |
| 303 | Slight–Moderate |
| 304 | Slight |
| 305 | Slight–Moderate |
| 306 | Slight |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Slight |
| 310 | Moderate |
| 311 | Slight |
| 312 | Slight–Moderate |
| 313 | Moderate |
| 314 | Moderate |
| 315 | Slight–Moderate |
| 316 | Moderate |
| 317 | Moderate |
| 318 | Moderate |
| 319 | Moderate–Severe |
| 320 | Slight |
| 321 | Moderate |
| 322 | Moderate |
| 323 | Slight |
| 324 | Moderate |
| 325 | Moderate |
| 326 | Slight |
| 327 | Slight–Moderate |
| 328 | Slight–Moderate |
| 329 | Moderate |
| 330 | Slight |
| 331 | Slight |
| 332 | Slight–Moderate |
| 333 | Slight |
| 334 | Moderate |
| 335 | Moderate |
| 337 | Moderate |
| 338 | Moderate |
| 339 | Moderate–Severe |
| 340 | Moderate–Severe |
| 341 | Slight–Moderate |
| 342 | Moderate–Severe |
| 343 | Moderate–Severe |
| 344 | Moderate |
| 345 | Moderate |
| 346 | Slight |
| 347 | Slight |
| 348 | Moderate |
| 349 | Moderate |
| 350 | Moderate |
| 351 | Moderate |
| 352 | Slight |
| 353 | Slight |
| 354 | Moderate–Severe |
| 355 | Moderate–Severe |
| 356 | Slight |
| 357 | Moderate–Severe |
| 358 | Slight |
| 359 | Moderate |
| 360 | Severe |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Moderate–Severe |
| 362 | Severe |
| 363 | Slight–Moderate |
| 364 | Slight–Moderate |
| 374 | Slight |
| 375 | Moderate |
| 376 | Slight |
| 377 | Moderate |
| 378 | Slight |
| 379 | Slight |
| 380 | Slight |
| 481 | Moderate |
| 382 | Moderate |
| 500 | Slight |

# SUBSOIL EROSION POTENTIAL

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

Generally, subsoil material is finer-textured and does not transmit water as rapidly as surface soil material. Slowly permeable, fine-textured subsoils erode more rapidly than coarse-textured soils.

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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | High |
| 2 | High |
| 3 | Low |
| 4 | Low |
| 5 | — |
| 6 | — |
| 7 | — |
| 8 | High |
| 9 | Moderate |
| 10 | — |
| 11 | Low |
| 12 | — |
| 13 | Moderate–High |
| 14 | — |
| 15 | High |
| 100 | High |
| 101 | High |
| 102 | High |
| 103 | High |
| 104 | Moderate—High |
| 105 | High |
| 106 | High |
| 107 | Moderate |
| 108 | High |
| 109 | High |
| 110 | High |
| 111 | High |
| 112 | High |
| 113 | High |
| 115 | Moderate–High |
| 116 | High |
| 117 | High |
| 118 | High |
| 119 | High |
| 120 | Moderate–High |
| 152 | Low–Moderate |
| 153 | Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Moderate–High |
| 155 | Moderate–High |
| 156 | Moderate |
| 157 | Moderate–High |
| 158 | High |
| 159 | Moderate |
| 160 | Moderate |
| 161 | Moderate |
| 162 | Moderate |
| 163 | Moderate |
| 164 | Moderate |
| 165 | Moderate |
| 166 | High |
| 167 | High |
| 168 | Moderate–High |
| 169 | High |
| 170 | High |
| 171 | ModerateHigh |
| 172 | High |
| 173 | High |
| 200 | High |
| 201 | High |
| 202 | High |
| 203 | High |
| 204 | Moderate–High |
| 205 | High |
| 206 | High |
| 207 | High |
| 208 | High |
| 209 | Moderate |
| 210 | High |
| 211 | High |
| 212 | High |
| 213 | High |
| 214 | High |
| 215 | High |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Low–Moderate |
| 302 | Low–Moderate |
| 303 | Moderate |
| 304 | Low–Moderate |
| 305 | Moderate |
| 306 | Low–Moderate |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Moderate |
| 310 | Moderate–High |
| 311 | Low–Moderate |
| 312 | Moderate |
| 313 | High |
| 314 | High |
| 315 | Moderate |
| 316 | Moderate–High |
| 317 | Moderate— High |
| 318 | Moderate–High |
| 319 | High |
| 320 | Moderate |
| 321 | Moderate–High |
| 322 | Moderate–High |
| 323 | Moderate |
| 324 | Moderate–High |
| 325 | Moderate–High |
| 326 | Low |
| 327 | Moderate |
| 328 | Moderate |
| 329 | Moderate–High |
| 330 | Moderate |
| 331 | Moderate |
| 332 | Moderate |
| 333 | Moderate |
| 334 | Moderate–High |
| 335 | Moderate–High |
| 337 | Moderate–High |
| 338 | Moderate–High |
| 339 | High |
| 340 | High |
| 341 | Moderate |
| 342 | High |
| 343 | High |
| 344 | Moderate–High |
| 345 | Moderate–High |
| 346 | Low |
| 347 | Moderate |
| 348 | Moderate–High |
| 349 | Moderate–High |
| 350 | High |
| 351 | High |
| 352 | Moderate–High |
| 353 | Moderate–High |
| 354 | High |
| 355 | High |
| 356 | Moderate |
| 357 | High |
| 358 | Moderate |
| 359 | Moderate–High |
| 360 | High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | High |
| 362 | High |
| 363 | Moderate–High |
| 364 | Moderate–High |
| 374 | Moderate |
| 375 | Moderate |
| 376 | Moderate |
| 377 | Moderate–High |
| 378 | Moderate |
| 379 | Moderate |
| 380 | Moderate |
| 381 | Moderate–High |
| 382 | Moderate–High |
| 500 | Low |

# NATURAL SOIL MANTLE STABILITY

This interpretation is based on relative stability of the mapping units as they occur in the natural state. This includes any movement or soil loss other than surface and subsoil erosion, by slumps, slides, and all types of deep-seated failures.

Soil factors evaluated in making this rating include: parent material, bedrock type, dip of bedrock, soil slope, soil depth, soil texture, internal drainage characteristics, and vegetation. The presence of other indicators of soil instability such as slide scarps, sag ponds, tension cracks, and leaning trees were also observed.

Very Stable: No evidences of soil instability.

Stable: Only occassional failures are observed.

Moderately Stable: Several failures are observed.

Unstable: Many failures are observed.

Very Unstable: Entire area shows evidence of recent and past failure.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Moderately Stable |
| 2 | Unstable–Very Unstable |
| 3 | Stable |
| 4 | Stable |
| 5 | Stable |
| 6 | Stable–Moderately Stable |
| 7 | Very Stable |
| 8 | Very Stable |
| 9 | Stable–Moderately Stable |
| 10 | Very Stable |
| 11 | Very Stable |
| 12 | Stable–Moderately Stable |
| 13 | Stable |
| 14 | N/A |
| 15 | Very Unstable |
| 100 | Stable–Moderately Stable |
| 101 | Moderately Stable–Unstable |
| 102 | Moderately Stable–Unstable |
| 103 | Very Unstable |
| 104 | Stable–Moderately Unstable |
| 105 | Unstable |
| 106 | Unstable |
| 107 | Very Stable |
| 108 | Unstable |
| 109 | Unstable |
| 110 | Moderately Stable–Unstable |
| 111 | Stable–Moderately Stable |
| 112 | Moderately Stable–Unstable |
| 113 | Unstable |
| 115 | Stable |
| 116 | Stable–Moderately Stable |
| 117 | Stable–Moderately Stable |
| 118 | Moderately Stable |
| 119 | Moderately Stable |
| 120 | Moderately Stable |
| 152 | Very Stable |
| 153 | Very Stable |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Stable |
| 155 | Stable |
| 156 | Very Stable |
| 157 | Stable–Moderately Stable |
| 158 | Very Stable |
| 159 | Stable |
| 160 | Very Stable |
| 161 | Very Stable |
| 162 | Stable |
| 163 | Stable |
| 164 | Stable |
| 165 | Stable |
| 166 | Stable–Moderately Stable |
| 167 | Stable–Moderately Stable |
| 168 | Stable |
| 169 | Stable–Moderately Stable |
| 170 | Stable–Moderately Stable |
| 171 | Stable |
| 172 | Moderately Stable |
| 173 | Moderately Stable |
| 200 | Moderately Stable–Unstable |
| 201 | Moderately Stable–Unstable |
| 202 | Moderately Stable–Unstable |
| 203 | Moderately Stable–Unstable |
| 204 | Stable |
| 205 | Moderately Stable |
| 206 | Moderately Stable |
| 207 | Stable–Moderately Stable |
| 208 | Stable–Moderately Stable |
| 209 | Stable–Moderately Stable |
| 210 | Stable |
| 211 | Stable–Moderately Stable |
| 212 | Moderately Stable |
| 213 | Moderately Stable |
| 214 | Stable |
| 215 | Stable |
| 300 | Very Stable |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Stable |
| 302 | Very Stable |
| 303 | Stable |
| 304 | Very Stable |
| 305 | Stable |
| 306 | Very Stable |
| 307 | Very Stable |
| 308 | Stable |
| 309 | Very Stable |
| 310 | Stable |
| 311 | Very Stable–Stable |
| 312 | Stable |
| 313 | Moderately Stable |
| 314 | Moderately Stable |
| 315 | Stable |
| 316 | Stable–Moderately Stable |
| 317 | Moderately Stable |
| 318 | Stable |
| 319 | Moderately Stable–Unstable |
| 320 | Very Stable |
| 321 | Stable |
| 322 | Stable |
| 323 | Very Stable |
| 324 | Stable |
| 325 | Stable |
| 326 | Very Stable |
| 327 | Stable |
| 328 | Moderately Stable |
| 329 | Moderately Stable |
| 330 | Very Stable |
| 331 | Very Stable |
| 332 | Stable |
| 333 | Very Stable |
| 334 | Moderately Stable |
| 335 | Moderately Stable–Unstable |
| 337 | Stable |
| 338 | Very Stable–Stable |
| 339 | Moderately Stable |
| 340 | Very Stable–Stable |
| 341 | Stable–Moderately Stable |
| 342 | Stable–Moderately Stable |
| 343 | Stable–Moderately Stable |
| 344 | Stable–Moderately Stable |
| 345 | Moderately Stable |
| 346 | Stable |
| 347 | Stable |
| 348 | Moderately Stable |
| 349 | Moderately Stable |
| 350 | Stable |
| 351 | Stable |
| 352 | Very Stable–Stable |
| 353 | Very Stable |
| 354 | Stable |
| 355 | Stable |
| 356 | Very Stable–Stable |
| 357 | Moderately Stable |
| 358 | Very Stable–Stable |
| 359 | Stable–Moderately Stable |
| 360 | Moderately Stable–Unstable |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Moderately Stable |
| 362 | Stable–Moderately Stable |
| 363 | Stable |
| 364 | Stable–Moderately Stable |
| 374 | Stable |
| 375 | Moderately Stable |
| 376 | Stable |
| 377 | Moderately Stable |
| 378 | Stable |
| 379 | Stable |
| 380 | Stable–Moderately Stable |
| 381 | Moderately Stable |
| 382 | Moderately Stable |
| 500 | Very Stable |

# COMPACTION HAZARD

This interpretation indicates a soils inherent ability to be compressed by ground yarding equipment to a point where plant growth is either slowed considerably or stopped. Soil factors evaluated in making this interpretation include: soil texture, structure, bulk density, pore size distribution, and infiltration rate.

Generally speaking, soils with surface textures of silty clay loam and clay loam have the highest compaction hazard.

It should be remembered that compaction hazard can change with the type of yarding equipment being used.

Low: Factors indicate the soil will resist compaction

Moderate: Factors indicate the soil has tendencies to become compacted under tractor yarding operations. Time of operation is important on these soil units.

High: Factors indicate that soil compaction will be severe unless tractor yarding is curtailed until the soils have dried adequately.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Low |
| 2 | High |
| 3 | High |
| 4 | Moderate–High |
| 5 | — |
| 6 | Low |
| 7 | — |
| 8 | Moderate |
| 9 | Low |
| 10 | Low |
| 11 | Low |
| 12 | Low |
| 13 | Low |
| 14 | — |
| 15 | Low |
| 100 | High |
| 101 | High |
| 102 | High |
| 103 | High |
| 104 | Moderate—High |
| 105 | Moderate |
| 106 | Moderate |
| 107 | Moderate–High |
| 108 | Moderate |
| 109 | Moderate |
| 110 | Low–Moderate |
| 111 | Low–Moderate |
| 112 | Low–Moderate |
| 113 | Low–Moderate |
| 115 | Moderate–High |
| 116 | Moderate |
| 117 | Moderate |
| 118 | Moderate |
| 119 | Moderate |
| 120 | Low–Moderate |
| 152 | Low–Moderate |
| 153 | Low–Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Low |
| 155 | Low |
| 156 | Low–Moderate |
| 157 | Low–Moderate |
| 158 | Moderate |
| 159 | Moderate |
| 160 | Low |
| 161 | Moderate |
| 162 | Moderate |
| 163 | Moderate |
| 164 | Moderate |
| 165 | Low–Moderate |
| 166 | Moderate |
| 167 | Moderate |
| 168 | Moderate |
| 169 | Moderate |
| 170 | Moderate |
| 171 | High |
| 172 | High |
| 173 | High |
| 200 | Low |
| 201 | Low |
| 202 | Low |
| 203 | Low |
| 204 | Low |
| 205 | Low |
| 206 | Low |
| 207 | Moderate |
| 208 | Moderate |
| 209 | Low–Moderate |
| 210 | Low |
| 211 | Moderate |
| 212 | Moderate |
| 213 | Low–Moderate |
| 214 | Moderate |
| 215 | Moderate |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Low |
| 302 | Low |
| 303 | Low |
| 304 | Low–Moderate |
| 305 | Low |
| 306 | Moderate |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Low |
| 310 | Low |
| 311 | Low |
| 312 | Moderate |
| 313 | Moderate |
| 314 | Moderate |
| 315 | Moderate |
| 316 | Moderate |
| 317 | Moderate |
| 318 | Moderate |
| 319 | High |
| 320 | Moderate |
| 321 | Moderate |
| 322 | Low–Moderate |
| 323 | Moderate |
| 324 | Moderate |
| 325 | Moderate |
| 326 | Low |
| 327 | Moderate |
| 328 | Low |
| 329 | Moderate |
| 330 | Low–Moderate |
| 331 | Low–Moderate |
| 332 | Low–Moderate |
| 333 | Low–Moderate |
| 334 | Low |
| 335 | Low |
| 337 | Moderate |
| 338 | Moderate |
| 339 | Low |
| 340 | Low |
| 341 | Moderate |
| 342 | Low |
| 343 | Low |
| 344 | Low |
| 345 | Low |
| 346 | Low |
| 347 | Low |
| 348 | Low |
| 349 | Low |
| 350 | Low–Moderate |
| 351 | Low–Moderate |
| 352 | Moderate |
| 353 | Moderate |
| 354 | Low–Moderate |
| 355 | Low–Moderate |
| 356 | Moderate |
| 357 | Low–Moderate |
| 358 | Moderate |
| 359 | Low |
| 360 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Low–Moderate |
| 362 | Low |
| 363 | Low–Moderate |
| 364 | Low–Moderate |
| 374 | Moderate |
| 375 | Moderate |
| 376 | Moderate |
| 377 | Low–Moderate |
| 378 | Low–Moderate |
| 379 | Low–Moderate |
| 380 | Moderate |
| 381 | Low |
| 382 | Low |
| 500 | Low |

# SUSCEPTIBILITY TO SOIL DISPLACEMENT

This interpretation indicates the general susceptibility of a soil to be displaced by logs dragging across the soil surface during cable yarding operations. Soil displacement refers to the downslope movement of soil following its detachment from its original position. Cable yarding causes displacement by the gouging of the soil by logs and branches. Soil particles are moved downslope by gravity, water, and wind. Displacement ratings are based on soil factors such as texture, structure, slope, and field observations.

Low: Factors indicate that displacement is insignificant. Slopes are usually less than 35 percent.

Moderate: Factors indicate that moderate soil displacement will occur.

High: Factors indicate that displacement is severe and slopes usually exceed 50 percent.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Low |
| 2 | High |
| 3 | Moderate |
| 4 | Moderate |
| 5 | Low |
| 6 | Low |
| 7 | Low |
| 8 | Moderate |
| 9 | Low–Moderate |
| 10 | Low |
| 11 | Low |
| 12 | Low |
| 13 | Low–Moderate |
| 14 | — |
| 15 | High |
| 100 | Moderate |
| 101 | Moderate–High |
| 102 | Moderate–High |
| 103 | Moderate |
| 104 | Low–Moderate |
| 105 | High |
| 106 | High |
| 107 | Low |
| 108 | High |
| 109 | High |
| 110 | High |
| 111 | High |
| 112 | High |
| 113 | High |
| 115 | Low–Moderate |
| 116 | Moderate–High |
| 117 | Moderate–High |
| 118 | High |
| 119 | High |
| 120 | Moderate |
| 152 | Low |
| 153 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Moderate |
| 155 | Moderate |
| 156 | Low |
| 157 | Moderate–High |
| 158 | Moderate |
| 159 | Moderate–High |
| 160 | Low |
| 161 | Low–Moderate |
| 162 | Moderate–High |
| 163 | Moderate–High |
| 164 | Low–Moderate |
| 165 | Low–Moderate |
| 166 | High |
| 167 | High |
| 168 | High |
| 169 | High |
| 170 | Moderate–High |
| 171 | Low–Moderate |
| 172 | High |
| 173 | High |
| 200 | High |
| 201 | High |
| 202 | High |
| 203 | High |
| 204 | Moderate |
| 205 | High |
| 206 | High |
| 207 | High |
| 208 | High |
| 209 | Moderate–High |
| 210 | Low–Moderate |
| 211 | Moderate–High |
| 212 | Moderate–High |
| 213 | Moderate–High |
| 214 | Moderate–High |
| 215 | Moderate–High |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Low–Moderate |
| 302 | Low |
| 303 | Low–Moderate |
| 304 | Low |
| 305 | Low–Moderate |
| 306 | Low |
| 307 | Low–Moderate |
| 308 | Low–Moderate |
| 309 | Low |
| 310 | Low–Moderate |
| 311 | Low |
| 312 | Low |
| 313 | Moderate–High |
| 314 | Moderate–High |
| 315 | Low–Moderate |
| 316 | Moderate–High |
| 317 | Moderate–High |
| 318 | High |
| 319 | Moderate–High |
| 320 | Low |
| 321 | Moderate |
| 322 | Moderate |
| 323 | Low |
| 324 | Moderate |
| 325 | Moderate |
| 326 | Low |
| 327 | Low |
| 328 | High |
| 329 | High |
| 330 | Low |
| 331 | Low |
| 332 | Low |
| 333 | Low |
| 334 | Moderate–High |
| 335 | Moderate–High |
| 337 | Moderate |
| 338 | Low |
| 339 | Moderate |
| 340 | Moderate |
| 341 | Low |
| 342 | Moderate |
| 343 | Moderate |
| 344 | High |
| 345 | High |
| 346 | Low |
| 347 | Low |
| 348 | Moderate |
| 349 | Moderate |
| 350 | Moderate–High |
| 351 | Moderate–High |
| 352 | Low |
| 353 | Low |
| 354 | Moderate |
| 355 | Moderate |
| 356 | Low |
| 357 | Moderate–High |
| 358 | Low |
| 359 | Moderate–High |
| 360 | High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Moderate–High |
| 362 | Moderate–High |
| 363 | Low |
| 364 | Low–Moderate |
| 374 | Low |
| 375 | High |
| 376 | Low |
| 377 | Low–Moderate |
| 378 | Low |
| 379 | Low |
| 380 | Low |
| 381 | Moderate |
| 382 | Moderate |
| 500 | Low |

# SOIL AND WATERSHED IMPACTS FROM TRACTOR TIMBER HARVESTING

This interpretation indicates the susceptibility of soil and watershed resources to incur damage from tractor timber harvest methods. The evaluation of expected impact includes soil and watershed resource damages from timber removal, main access roads, spur roads, landings 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. Factors involved in making these ratings are wetness of soil, soil texture and structure, percentage of coarse fragments, slope, drainage and climate.

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

Moderate: This rating indicates that the impacts to soil and watershed resources are moderate. Soils and watershed resources are expected to incur moderate damage.

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

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Low–Moderate |
| 2 | High |
| 3 | High |
| 4 | High |
| 5 | — |
| 6 | Low |
| 7 | — |
| 8 | Low |
| 9 | Low–Moderate |
| 10 | — |
| 11 | Low |
| 12 | Low |
| 13 | Low |
| 14 | — |
| 15 | High |
| 100 | High |
| 101 | High |
| 102 | High |
| 103 | High |
| 104 | Moderate–High |
| 105 | High |
| 106 | High |
| 107 | High |
| 108 | Low |
| 109 | Low |
| 110 | Low |
| 111 | Low |
| 112 | Low–Moderate |
| 113 | Low–Moderate |
| 115 | Moderate–High |
| 116 | High |
| 117 | High |
| 118 | Low |
| 119 | Low |
| 120 | Moderate |
| 152 | Moderate–High |
| 153 | Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | High |
| 155 | High |
| 156 | High |
| 157 | High |
| 158 | Low |
| 159 | Moderate |
| 160 | Moderate–High |
| 161 | Moderate |
| 162 | Moderate |
| 163 | Moderate |
| 164 | Moderate |
| 165 | Low |
| 166 | Moderate |
| 167 | Moderate |
| 168 | Moderate |
| 169 | Moderate |
| 170 | Moderate |
| 171 | High |
| 172 | High |
| 173 | High |
| 200 | Low |
| 201 | Low |
| 202 | Low |
| 203 | Low |
| 204 | Low |
| 205 | Low |
| 206 | Low |
| 207 | Moderate |
| 208 | Moderate |
| 209 | Low–Moderate |
| 210 | Low |
| 211 | Moderate |
| 212 | Moderate |
| 213 | Low–Moderate |
| 214 | Moderate |
| 215 | Moderate |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Moderate |
| 302 | Moderate |
| 303 | Moderate–High |
| 304 | Moderate |
| 305 | Moderate–High |
| 306 | Moderate |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Low |
| 310 | Low |
| 311 | Low |
| 312 | Moderate |
| 313 | Moderate |
| 314 | Moderate |
| 315 | Moderate |
| 316 | Moderate |
| 317 | Moderate |
| 318 | Moderate |
| 319 | High |
| 320 | Moderate |
| 321 | Moderate |
| 322 | Low–Moderate |
| 323 | Moderate |
| 324 | Moderate |
| 325 | Moderate |
| 326 | Low |
| 327 | Moderate |
| 328 | Low |
| 329 | Moderate |
| 330 | Low–Moderate |
| 331 | Low–Moderate |
| 332 | Low |
| 333 | Low |
| 334 | Low |
| 335 | Low |
| 337 | Moderate |
| 338 | Moderate |
| 339 | Low |
| 340 | Low |
| 341 | Moderate |
| 342 | Low |
| 343 | Low |
| 344 | Low |
| 345 | Low |
| 346 | Low |
| 347 | Low |
| 348 | Low |
| 349 | Low |
| 350 | Low–Moderate |
| 351 | Low–Moderate |
| 352 | Moderate |
| 353 | Moderate |
| 354 | Low–Moderate |
| 355 | Low–Moderate |
| 356 | Moderate |
| 357 | Low–Moderate |
| 358 | Moderate |
| 359 | Low |
| 360 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Low–Moderate |
| 362 | Low |
| 363 | Low–Moderate |
| 364 | Low–Moderate |
| 374 | Moderate |
| 375 | Moderate |
| 376 | Moderate |
| 377 | Low–Moderate |
| 378 | Low–Moderate |
| 379 | Low–Moderate |
| 380 | Moderate |
| 381 | Low |
| 382 | Low |
| 500 | Low |

# SOIL AND WATERSHED IMPACTS FROM CABLE TIMBER HARVEST METHODS PARTIAL AND FULL SUSPENSION

This interpretation indicates the susceptibility of soil and watershed resources to incur damage from uphill cable timber harvest methods. The evaluation of expected impact includes soil and watershed resource damages from timber removal, main access roads, 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. Factors involved in making these ratings are wetness of soil, soil texture and structure, percentage of coarse fragments, slope, drainage and climate.

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

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

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

| MAP UNIT | PARTIAL SUSPENSION | FULL SUSPENSION |
|---|---|---|
| 1 | Low | Low |
| 2 | Moderate–High | Moderate |
| 3 | Moderate | Low |
| 4 | Moderate | Low |
| 5 | — | — |
| 6 | Low | Low |
| 7 | — | — |
| 8 | Low | Low |
| 9 | Moderate | Low |
| 10 | — | — |
| 11 | Low–Moderate | Low |
| 12 | Low | Low |
| 13 | Low | Low |
| 14 | — | — |
| 15 | High | Moderate |
| 100 | Low–Moderate | Low |
| 101 | High | Moderate |
| 102 | High | Moderate |
| 103 | Moderate–High | Low–Moderate |
| 104 | Low | Low |
| 105 | High | Moderate |
| 106 | High | Moderate |
| 107 | Low | Low |
| 108 | High | Moderate |
| 109 | High | Moderate |
| 110 | High | Moderate |
| 111 | High | Moderate |
| 112 | High | Moderate |
| 113 | High | Moderate–High |
| 115 | Low | Low |
| 116 | Moderate | Low–Moderate |
| 117 | Moderate | Low–Moderate |
| 118 | High | Moderate |
| 119 | High | Moderate |
| 120 | Moderate | Low |
| 152 | Low | Low |
| 153 | Low | Low |

| MAP UNIT | PARTIAL SUSPENSION | FULL SUSPENSION |
|---|---|---|
| 154 | Low | Low |
| 155 | Moderate | Low |
| 156 | Low | Low |
| 157 | Moderate | Low |
| 158 | Moderate | Low |
| 159 | Moderate | Low |
| 160 | Low | Low |
| 161 | Low | Low |
| 162 | Moderate | Low |
| 163 | Moderate | Low |
| 164 | Low | Low |
| 165 | Low | Low |
| 166 | Moderate | Low |
| 167 | Moderate | Low |
| 168 | Moderate | Low |
| 169 | Moderate | Low |
| 170 | Moderate | Low |
| 171 | Moderate | Low |
| 172 | High | Moderate–High |
| 173 | High | Moderate–High |
| 200 | High | Low–Moderate |
| 201 | High | Low–Moderate |
| 202 | High | Low–Moderate |
| 203 | High | Low–Moderate |
| 204 | Moderate | Low |
| 205 | High | Low |
| 206 | High | Low |
| 207 | Moderate | Low |
| 208 | Moderate | Low |
| 209 | Moderate | Low |
| 210 | Low–Moderate | Low |
| 211 | Moderate | Low |
| 212 | Moderate | Low |
| 213 | Low–Moderate | Low |
| 214 | Low–Moderate | Low |
| 215 | Low–Moderate | Low |
| 300 | Low | Low |

| MAP UNIT | PARTIAL SUSPENSION | FULL SUSPENSION |
|---|---|---|
| 301 | Low | Low |
| 302 | Low | Low |
| 303 | Moderate | Low |
| 304 | Low | Low |
| 305 | Low–Moderate | Low |
| 306 | Low | Low |
| 307 | Low–Moderate | Low |
| 308 | Low–Moderate | Low |
| 309 | Low | Low |
| 310 | Low–Moderate | Low |
| 311 | Low | Low |
| 312 | Low–Moderate | Low |
| 313 | Moderate | Low |
| 314 | Moderate | Low |
| 315 | Low–Moderate | Low |
| 316 | Moderate–High | Moderate |
| 317 | Moderate–High | Moderate |
| 318 | High | Moderate |
| 319 | High | Moderate |
| 320 | Low–Moderate | Low |
| 321 | Moderate–High | Low–Moderate |
| 322 | Moderate–High | Low–Moderate |
| 323 | Low | Low |
| 324 | Moderate | Low |
| 325 | Moderate | Low |
| 326 | Low | Low |
| 327 | Low | Low |
| 328 | Moderate | Low |
| 329 | Moderate | Low |
| 330 | Low | Low |
| 331 | Low | Low |
| 332 | Moderate | Low |
| 333 | Low | Low |
| 334 | Low–Moderate | Low |
| 335 | Moderate–High | Moderate |
| 337 | Moderate | Low |
| 338 | Low | Low |
| 339 | Moderate | Low |
| 340 | Moderate | Low |
| 341 | Low | Low |
| 342 | Moderate | Low |
| 343 | Moderate | Low |
| 344 | Moderate–High | Moderate |
| 345 | Moderate–High | Moderate |
| 346 | Low | Low |
| 347 | Low | Low |
| 348 | Moderate–High | Moderate |
| 349 | Moderate–High | Moderate |
| 350 | Moderate | Low |
| 351 | Moderate | Low |
| 352 | Low | Low |
| 353 | Low | Low |
| 354 | Moderate | Low |
| 355 | Moderate | Low |
| 356 | Moderate | Low |
| 357 | Moderate–High | Moderate |
| 358 | Low–Moderate | Low |
| 359 | High | Moderate |
| 360 | High | Moderate |

| MAP UNIT | PARTIAL SUSPENSION | FULL SUSPENSION |
|---|---|---|
| 361 | Moderate–High | Moderate |
| 362 | Moderate–High | Moderate |
| 363 | Moderate | Low |
| 364 | Moderate | Low |
| 374 | Low | Low |
| 375 | Moderate–High | Moderate |
| 376 | Low | Low |
| 377 | Moderate | Low |
| 378 | Low | Low |
| 379 | Low | Low |
| 380 | Low | Low |
| 381 | Moderate–High | Moderate |
| 382 | Moderate–High | Moderate |
| 500 | Low | Low |

# SEDIMENTATION 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 of 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Low |
| 2 | High |
| 3 | High |
| 4 | High |
| 5 | Low |
| 6 | Low |
| 7 | Low |
| 8 | Low |
| 9 | Moderate |
| 10 | — |
| 11 | Moderate |
| 12 | Low |
| 13 | Moderate |
| 14 | — |
| 15 | High |
| 100 | High |
| 101 | High |
| 102 | High |
| 103 | High |
| 104 | Moderate |
| 105 | Moderate–High |
| 106 | Moderate–High |
| 107 | Moderate |
| 108 | High |
| 109 | High |
| 110 | Moderate |
| 111 | Moderate |
| 112 | High |
| 113 | High |
| 115 | Low–Moderate |
| 116 | Moderate |
| 117 | Moderate |
| 118 | High |
| 119 | High |
| 120 | Moderate |
| 152 | Low |
| 153 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Moderate |
| 155 | Moderate |
| 156 | Low |
| 157 | Moderate |
| 158 | Moderate |
| 159 | Low |
| 160 | Low |
| 161 | Low |
| 162 | Low |
| 163 | Low |
| 164 | Low |
| 165 | Low |
| 166 | Moderate |
| 167 | Moderate |
| 168 | Low |
| 169 | Moderate |
| 170 | Moderate |
| 171 | Moderate |
| 172 | High |
| 173 | High |
| 200 | Moderate–High |
| 201 | Moderate–High |
| 202 | Moderate |
| 203 | Moderate |
| 204 | Moderate |
| 205 | Moderate |
| 206 | Moderate |
| 207 | Low |
| 208 | Low |
| 209 | Moderate |
| 210 | Low |
| 211 | Low–Moderate |
| 212 | Moderate |
| 213 | Moderate |
| 214 | Low |
| 215 | Low |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Low |
| 302 | Low |
| 303 | Low |
| 304 | Low |
| 305 | Low |
| 306 | Low–Moderate |
| 307 | Moderate |
| 308 | Low–Moderate |
| 309 | Low |
| 310 | Low |
| 311 | Low |
| 312 | Low–Moderate |
| 313 | Moderate |
| 314 | Moderate |
| 315 | Low–Moderate |
| 316 | Moderate |
| 317 | Moderate |
| 318 | Moderate |
| 319 | Moderate–High |
| 320 | Low |
| 321 | Low–Moderate |
| 322 | Low–Moderate |
| 323 | Low |
| 324 | Low–Moderate |
| 325 | Low–Moderate |
| 326 | Low |
| 327 | Low–Moderate |
| 328 | Moderate |
| 329 | Moderate |
| 330 | Moderate |
| 331 | Low |
| 332 | Low |
| 333 | Low |
| 334 | Moderate–High |
| 335 | Moderate–High |
| 337 | Low–Moderate |
| 338 | Low |
| 339 | Moderate |
| 340 | Moderate |
| 341 | Low |
| 342 | Moderate |
| 343 | Moderate |
| 344 | Low |
| 345 | Low |
| 346 | Low |
| 347 | Low–Moderate |
| 348 | Low–Moderate |
| 349 | Low–Moderate |
| 350 | Moderate |
| 351 | Moderate |
| 352 | Low |
| 353 | Low |
| 354 | Moderate |
| 355 | Moderate |
| 356 | Low |
| 357 | Low |
| 358 | Low |
| 359 | Moderate |
| 360 | Low–Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Low–Moderate |
| 362 | Low |
| 363 | Low |
| 364 | Low |
| 374 | Low |
| 375 | Moderate |
| 376 | Low |
| 377 | Moderate |
| 378 | Low |
| 379 | Low |
| 380 | Low |
| 381 | Moderate |
| 382 | Moderate |
| 500 | Moderate |

# 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 dominant 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.

| MAP UNIT | SURFACE SOIL | SUBSOIL |
|---|---|---|
| 1 | Gravel–Sand | Gravel–Sand |
| 2 | Silt–Clay | Silt–Clay |
| 3 | Silt–Clay | Silt–Clay |
| 4 | Sand–Silt | Silt–Clay |
| 5 | — | — |
| 6 | — | — |
| 7 | — | — |
| 8 | Gravel–Sand | Sand–Silt |
| 9 | Gravel–Sand | Gravel–Sand |
| 10 | — | — |
| 11 | Gravel–Sand | Gravel–Sand |
| 12 | — | — |
| 13 | Gravel–Sand | Gravel–Sand |
| 14 | — | — |
| 15 | Sand–Silt | Silt–Clay |
| 100 | Sand–Silt | Silt–Clay |
| 101 | Sand–Silt | Silt–Clay |
| 102 | Sand–Silt | Silt–Clay |
| 103 | Silt–Clay | Silt–Clay |
| 104 | Sand–Silt | Silt–Clay |
| 105 | Sand–Silt | Silt–Clay |
| 106 | Sand–Silt | Silt–Clay |
| 107 | Gravel–Sand | Silt–Clay |
| 108 | Gravel–Sand | Sand–Silt |
| 109 | Gravel–Sand | Sand–Silt |
| 110 | Gravel–Sand | Gravel–Sand |
| 111 | Gravel–Sand | Gravel–Sand |
| 112 | Gravel–Sand | Sand–Silt |
| 113 | Gravel–Sand | Gravel–Sand |
| 115 | Sand–Silt | Sand–Silt |
| 116 | Sand–Silt | Sand–Silt |
| 117 | Sand–Silt | Sand–Silt |
| 118 | Gravel–Sand | Gravel–Sand |
| 119 | Gravel–Sand | Gravel–Sand |
| 120 | Gravel–Sand | Gravel–Sand |
| 152 | Sand–Silt | Sand–Silt |
| 153 | Gravel–Sand | Sand–Silt |

| MAP UNIT | SURFACE SOIL | SUBSOIL |
|---|---|---|
| 154 | Gravel–Sand | Sand–Silt |
| 155 | Gravel–Sand | Sand–Silt |
| 156 | Sand–Silt | Sand–Silt |
| 157 | Gravel–Sand | Sand–Silt |
| 158 | Gravel–Sand | Gravel–Sand |
| 159 | Gravel–Sand | Gravel–Sand |
| 160 | Gravel–Sand | Gravel–Sand |
| 161 | Gravel–Sand | Sand–Silt |
| 162 | Gravel–Sand | Sand–Silt |
| 163 | Gravel–Sand | Sand–Silt |
| 164 | Sand–Silt | Sand–Silt |
| 165 | Gravel–Sand | Gravel–Sand |
| 166 | Gravel–Sand | Gravel–Sand |
| 167 | Gravel–Sand | Sand–Silt |
| 168 | Sand–Silt | Sand–Silt |
| 169 | Sand–Silt | Sand–Silt |
| 170 | Sand–Silt | Sand–Silt |
| 171 | Sand–Silt | Silt–Clay |
| 172 | Sand–Silt | Silt–Clay |
| 173 | Sand–Silt | Silt–Clay |
| 200 | Gravel–Sand | Gravel–Sand |
| 201 | Gravel–Sand | Gravel–Sand |
| 202 | Gravel–Sand | Gravel–Sand |
| 203 | Gravel–Sand | Gravel–Sand |
| 204 | Gravel–Sand | Gravel–Silt |
| 205 | Gravel–Sand | Gravel–Silt |
| 206 | Gravel–Sand | Gravel–Silt |
| 207 | Gravel–Sand | Gravel–Silt |
| 208 | Gravel–Sand | Gravel–Silt |
| 209 | Gravel–Sand | Gravel–Silt |
| 210 | Gravel–Sand | Gravel–Sand |
| 211 | Sand–Silt | Gravel–Silt |
| 212 | Sand–Silt | Gravel–Silt |
| 213 | Gravel–Sand | Sand–Silt |
| 214 | Gravel–Sand | Sand–Silt |
| 215 | Gravel–Sand | Sand–Silt |
| 300 | Gravel–Sand | Gravel–Sand |

| MAP UNIT | SURFACE SOIL | SUBSOIL |
|---|---|---|
| 301 | Gravel–Sand | Gravel–Sand |
| 302 | Gravel–Sand | Sand–Silt |
| 303 | Gravel–Sand | Gravel–Sand |
| 304 | Gravel–Sand | Gravel–Sand |
| 305 | Gravel–Sand | Gravel–Sand |
| 306 | Gravel–Silt | Sand–Silt |
| 307 | Gravel–Silt | Gravel–Silt |
| 308 | Gravel–Sand | Gravel–Silt |
| 309 | Gravel–Sand | Gravel–Sand |
| 310 | Gravel–Sand | Gravel–Sand |
| 311 | Gravel–Sand | Gravel–Silt |
| 312 | Sand–Silt | Silt–Clay |
| 313 | Sand–Silt | Silt–Clay |
| 314 | Sand–Silt | Silt–Clay |
| 315 | Gravel–Sand | Gravel–Sand |
| 316 | Gravel–Sand | Gravel–Sand |
| 317 | Gravel–Sand | Gravel–Sand |
| 318 | Gravel–Sand | Gravel–Sand |
| 319 | Gravel–Sand | Gravel–Silt |
| 320 | Gravel–Sand | Gravel–Silt |
| 321 | Gravel–Sand | Gravel–Silt |
| 322 | Gravel–Sand | Gravel–Silt |
| 323 | Gravel–Silt | Silt–Clay |
| 324 | Gravel–Silt | Silt–Clay |
| 325 | Gravel–Silt | Silt–Clay |
| 326 | Gravel–Sand | Gravel–Sand |
| 327 | Gravel–Sand | Gravel–Silt |
| 328 | Gravel–Sand | Gravel–Silt |
| 329 | Gravel–Sand | Gravel–Silt |
| 330 | Gravel–Sand | Gravel–Sand |
| 331 | Gravel–Silt | Gravel–Sand |
| 332 | Gravel–Sand | Gravel–Sand |
| 333 | Gravel–Sand | Gravel–Silt |
| 334 | Gravel–Sand | Gravel–Silt |
| 335 | Gravel–Sand | Gravel–Sand |
| 337 | Gravel–Sand | Gravel–Silt |
| 338 | Gravel–Sand | Gravel–Silt |
| 339 | Gravel–Sand | Gravel–Silt |
| 340 | Gravel–Sand | Gravel–Silt |
| 341 | Gravel–Sand | Gravel–Silt |
| 342 | Gravel–Sand | Gravel–Silt |
| 343 | Gravel–Sand | Gravel–Sand |
| 344 | Gravel–Sand | Gravel–Sand |
| 345 | Gravel–Sand | Gravel–Sand |
| 346 | Gravel–Sand | Gravel–Sand |
| 347 | Gravel–Sand | Gravel–Silt |
| 348 | Gravel–Sand | Gravel–Silt |
| 349 | Gravel–Sand | Gravel–Silt |
| 350 | Gravel–Sand | Sand–Silt |
| 351 | Gravel–Sand | Sand–Silt |
| 352 | Gravel–Sand | Sand–Silt |
| 353 | Gravel–Silt | Sand–Silt |
| 354 | Gravel–Silt | Sand–Silt |
| 355 | Gravel–Sand | Gravel–Sand |
| 356 | Gravel–Sand | Sand–Silt |
| 357 | Sand–Silt | Gravel–Silt |
| 358 | Sand–Silt | Sand–Silt |
| 359 | Gravel–Silt | Gravel–Silt |
| 360 | Gravel–Sand | Gravel–Sand |

| MAP UNIT | SURFACE SOIL | SUBSOIL |
|---|---|---|
| 361 | Gravel–Sand | Gravel–Sand |
| 362 | Gravel–Sand | Gravel–Sand |
| 363 | Gravel–Sand | Gravel–Sand |
| 364 | Gravel–Sand | Sand–Silt |
| 374 | Gravel–Silt | Gravel–Silt |
| 375 | Gravel–Sand | Gravel–Sand |
| 376 | Gravel–Sand | Gravel–Sand |
| 377 | Gravel–Sand | Gravel–Silt |
| 378 | Gravel–Sand | Gravel–Silt |
| 379 | Gravel–Sand | Gravel–Silt |
| 380 | Gravel–Sand | Gravel–Sand |
| 382 | Gravel–Sand | Gravel–Sand |
| 500 | Gravel–Silt | Gravel–Silt |

# 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 such as slope, internal drainage, revegetation potential, and the 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Increased |
| 2 | Greatly Increased |
| 3 | Increased |
| 4 | Increased |
| 5 | Unchanged |
| 6 | Increased |
| 7 | Unchanged |
| 8 | Unchanged |
| 9 | Increased |
| 10 | Unchanged |
| 11 | Unchanged |
| 12 | Increased |
| 13 | Unchanged |
| 14 | — |
| 15 | Greatly Increased |
| 100 | Increased |
| 101 | Increased |
| 102 | Increased |
| 103 | Greatly Increased |
| 104 | Increased |
| 105 | Greatly Increased |
| 106 | Greatly Increased |
| 107 | Unchanged |
| 108 | Greatly Increased |
| 109 | Greatly Increased |
| 110 | Increased |
| 111 | Increased |
| 112 | Increased |
| 113 | Greatly Increased |
| 115 | Unchanged |
| 116 | Increased |
| 117 | Increased |
| 118 | Increased |
| 119 | Increased |
| 120 | Increased |
| 152 | Unchanged |
| 153 | Unchanged |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Unchanged |
| 155 | Unchanged |
| 156 | Unchanged |
| 157 | Increased |
| 158 | Increased |
| 159 | Unchanged |
| 160 | Unchanged |
| 161 | Unchanged |
| 162 | Unchanged |
| 163 | Unchanged |
| 164 | Unchanged |
| 165 | Unchanged |
| 166 | Increased |
| 167 | Increased |
| 168 | Unchanged |
| 169 | Increased |
| 170 | Increased |
| 171 | Increased |
| 172 | Greatly Increased |
| 173 | Greatly Increased |
| 200 | Greatly Increased |
| 201 | Greatly Increased |
| 202 | Greatly Increased |
| 203 | Greatly Increased |
| 204 | Increased |
| 205 | Increased |
| 206 | Increased |
| 207 | Increased |
| 208 | Increased |
| 209 | Increased |
| 210 | Unchanged |
| 211 | Unchanged |
| 212 | Increased |
| 213 | Increased |
| 214 | Unchanged |
| 215 | Unchanged |
| 300 | Unchanged |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Unchanged |
| 302 | Unchanged |
| 303 | Increased |
| 304 | Unchanged |
| 305 | Increased |
| 306 | Unchanged |
| 307 | Increased |
| 308 | Increased |
| 309 | Unchanged |
| 310 | Unchanged |
| 311 | Increased |
| 312 | Unchanged |
| 313 | Increased |
| 314 | Increased |
| 315 | Unchanged |
| 316 | Unchanged |
| 317 | Increased |
| 318 | Increased |
| 319 | Increased |
| 320 | Unchanged |
| 321 | Increased |
| 322 | Increased |
| 323 | Unchanged |
| 324 | Increased |
| 325 | Increased |
| 326 | Unchanged |
| 327 | Unchanged |
| 328 | Increased |
| 329 | Increased |
| 330 | Unchanged |
| 331 | Unchanged |
| 332 | Unchanged |
| 333 | Unchanged |
| 334 | Increased |
| 335 | Increased |
| 337 | Unchanged |
| 338 | Unchanged |
| 339 | Increased |
| 340 | Unchanged |
| 341 | Increased |
| 342 | Increased |
| 343 | Increased |
| 344 | Increased |
| 345 | Increased |
| 346 | Unchanged |
| 347 | Unchanged |
| 348 | Increased |
| 349 | Increased |
| 350 | Increased |
| 351 | Increased |
| 352 | Unchanged |
| 353 | Unchanged |
| 354 | Increased |
| 355 | Increased |
| 356 | Unchanged |
| 357 | Increased |
| 358 | Unchanged |
| 359 | Unchanged |
| 360 | Increased |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Increased |
| 362 | Increased |
| 363 | Unchanged |
| 364 | Unchanged |
| 374 | Unchanged |
| 375 | Increased |
| 376 | Unchanged |
| 377 | Increased |
| 378 | Unchanged |
| 379 | Unchanged |
| 380 | Increased |
| 381 | Increased |
| 382 | Increased |
| 500 | Unchanged |

# 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, 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 intially 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | III |
| 2 | I |
| 3 | I |
| 4 | I |
| 5 | — |
| 6 | III |
| 7 | — |
| 8 | II |
| 9 | III |
| 10 | — |
| 11 | III |
| 12 | III |
| 13 | II |
| 14 | — |
| 15 | I |
| 100 | I |
| 101 | I |
| 102 | I |
| 103 | I |
| 104 | II |
| 105 | II |
| 106 | II |
| 107 | II |
| 108 | II |
| 109 | II |
| 110 | II |
| 111 | II |
| 112 | II |
| 113 | II |
| 115 | II |
| 116 | II |
| 117 | II |
| 118 | III |
| 119 | III |
| 120 | II |
| 152 | II |
| 153 | II |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | II |
| 155 | II |
| 156 | II |
| 157 | II |
| 158 | II |
| 159 | II |
| 160 | III |
| 161 | III |
| 162 | II |
| 163 | II |
| 164 | II |
| 165 | II |
| 166 | II |
| 167 | II–III |
| 168 | II–III |
| 169 | III |
| 170 | III |
| 171 | I |
| 172 | I |
| 173 | I |
| 200 | III |
| 201 | III |
| 202 | II |
| 203 | II |
| 204 | II |
| 205 | II |
| 206 | II |
| 207 | II |
| 208 | II |
| 209 | II |
| 210 | III |
| 211 | II |
| 212 | II |
| 213 | II |
| 214 | III |
| 215 | III |
| 300 | III |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | III |
| 302 | II |
| 303 | II–III |
| 304 | II |
| 305 | II–III |
| 306 | II |
| 307 | II |
| 308 | II |
| 309 | II |
| 310 | II |
| 311 | II |
| 312 | II |
| 313 | II |
| 314 | II |
| 315 | II |
| 316 | II |
| 317 | II |
| 318 | III |
| 319 | I |
| 320 | II |
| 321 | II |
| 322 | II |
| 323 | II |
| 324 | II |
| 325 | II |
| 326 | III |
| 327 | I |
| 328 | II |
| 329 | II |
| 330 | II |
| 331 | II |
| 332 | II |
| 333 | II |
| 334 | II |
| 335 | II |
| 337 | II |
| 338 | II |
| 339 | II |
| 340 | II |
| 341 | II |
| 342 | II |
| 343 | II |
| 344 | III |
| 345 | III |
| 346 | III |
| 347 | II |
| 348 | II |
| 349 | II |
| 350 | II |
| 351 | II |
| 352 | II |
| 353 | II |
| 354 | II |
| 355 | II |
| 356 | III |
| 357 | II |
| 358 | II |
| 359 | II |
| 360 | III |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | III |
| 362 | II |
| 363 | II |
| 364 | II |
| 374 | II |
| 375 | II |
| 376 | II |
| 377 | II |
| 378 | II |
| 379 | II |
| 380 | II |
| 381 | III |
| 382 | III |
| 500 | III |

# 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 interflow 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 geniss) and other hard-fractured rocks such as conglomerate.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | I |
| 2 | II |
| 3 | I |
| 4 | I |
| 5 | II |
| 6 | I |
| 7 | I |
| 8 | I |
| 9 | I |
| 10 | I |
| 11 | I |
| 12 | I |
| 13 | I |
| 14 | I–II |
| 15 | II |
| 100 | II |
| 101 | II |
| 102 | II |
| 103 | II |
| 104 | II |
| 105 | II |
| 106 | II |
| 107 | II |
| 108 | II |
| 109 | II |
| 110 | II |
| 111 | II |
| 112 | II |
| 113 | II |
| 115 | II |
| 116 | II |
| 117 | II |
| 118 | II |
| 119 | II |
| 120 | II |
| 152 | I |
| 153 | I |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | I |
| 155 | I |
| 156 | I |
| 157 | I |
| 158 | I |
| 159 | I |
| 160 | I |
| 161 | I |
| 162 | I |
| 163 | I |
| 164 | I |
| 165 | I |
| 166 | I |
| 167 | I |
| 168 | I |
| 169 | I |
| 170 | I |
| 171 | I |
| 172 | I |
| 173 | I |
| 200 | I |
| 201 | I |
| 202 | I |
| 203 | I |
| 204 | I |
| 205 | I |
| 206 | I |
| 207 | I |
| 208 | I |
| 209 | I |
| 210 | I |
| 211 | I |
| 212 | I |
| 213 | I |
| 214 | I |
| 215 | I |
| 300 | I |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | I |
| 302 | I |
| 303 | I |
| 304 | I |
| 305 | I |
| 306 | I |
| 307 | I |
| 308 | I |
| 309 | I |
| 310 | I |
| 311 | I |
| 312 | II |
| 313 | II |
| 314 | II |
| 315 | II |
| 316 | II |
| 317 | II |
| 318 | II |
| 319 | II |
| 320 | I |
| 321 | I |
| 322 | I |
| 323 | I |
| 324 | I |
| 325 | I |
| 326 | I |
| 327 | II |
| 328 | II |
| 329 | II |
| 330 | I |
| 331 | I |
| 332 | I |
| 333 | I |
| 334 | I |
| 335 | I |
| 337 | I |
| 338 | I |
| 339 | I |
| 340 | I |
| 341 | I |
| 342 | I |
| 343 | I |
| 344 | I |
| 345 | I |
| 346 | I |
| 347 | I |
| 348 | I |
| 349 | I |
| 350 | I |
| 351 | I |
| 352 | I |
| 353 | I |
| 354 | I |
| 355 | I |
| 356 | I |
| 357 | I |
| 358 | I |
| 359 | I |
| 360 | II |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | II |
| 362 | II |
| 363 | II |
| 364 | II |
| 374 | I |
| 375 | I |
| 376 | I |
| 377 | I |
| 378 | I |
| 379 | I |
| 380 | II |
| 381 | II |
| 382 | II |

# HYDROLOGIC SOIL GROUPS

Hydrologic soil groups are used in watershed management planning to estimate runoff from rainfall. Soil properties that influence the minimum rate of infiltration obtained for a bare soil after prolonged wetting are considered. These properties include: depth of seasonally high water table, infiltration rate and permeability after prolonged wetting, and depth to very slowly permeable layers. The influence of ground cover is treated independently.

A: (Low runoff potential.) Soils having rapid infiltration rates even though thoroughly wetted and consisting primarily of deep, well to excessively drained sands and gravels. These soils have a high rate of water transmission.

B: (Moderately low runoff potential.) Soils having moderate infiltration rates when thoroughly wetted and consisting primarily of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures with moderately slow to moderately rapid permeability. These soils have a moderate rate of water transmission.

C: (Moderately high runoff potential.) Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, soils with moderately fine to fine texture, soils with slow infiltration due to salts or alkali, or soils with moderate water tables. These soils may be somewhat poorly drained.

D: (High runoff potential.) Soils having very slow infiltration rates when thoroughly wetted and consisting primarily of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer near the surface, soils with very slow infiltration rates due to salts or alkali, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

| MAP UNIT | HYDROLOGIC GROUP |
|---|---|
| 1 | A |
| 2 | C |
| 3 | D |
| 4 | D |
| 5 | — |
| 6 | A |
| 7 | — |
| 8 | B |
| 9 | A |
| 10 | — |
| 11 | A |
| 12 | A |
| 13 | B |
| 14 | — |
| 15 | C |
| 100 | C |
| 101 | C |
| 102 | C |
| 103 | C |
| 104 | B |
| 105 | B |
| 106 | B |
| 107 | B |
| 108 | B |
| 109 | B |
| 110 | B |
| 111 | B |
| 112 | B |
| 113 | C |
| 115 | B |
| 116 | B |
| 117 | B |
| 118 | B |
| 119 | B |
| 120 | B |
| 152 | B |
| 153 | B |

| MAP UNIT | HYDROLOGIC GROUP |
|---|---|
| 154 | B |
| 155 | B |
| 156 | B |
| 157 | B |
| 158 | B |
| 159 | B |
| 160 | B |
| 161 | B |
| 162 | B |
| 163 | B |
| 164 | B |
| 165 | B |
| 166 | B |
| 167 | B |
| 168 | B |
| 169 | B |
| 170 | B |
| 171 | C |
| 172 | B |
| 173 | B |
| 200 | B |
| 201 | B |
| 202 | B |
| 203 | B |
| 204 | B |
| 205 | B |
| 206 | B |
| 207 | B |
| 208 | B |
| 209 | B |
| 210 | B |
| 211 | B |
| 212 | B |
| 213 | B |
| 214 | B |
| 215 | B |
| 300 | B |

| MAP UNIT | HYDROLOGIC GROUP |
|---|---|
| 301 | B |
| 302 | B |
| 303 | B |
| 304 | B |
| 305 | B |
| 306 | B |
| 307 | B |
| 308 | B |
| 309 | B |
| 310 | B |
| 311 | B |
| 312 | B |
| 313 | B |
| 314 | B |
| 315 | B |
| 316 | B |
| 317 | B |
| 318 | B |
| 319 | B |
| 320 | B |
| 321 | B |
| 322 | B |
| 323 | B |
| 324 | B |
| 325 | B |
| 326 | B |
| 327 | B |
| 328 | B |
| 329 | B |
| 330 | B |
| 331 | B |
| 332 | B |
| 333 | B |
| 334 | B |
| 335 | B |
| 337 | B |
| 338 | B |
| 339 | B |
| 340 | B |
| 341 | B |
| 342 | B |
| 343 | B |
| 344 | B |
| 345 | B |
| 346 | A |
| 347 | B |
| 348 | B |
| 349 | B |
| 350 | B |
| 351 | B |
| 352 | C |
| 353 | B |
| 354 | B |
| 355 | B |
| 356 | B |
| 357 | B |
| 358 | B |
| 359 | B |
| 360 | B |

| MAP UNIT | HYDROLOGIC GROUP |
|---|---|
| 361 | B |
| 362 | B |
| 363 | B |
| 364 | B |
| 374 | B |
| 375 | B |
| 376 | B |
| 377 | B |
| 378 | B |
| 379 | B |
| 380 | B |
| 381 | B |
| 382 | B |
| 500 | A |

# CUTBANK AND DITCH EROSION POTENTIAL

This interpretation indicates the potential for subsoil erosion by running water of each soil. Subsoil refers to that material from approximately the 5 foot depth extending to bedrock. It includes erosion which takes place along 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 not 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Moderate |
| 2 | High |
| 3 | Moderate–High |
| 4 | Moderate–High |
| 5 | Low |
| 6 | Low |
| 7 | Low |
| 8 | Low–Moderate |
| 9 | Low–Moderate |
| 10 | — |
| 11 | Low |
| 12 | Low |
| 13 | Low |
| 14 | — |
| 15 | High |
| 100 | Moderate |
| 101 | High |
| 102 | High |
| 103 | Moderate–High |
| 104 | Low–Moderate |
| 105 | High |
| 106 | High |
| 107 | Moderate |
| 108 | High |
| 109 | High |
| 110 | High |
| 111 | High |
| 112 | High |
| 113 | High |
| 115 | Low |
| 116 | Moderate |
| 117 | Moderate |
| 118 | High |
| 119 | High |
| 120 | Low–Moderate |
| 152 | Low |
| 153 | Low–Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Moderate |
| 155 | Moderate |
| 156 | Low |
| 157 | Moderate |
| 158 | Low–Moderate |
| 159 | Moderate |
| 160 | Low |
| 161 | Low |
| 162 | Moderate |
| 163 | Moderate |
| 164 | Low |
| 165 | Low |
| 166 | Moderate |
| 167 | Moderate |
| 168 | High |
| 169 | High |
| 170 | High |
| 171 | Moderate |
| 172 | High |
| 173 | High |
| 200 | High |
| 201 | High |
| 202 | High |
| 203 | High |
| 204 | Moderate |
| 205 | High |
| 206 | High |
| 207 | High |
| 208 | High |
| 209 | High |
| 210 | High |
| 211 | High |
| 212 | High |
| 213 | High |
| 214 | High |
| 215 | High |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Low–Moderate |
| 302 | Low–Moderate |
| 303 | Moderate |
| 304 | Low–Moderate |
| 305 | Moderate |
| 306 | Low–Moderate |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Moderate |
| 310 | Moderate–High |
| 311 | Low–Moderate |
| 312 | Moderate |
| 313 | High |
| 314 | High |
| 315 | Moderate |
| 316 | Moderate–High |
| 317 | Moderate–High |
| 318 | Moderate–High |
| 319 | High |
| 320 | Moderate |
| 321 | Moderate |
| 322 | Moderate |
| 323 | Moderate |
| 324 | Moderate–High |
| 325 | Moderate–High |
| 326 | Low |
| 327 | Moderate |
| 328 | Moderate |
| 329 | Moderate–High |
| 330 | Moderate |
| 331 | Moderate |
| 332 | Moderate |
| 333 | Moderate |
| 334 | Moderate–High |
| 335 | Moderate–High |
| 337 | Moderate–High |
| 338 | Moderate–High |
| 339 | High |
| 340 | High |
| 341 | Moderate |
| 342 | High |
| 343 | High |
| 344 | Moderate–High |
| 345 | Moderate–High |
| 346 | Low |
| 347 | Moderate |
| 348 | Moderate |
| 349 | Moderate |
| 350 | High |
| 351 | High |
| 352 | Moderate |
| 353 | Moderate |
| 354 | High |
| 355 | High |
| 356 | Moderate |
| 357 | High |
| 358 | Moderate |
| 359 | Moderate |
| 360 | High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | High |
| 362 | High |
| 363 | Moderate |
| 364 | Moderate |
| 374 | Moderate |
| 375 | Moderate |
| 376 | Moderate |
| 377 | Moderate |
| 378 | Moderate |
| 379 | Moderate |
| 380 | Moderate |
| 381 | Moderate–High |
| 382 | Moderate–High |
| 500 | Low |

# 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 causes 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Moderate–High |
| 2 | High |
| 3 | Low–Moderate |
| 4 | Low–Moderate |
| 5 | Low |
| 6 | Low–Moderate |
| 7 | Low |
| 8 | Low |
| 9 | Low–Moderate |
| 10 | — |
| 11 | Low |
| 12 | Low–Moderate |
| 13 | Low |
| 14 | — |
| 15 | High |
| 100 | Moderate |
| 101 | Moderate–High |
| 102 | Moderate–High |
| 103 | Low |
| 104 | Low |
| 105 | Moderate–High |
| 106 | Moderate–High |
| 107 | Low |
| 108 | High |
| 109 | High |
| 110 | High |
| 111 | High |
| 112 | High |
| 113 | High |
| 115 | Low |
| 116 | Moderate |
| 117 | Moderate |
| 118 | Moderate–High |
| 119 | Moderate–High |
| 120 | Moderate |
| 152 | Moderate |
| 153 | Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Moderate–High |
| 155 | Moderate–High |
| 156 | Moderate |
| 157 | Moderate–High |
| 158 | Low–Moderate |
| 159 | Moderate–High |
| 160 | Low |
| 161 | Low |
| 162 | Moderate |
| 163 | Moderate |
| 164 | Low |
| 165 | Low–Moderate |
| 166 | Moderate |
| 167 | Moderate–High |
| 168 | Moderate |
| 169 | Moderate–High |
| 170 | Moderate–High |
| 171 | Moderate |
| 172 | High |
| 173 | High |
| 200 | High |
| 201 | High |
| 202 | High |
| 203 | High |
| 204 | Moderate |
| 205 | High |
| 206 | High |
| 207 | High |
| 208 | High |
| 209 | Moderate–High |
| 210 | Moderate |
| 211 | Moderate–High |
| 212 | Moderate–High |
| 213 | Moderate–High |
| 214 | Moderate–High |
| 215 | Moderate–High |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Low |
| 302 | Low |
| 303 | Low–Moderate |
| 304 | Low |
| 305 | Moderate |
| 306 | Low |
| 307 | Moderate |
| 308 | Moderate–High |
| 309 | Low–Moderate |
| 310 | Moderate |
| 311 | Low |
| 312 | Low–Moderate |
| 313 | Moderate–High |
| 314 | Moderate–High |
| 315 | Low |
| 316 | Moderate |
| 317 | Moderate |
| 318 | Moderate |
| 319 | Moderate |
| 320 | Low |
| 321 | Moderate |
| 322 | Moderate |
| 323 | Low |
| 324 | Moderate |
| 325 | Moderate |
| 326 | Low |
| 327 | Low–Moderate |
| 328 | Moderate–High |
| 329 | Moderate–High |
| 330 | Low |
| 331 | Low |
| 332 | Moderate |
| 333 | Low |
| 334 | Moderate |
| 335 | Moderate |
| 337 | High |
| 338 | Low |
| 339 | Moderate |
| 340 | Moderate |
| 341 | Low |
| 342 | Moderate |
| 343 | Moderate |
| 344 | Moderate–High |
| 345 | Moderate–High |
| 346 | Low |
| 347 | Low |
| 348 | Moderate–High |
| 349 | Moderate–High |
| 350 | High |
| 351 | High |
| 352 | Low–Moderate |
| 353 | Low |
| 354 | Moderate–High |
| 355 | Moderate–High |
| 356 | Low |
| 357 | Moderate–High |
| 358 | Low |
| 359 | Moderate–High |
| 360 | High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Moderate–High |
| 362 | Moderate–High |
| 363 | Low |
| 364 | Moderate–Low |
| 374 | Low |
| 375 | Moderate |
| 376 | Low |
| 377 | Moderate |
| 378 | Low |
| 379 | Low |
| 380 | Low |
| 381 | Moderate–High |
| 382 | Moderate–High |
| 500 | Low |

# PROBABILITY OF CUTBANK FAILURES

This interpretation indicates the probability of failures in cutbanks following road or building excavation. The highest rate of failing will probably occur with the first two years after excavation. On soils rated as having cutbank stability I and II, there should be few failures after the initial two-year period. Soil units rated as having cutbank stability III, IV or V, will experience failures after the initial two-year period. In the case of soil rated with cutbank stavility of V, failures can be expected to occur indefinitely.

Failures are considered to be at least 10 cubic yards of material in volume. It should be realized that as the probability of cutbank failures increases, so does the probability that a few of these failures will have volumes in excess of 50 cubic yards, and in some instances there will be massive failure where entire sections of the road are lost.

Ratings are based on cutbanks of at least 10 feet in height, and refer to more than a 50-percent chance of failure.

Very Stable: Practically no probability of chance of cutbank failures.

Stable: Probability of no more than 3 failures per mile of road cutbank.

Moderately Stable: Probability of 4 to 8 failures per mile of road cutbank.

Unstable: Probability of 9 to 15 failures per mile of road cutbank.

Very Unstable: Probability of more than 15 failures per mile of road cutbank.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Unstable |
| 2 | Very Unstable |
| 3 | Unstable–Very Unstable |
| 4 | Moderately Stable–Unstable |
| 5 | — |
| 6 | Moderately Stable |
| 7 | — |
| 8 | Stable |
| 9 | Moderately Stable |
| 10 | — |
| 11 | Stable |
| 12 | Moderately Stable |
| 13 | Stable |
| 14 | — |
| 15 | Very Unstable |
| 100 | Moderately Stable |
| 101 | Unstable |
| 102 | Unstable |
| 103 | Unstable–Very Unstable |
| 104 | Stable–Moderately Stable |
| 105 | Unstable |
| 106 | Unstable |
| 107 | Moderately Stable |
| 108 | Unstable |
| 109 | Unstable |
| 110 | Moderately Stable |
| 111 | Unstable |
| 112 | Unstable |
| 113 | Unstable–Very Unstable |
| 115 | Stable |
| 116 | Moderately Stable |
| 117 | Moderately Stable |
| 118 | Unstable |
| 119 | Unstable |
| 120 | Moderately Stable |
| 152 | Stable |
| 153 | Stable |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Stable |
| 155 | Moderately Stable |
| 156 | Stable |
| 157 | Moderately Stable |
| 158 | Stable |
| 159 | Moderately–Stable |
| 160 | Very Stable |
| 161 | Stable |
| 162 | Stable–Moderately Stable |
| 163 | Stable–Moderately Stable |
| 164 | Stable–Moderately Stable |
| 165 | Stable |
| 166 | Moderately Stable |
| 167 | Moderately Stable |
| 168 | Stable–Moderately Stable |
| 169 | Moderately Stable–Unstable |
| 170 | Moderately Stable–Unstable |
| 171 | Stable–Moderately Stable |
| 172 | Moderately Stable–Unstable |
| 173 | Moderately Stable–Unstable |
| 200 | Moderately Stable |
| 201 | Moderately Stable |
| 202 | Unstable |
| 203 | Unstable |
| 204 | Stable–Moderately Stable |
| 205 | Unstable |
| 206 | Unstable |
| 207 | Moderately Stable |
| 208 | Moderately Stable |
| 209 | Moderately Stable–Unstable |
| 210 | Stable |
| 211 | Moderately Stable |
| 212 | Moderately Stable |
| 213 | Moderately Stable |
| 214 | Moderately Stable |
| 215 | Moderately Stable |
| 300 | Very Stable |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Stable |
| 302 | Stable |
| 303 | Moderately Stable |
| 304 | Stable |
| 305 | Moderately Stable |
| 306 | Stable |
| 307 | Stable |
| 308 | Moderately Stable |
| 309 | Stable |
| 310 | Stable |
| 311 | Stable |
| 312 | Stable |
| 313 | Moderately Stable |
| 314 | Moderately Stable |
| 315 | Stable |
| 316 | Moderately Stable |
| 317 | Moderately Stable |
| 318 | Moderately Stable |
| 319 | Moderately Stable |
| 320 | Stable |
| 321 | Moderately Stable |
| 322 | Moderately Stable |
| 323 | Stable |
| 324 | Stable–Moderately Stable |
| 325 | Stable–Moderately Stable |
| 326 | Very Stable |
| 327 | Stable |
| 328 | Moderately Stable |
| 329 | Moderately Stable |
| 330 | Stable |
| 331 | Stable |
| 332 | Stable |
| 333 | Moderately Stable |
| 334 | Moderately Stable |
| 335 | Moderately Stable |
| 337 | Stable–Moderately Stable |
| 338 | Very Stable–Stable |
| 339 | Moderately Stable |
| 340 | Moderately Stable |
| 341 | Stable |
| 342 | Moderately Stable |
| 343 | Moderately Stable |
| 344 | Moderately Stable |
| 345 | Moderately Stable |
| 346 | Unstable |
| 347 | Stable |
| 348 | Stable |
| 349 | Moderately Stable |
| 350 | Moderately Stable |
| 351 | Moderately Stable |
| 352 | Stable |
| 353 | Stable |
| 354 | Moderately Stable |
| 355 | Moderately Stable |
| 356 | Stable |
| 357 | Moderately Stable |
| 358 | Moderately Stable |
| 359 | Moderately Stable–Unstable |
| 360 | Moderately Stable–Unstable |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Moderately Stable |
| 362 | Moderately Stable–Unstable |
| 363 | Stable |
| 364 | Stable |
| 374 | Stable |
| 375 | Moderately Stable |
| 376 | Stable |
| 377 | Moderately Stable |
| 378 | Stable |
| 379 | Stable |
| 380 | Stable |
| 381 | Moderately Stable |
| 382 | Very Stable |
| 500 | Very Stable |

# 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Low |
| 2 | High |
| 3 | Low |
| 4 | Moderate |
| 5 | — |
| 6 | — |
| 7 | — |
| 8 | Low |
| 9 | Low |
| 10 | — |
| 11 | Moderate |
| 12 | Low |
| 13 | Low |
| 14 | — |
| 15 | Low–Moderate |
| 100 | High |
| 101 | High |
| 102 | Moderate |
| 103 | High |
| 104 | Moderate |
| 105 | Moderate |
| 106 | Low–Moderate |
| 107 | High |
| 108 | Low |
| 109 | Low–Moderate |
| 110 | Moderate |
| 111 | Low |
| 112 | Moderate |
| 113 | Moderate |
| 115 | Moderate–High |
| 116 | Moderate |
| 117 | High |
| 118 | Low |
| 119 | Moderate |
| 120 | Moderate |
| 152 | Low |
| 153 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Low |
| 155 | Moderate |
| 156 | Low–Moderate |
| 157 | Moderate |
| 158 | Low |
| 159 | Low |
| 160 | Low |
| 161 | Moderate |
| 162 | Moderate |
| 163 | Low |
| 164 | Low |
| 165 | Low |
| 166 | Low |
| 167 | Low |
| 168 | Low |
| 169 | Low |
| 170 | Moderate |
| 171 | High |
| 172 | High |
| 173 | High |
| 200 | Low |
| 201 | Moderate |
| 202 | Moderate |
| 203 | Low–Moderate |
| 204 | Moderate–High |
| 205 | Moderate |
| 206 | Low |
| 207 | High |
| 208 | Moderate |
| 209 | Moderate–High |
| 210 | Low |
| 211 | Low |
| 212 | Moderate |
| 213 | Low–Moderate |
| 214 | Low |
| 215 | Moderate |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Low |
| 302 | Low–Moderate |
| 303 | Low |
| 304 | Moderate |
| 305 | Moderate |
| 306 | Moderate–High |
| 307 | High |
| 308 | Moderate–High |
| 309 | Moderate |
| 310 | Low |
| 311 | Low–Moderate |
| 312 | Moderate |
| 313 | Moderate–High |
| 314 | Moderate |
| 315 | Moderate |
| 316 | Moderate |
| 317 | Low |
| 318 | Low |
| 319 | High |
| 320 | Moderate |
| 321 | Moderate |
| 322 | Low–Moderate |
| 323 | High |
| 324 | Moderate |
| 325 | Moderate |
| 326 | Low |
| 327 | Moderate–High |
| 328 | Moderate |
| 329 | Low |
| 330 | Moderate |
| 331 | Low |
| 332 | Low |
| 333 | Moderate |
| 334 | Moderate |
| 335 | Low |
| 337 | Low–Moderate |
| 338 | High |
| 339 | High |
| 340 | Moderate–High |
| 341 | Moderate–High |
| 342 | Moderate–High |
| 343 | Moderate |
| 344 | Moderate |
| 345 | Low |
| 346 | Low |
| 347 | Moderate |
| 348 | Moderate–High |
| 349 | Low–Moderate |
| 350 | Low–Moderate |
| 351 | Moderate |
| 352 | Moderate |
| 353 | Moderate |
| 354 | Low |
| 355 | Moderate |
| 356 | Low–Moderate |
| 357 | Low |
| 358 | Moderate |
| 359 | Low–Moderate |
| 360 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Low |
| 362 | Low |
| 363 | Low–Moderate |
| 364 | Low |
| 374 | Low–Moderate |
| 375 | Low |
| 376 | Moderate |
| 377 | Moderate |
| 378 | Moderate |
| 379 | Low |
| 380 | Low |
| 381 | Low |
| 382 | Low |

# SUSCEPTIBILITY TO ALDER REVEGETATION (WEST SIDE ONLY)

This interpretation indicates the susceptibility of mapping units to revegetate to alder following clearcut timber harvest. These ratings are based on soil characteristics, drainage elevation, climate, topographic position and field observations.

Low: Factors do not encourage alder establishment and growth. Little or no alder revegetation occurs.

Moderate: Factors are moderately favorable for alder establishment and growth. Alder revegetation is moderate.

High: Factors are highly favorable for alder establishment and growth. Alder revegetation occurs rapidly.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Low |
| 2 | High |
| 3 | Moderate–High |
| 4 | Moderate |
| 5 | — |
| 6 | Low |
| 7 | — |
| 9 | Moderate–High |
| 11 | High |
| 12 | Moderate–High |
| 13 | Low |
| 15 | High |
| 100 | High |
| 101 | High |
| 102 | High |
| 103 | High |
| 104 | Moderate |
| 105 | Moderate |
| 106 | Moderate |
| 107 | High |
| 108 | Moderate–High |
| 109 | Moderate–High |
| 110 | High |
| 111 | High |
| 112 | High |
| 113 | High |
| 115 | Low |
| 116 | Low–Moderate |
| 117 | Low–Moderate |
| 118 | Moderate |
| 119 | Moderate |
| 120 | High |
| 171 | High |
| 172 | High |
| 173 | High |
| 200 | Low |
| 201 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 202 | Moderate |
| 203 | Moderate |
| 204 | High |
| 205 | Moderate |
| 206 | Moderate |
| 300 | Low |
| 301 | Low |
| 302 | Low |
| 304 | Low |
| 305 | Low |
| 306 | Moderate |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Low |
| 310 | Low |
| 311 | Low |
| 312 | High |
| 313 | High |
| 314 | High |
| 315 | Moderate–High |
| 316 | Moderate–High |
| 317 | Moderate–High |
| 318 | Low |
| 319 | Moderate |
| 320 | Moderate |
| 321 | Moderate |
| 322 | Moderate |
| 323 | High |
| 324 | High |
| 325 | High |
| 326 | Low |
| 328 | Low |
| 329 | Low |
| 330 | High |
| 331 | Low |
| 332 | Low |
| 333 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 334 | Low |
| 335 | Low |
| 337 | Low |
| 338 | High |
| 339 | High |
| 340 | High |
| 341 | Moderate |
| 342 | Moderate |
| 343 | Moderate |
| 344 | Moderate |
| 345 | Moderate |
| 346 | Low |
| 347 | Moderate–High |
| 348 | Moderate–High |
| 349 | Moderate–High |
| 374 | Moderate–High |
| 375 | High |
| 376 | High |
| 377 | High |
| 378 | Moderate |
| 379 | Moderate |
| 380 | Low |
| 381 | Low |
| 382 | Low |
| 500 | High |

# SUSCEPTIBILITY TO PINEGRASS REVEGETATIONS (EAST SIDE ONLY)

This interpretation indicates the susceptibility of mapping units to revegetate to pinegrass following timber harvest operations. These ratings are based on soil characteristics, drainage, elevation, climate, topography position and field observations.

Low: Factors do not encourage pinegrass establishment and growth. Little or no pinegrass revegetation occurs.

Moderate: Factors are moderately favorable for pinegrass establishment and growth. Pinegrass revegetation is moderate.

High: Factors are highly favorable for pinegrass establishment and growth. Pinegrass revegetation occurs rapidly.

| MAP UNIT | INTERPRETATION |
|---|---|
| 8 | Moderate |
| 152 | Low |
| 153 | Low |
| 154 | Low |
| 155 | Moderate |
| 156 | Moderate–High |
| 157 | High |
| 158 | Low |
| 159 | High |
| 160 | Moderate–High |
| 161 | High |
| 162 | High |
| 163 | High |
| 164 | Moderate–High |
| 165 | Low–Moderate |
| 166 | Low–Moderate |
| 167 | Low–Moderate |
| 168 | Moderate–High |
| 169 | High |
| 170 | High |
| 207 | Moderate–High |
| 208 | Moderate–High |
| 209 | High |
| 210 | High |
| 211 | High |
| 212 | High |
| 213 | High |
| 214 | High |
| 215 | High |
| 350 | Moderate–High |
| 351 | Moderate–High |
| 352 | Moderate |
| 353 | High |
| 354 | High |
| 355 | High |
| 356 | Low–Moderate |
| 357 | Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 358 | Moderate |
| 359 | Moderate |
| 360 | Low |
| 361 | Low |
| 362 | Low |
| 363 | Low |
| 364 | Low |

# SUSCEPTIBILITY TO BRUSH REVEGETATION

This interpretation indicates the susceptibility of mapping units to revegetate naturally following timber harvest. These interpretations are based on soil characteristics, field observations, slope, aspect, climate, and elevation.

It should be remembered that the type and amount of brush revegetations can vary with management practices.

Low: Indicates brush revegetation is insignificant.

Moderate: Indicates some brush revegetation will occur.

High: Indicates brush revegetation is very dense.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Low |
| 2 | High |
| 3 | Low–Moderate |
| 4 | Moderate |
| 5 | — |
| 6 | Low |
| 7 | — |
| 8 | Low |
| 9 | Moderate |
| 10 | — |
| 11 | Moderate–High |
| 12 | High |
| 13 | High |
| 14 | — |
| 15 | Moderate |
| 100 | Moderate |
| 101 | Moderate |
| 102 | Moderate |
| 103 | Moderate |
| 104 | Moderate–High |
| 105 | Moderate–High |
| 106 | Moderate |
| 107 | Moderate–High |
| 108 | Moderate |
| 109 | Moderate |
| 110 | Moderate–High |
| 111 | Moderate–High |
| 112 | High |
| 113 | Moderate |
| 115 | Low–Moderate |
| 116 | Moderate |
| 117 | Low |
| 118 | Low |
| 119 | Moderate |
| 120 | Moderate–High |
| 152 | Low |
| 153 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Low |
| 155 | Moderate |
| 156 | Low |
| 157 | Low |
| 158 | Low |
| 159 | Moderate |
| 160 | Low |
| 161 | Moderate |
| 162 | Moderate |
| 163 | High |
| 164 | Moderate–High |
| 165 | Moderate–High |
| 166 | Moderate–High |
| 167 | Moderate–High |
| 168 | Moderate |
| 169 | Moderate–High |
| 170 | Moderate–High |
| 171 | High |
| 172 | High |
| 173 | Moderate–High |
| 200 | Low–Moderate |
| 201 | Low |
| 202 | Moderate |
| 203 | High |
| 204 | High |
| 205 | High |
| 206 | High |
| 207 | High |
| 208 | High |
| 209 | Moderate |
| 210 | Low |
| 211 | Moderate |
| 212 | Moderate–High |
| 213 | Moderate–High |
| 214 | Moderate |
| 215 | Moderate–High |
| 300 | Moderate–High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Moderate–High |
| 302 | High |
| 303 | High |
| 304 | Moderate |
| 305 | Moderate–High |
| 306 | Moderate |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Moderate–High |
| 310 | High |
| 311 | Moderate–High |
| 312 | Moderate–High |
| 313 | High |
| 314 | High |
| 315 | Moderate–High |
| 316 | Moderate–High |
| 317 | High |
| 318 | Moderate–High |
| 319 | High |
| 320 | Moderate–High |
| 321 | Moderate–High |
| 322 | Moderate–High |
| 323 | Moderate–High |
| 324 | Moderate–High |
| 325 | Moderate |
| 326 | Low |
| 327 | Moderate |
| 328 | Moderate |
| 329 | High |
| 330 | Moderate |
| 331 | Moderate |
| 332 | Moderate |
| 333 | Moderate |
| 334 | Moderate |
| 335 | High |
| 337 | High |
| 338 | Moderate |
| 339 | Moderate |
| 340 | Moderate–High |
| 341 | High |
| 342 | High |
| 343 | High |
| 344 | Moderate–High |
| 345 | High |
| 346 | High |
| 347 | Moderate |
| 348 | Moderate |
| 349 | Moderate–High |
| 350 | Moderate |
| 351 | Moderate–High |
| 352 | Moderate |
| 353 | High |
| 354 | High |
| 355 | Moderate–High |
| 356 | Moderate |
| 357 | Moderate |
| 358 | Moderate |
| 359 | Moderate–High |
| 360 | Low–Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Moderate–High |
| 362 | Low |
| 363 | Moderate |
| 364 | Low |
| 374 | Moderate–High |
| 375 | High |
| 376 | Moderate |
| 377 | Moderate–High |
| 378 | Moderate |
| 379 | Moderate–High |
| 380 | Moderate–High |
| 381 | Moderate–High |
| 382 | Low–Moderate |
| 500 | Low–Moderate |

# LANDTYPE SUITABILITY FOR RECREATION AREA DEVELOPMENT

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

Unsuitable: 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Unsuitable |
| 2 | Unsuitable |
| 3 | Unsuitable |
| 4 | Low |
| 5 | Unsuitable |
| 6 | Unsuitable |
| 7 | Unsuitable |
| 8 | Moderate |
| 9 | Low. |
| 10 | Unsuitable |
| 11 | Moderate |
| 12 | Unsuitable |
| 13 | Unsuitable |
| 14 | Unsuitable |
| 15 | Unsuitable |
| 100 | High |
| 101 | Moderate |
| 102 | Moderate |
| 103 | Low |
| 104 | Moderate |
| 105 | Low |
| 106 | Low |
| 107 | High |
| 108 | Unsuitable |
| 109 | Unsuitable |
| 110 | Unsuitable |
| 111 | Unsuitable |
| 112 | Unsuitable |
| 113 | Unsuitable |
| 115 | Moderate |
| 116 | Low |
| 117 | Low |
| 118 | Unsuitable |
| 119 | Unsuitable |
| 120 | Unsuitable |
| 152 | High |
| 153 | High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Moderate |
| 155 | Moderate |
| 156 | High |
| 157 | Moderate |
| 158 | Moderate |
| 159 | Low |
| 160 | Low |
| 161 | Low-Moderate |
| 162 | Unsuitable |
| 163 | Unsuitable |
| 164 | Low-Moderate |
| 165 | Low-Moderate |
| 166 | Low |
| 167 | Unsuitable |
| 168 | Low-Moderate |
| 169 | Low |
| 170 | Low |
| 171 | Moderate |
| 172 | Low |
| 173 | Low |
| 200 | Unsuitable |
| 201 | Unsuitable |
| 202 | Unsuitable |
| 203 | Unsuitable |
| 204 | Low |
| 205 | Unsuitable |
| 206 | Unsuitable |
| 207 | Low |
| 208 | Low |
| 209 | Low |
| 210 | Unsuitable |
| 211 | Low |
| 212 | Low |
| 213 | Low |
| 214 | Low |
| 215 | Low |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Unsuitable |
| 302 | Low |
| 303 | Unsuitable |
| 304 | Low–Moderate |
| 305 | Low |
| 306 | Low–Moderate |
| 307 | Low |
| 308 | Low |
| 309 | Low–Moderate |
| 310 | Unsuitable |
| 311 | Low–Moderate |
| 312 | Moderate |
| 313 | Unsuitable |
| 314 | Unsuitable |
| 315 | Low–Moderate |
| 316 | Low |
| 317 | Low |
| 318 | Unsuitable |
| 319 | Low |
| 320 | Low–Moderate |
| 321 | Low |
| 322 | Low |
| 323 | Moderate |
| 324 | Low |
| 325 | Low |
| 326 | Low |
| 327 | Low–Moderate |
| 328 | Low |
| 329 | Unsuitable |
| 330 | Low–Moderate |
| 331 | Low–Moderate |
| 332 | Unsuitable |
| 333 | Low |
| 334 | Unsuitable |
| 335 | Unsuitable |
| 337 | Low |
| 338 | Moderate |
| 339 | Low |
| 340 | Low |
| 341 | Moderate |
| 342 | Low |
| 343 | Low |
| 344 | Low |
| 345 | Low |
| 346 | Moderate |
| 347 | Moderate |
| 348 | Low |
| 349 | Low |
| 350 | Low |
| 351 | Low |
| 352 | Moderate–High |
| 353 | Moderate–High |
| 354 | Low |
| 355 | Low |
| 356 | Low–Moderate |
| 357 | Unsuitable–Low |
| 358 | Low–Moderate |
| 359 | Low |
| 360 | Unsuitable |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Unsuitable–Low |
| 362 | Unsuitable–Low |
| 363 | Low–Moderate |
| 364 | Low |
| 374 | Low–Moderate |
| 375 | Unsuitable |
| 376 | Low |
| 377 | Low |
| 378 | Low–Moderate |
| 379 | Low |
| 380 | Low–Moderate |
| 381 | Low |
| 382 | Low |
| 500 | Moderate |

# 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 non-use and major rehabilitation will be required.

| MAP UNIT | INTERPRETATION |
|---|---|
| 4 | High |
| 8 | Moderate |
| 9 | Moderate |
| 11 | Low |
| 100 | High |
| 101 | High |
| 102 | High |
| 103 | High |
| 104 | Moderate |
| 105 | High |
| 106 | High |
| 107 | Moderate |
| 115 | Moderate |
| 116 | High |
| 117 | High |
| 152 | Low |
| 153 | Low |
| 154 | Low–Moderate |
| 155 | Moderate |
| 156 | Low |
| 157 | Moderate |
| 158 | Low–Moderate |
| 159 | High |
| 160 | High |
| 161 | Low–Moderate |
| 162 | High |
| 163 | High |
| 164 | Low–Moderate |
| 165 | Low–Moderate |
| 166 | High |
| 168 | Moderate |
| 169 | High |
| 170 | High |
| 171 | Moderate |
| 172 | High |
| 173 | High |
| 204 | Moderate–High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 207 | High |
| 208 | High |
| 209 | High |
| 211 | High |
| 212 | High |
| 213 | High |
| 214 | High |
| 215 | High |
| 300 | Low |
| 302 | Low |
| 304 | Low–Moderate |
| 305 | Moderate |
| 306 | Low–Moderate |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Low |
| 311 | Low |
| 312 | Moderate–High |
| 315 | Moderate–High |
| 316 | High |
| 317 | High |
| 319 | Moderate–High |
| 320 | Low |
| 321 | Moderate–High |
| 322 | Moderate–High |
| 323 | Low |
| 324 | High |
| 325 | High |
| 326 | Low |
| 327 | Low–Moderate |
| 328 | High |
| 330 | Low |
| 331 | Low–Moderate |
| 333 | Low–Moderate |
| 337 | Moderate |
| 338 | Low–Moderate |
| 339 | High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 340 | High |
| 341 | Low |
| 342 | High |
| 343 | High |
| 344 | High |
| 345 | High |
| 346 | Low |
| 347 | Low–Moderate |
| 348 | High |
| 349 | High |
| 350 | Moderate–High |
| 351 | Moderate–High |
| 352 | Low |
| 353 | Low |
| 354 | High |
| 355 | High |
| 356 | Moderate–High |
| 357 | High |
| 358 | Moderate |
| 359 | High |
| 363 | Moderate–High |
| 364 | Moderate–High |
| 374 | Moderate |
| 376 | Low–Moderate |
| 377 | Moderate–High |
| 378 | Low |
| 379 | Moderate |
| 380 | Moderate |
| 381 | Moderate–High |
| 382 | Moderate–High |
| 500 | Low |

# 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 4 | Low |
| 8 | High |
| 11 | Low |
| 100 | Moderate |
| 101 | Moderate |
| 102 | Moderate |
| 103 | Low |
| 104 | Moderate |
| 105 | Low |
| 106 | Low |
| 107 | Moderate |
| 115 | Moderate |
| 116 | Moderate |
| 117 | Moderate |
| 152 | High |
| 153 | High |
| 154 | High |
| 155 | High |
| 156 | High |
| 157 | High |
| 158 | High |
| 159 | High |
| 160 | High |
| 161 | High |
| 162 | High |
| 163 | High |
| 164 | High |
| 165 | High |
| 166 | High |
| 168 | High |
| 169 | High |
| 170 | High |
| 171 | Moderate |
| 172 | Moderate |
| 173 | Moderate |
| 204 | Low |
| 207 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 208 | Low |
| 209 | Moderate |
| 211 | Moderate |
| 212 | Moderate |
| 213 | Moderate |
| 214 | Moderate |
| 215 | Moderate |
| 300 | Low |
| 302 | Low |
| 304 | Low–Moderate |
| 305 | Low–Moderate |
| 306 | Moderate |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Low |
| 311 | Low |
| 312 | Moderate |
| 315 | Moderate |
| 316 | Moderate |
| 317 | Moderate |
| 319 | Moderate |
| 320 | Low |
| 321 | Low |
| 322 | Low |
| 323 | Moderate |
| 324 | Moderate |
| 325 | Moderate |
| 326 | Low |
| 327 | High |
| 328 | Moderate |
| 330 | Moderate |
| 331 | Low–Moderate |
| 333 | Low–Moderate |
| 337 | Low |
| 338 | Low–Moderate |
| 339 | Low |
| 340 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 341 | Low–Moderate |
| 342 | Low |
| 343 | Low |
| 344 | Low |
| 345 | Low |
| 346 | Low |
| 347 | Moderate |
| 348 | Low |
| 349 | Low |
| 350 | High |
| 351 | High |
| 352 | High |
| 353 | High |
| 354 | High |
| 355 | High |
| 356 | High |
| 357 | Moderate |
| 358 | Moderate |
| 359 | Low |
| 363 | Moderate |
| 364 | Low |
| 374 | Moderate |
| 376 | Moderate |
| 377 | Moderate |
| 378 | Moderate |
| 379 | Moderate |
| 380 | Low |
| 381 | Low |
| 382 | Low |
| 500 | Low |

# 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 4 | High |
| 8 | Moderate |
| 11 | Low |
| 100 | High |
| 101 | High |
| 102 | High |
| 103 | High |
| 104 | Moderate |
| 105 | High |
| 106 | High |
| 107 | High |
| 115 | High |
| 116 | High |
| 117 | High |
| 152 | Moderate |
| 153 | Moderate |
| 154 | Moderate |
| 155 | Moderate |
| 156 | Moderate |
| 157 | Moderate |
| 158 | High |
| 159 | Moderate |
| 160 | Moderate |
| 161 | Moderate |
| 162 | Moderate |
| 163 | Moderate |
| 164 | Moderate |
| 165 | Moderate |
| 166 | Moderate |
| 168 | Moderate |
| 169 | High |
| 170 | High |
| 171 | High |
| 172 | High |
| 173 | High |
| 204 | Moderate |
| 207 | Moderate |

| MAP UNIT | INTERPRETATION |
|---|---|
| 208 | Moderate |
| 209 | Moderate |
| 211 | High |
| 212 | High |
| 213 | High |
| 214 | High |
| 215 | High |
| 300 | Low |
| 302 | Low |
| 304 | Moderate |
| 305 | Moderate |
| 306 | Moderate–High |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Low |
| 311 | Low |
| 312 | High |
| 315 | Moderate–High |
| 316 | Moderate–High |
| 317 | Moderate–High |
| 319 | Moderate–High |
| 320 | Low–Moderate |
| 321 | Low–Moderate |
| 322 | Low–Moderate |
| 323 | Low |
| 324 | Low |
| 325 | Low |
| 326 | Low |
| 327 | Moderate |
| 328 | Moderate |
| 330 | Low–Moderate |
| 331 | Low–Moderate |
| 333 | Low |
| 337 | Low |
| 338 | Low |
| 339 | Low |
| 340 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 341 | Low |
| 342 | Low |
| 343 | Low |
| 344 | Low |
| 345 | Low |
| 346 | Low |
| 347 | Low–Moderate |
| 348 | Low |
| 349 | Low |
| 350 | Moderate |
| 351 | Moderate |
| 352 | Moderate–High |
| 353 | Moderate–High |
| 354 | Moderate |
| 355 | Low |
| 356 | Low |
| 357 | Low |
| 358 | Low |
| 359 | Low |
| 363 | Low |
| 364 | Low |
| 374 | Moderate |
| 377 | Moderate |
| 378 | Moderate |
| 379 | Moderate |
| 380 | Low |
| 381 | Low |
| 382 | Low |
| 500 | Low |

# 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Poor |
| 2 | Poor–Moderate |
| 3 | Poor |
| 4 | Moderate |
| 5 | — |
| 6 | Poor |
| 7 | — |
| 8 | Well |
| 9 | Moderate |
| 10 | — |
| 11 | Well |
| 12 | Poor |
| 13 | Poor–Moderate |
| 14 | — |
| 15 | Poor |
| 100 | Moderate–Well |
| 101 | Moderate |
| 102 | Moderate |
| 103 | Moderate |
| 104 | Moderate–Well |
| 105 | Moderate–Well |
| 106 | Moderate–Well |
| 107 | Well |
| 108 | Poor |
| 109 | Poor |
| 110 | Poor |
| 111 | Poor |
| 112 | Poor |
| 113 | Poor |
| 115 | Well |
| 116 | Moderate–Well |
| 117 | Moderate–Well |
| 118 | Poor–Moderate |
| 119 | Poor–Moderate |
| 120 | Moderate |
| 152 | Well |
| 153 | Well |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Moderate |
| 155 | Moderate |
| 156 | Well |
| 157 | Moderate |
| 158 | Moderate–Well |
| 159 | Poor |
| 160 | Moderate |
| 161 | Low–Moderate |
| 162 | Low |
| 163 | Low |
| 164 | Low–Moderate |
| 165 | Low |
| 166 | Low |
| 167 | Low–Moderate |
| 168 | Low–Moderate |
| 169 | Low |
| 170 | Low |
| 171 | Well |
| 172 | Moderate |
| 173 | Moderate |
| 200 | Low |
| 201 | Low |
| 202 | Low |
| 203 | Low |
| 204 | Moderate |
| 205 | Low |
| 206 | Low |
| 207 | Low–Moderate |
| 208 | Low–Moderate |
| 209 | Low–Moderate |
| 210 | Low |
| 211 | Well |
| 212 | Moderate |
| 213 | Moderate |
| 214 | Moderate |
| 215 | Moderate |
| 300 | Well |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Moderate–Well |
| 302 | Moderate–Well |
| 303 | Moderate–Well |
| 304 | Well |
| 305 | Well |
| 306 | Well |
| 307 | Moderate–Well |
| 308 | Moderate–Well |
| 309 | Well |
| 310 | Moderate |
| 311 | Well |
| 312 | Well |
| 313 | Moderate–Well |
| 314 | Moderate–Well |
| 315 | Well |
| 316 | Moderate |
| 317 | Moderate |
| 318 | Moderate |
| 319 | Moderate |
| 320 | Well |
| 321 | Moderate |
| 322 | Moderate |
| 323 | Well |
| 324 | Moderate–Well |
| 325 | Moderate–Well |
| 326 | Well |
| 327 | Well |
| 328 | Moderate |
| 329 | Moderate |
| 330 | Well |
| 331 | Moderate–Well |
| 332 | Moderate |
| 333 | Well |
| 334 | Low |
| 335 | Low |
| 337 | Moderate–Well |
| 338 | Well |
| 339 | Moderate–Well |
| 340 | Moderate–Well |
| 341 | Well |
| 342 | Moderate–Well |
| 343 | Moderate–Well |
| 344 | Moderate–Well |
| 345 | Moderate–Well |
| 346 | Well |
| 347 | Well |
| 348 | Moderate–Well |
| 349 | Moderate–Well |
| 350 | Well |
| 351 | Well |
| 352 | Well |
| 353 | Well |
| 354 | Well |
| 355 | Well |
| 356 | Well |
| 357 | Moderate |
| 358 | Well |
| 359 | Moderate |
| 360 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Moderate |
| 362 | Low–Moderate |
| 363 | Well |
| 364 | Well |
| 374 | Well |
| 375 | Moderate |
| 376 | Well |
| 377 | Moderate–Well |
| 378 | Well |
| 379 | Well |
| 380 | Well |
| 381 | Moderate |
| 382 | Moderate |
| 500 | Well |

# 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. 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 4 | Poor |
| 8 | Moderate–Poor |
| 11 | Poor |
| 100 | Moderate |
| 101 | Poor |
| 102 | Poor |
| 103 | Poor |
| 104 | Moderate–Well |
| 105 | Poor |
| 106 | Poor |
| 107 | Moderate–Well |
| 115 | Moderate–Well |
| 116 | Poor |
| 117 | Poor |
| 152 | Moderate–Well |
| 153 | Moderate–Well |
| 154 | Poor |
| 155 | Poor |
| 156 | Moderate–Well |
| 157 | Poor |
| 158 | Poor–Moderate |
| 159 | Poor |
| 160 | Poor |
| 161 | Moderate–Well |
| 162 | Moderate–Well |
| 163 | Poor |
| 164 | Moderate–Well |
| 165 | Moderate–Well |
| 166 | Poor |
| 168 | Moderate–Well |
| 169 | Poor |
| 170 | Poor |
| 171 | Moderate–Well |
| 172 | Poor |
| 173 | Poor |
| 204 | Poor |
| 207 | Poor |

| MAP UNIT | INTERPRETATION |
|---|---|
| 208 | Poor |
| 209 | Poor |
| 211 | Poor |
| 212 | Poor |
| 213 | Poor |
| 214 | Poor |
| 215 | Poor |
| 300 | Poor |
| 302 | Poor–Moderate |
| 304 | Poor–Moderate |
| 305 | Poor |
| 306 | Poor–Moderate |
| 307 | Poor |
| 308 | Poor |
| 309 | Poor |
| 311 | Poor |
| 312 | Poor–Moderate |
| 315 | Poor–Moderate |
| 316 | Poor |
| 317 | Poor |
| 319 | Poor |
| 320 | Poor–Moderate |
| 321 | Poor |
| 322 | Poor |
| 323 | Poor–Moderate |
| 324 | Poor |
| 325 | Poor |
| 326 | Poor |
| 327 | Poor–Moderate |
| 328 | Poor |
| 330 | Poor–Moderate |
| 331 | Poor |
| 333 | Poor–Moderate |
| 337 | Poor |
| 338 | Moderate |
| 339 | Poor |
| 340 | Poor |

| MAP UNIT | INTERPRETATION |
|---|---|
| 341 | Moderate |
| 342 | Poor |
| 343 | Poor |
| 344 | Poor |
| 345 | Poor |
| 346 | Poor |
| 347 | Poor–Moderate |
| 348 | Poor |
| 349 | Poor |
| 350 | Poor |
| 351 | Poor |
| 352 | Moderate |
| 353 | Moderate |
| 354 | Poor |
| 355 | Poor |
| 356 | Moderate |
| 357 | Poor |
| 358 | Poor–Moderate |
| 359 | Poor |
| 363 | Poor–Moderate |
| 364 | Poor |
| 374 | Poor |
| 376 | Poor–Moderate |
| 377 | Poor |
| 378 | Moderate |
| 379 | Moderate |
| 380 | Moderate |
| 381 | Poor |
| 382 | Poor |
| 500 | Poor |

# 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 30 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Unsuited |
| 2 | Suited |
| 3 | Suited |
| 4 | Suited |
| 5 | — |
| 6 | Unsuited |
| 7 | — |
| 8 | Unsuited |
| 9 | Unsuited |
| 10 | — |
| 11 | Unsuited |
| 12 | Unsuited |
| 13 | Unsuited |
| 14 | — |
| 15 | Unsuited |
| 100 | Suited |
| 101 | Suited |
| 102 | Suited |
| 103 | Suited |
| 104 | Unsuited |
| 105 | Suited |
| 106 | Suited |
| 107 | Suited |
| 108 | Unsuited |
| 109 | Unsuited |
| 110 | Unsuited |
| 111 | Unsuited |
| 112 | Unsuited |
| 113 | Unsuited |
| 115 | Suited |
| 116 | Suited |
| 117 | Suited |
| 118 | Unsuited |
| 119 | Unsuited |
| 120 | Unsuited |
| 152 | Suited |
| 153 | Unsuited |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Unsuited |
| 155 | Unsuited |
| 156 | Suited |
| 157 | Unsuited |
| 158 | Unsuited |
| 159 | Unsuited |
| 160 | Unsuited |
| 161 | Unsuited |
| 162 | Unsuited |
| 163 | Unsuited |
| 164 | Unsuited |
| 165 | Unsuited |
| 166 | Unsuited |
| 167 | Unsuited |
| 168 | Unsuited |
| 169 | Unsuited |
| 170 | Unsuited |
| 171 | Suited |
| 172 | Suited |
| 173 | Suited |
| 200 | Unsuited |
| 201 | Unsuited |
| 202 | Unsuited |
| 203 | Unsuited |
| 204 | Unsuited |
| 205 | Unsuited |
| 206 | Unsuited |
| 207 | Unsuited |
| 208 | Unsuited |
| 209 | Unsuited |
| 210 | Unsuited |
| 211 | Unsuited |
| 212 | Unsuited |
| 213 | Unsuited |
| 214 | Unsuited |
| 215 | Unsuited |
| 300 | Unsuited |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Unsuited |
| 302 | Unsuited |
| 303 | Unsuited |
| 304 | Unsuited |
| 305 | Unsuited |
| 306 | Suited |
| 307 | Unsuited |
| 308 | Unsuited |
| 309 | Unsuited |
| 310 | Unsuited |
| 311 | Unsuited |
| 312 | Unsuited |
| 313 | Unsuited |
| 314 | Unsuited |
| 315 | Unsuited |
| 316 | Unsuited |
| 317 | Unsuited |
| 318 | Unsuited |
| 319 | Unsuited |
| 320 | Unsuited |
| 321 | Unsuited |
| 322 | Unsuited |
| 323 | Unsuited |
| 324 | Unsuited |
| 325 | Unsuited |
| 326 | Unsuited |
| 327 | Unsuited |
| 328 | Unsuited |
| 329 | Unsuited |
| 330 | Unsuited |
| 331 | Unsuited |
| 332 | Unsuited |
| 333 | Unsuited |
| 334 | Unsuited |
| 335 | Unsuited |
| 337 | Unsuited |
| 338 | Unsuited |
| 339 | Unsuited |
| 340 | Unsuited |
| 341 | Unsuited |
| 342 | Unsuited |
| 343 | Unsuited |
| 344 | Unsuited |
| 345 | Unsuited |
| 346 | Unsuited |
| 347 | Unsuited |
| 348 | Unsuited |
| 349 | Unsuited |
| 350 | Unsuited |
| 351 | Unsuited |
| 352 | Unsuited |
| 353 | Unsuited |
| 354 | Unsuited |
| 355 | Unsuited |
| 356 | Unsuited |
| 357 | Unsuited |
| 358 | Unsuited |
| 359 | Unsuited |
| 360 | Unsuited |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Unsuited |
| 362 | Unsuited |
| 363 | Unsuited |
| 364 | Unsuited |
| 374 | Unsuited |
| 375 | Unsuited |
| 376 | Unsuited |
| 377 | Unsuited |
| 378 | Unsuited |
| 379 | Unsuited |
| 380 | Unsuited |
| 381 | Unsuited |
| 382 | Unsuited |
| 500 | Unsuited |

# 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 thick and has no more than a 5-foot overburden.

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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Suited |
| 2 | Unsuited |
| 3 | Unsuited |
| 4 | Unsuited |
| 5 | — |
| 6 | Unsuited |
| 7 | — |
| 8 | Unsuited |
| 9 | Unsuited |
| 10 | — |
| 11 | Suited |
| 12 | Unsuited |
| 13 | Unsuited |
| 14 | — |
| 15 | Unsuited |
| 100 | Unsuited |
| 101 | Unsuited |
| 102 | Unsuited |
| 103 | Unsuited |
| 104 | Unsuited |
| 105 | Unsuited |
| 106 | Unsuited |
| 107 | Unsuited |
| 108 | Unsuited |
| 109 | Unsuited |
| 110 | Unsuited |
| 111 | Unsuited |
| 112 | Unsuited |
| 113 | Unsuited |
| 115 | Unsuited |
| 116 | Unsuited |
| 117 | Unsuited |
| 118 | Unsuited |
| 119 | Unsuited |
| 120 | Unsuited |
| 152 | Unsuited |
| 153 | Unsuited |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Unsuited |
| 155 | Unsuited |
| 156 | Unsuited |
| 157 | Unsuited |
| 158 | Unsuited |
| 159 | Unsuited |
| 160 | Unsuited |
| 161 | Unsuited |
| 162 | Unsuited |
| 163 | Unsuited |
| 164 | Unsuited |
| 165 | Unsuited |
| 166 | Unsuited |
| 167 | Unsuited |
| 168 | Unsuited |
| 169 | Unsuited |
| 170 | Unsuited |
| 171 | Unsuited |
| 172 | Unsuited |
| 173 | Unsuited |
| 200 | Unsuited |
| 201 | Unsuited |
| 202 | Unsuited |
| 203 | Unsuited |
| 204 | Unsuited |
| 205 | Unsuited |
| 206 | Unsuited |
| 207 | Unsuited |
| 208 | Unsuited |
| 209 | Unsuited |
| 210 | Unsuited |
| 211 | Unsuited |
| 212 | Unsuited |
| 213 | Unsuited |
| 214 | Unsuited |
| 215 | Unsuited |
| 300 | Possible |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Possible |
| 302 | Possible |
| 303 | Possible |
| 304 | Possible |
| 305 | Possible |
| 306 | Unsuited |
| 307 | Unsuited |
| 308 | Unsuited |
| 309 | Possible |
| 310 | Possible |
| 311 | Possible |
| 312 | Unsuited |
| 313 | Unsuited |
| 314 | Unsuited |
| 315 | Unsuited |
| 316 | Unsuited |
| 317 | Unsuited |
| 318 | Unsuited |
| 319 | Unsuited |
| 320 | Unsuited |
| 321 | Unsuited |
| 322 | Unsuited |
| 323 | Unsuited |
| 324 | Unsuited |
| 325 | Unsuited |
| 326 | Possible |
| 327 | Unsuited |
| 328 | Unsuited |
| 329 | Unsuited |
| 330 | Possible |
| 331 | Possible |
| 332 | Possible |
| 333 | Possible |
| 334 | Possible |
| 335 | Possible |
| 337 | Unsuited |
| 338 | Suited |
| 339 | Unsuited |
| 340 | Unsuited |
| 341 | Unsuited |
| 342 | Possible |
| 343 | Possible |
| 344 | Possible |
| 345 | Possible |
| 346 | Suited |
| 347 | Unsuited |
| 348 | Unsuited |
| 349 | Unsuited |
| 350 | Unsuited |
| 351 | Unsuited |
| 352 | Unsuited |
| 353 | Unsuited |
| 354 | Unsuited |
| 355 | Unsuited |
| 356 | Unsuited |
| 357 | Unsuited |
| 358 | Unsuited |
| 359 | Possible |
| 360 | Possible |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Possible |
| 362 | Possible |
| 363 | Possible |
| 364 | Possible |
| 374 | Possible |
| 375 | Possible |
| 376 | Possible |
| 377 | Possible |
| 378 | Possible |
| 379 | Possible |
| 380 | Unsuited |
| 381 | Unsuited |
| 382 | Unsuited |
| 500 | Possible |

# 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 30 percent. This layer is at least 2 feet thick.

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

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Unsuited |
| 2 | Suited |
| 3 | Suited |
| 4 | Unsuited |
| 5 | — |
| 6 | Unsuited |
| 7 | — |
| 8 | Unsuited |
| 9 | Unsuited |
| 10 | Unsuited |
| 11 | Unsuited |
| 12 | Unsuited |
| 13 | Unsuited |
| 14 | — |
| 15 | Unsuited |
| 100 | Suited |
| 101 | Suited |
| 102 | Suited |
| 103 | Suited |
| 104 | Suited |
| 105 | Suited |
| 106 | Suited |
| 107 | Suited |
| 108 | Unsuited |
| 109 | Unsuited |
| 110 | Unsuited |
| 111 | Unsuited |
| 112 | Unsuited |
| 113 | Unsuited |
| 115 | Unsuited |
| 116 | Unsuited |
| 117 | Unsuited |
| 118 | Unsuited |
| 119 | Unsuited |
| 120 | Unsuited |
| 152 | Unsuited |
| 153 | Unsuited |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Unsuited |
| 155 | Unsuited |
| 156 | Unsuited |
| 157 | Unsuited |
| 158 | Unsuited |
| 159 | Unsuited |
| 160 | Unsuited |
| 161 | Unsuited |
| 162 | Unsuited |
| 163 | Unsuited |
| 164 | Unsuited |
| 165 | Unsuited |
| 166 | Unsuited |
| 167 | Unsuited |
| 168 | Unsuited |
| 169 | Unsuited |
| 170 | Unsuited |
| 171 | Suited |
| 172 | Suited |
| 173 | Suited |
| 200 | Unsuited |
| 201 | Unsuited |
| 202 | Unsuited |
| 203 | Unsuited |
| 204 | Unsuited |
| 205 | Unsuited |
| 206 | Unsuited |
| 207 | Unsuited |
| 208 | Unsuited |
| 209 | Unsuited |
| 210 | Unsuited |
| 211 | Unsuited |
| 212 | Unsuited |
| 213 | Unsuited |
| 214 | Unsuited |
| 215 | Unsuited |
| 300 | Unsuited |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Unsuited |
| 302 | Unsuited |
| 303 | Unsuited |
| 304 | Unsuited |
| 305 | Unsuited |
| 306 | Unsuited |
| 307 | Unsuited |
| 308 | Unsuited |
| 309 | Unsuited |
| 310 | Unsuited |
| 311 | Unsuited |
| 312 | Unsuited |
| 313 | Unsuited |
| 314 | Unsuited |
| 315 | Unsuited |
| 316 | Unsuited |
| 317 | Unsuited |
| 318 | Unsuited |
| 319 | Unsuited |
| 320 | Unsuited |
| 321 | Unsuited |
| 322 | Unsuited |
| 323 | Unsuited |
| 324 | Unsuited |
| 325 | Unsuited |
| 326 | Unsuited |
| 327 | Unsuited |
| 328 | Unsuited |
| 329 | Unsuited |
| 330 | Unsuited |
| 331 | Unsuited |
| 332 | Unsuited |
| 333 | Unsuited |
| 334 | Unsuited |
| 335 | Unsuited |
| 337 | Unsuited |
| 338 | Unsuited |
| 339 | Unsuited |
| 340 | Unsuited |
| 341 | Unsuited |
| 342 | Unsuited |
| 343 | Unsuited |
| 344 | Unsuited |
| 345 | Unsuited |
| 346 | Unsuited |
| 347 | Unsuited |
| 348 | Unsuited |
| 349 | Unsuited |
| 350 | Unsuited |
| 351 | Unsuited |
| 352 | Unsuited |
| 353 | Unsuited |
| 354 | Unsuited |
| 355 | Unsuited |
| 356 | Unsuited |
| 357 | Unsuited |
| 358 | Unsuited |
| 359 | Unsuited |
| 360 | Unsuited |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Unsuited |
| 362 | Unsuited |
| 363 | Unsuited |
| 364 | Unsuited |
| 374 | Unsuited |
| 375 | Unsuited |
| 376 | Unsuited |
| 377 | Unsuited |
| 378 | Unsuited |
| 379 | Unsuited |
| 380 | Unsuited |
| 381 | Unsuited |
| 382 | Unsuited |
| 500 | Unsuited |

# SUITABILITY OF BEDROCK FOR ROAD ROCK

This interpretation indicates the general stability 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 purpose 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Unsuited |
| 2 | Unsuited |
| 3 | Variable |
| 4 | Fair |
| 5 | Unsuited–Poor |
| 6 | Good |
| 7 | Good |
| 8 | Fair–Good |
| 9 | Good |
| 10 | Fair–Good |
| 11 | Fair |
| 12 | Good |
| 13 | Good |
| 14 | — |
| 15 | Unsuited |
| 100 | Unsuited |
| 101 | Unsuited |
| 102 | Unsuited |
| 103 | Unsuited |
| 104 | Unsuited |
| 105 | Unsuited |
| 106 | Unsuited |
| 107 | Unsuited |
| 108 | Unsuited |
| 109 | Poor |
| 110 | Unsuited–Poor |
| 111 | Poor |
| 112 | Poor |
| 113 | Unsuited–Poor |
| 115 | Unsuited |
| 116 | Unsuited |
| 117 | Unsuited |
| 118 | Poor |
| 119 | Poor |
| 120 | Poor |
| 152 | Fair–Good |
| 153 | Good |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Good |
| 155 | Good |
| 156 | Fair–Good |
| 157 | Good |
| 158 | Good |
| 159 | Fair–Good |
| 160 | Fair–Good |
| 161 | Good |
| 162 | Good |
| 163 | Good |
| 164 | Good |
| 165 | Good |
| 166 | Good |
| 167 | Good |
| 168 | Good |
| 169 | Good |
| 170 | Good |
| 171 | Unsuited |
| 172 | Unsuited |
| 173 | Unsuited |
| 200 | Good |
| 201 | Good |
| 202 | Good |
| 203 | Good |
| 204 | Good |
| 205 | Good |
| 206 | Good |
| 207 | Good |
| 208 | Good |
| 209 | Good |
| 210 | Good |
| 211 | Good |
| 212 | Good |
| 213 | Good |
| 214 | Good |
| 215 | Good |
| 300 | Good |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Good |
| 302 | Good |
| 303 | Good |
| 304 | Good |
| 305 | Good |
| 306 | Fair–Good |
| 307 | Fair–Good |
| 308 | Fair–Good |
| 309 | Poor–Fair |
| 310 | Poor–Fair |
| 311 | Poor–Fair |
| 312 | Poor |
| 313 | Poor |
| 314 | Poor |
| 315 | Poor |
| 316 | Poor |
| 317 | Poor |
| 318 | Poor–Fair |
| 319 | Poor |
| 320 | Fair–Good |
| 321 | Good |
| 322 | Good |
| 323 | Good |
| 324 | Good |
| 325 | Good |
| 326 | Good |
| 327 | Poor |
| 328 | Poor |
| 329 | Poor |
| 330 | Good |
| 331 | Fair–Good |
| 332 | Fair–Good |
| 333 | Good |
| 334 | Good |
| 335 | Good |
| 337 | Good |
| 338 | Fair–Good |
| 339 | Good |
| 340 | Good |
| 341 | Good |
| 342 | Good |
| 343 | Good |
| 344 | Fair |
| 345 | Fair |
| 346 | — |
| 347 | Fair |
| 348 | Fair |
| 349 | Fair |
| 350 | Fair |
| 351 | Fair |
| 352 | Fair |
| 353 | Fair |
| 354 | Fair |
| 355 | Fair–Good |
| 356 | Fair–Good |
| 357 | Fair–Good |
| 358 | Fair |
| 359 | Good |
| 360 | Fair–Good |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Fair–Good |
| 362 | — |
| 363 | Fair |
| 364 | Poor–Fair |
| 374 | Poor–Fair |
| 375 | Poor–Fair |
| 376 | Fair |
| 377 | Fair |
| 378 | Fair |
| 379 | Fair |
| 380 | — |
| 381 | — |
| 382 | — |
| 500 | — |

# 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 fill slope. Considered are intitial and subsequent failures caused by construction, erosion and additional sidecast during maintenance. Failure results 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 fill slope 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.

| MAP UNIT | INTERPRETATION |
|---|---|
| 1 | Moderate |
| 2 | High |
| 3 | High |
| 4 | High |
| 5 | — |
| 6 | Low–Moderate |
| 7 | — |
| 8 | Low |
| 9 | Low–Moderate |
| 10 | — |
| 11 | Moderate |
| 12 | Moderate |
| 13 | Moderate |
| 14 | — |
| 15 | High |
| 100 | Moderate |
| 101 | High |
| 102 | High |
| 103 | High |
| 104 | Moderate |
| 105 | High |
| 106 | High |
| 107 | Low |
| 108 | High |
| 109 | High |
| 110 | High |
| 111 | High |
| 112 | High |
| 113 | High |
| 115 | Low |
| 116 | Moderate |
| 117 | Moderate |
| 118 | High |
| 119 | High |
| 120 | Moderate |
| 152 | Low |
| 153 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 154 | Low–Moderate |
| 155 | Low–Moderate |
| 156 | Low |
| 157 | Moderate |
| 158 | Low |
| 159 | Moderate |
| 160 | Low |
| 161 | Moderate |
| 162 | Moderate |
| 163 | Moderate |
| 164 | Moderate |
| 165 | Moderate |
| 166 | Moderate |
| 167 | Moderate–High |
| 168 | Moderate |
| 169 | Moderate–High |
| 170 | Moderate–High |
| 171 | Moderate |
| 172 | High |
| 173 | High |
| 200 | High |
| 201 | High |
| 202 | High |
| 203 | High |
| 204 | Moderate |
| 205 | High |
| 206 | High |
| 207 | High |
| 208 | High |
| 209 | High |
| 210 | Low–Moderate |
| 211 | Moderate |
| 212 | Moderate–High |
| 213 | Moderate–High |
| 214 | Moderate |
| 215 | Moderate |
| 300 | Low |

| MAP UNIT | INTERPRETATION |
|---|---|
| 301 | Low–Moderate |
| 302 | Low |
| 303 | Moderate |
| 304 | Low |
| 305 | Moderate |
| 306 | Low |
| 307 | Moderate |
| 308 | Moderate |
| 309 | Moderate |
| 310 | Moderate |
| 311 | Low–Moderate |
| 312 | Low–Moderate |
| 313 | Moderate–High |
| 314 | Moderate–High |
| 315 | Moderate |
| 316 | Moderate |
| 317 | Moderate |
| 318 | Moderate |
| 319 | Moderate–High |
| 320 | Moderate |
| 321 | Moderate–High |
| 322 | Moderate–High |
| 323 | Low–Moderate |
| 324 | Moderate |
| 325 | Moderate |
| 326 | Low–Moderate |
| 327 | Moderate |
| 328 | Moderate |
| 329 | Moderate |
| 330 | Low |
| 331 | Low |
| 332 | Moderate–High |
| 333 | Moderate |
| 334 | High |
| 335 | High |
| 337 | Moderate |
| 338 | Low |
| 339 | Moderate–High |
| 340 | Moderate–High |
| 341 | Low |
| 342 | Moderate |
| 343 | Moderate |
| 344 | Moderate–High |
| 345 | Moderate–High |
| 346 | Low |
| 347 | Low–Moderate |
| 348 | Moderate |
| 349 | Moderate |
| 350 | Moderate |
| 351 | Moderate |
| 352 | Low |
| 353 | Low |
| 354 | Moderate |
| 355 | Moderate |
| 356 | Low |
| 357 | Moderate–High |
| 358 | Moderate |
| 359 | High |
| 360 | High |

| MAP UNIT | INTERPRETATION |
|---|---|
| 361 | Moderate–High |
| 362 | High |
| 363 | Moderate |
| 364 | Low–Moderate |
| 374 | Low–Moderate |
| 375 | Moderate–High |
| 376 | Low–Moderate |
| 377 | Moderate–High |
| 378 | Low–Moderate |
| 379 | Low–Moderate |
| 380 | Moderate |
| 381 | Moderate |
| 382 | Moderate–High |
| 500 | Low |

# SOIL MOISTURE

The understanding of soil moisture and the use of available data on soil moisture is very important to the use and management of forest soils.

Knowledge of Soil Moisture Is Important For The Following Reasons:

1. Soil moisture is one of the most important factors which affect the rate of tree growth.
2. The success of erosion control plantings is closely related to available moisture at the time of germination.
3. Moisture levels determine the ease of which soil compaction can occur and the resultant loss of soil productivity.
4. Engineering properties of soils such as shear strength and compaction are greatly affected by moisture levels.

Under field conditions moisture levels and the tension at which moisture is held in the soil are easily measured. Speedy moisture meters will quickly measure the amount of moisture in a soil. Tensionmeters will measure the ease at which plants may obtain moisture from the soil.

Data Available:

1. Soil moisture curves have been developed for 14 different areas on the Forest. Those data follow immediately (Figures 12 through 20) after this narrative and show approximate soil moisture percentage by months and years as indicated by the legend.

Legend: 1977
1976
1975
1974
1973

2. Moisture tension is measured in atmospheres of tension—the standard atmosphere being 14.7 pounds per square inch. Figure 21 shows the general relationship between atmospheres of tension and percentage of moisture for different textures. Moisture tension data are available for all of the major soils on the Forest. The data are located in the table on physical properties of soils which follow (Table 12). Moisture levels are reported in the physical properties section in 0.1, 1/3, 1.0, 5.0, 15 atmospheres. Field capacity is the amount of moisture that soils can hold at 1/3 atmosphere of tension. The wilting point is approximately 15 atmospheres, but the growth of most plants is greatly reduced when tensions are greater than 1 atmosphere.

3. Moisture deficit tables 3–16 have been developed for estimating the chance of having adequate soil moisture to successfully plant trees. These data are available for four broad areas of the Forest with various combinations of aspects and slopes. These tables follow after the soil moisture curves at the end of the moisture section.

4. Bulk density data have been collected for all major soil types on the Forest. The data are available in the tables on physical properties of soil which follow. Bulk density x percent moisture x 12 equals inches of water per foot of soil.

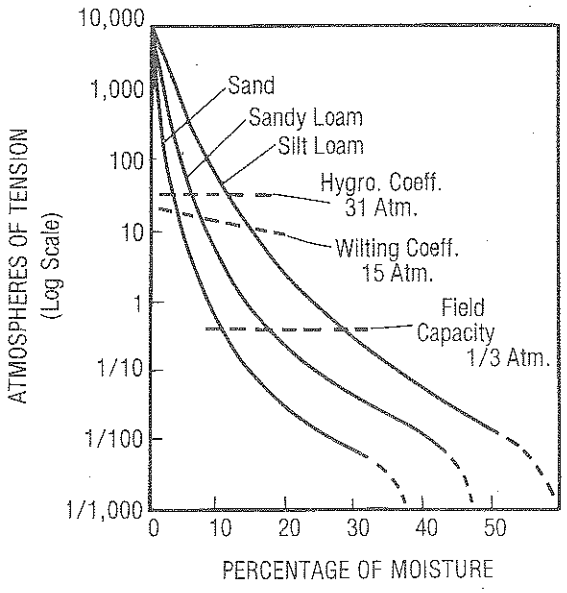



Figure 21[1] Tension curves for three representative mineral soils. The atmospneres of tension are plotted against percentage of soil moisture present. Note the rapid drop in tension as the amounts of soil moisture increase and the films thicken. The silt-loam has the greatest water capacity.

[1] From Buckman, H.O., and N.C. Brady. 1969. The Nature and Properties of Soils. The Macmillan Company, New York, New York. 653pp.

# TABLE 2—PHYSICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | Bulk Density | % Rock Greater Than 2 mm | PERCENT MOISTURE BY WEIGHT Moisture Tensions (ATM) 0.1 | 1/3 | 1.0 | 5.0 | 15.0 |
|---|---|---|---|---|---|---|---|---|---|
| 100 | NW¼, SE¼, Sec. 26, T.6S., R.6E. | 0–9″ | 1.00 | 47.96 | 46.66 | 38.24 | 31.49 | 23.03 | 18.92 |
| | | 9–22″ | 1.04 | 38.86 | 44.73 | 36.96 | 31.08 | 23.45 | 19.52 |
| 100 | NE¼, SE¼, Sec. 14, T.6S., R.6E. | 0–9″ | 0.89 | 31.97 | 39.69 | 33.77 | 30.06 | 22.85 | 18.71 |
| | | 9–21″ | 1.26 | 5.79 | 38.95 | 32.22 | 27.31 | 21.51 | 18.92 |
| 101 | NW¼, SE¼, Sec. 12, T.6S., R.6E. | 0–5″ | 1.15 | 14.15 | 46.62 | 41.30 | 35.23 | 27.52 | 23.26 |
| | | 5–15″ | 1.28 | 7.67 | 45.17 | 41.32 | 34.50 | 27.98 | 23.85 |
| 104 | SE¼, NE¼, Sec. 36, T.6S., R.6E. | 0–15″ | 0.86 | 44.48 | 44.09 | 36.95 | 30.33 | 21.76 | 16.97 |
| | | 15–25″ | 0.98 | 35.75 | 46.44 | 38.15 | 32.06 | 25.32 | 20.51 |
| 107 | SW¼, NW¼, Sec. 21, T.4S., R.5E. | 0–8″ | 1.10 | 38.86 | 43.30 | 36.44 | 30.93 | 23.80 | 20.01 |
| | | 8–15″ | 1.09 | 27.08 | 38.32 | 32.74 | 28.52 | 22.61 | 19.74 |
| 108 | NW¼, SW¼, Sec. 11, T.7S., R.5E. | 0–12″ | 0.97 | 33.21 | 47.56 | 42.14 | 35.91 | 27.69 | 23.01 |
| | | 12–20″ | 0.94 | 28.92 | 50.25 | 46.50 | 32.49 | 24.83 | 20.85 |
| 115 | SE¼, NW¼, Sec. 2, T.1S., R.9E. | 1–6″ | 0.76 | 29.22 | 38.65 | 30.00 | 19.03 | 10.62 | 7.12 |
| | | 6–12″ | 1.06 | 25.09 | 39.49 | 32.48 | 21.99 | 13.99 | 9.49 |
| 115 | NE¼, SW¼, Sec. 2, T.1N., R.9E. | 0–9″ | 1.09 | 39.81 | 32.90 | 26.31 | | | 12.02 |
| | | 9–16″ | 1.00 | 26.86 | 31.30 | 25.11 | | | 11.88 |
| 119 | NE¼, NW¼, Sec. 22, T.4S., R.11E. | 0–10″ | 1.39 | 16.35 | 31.67 | 23.95 | | | 9.97 |
| | | 10–29″ | 1.35 | 5.25 | 28.69 | 21.50 | | | 9.42 |
| 153 | SW¼, NW¼, Sec. 28, T.3S., R.12E. | 0–10″ | 1.32 | 5.88 | 29.18 | 18.94 | | | 5.86 |
| | | 10–21″ | 1.20 | 7.59 | 26.93 | 17.11 | | | 5.61 |
| 156 | NW¼, NE¼, Sec. 26, T.3S., R.11E. | 0–3″ | 1.37 | 7.50 | 32.00 | 19.39 | | | 5.87 |
| | | 3–15″ | 1.04 | 5.92 | 27.52 | 20.51 | | | 5.78 |

## TABLE 2—PHYSICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | Bulk Density | % Rock Greater Than 2 mm | PERCENT MOISTURE BY WEIGHT Moisture Tensions (ATM) 0.1 | 1/3 | 1.0 | 5.0 | 15.0 |
|---|---|---|---|---|---|---|---|---|---|
| 156 | SE¼ , SW¼ , Sec. 28, T.2S., R.11E. | 0–8″ | 1.37 | 3.72 | 28.59 | 23.43 | 14.53 | 8.20 | 5.44 |
| | | 8–19″ | 1.04 | 3.19 | 26.58 | 22.87 | 14.54 | 8.43 | 5.84 |
| 156 | NW¼ , SE¼ , Sec. 12, T.2S., R.11E. | 0–5″ | 1.30 | 11.17 | 33.31 | 28.87 | 15.88 | 9.01 | 6.27 |
| | | 5–14″ | 1.02 | 7.15 | 35.07 | 26.60 | 15.46 | 9.13 | 6.38 |
| 157 | SE¼ , NW¼ , Sec. 23, T.1S., R.11E. | 0–7″ | 1.23 | 29.18 | 34.85 | 25.39 | | | 8.09 |
| | | 7–15″ | 1.16 | 23.17 | 29.36 | 22.13 | | | 7.46 |
| 161 | NW¼ , SW¼ , Sec. 1, T.2S., R.10E. | 0–5″ | 1.05 | 8.89 | 39.48 | 19.14 | | | 6.15 |
| | | 5–15″ | 0.94 | 14.77 | 41.17 | 24.17 | | | 5.98 |
| 168 | NW¼ , SE¼ , Sec. 15, T.1S., R.10E. | 0–6″ | 1.24 | 24.62 | 33.30 | 18.72 | | | 6.63 |
| | | 6–18″ | 1.19 | 24.77 | 34.71 | 21.46 | | | 6.58 |
| 171 | NW¼ , NW¼ , Sec. 36, T.1S., R.5E. | 0–3″ | 0.47 | | 83.00 | 76.00 | | | 38.00 |
| | | 3–7″ | 0.71 | | 60.00 | 57.00 | | | 22.00 |
| | | 7–13″ | 0.72 | | 59.00 | 53.00 | | | 18.00 |
| 300 | NW¼ , SE¼ , Sec. 14, T.9S., R.8E. | 0–8″ | 0.63 | 28.35 | 65.69 | 50.21 | 31.96 | 21.53 | 21.10 |
| | | 8–16″ | 0.44 | 52.70 | 60.69 | 49.81 | 41.52 | 31.85 | 29.75 |
| 302 | SE¼ , NW¼ , Sec. 16, T.9S., R.8E. | 0–13″ | 0.69 | 39.51 | 43.39 | 35.32 | 27.69 | 22.08 | 20.20 |
| | | 13–23″ | 0.75 | 53.14 | 46.28 | 41.25 | 31.84 | 25.85 | 22.04 |
| 304 | SW¼ , NW¼ , Sec. 13, T.6S., R.7E. | 0–13″ | 0.92 | 44.43 | 51.48 | 41.85 | 30.12 | 21.16 | 18.59 |
| | | 13–25″ | 0.94 | 30.55 | 57.40 | 50.80 | 30.89 | 21.32 | 17.83 |
| 304 | SW¼ , SE¼ , Sec. 7, T.6S., R.8E. | 0–9″ | 0.95 | 46.74 | 54.38 | 51.04 | 30.19 | 20.47 | 16.17 |
| | | 9–25″ | 0.91 | 37.70 | 52.83 | 49.41 | 32.15 | 23.98 | 20.68 |
| 304 | NE¼ , SW¼ , Sec. 35, T.4S., R.8E. | 0–8″ | 1.06 | 34.65 | 46.09 | 33.80 | 23.52 | 17.17 | 13.35 |
| | | 8–16″ | 0.68 | 38.74 | 39.80 | 30.68 | 23.83 | 18.83 | 13.57 |
| 304 | NW¼ , SW¼ , Sec. 26, T.4S., R8½ E. | 0–9″ | 0.96 | 21.66 | 56.11 | 38.63 | 26.94 | 19.32 | 13.29 |
| | | 9–28″ | 1.02 | 29.62 | 50.90 | 41.53 | 32.94 | 26.08 | 20.58 |

## TABLE 2—PHYSICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | Bulk Density | % Rock Greater Than 2 mm | PERCENT MOISTURE BY WEIGHT Moisture Tensions (ATM) 0.1 | 1/3 | 1.0 | 5.0 | 15.0 |
|---|---|---|---|---|---|---|---|---|---|
| 304 | SW¼ , NW¼ , Sec. 1, T.6S., R.8½ E. | 0–10″ | 0.82 | 6.14 | 33.98 | 27.04 | 21.04 | 15.21 | 10.56 |
| | | 10–19″ | 1.05 | 4.67 | 31.80 | 26.12 | 21.57 | 16.88 | 12.52 |
| 304 | SW¼ , SE¼ , Sec. 3, T.8S., R.7E. | 0–4″ | 1.10 | 34.99 | 56.85 | 39.88 | 30.58 | 19.85 | 14.14 |
| | | 4–17″ | 1.08 | 44.59 | 49.90 | 36.23 | 29.69 | 22.82 | 17.69 |
| 304 | SW¼ , NW¼ , Sec. 14, T.8S., R.8E. | 0–8″ | 1.00 | 24.72 | 57.60 | 44.37 | 34.58 | 25.31 | 21.07 |
| | | 8–28″ | 0.81 | 25.13 | 54.25 | 46.45 | 38.16 | 26.28 | 19.71 |
| 305 | NE¼ , SE¼ , Sec. 3, T.7S., R.7E. | 1–9″ | 0.95 | 50.54 | 51.88 | 38.52 | 29.92 | 22.06 | 17.59 |
| | | 9–21″ | 0.87 | 57.08 | 63.47 | 38.16 | 30.57 | 23.56 | 19.72 |
| 306 | SW¼ , NW¼ , Sec. 28, T.6S., R.7E. | 0–8″ | 0.91 | 23.82 | 51.40 | 41.75 | 34.37 | 26.40 | 22.63 |
| | | 8–16″ | 0.78 | 38.05 | 53.22 | 43.72 | 34.95 | 24.55 | 19.93 |
| 306 | NE¼ , SE¼ , Sec. 30, T.6S., R.8E. | 0–10″ | 1.05 | 21.57 | 50.21 | 39.20 | 27.72 | 18.38 | 14.87 |
| | | 10–21″ | 1.13 | 20.47 | 52.88 | 38.81 | 29.85 | 22.26 | 16.76 |
| 306 | SW¼ , NW¼ , Sec. 25, T.7S., R.7E. | 0–5″ | 1.15 | 16.96 | 48.12 | 39.80 | 30.45 | 18.95 | 15.01 |
| | | 5–23″ | 1.23 | 18.99 | 53.00 | 41.74 | 31.22 | 21.23 | 15.64 |
| 309 | NW¼ , SW¼ , Sec. 21, T.7S., R.7E. | 0–6″ | 0.79 | 45.61 | 54.56 | 41.64 | 30.77 | 24.47 | 19.93 |
| | | 6–19″ | 0.92 | 38.83 | 54.47 | 40.18 | 31.46 | 24.50 | 19.72 |
| 309 | SW¼ , NE¼ , Sec. 27, T.8S., R.7E. | 0–9″ | 0.86 | 30.00 | 59.80 | 43.38 | 31.08 | 23.18 | 18.31 |
| | | 9–21″ | 0.84 | 32.26 | 64.05 | 44.87 | 34.19 | 28.73 | 21.16 |
| 310 | NW¼ , SE¼ , Sec. 22, T.8S., R.8E. | 0–12″ | 0.77 | 26.13 | 58.53 | 41.70 | 29.72 | 19.62 | 17.45 |
| | | 12–30″ | 0.67 | 45.59 | 62.45 | 48.43 | 35.51 | 25.39 | 23.38 |
| 312 | NE¼ , SE¼ , Sec. 19, T.4S., R.6E. | 0–19″ | 1.03 | 58.06 | 40.71 | 35.00 | 27.63 | 17.16 | 12.38 |

## TABLE 2—PHYSICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | Bulk Density | % Rock Greater Than 2 mm | PERCENT MOISTURE BY WEIGHT Moisture Tensions (ATM) 0.1 | 1/3 | 1.0 | 5.0 | 15.0 |
|---|---|---|---|---|---|---|---|---|---|
| 312 | NE¼, NW¼, Sec. 7, T.4S., R.6E. | 0–11″ | 0.85 | 28.79 | 53.44 | 45.37 | 37.96 | 28.28 | 21.71 |
| | | 11–13″ | 0.75 | 12.78 | 48.68 | 40.11 | 34.12 | 25.15 | 20.51 |
| 312 | SW¼, NW¼, Sec. 25, T.4S., R.5E. | 0–10″ | 0.99 | 20.76 | 50.92 | 41.79 | 34.67 | 27.04 | 22.85 |
| | | 10–27″ | 0.98 | 7.64 | 47.49 | 39.35 | 32.50 | 25.62 | 22.27 |
| 312 | NW¼, NE¼, Sec. 17, T.3S., R.6E. | 0–7″ | 0.89 | 3.51 | 43.91 | 38.29 | 34.24 | 27.21 | 22.26 |
| | | 7–15″ | 0.99 | 0.83 | 59.42 | 52.46 | 47.78 | 41.45 | 35.30 |
| 312 | NE¼, SE¼, Sec. 19, T.4S., R.6E. | 0–10″ | 1.19 | 42.15 | 48.56 | 39.14 | | | 16.43 |
| | | 10–27″ | 1.15 | 37.05 | 49.94 | 40.96 | | | 17.93 |
| 315 | SW¼, SE¼, Sec. 16, T.4S., R.6E. | 0–13″ | 0.95 | 38.71 | 46.56 | 37.34 | 29.78 | 18.92 | 16.42 |
| | | 13–36″ | 1.11 | 28.66 | 45.76 | 34.27 | 28.92 | 19.11 | 15.86 |
| 315 | NW¼, SE¼, Sec. 6, T.4S., R.6E. | 0–5″ | 0.84 | 31.72 | 50.04 | 40.25 | 31.52 | 22.11 | 16.12 |
| | | 5–13″ | 0.73 | 31.51 | 44.18 | 36.02 | 29.73 | 21.94 | 16.04 |
| 317 | SE¼, NE¼, Sec. 23, T.5S., R.4E. | 0–9″ | 0.65 | 23.65 | 73.34 | 56.98 | 43.96 | 31.09 | 27.67 |
| | | 9–22″ | 0.72 | 20.65 | 53.87 | 47.23 | 37.68 | 27.12 | 21.08 |
| 320 | SW¼, NE¼, Sec. 19, T.5S., R.5E. | 0–11″ | 0.90 | 53.70 | 73.45 | 58.31 | 42.71 | 23.52 | 18.49 |
| | | 11–29″ | 0.80 | 58.06 | 60.36 | 53.03 | 38.77 | 22.77 | 18.09 |
| 320 | NE¼, SE¼, Sec. 13, T.5S., R.6E. | 0–9″ | 0.78 | 36.41 | 55.82 | 41.91 | 34.10 | 26.04 | 21.05 |
| | | 9–21″ | 0.99 | 40.59 | 53.99 | 36.35 | 30.59 | 25.22 | 19.87 |
| 322 | SE¼, NW¼, Sec. 6, T.6S., R.5E. | 0–9″ | 0.85 | 26.51 | 70.94 | 59.81 | 49.10 | 36.82 | 22.78 |
| | | 9–19″ | 0.95 | 27.45 | 70.60 | 59.62 | 48.33 | 35.58 | 31.10 |
| 323 | NW¼, NE¼, Sec. 17, T.6S., R.7E. | 0–8″ | 1.05 | 33.49 | 51.28 | 41.79 | 31.91 | 21.95 | 18.99 |
| | | 8–17″ | 0.99 | 25.97 | 47.31 | 39.40 | 31.79 | 22.71 | 19.78 |
| 323 | SE¼, NW¼, Sec. 21, T.6S., R.8E. | 0–11″ | 0.95 | 33.89 | 48.94 | 34.81 | 27.18 | 21.04 | 17.26 |
| | | 11–22″ | 0.91 | 20.46 | 41.82 | 33.00 | 27.83 | 22.34 | 18.61 |

# TABLE 2—PHYSICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | Bulk Density | % Rock Greater Than 2 mm | PERCENT MOISTURE BY WEIGHT Moisture Tensions (ATM) 0.1 | 1/3 | 1.0 | 5.0 | 15.0 |
|---|---|---|---|---|---|---|---|---|---|
| 323 | SW¼, NE¼, Sec. 1, T.5S., R.4E. | 0–8″ | 0.81 | 66.79 | 70.79 | 55.99 | 46.80 | 36.41 | 29.51 |
| | | 8–17″ | 0.89 | 45.70 | 51.93 | 41.48 | 37.76 | 28.27 | 21.39 |
| 327 | SW¼, NE¼, Sec. 19, T.7S., R.7E. | 4–10″ | 1.37 | 43.08 | 39.23 | 31.25 | 25.04 | 17.02 | 12.46 |
| | | 10–27″ | 1.17 | 26.82 | 44.93 | 33.50 | 28.59 | 19.53 | 16.92 |
| 327 | NW¼, SE¼, Sec. 32, T.7S., R.5E. | 0–6″ | 0.89 | 49.11 | 48.49 | 42.07 | 35.85 | 26.35 | 23.15 |
| | | 6–26″ | 0.93 | 42.76 | 43.12 | 38.24 | 33.93 | 24.76 | 20.60 |
| 327 | SW¼, NE¼, Sec. 19, T.7S., R.7E. | 0–4″ | 1.22 | 15.02 | 58.54 | 49.77 | 40.26 | 29.13 | 28.35 |
| | | 4–10″ | 1.12 | 15.73 | 49.39 | 42.54 | 34.41 | 24.76 | 23.58 |
| 329 | NE¼, SE¼, Sec. 6, T.6S., R.5E. | 0–10″ | 0.89 | 22.53 | 63.78 | 51.54 | 38.93 | 26.57 | 22.44 |
| | | 10–21″ | 0.92 | 23.05 | 60.22 | 48.69 | 39.16 | 27.89 | 24.97 |
| 330 | SE¼, NE¼, Sec. 34, T.1N., R.8E. | 0–9″ | 0.92 | 43.84 | 56.47 | 42.94 | 29.77 | 20.45 | 14.61 |
| | | 9–19″ | 1.05 | 44.13 | 59.41 | 46.62 | 33.13 | 21.32 | 14.68 |
| 331 | SE¼, NW¼, Sec. 18, T.1S., R.9E. | 0–3″ | 0.83 | 37.87 | 42.74 | 33.99 | 23.52 | 13.79 | 9.27 |
| | | 3–19″ | 0.82 | 40.29 | 42.33 | 34.78 | 23.57 | 14.20 | 9.19 |
| 331 | SW¼, NE¼, Sec. 33, T.5S., R.10E. | 0–6″ | 1.08 | 37.06 | 58.56 | 43.31 | 30.48 | 21.02 | 18.09 |
| | | 6–12″ | 1.04 | 44.97 | 51.73 | 39.36 | 30.25 | 22.74 | 20.53 |
| | | 12–24″ | 1.02 | 47.35 | 52.93 | 39.93 | 30.81 | 22.00 | 20.05 |
| 333 | SE¼, NW¼, Sec. 25, T.1S., R.8½ E. | 1–4″ | 0.92 | 28.52 | 49.64 | 35.14 | 26.96 | 21.20 | 16.11 |
| | | 4–13″ | 1.02 | 36.24 | 50.44 | 38.71 | 31.71 | 27.09 | 20.87 |
| 333 | NE¼, SW¼, Sec. 11, T.4S., R.8½ E. | 0–10″ | 0.87 | 22.51 | 54.43 | 40.36 | 28.70 | 20.13 | 14.79 |
| | | 10–15″ | 1.08 | 27.85 | 57.69 | 40.91 | 27.73 | 18.54 | 13.46 |
| 333 | SE¼, NW¼, Sec. 15, T.3S., R.8E. | 1–7″ | 1.20 | | 10.0 | | | | 2.0 |
| 335 | SW¼, SW¼, Sec. 20, T.4S., R.9E. | 2–11″ | 0.60 | 24.02 | 36.74 | 26.63 | 19.44 | 14.22 | 10.85 |
| | | 11–19″ | 0.92 | 24.47 | 34.98 | 27.33 | 21.02 | 15.55 | 11.67 |

## TABLE 2 — PHYSICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | Bulk Density | % Rock Greater Than 2 mm | PERCENT MOISTURE BY WEIGHT Moisture Tensions (ATM) 0.1 | 1/3 | 1.0 | 5.0 | 15.0 |
|---|---|---|---|---|---|---|---|---|---|
| 337 | SE¼ , SW¼ , Sec. 26, T.5S., R.7E. | 0–10″ | 0.98 | 46.09 | 42.13 | 33.05 | 27.57 | 20.63 | 16.21 |
| | | 10–20″ | 0.96 | 44.34 | 42.26 | 31.36 | 27.55 | 22.27 | 16.91 |
| 338 | SE¼ , SW¼ , Sec. 27, T.1N., R.6E. | 1–9″ | 0.77 | | 57.0 | 53.0 | | | 18.0 |
| 343 | SE¼ , NE¼ , Sec. 32, T.1N., R.6E. | 0–3″ | 0.51 | | 77.0 | | | | 26.0 |
| | | 3–10″ | 1.00 | | 45.0 | | | | 24.0 |
| 344 | SW¼ , NW¼ , Sec. 25, T.3S., R.8½ E. | 1–9″ | 0.84 | | 34.0 | 28.0 | | | 10.0 |
| 346 | SW¼ , NW¼ , Sec. 20, T.2S., R.8E. | 4–10″ | 0.70 | | 40.0 | 36.0 | | | 11.0 |
| | | 10–20″ | 0.86 | | 44.0 | 41.0 | | | 18.0 |
| 346 | SE¼ , SE¼ , Sec. 19, T.2S., R.8E. | 0–10″ | 0.58 | | 66.0 | | | | 24.0 |
| | | 10–23″ | 0.62 | | 53.0 | | | | 18.0 |
| 347 | SW¼ , SE¼ , Sec. 1, T.1S., R.10E. | 1–4″ | 1.05 | 33.28 | 33.12 | 22.11 | | | 9.73 |
| | | 4–11″ | 1.22 | 33.84 | 33.40 | 22.23 | | | 10.20 |
| 353 | NE¼ , SE¼ , Sec. 8, T.4S., R.10E. | 0–8″ | 0.95 | 28.95 | 46.53 | 25.26 | | | 11.10 |
| | | 8–17″ | 1.05 | 33.97 | 45.62 | 27.21 | | | 10.79 |
| 353 | SE¼ , NW¼ , Sec. 8, T.4S., R.10E. | 0–6″ | 0.92 | 15.47 | 39.36 | 24.57 | | | 5.81 |
| | | 6–14″ | 1.00 | 39.31 | 41.69 | 28.81 | | | 15.05 |
| 360 | SW¼ , NE¼ , Sec. 24, T.4S., R.9E. | 0–4″ | 1.05 | 17.27 | 47.73 | 32.08 | 19.44 | 11.31 | 7.76 |
| | | 4–12″ | 0.77 | 20.31 | 52.15 | 33.48 | 22.71 | 14.35 | 9.50 |
| 370 | SW¼ , NW¼ , Sec. 28, T.2N., R.9E. | 1–8″ | 0.76 | 40.85 | 49.85 | 33.81 | | | 17.58 |
| | | 8–14″ | 1.06 | 33.87 | 49.40 | 36.19 | | | 21.42 |

Table 3 Moisture Deficit Olallie Mdw. By slope and aspect at 4000 ft. elevation Annual precip. - 71"

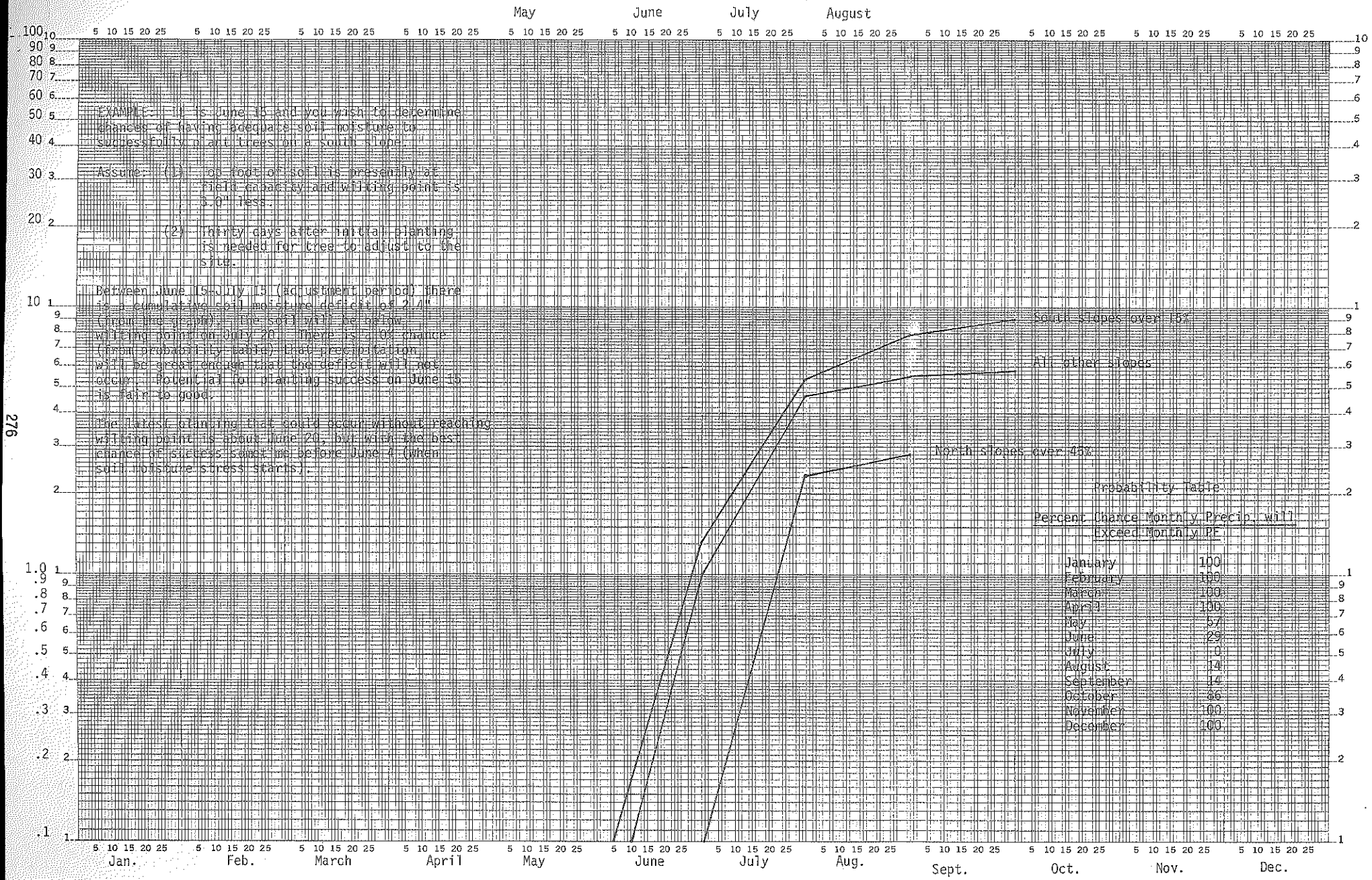


Table 4 Moisture Deficit Eastside By slope and aspect at 333 ft. elevation Annual precip 25"

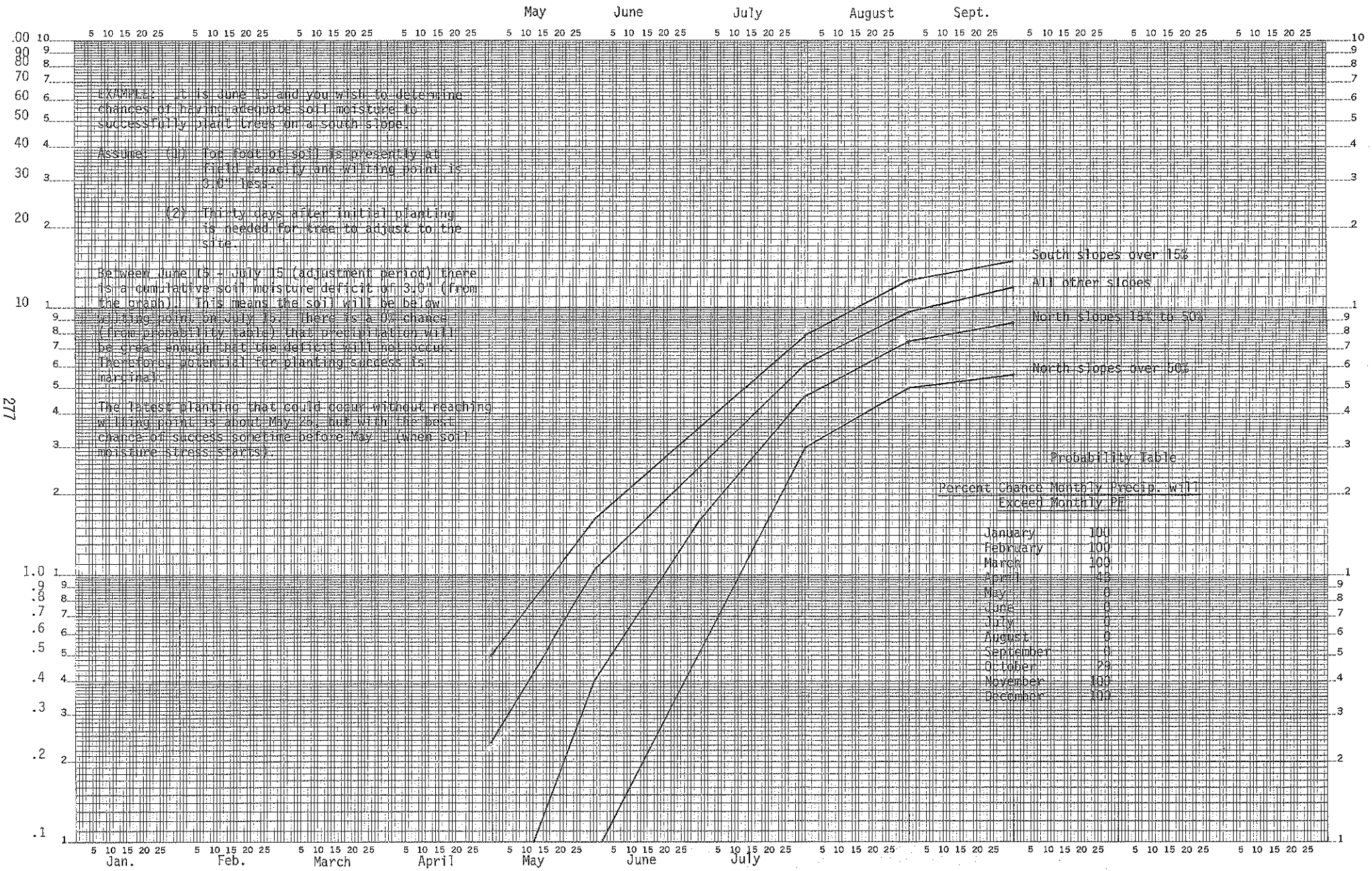


Table 5 Moisture Deficit Ripplebrook By slope and aspect at 2000 ft. elevation Annual precip. -

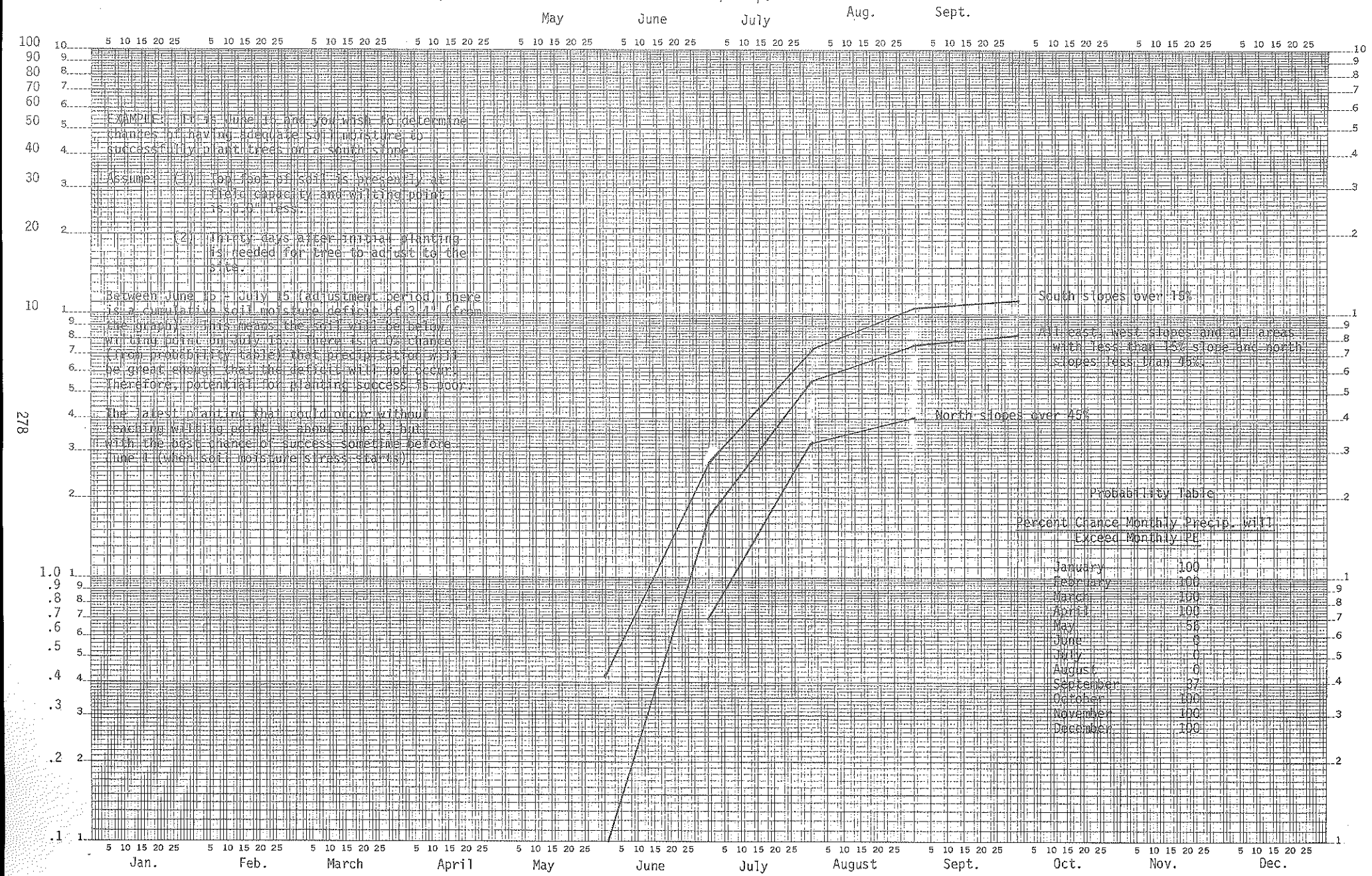


Table 6 Moisture Deficit Ripplebrook By slope and aspect at 4,000 ft. elevation Annual precip. 60"

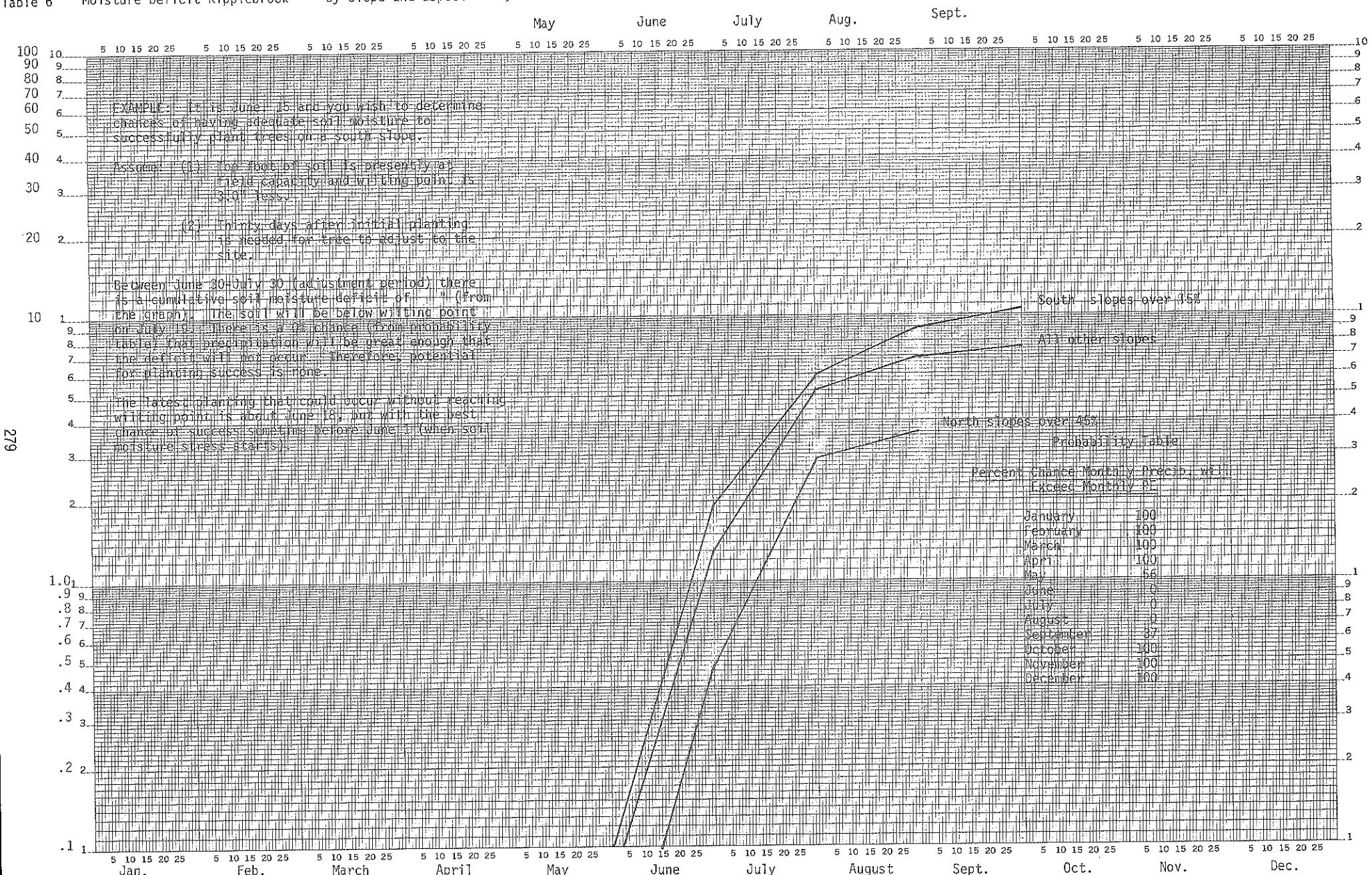
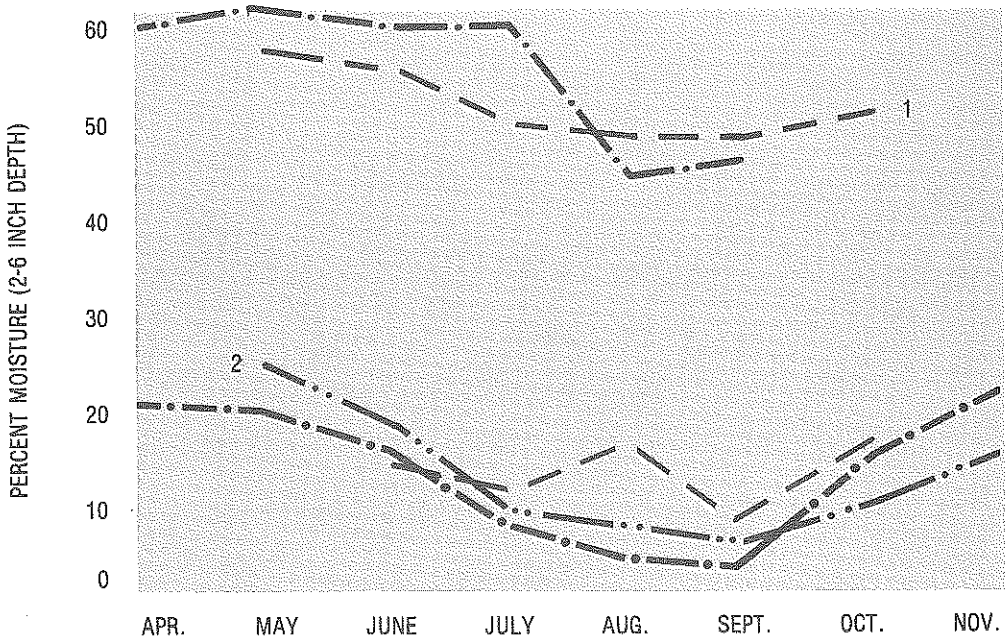
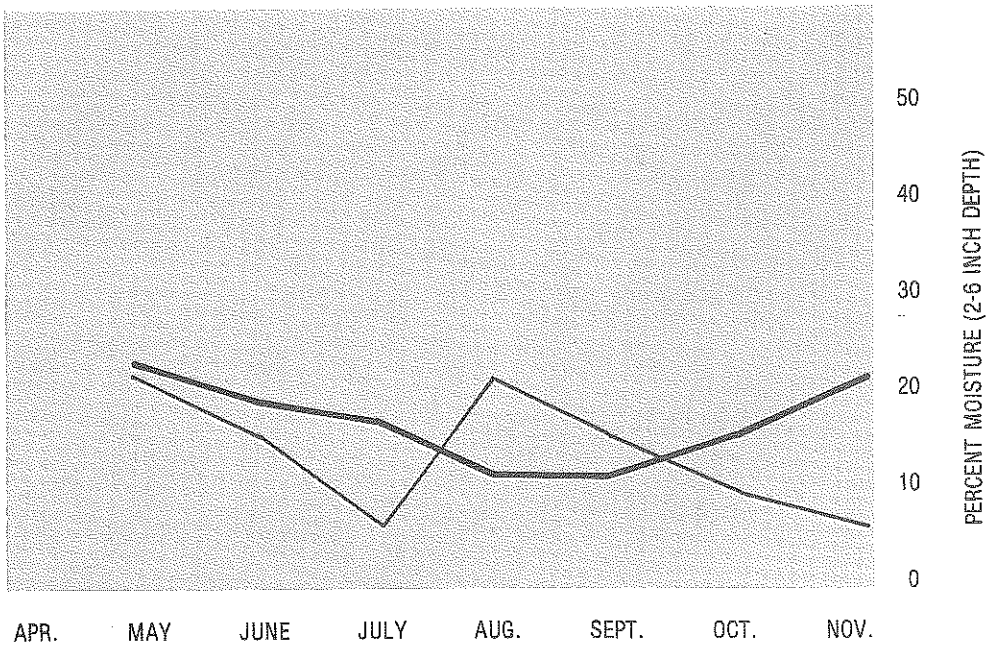


FIGURE 12



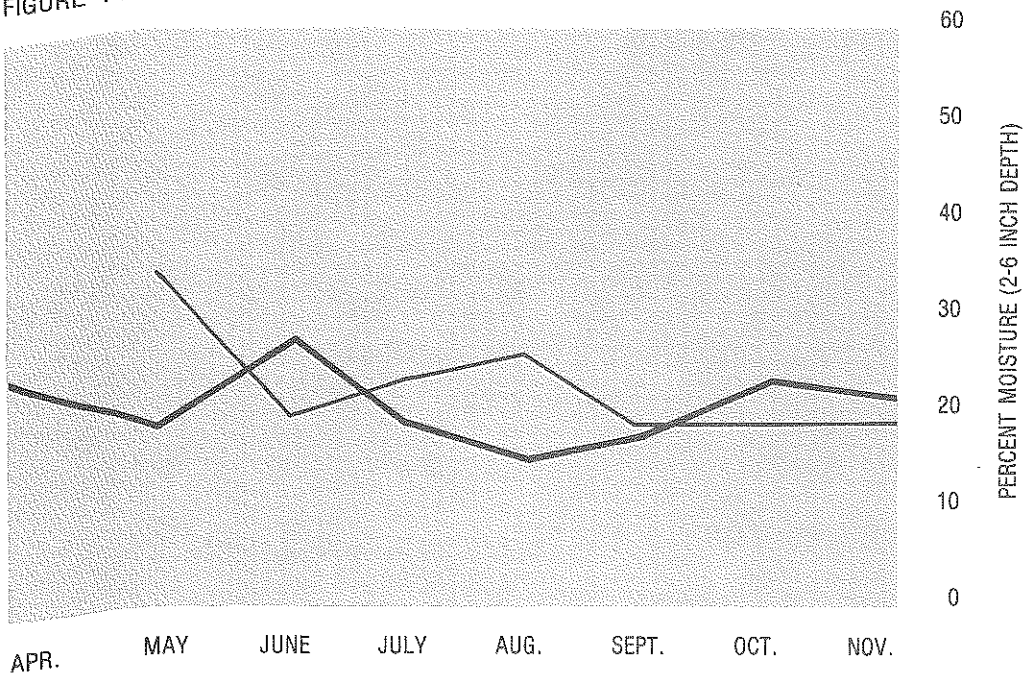

1. COLUMBIA GORGE R.D., 800′ S and 800′ E of center of Section 15, T1S, R6E, (Near Bull Run Res. No. 1), NW aspect, 6% slope, 1400′ elevation.
2. HOOD RIVER R.D., 400′ N and 1000′ E of center of Section 9, T2S, R10E, (about 3/4 mile N of Powder Spring), 4220′ elevation, N aspect, 5% slope. (Dog River)

FIGURE13



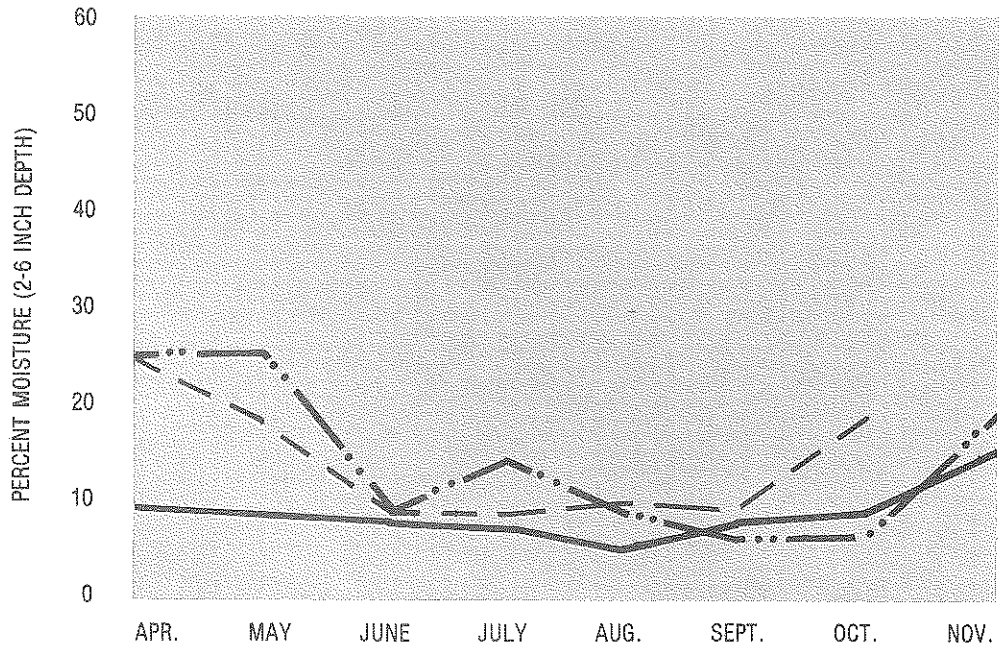

HOOD RIVER R.D., 300′ W of the SE corner of Sec. 4, T1S, R9E, E aspect, 4% slope, 3200′ elevation. (About 3-1/2 miles SW of Parkdale, OR.)

FIGURE 14



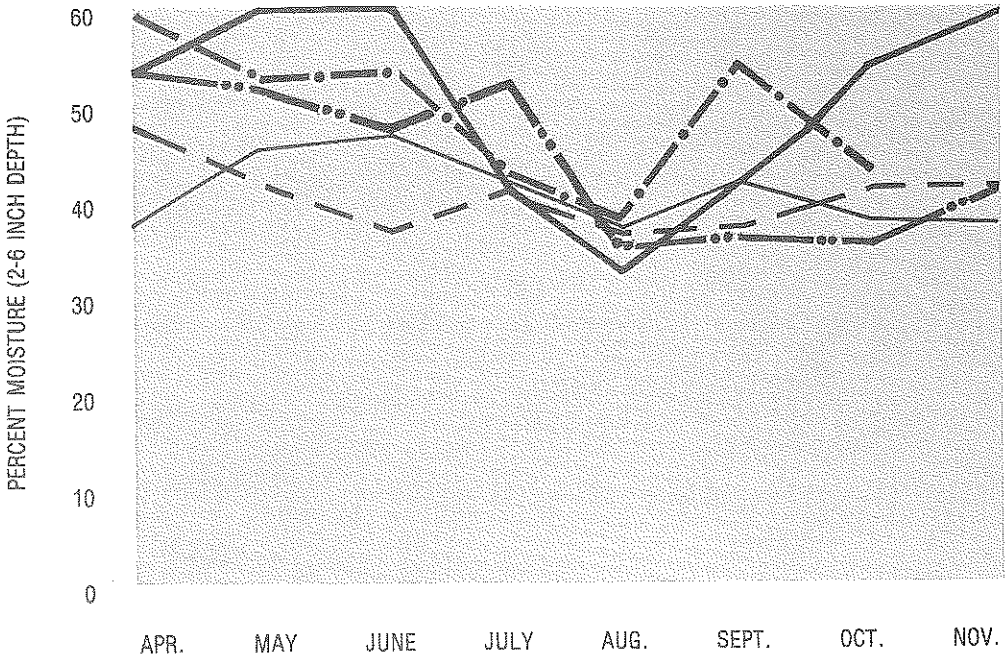

CLACKAMAS R.D., 1300' W of NE corner of S 36, T6S, R7E, W aspect, 4% slope, 2500' elevation. (About 3 miles W of Peavine Mtn.)

FIGURE 15



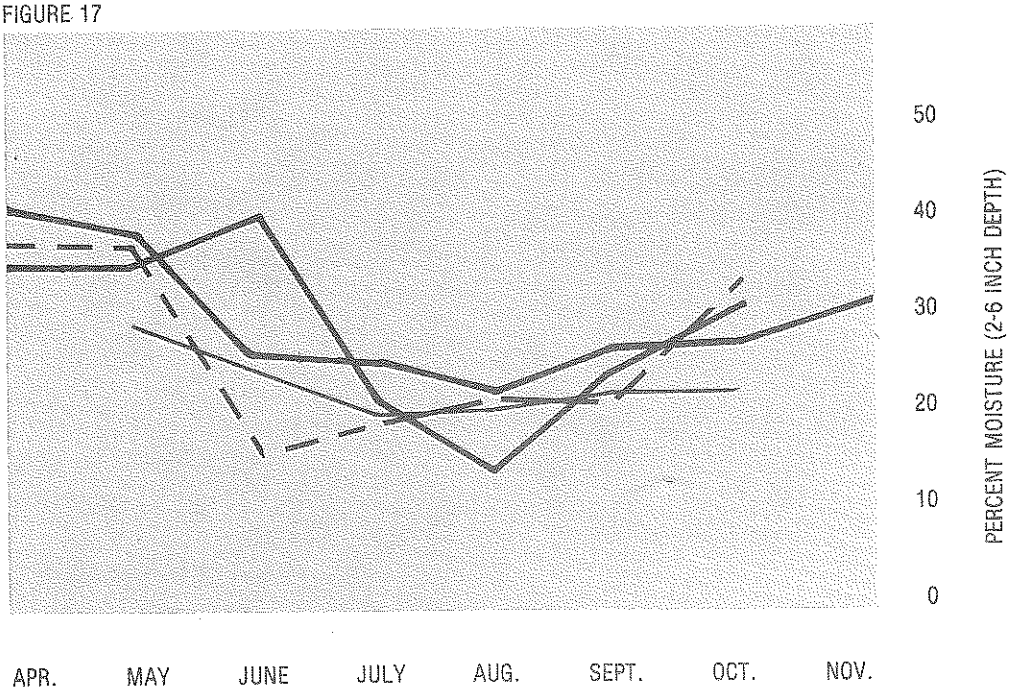

BARLOW, R.D., 2300' N and 600' E of SW corner of Sec. 22, T4S, R11E, S aspect, 4% slope, 2500' elevation. (About 1-1/2 miles SW of Rock Creek Reservoir).

FIGURE 16



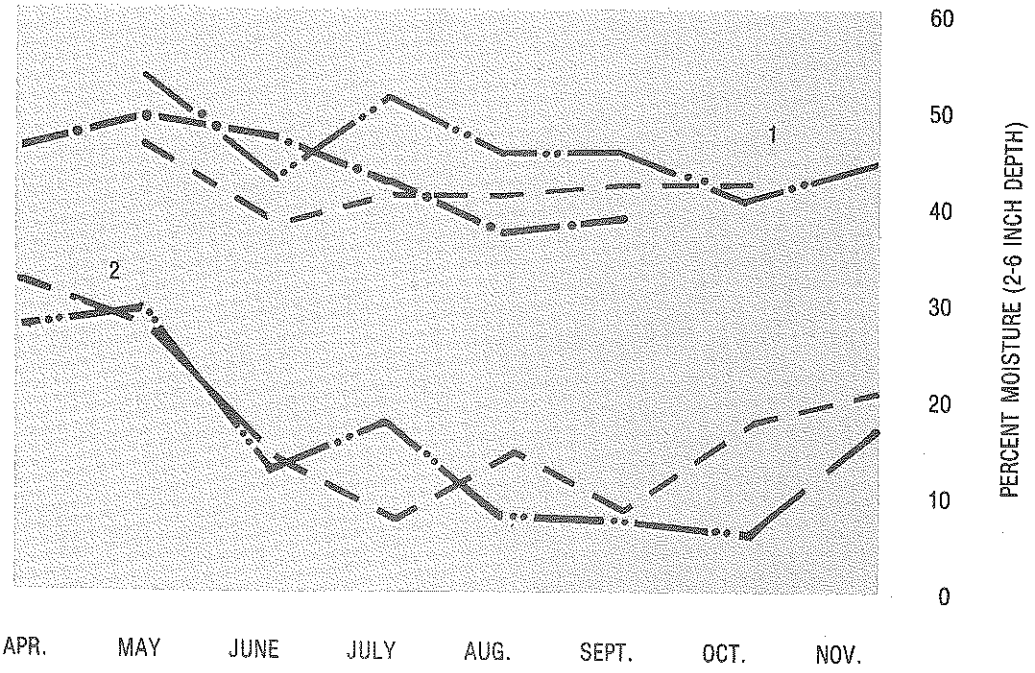

1. ZIGZAG R.D., 300′ N and 900′ E of SW corner of Section 7, T2S, R6E, NE aspect, 8% slope, 1250′ elevation, (About 1 mile NW of Marmot).

FIGURE 17



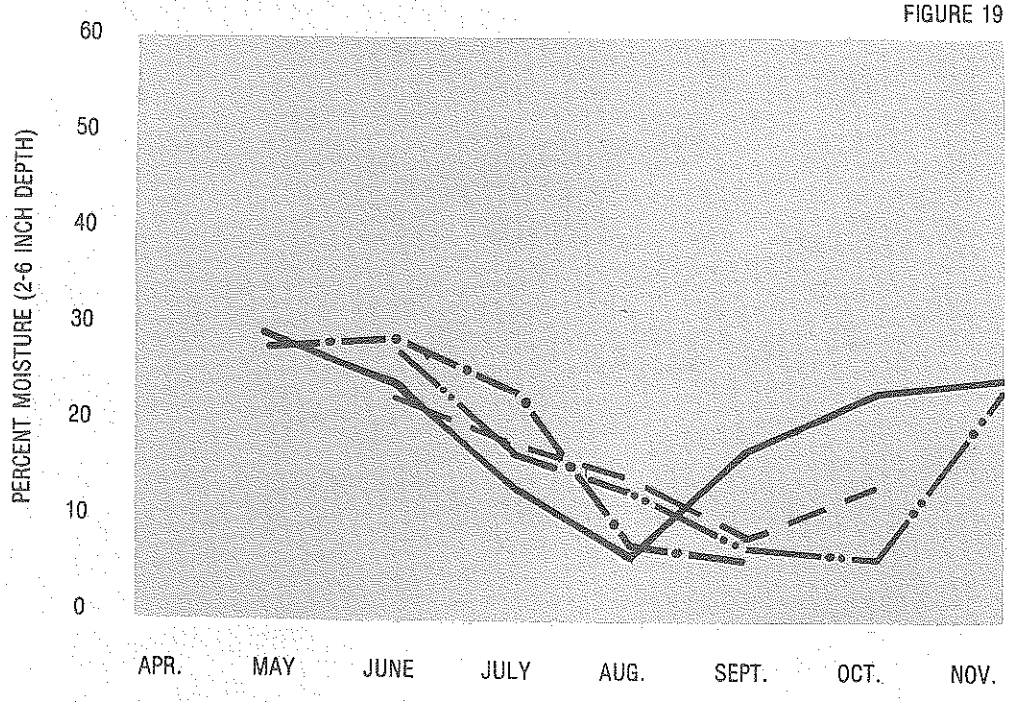

CLACKAMAS R.D., S1/4 corner, Sec. 5, T6S, R6E, S aspect, 10% slope, 1600′ elevation. (About 1 mile SE of Ripplebrook R.S.).

FIGURE 18



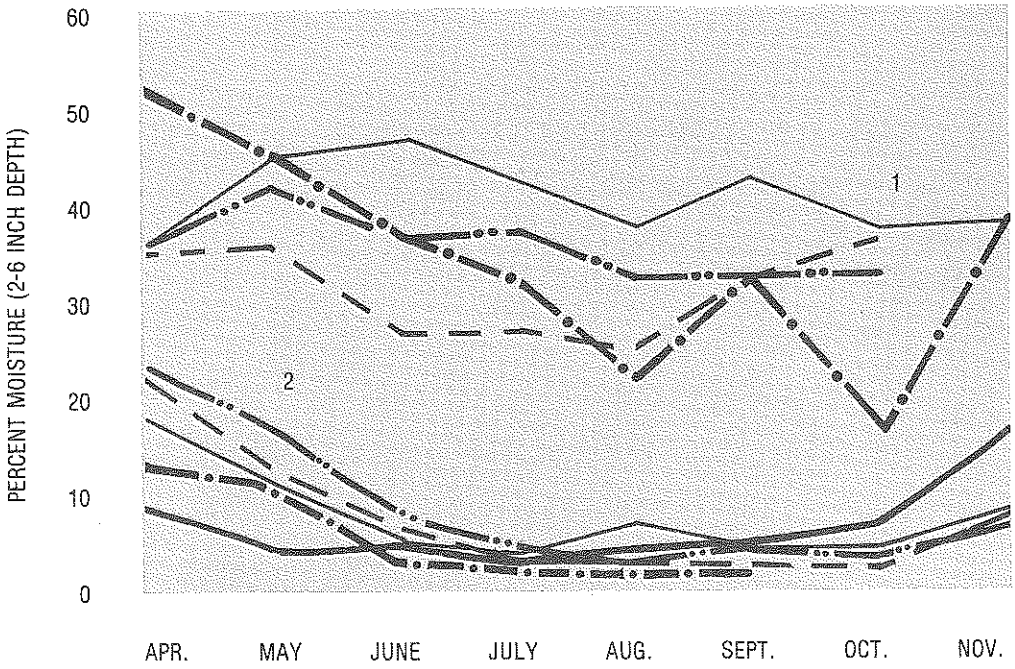

1. COLUMBIA GORGE R.D., 200′ S and 300′ W of center of Section 2, T2S, R6E (about 2 miles W of Ashoff Buttes), 4% slope, W aspect, 2925′ elevation. (S129)
2. BEAR SPRINGS R.D., 1000′ W and 900′ N of center of Section 22, T5S, R10E (about 1 mile NW of Bear Springs R.D.), 10% slope, SW aspect, 3120′ elevation. (White R. Road)

FIGURE 19




1. BEAR SPRINGS R.D., 2500′ S of center of Section 34, T5S, R8E, (about 2 miles SW of Timothy Lake), NE aspect, 8% slope, 3500′ elevation.

FIGURE 20




1. ESTACADA R.D., 1320′ N and 1000′ E of center of section 6, T4S, R5E (3 miles NW of Lookout Springs), 3% slope, W aspect, 2900′ elevation. (Sc Eagle)
2. BARLOW R.D., 1300′ N and 1300′ W of SE corner of Section 26, T4S, R11E (about 2 miles S of Rock Creek Res.), level area, 2200′ elevation.

# ENGINEERING TEST DATA

The following table (Table 7) displays the engineering test data as determined by the Materials Laboratory, Mt. Hood National Forest.

The columns under the heading "Sieve Size–Percent Passing" show the percentages of soil material that pass through the mesh of various standard sieve sizes. This information is useful in classifying soils in the Unified and AASHO Soil Classification Systems.

The colum under the heading "LL" shows the liquid limit of the soil. The liquid limit is the minimum percentage by weight of moisture at which a small sample of soil will barely flow under a standard treatment.

The column under the heading "PI" shows the plasticity index of each soil. The plasticity index is the numerical difference between the liquid limit and the plastic limit. The plastic limit is the minimum moisture percentage by weight at which a small sample of soil material can be deformed without rupture.

## TABLE 7—ENGINEERING TEST DATA

| Mapping Unit Number | Location | Depth | Sieve Size—Percent Passing 3″ | 1″ | 1/2″ | #4 | #10 | #200 | .034 | .009 | .0034 | LL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 108 | NW¼, SW¼, Sec. 11, T.7S., R.5E | 0–12″ | 100 | 95 | 90 | 72 | 34 | 17.1 | 8.1 | 5.1 | 1.7 | 59 | NP |
| | | 12–20″ | 100 | 100 | 99 | 87 | 69 | 31.3 | 25.0 | 12.7 | 3.6 | 46 | NP |
| | | 20–32″ | 100 | 97 | 92 | 83 | 72 | 40.5 | 26.0 | 13.3 | 3.7 | 49 | NP |
| | | 32–60″ | 100 | 94 | 83 | 74 | 57 | 26.1 | 19.9 | 11.4 | 3.0 | 45 | NP |
| 115 | SE¼, NW¼, Sec. 2, T.1S., R.9E | 1–6″ | 100 | 100 | 99.6 | 95 | 70 | 33.6 | 20.9 | 8.7 | 2.5 | 32 | NP |
| | | 6–13″ | 100 | 100 | 97 | 93 | 71 | 33.9 | 24.3 | 8.8 | 2.6 | 35 | NP |
| | | 13–24″ | 100 | 100 | 97 | 92 | 76 | 32.6 | 21.4 | 6.1 | 0.5 | 45 | NP |
| | NE¼, SW¼, Sec. 2, T.1N., R.9E | 0–9″ | 100 | 100 | 100 | 92 | 49 | 25.3 | 18.0 | 10.9 | 3.7 | NP | NP |
| | | 9–16″ | 100 | 100 | 100 | 91 | 58 | 33.6 | 24.3 | 15.6 | 5.4 | 28 | 4 |
| | | 16–34″ | 100 | 100 | 100 | 95 | 76 | 55.1 | 43.2 | 29.3 | 13.0 | 27 | 2 |
| | | 34–60″ | 100 | 100 | 100 | 92 | 71 | 58.7 | 51.4 | 36.8 | 20.7 | 52 | 15 |
| 153 | SW¼, NW¼, Sec. 28, T.3S., R.12E | 0–10″ | 100 | 100 | 100 | 99 | 94 | 71.2 | 44.0 | 29.0 | 11.0 | NP | NP |
| | | 10–21″ | 100 | 100 | 99 | 95 | 83 | 54.6 | 39.8 | 20.0 | 5.4 | NP | NP |
| | | 21–35″ | 100 | 100 | 100 | 93 | 83 | 56.3 | 41.5 | 20.6 | 5.4 | NP | NP |
| | | 35–60″ | 100 | 100 | 100 | 89 | 69 | 40.9 | 30.2 | 16.9 | 4.6 | 2.5 | 6 |
| 156 | NW¼, NE¼, Sec. 26, T.3S., R.11E | 0–3″ | 100 | 100 | 99 | 98 | 93 | 36.2 | 23.9 | 13.4 | 1.8 | 21 | NP |
| | | 3–15″ | 100 | 100 | 100 | 98 | 90 | 45.2 | 32.3 | 17.6 | 1.7 | 20 | NP |
| | | 15–31″ | 100 | 100 | 100 | 96 | 88 | 46.1 | 35.0 | 20.5 | 3.9 | 19 | NP |
| | | 31–60″ | 100 | 100 | 98 | 87 | 68 | 32.5 | 24.4 | 16.7 | 4.7 | 20 | NP |
| | NW¼, SE¼, Sec. 12, T.2S., R.11E | 0–5″ | 100 | 100 | 99 | 95 | 89 | 24.8 | 19.0 | 10.0 | 4.4 | 24 | NP |
| | | 5–14″ | 100 | 100 | 99 | 91 | 74 | 26.2 | 18.7 | 9.2 | 0.8 | 23 | NP |
| | | 14–23″ | 100 | 100 | 99 | 94 | 81.8 | 34.3 | 27.8 | 18.5 | 3.9 | 22 | NP |
| | | 23–60″ | 100 | 95 | 92 | 85 | 72.0 | 32.2 | 28.4 | 20.1 | 4.4 | 26 | 2 |
| 168 | NW¼, SE¼, Sec. 15, T.1S., R.10E | 0–6″ | 100 | 100 | 96 | 88 | 79 | 42.3 | 24.4 | 7.3 | 1.4 | NP | NP |
| | | 6–18″ | 100 | 100 | 95 | 84 | 74 | 35.5 | 24.8 | 9.8 | 1.8 | NP | NP |
| | | 18–32″ | 100 | 100 | 95 | 83 | 68 | 30.7 | 23.4 | 14.6 | 5.4 | NP | NP |
| | NW¼, SW¼, Sec. 15, T.1S., R.10E | 0–6″ | 100 | 100 | 99 | 96 | 93 | 56.0 | 28.0 | 7.6 | 0.9 | 29 | NP |
| | | 6–18″ | 100 | 100 | 98 | 94 | 89 | 50.0 | 26.7 | 7.3 | 0.9 | 29 | NP |
| | | 18–32″ | 100 | 100 | 94 | 89 | 81 | 37.0 | 23.0 | 7.8 | 0.8 | 29 | NP |
| | | 32–60″ | 100 | 100 | 95 | 88 | 77 | 40.2 | 28.9 | 14.2 | 2.4 | 25 | NP |

# TABLE 7—ENGINEERING TEST DATA

| Mapping Unit Number | Location | Depth | Sieve Size—Percent Passing 3″ | 1″ | 1/2″ | #4 | #10 | #200 | .034 | .009 | .0034 | LL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 304 | SW¼ , SW¼ , Sec. 35, T.6S., R.8½ E | 1–12″ | 100 | 95 | 91 | 87 | 81 | 26.1 | 13.1 | 6.0 | 1.8 | 35 | NP |
| | | 12–35″ | 100 | 72 | 42 | 35 | 32 | 20.0 | 14.0 | 9.2 | 3.6 | 40 | NP |
| | | 0–9″ | 100 | 100 | 97 | 88 | 78.5 | 38.7 | 17.5 | 11.7 | 2.1 | 46 | NP |
| | | 9–28″ | 100 | 100 | 91 | 77 | 66.1 | 36.8 | 29.2 | 19.5 | 5.6 | 43 | NP |
| | SW¼ , SE¼ , Sec. 3, T.8S., R.7E | 4–17″ | 100 | 84 | 68 | 59 | 49 | 22.8 | 17.7 | 8.3 | 1.8 | 40 | NP |
| | | 17–28″ | 100 | 98 | 94 | 79 | 64 | 43.8 | 36.8 | 21.9 | 8.9 | 39 | NP |
| | | 28–60″ | 100 | 92 | 84 | 68 | 54 | 34.4 | 31.9 | 19.3 | 6.7 | 44 | NP |
| | SW¼ , SE¼ , Sec. 7, T.6S., R.8E | 0–9″ | 100 | 88 | 87 | 71 | 45.6 | 18.5 | 11.6 | 6.9 | 0.7 | 47 | NP |
| | | 9–25″ | 100 | 100 | 100 | 95 | 85.5 | 45.9 | 30.5 | 19.1 | 5.2 | 46 | NP |
| | | 25–60″ | 100 | 100 | 89 | 75 | 61.6 | 40.8 | 33.0 | 20.2 | 7.4 | 47 | NP |
| | SW¼ , NW¼ , Sec. 1, T.6S., R.8½ E | 0–10″ | 100 | 100 | 99.7 | 97 | 91 | 28.1 | 12.4 | 5.9 | 0.7 | 29 | NP |
| | | 10–19″ | 100 | 100 | 100 | 99 | 96 | 33.8 | 28.3 | 15.9 | 6.2 | 26 | NP |
| | | 19–55″ | 100 | 100 | 93 | 83 | 71 | 52.2 | 40.3 | 32.1 | 18.9 | 35 | 10 |
| | | 55–70″ | 100 | 100 | 92 | 80 | 62 | 45.0 | 35.7 | 24.8 | 11.3 | 58 | NP |
| | SW¼ , NW¼ , Sec. 13, T.6S., R.7E | 0–13″ | 100 | 97 | 92 | 74 | 52 | 24.0 | 16.0 | 6.2 | 1.6 | 45 | NP |
| | | 13–25″ | 100 | 100 | 88 | 76 | 67 | 45.0 | 32.4 | 13.9 | 5.3 | 38 | NP |
| | | 25–60″ | 100 | 100 | 85 | 68 | 61 | 48.2 | 34.4 | 18.2 | 10.1 | 41 | NP |
| | SW¼ , NW¼ , Sec. 14, T.8S., R.8E | 0–8″ | 100 | 100 | 83 | 70 | 61 | 39 | 16 | 5.4 | 2.3 | 54 | NP |
| | | 8–28″ | 100 | 62 | 55 | 48 | 43 | 18 | 22.2 | 12.7 | 3.7 | 49 | NP |
| | | 28–60″ | 100 | 100 | 98 | 77 | 54 | 26 | 17.6 | 8.1 | 1.4 | 46 | NP |
| 305 | NE¼ , SE¼ , Sec. 3, T.7S., R.7E | 1–9″ | 100 | 91 | 78 | 64 | 49 | 21.6 | 12.5 | 8.2 | 2.5 | 46 | NP |
| | | 9–21″ | 100 | 94 | 88 | 75 | 60 | 31.7 | 24.0 | 18.5 | 6.7 | 47 | NP |
| | | 21–47″ | 100 | 96 | 74 | 57 | 47 | 22.4 | 17.0 | 10.2 | 3.5 | 37 | NP |

# TABLE 7—ENGINEERING TEST DATA

| Mapping Unit Number | Location | Depth | Sieve Size—Percent Passing 3" | 1" | 1/2" | #4 | #10 | #200 | .034 | .009 | .0034 | LL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 306 | SE¼, SW¼, Sec. 18, T.7S., R.8E | 0–13" | 100 | 96 | 82 | 66 | 52.1 | 16.6 | 7.9 | 4.8 | 1.4 | 46 | NP |
| | | 13–25" | 100 | 86 | 66 | 53 | 43.9 | 15.1 | 9.2 | 3.3 | — | 56 | NP |
| | | 25–60" | 100 | 98 | 81 | 62 | 49 | 18.9 | 12.7 | 4.7 | — | 45 | NP |
| | NE¼, SE¼, Sec. 30, T.6S., R.8E | 0–10" | 100 | 100 | 98 | 92 | 75 | 34.5 | 17.2 | 6.6 | 1.7 | 39 | NP |
| | | 10–21" | 100 | 100 | 98 | 86 | 70 | 31.8 | 21.2 | 15.0 | 4.3 | 46 | NP |
| | | 21–60" | 100 | 93 | 89 | 81 | 67 | 29.2 | 17.7 | 10.0 | 0.7 | 50 | NP |
| | SW¼, NW¼, Sec. 25, T.7S., R.7E | 5–25" | 100 | 100 | 97 | 84 | 67 | 26.2 | 20.9 | 4.6 | 2.0 | 42 | NP |
| | | 25–43" | 100 | 100 | 97 | 90 | 77 | 29.0 | 23.2 | 4.5 | 0.3 | 45 | NP |
| | | 43–60" | 100 | 100 | 99 | 94 | 82 | 26.9 | 19.6 | 2.3 | — | 52 | NP |
| | SW¼, NW¼, Sec. 28, T.6S., R.7E | 0–8" | 100 | 89 | 71 | 66 | 52 | 27.8 | 21.6 | 16.3 | 7.0 | 40 | NP |
| | | 8–16" | 100 | 94 | 90 | 83 | 55 | 25.6 | 18.2 | 10.9 | 2.8 | 42 | NP |
| | | 16–30" | 100 | 100 | 96 | 85 | 64 | 49.1 | 43.9 | 33.3 | 20.1 | 50 | 10 |
| | | 30–60" | 100 | 100 | 96 | 82 | 63 | 50.6 | 43.9 | 33.4 | 18.9 | 53 | NP |
| 307 | NW¼, SE¼, Sec. 30, T.6S., R.8E | 0–9" | 100 | 90 | 82 | 70 | 42 | 15.9 | 11.6 | 8.4 | 4.1 | 48 | NP |
| | | 9–13" | 100 | 100 | 96 | 87 | 68 | 34.4 | 33.2 | 18.3 | 5.4 | 43 | NP |
| | | 13–41" | 100 | 89 | 78 | 65 | 53 | 27.6 | 22.2 | 14.5 | 4.3 | 40 | NP |
| | | 41–87" | 100 | 85 | 77 | 69 | 59 | 38.2 | 19.4 | 12.6 | 5.0 | 44 | NP |
| 309 | SW¼, NE¼, Sec. 27, T.8S., R.7E | 0–9" | 100 | 100 | 83 | 69 | 58.7 | 27.8 | 11.6 | 4.5 | 1.9 | 56 | NP |
| | | 9–21" | 100 | 84 | 69 | 56 | 46.7 | 18.7 | 10.5 | 2.2 | 1.5 | 61 | NP |
| | | 21–34" | 100 | 67 | 45 | 35 | 28.0 | 12.6 | 7.2 | 2.6 | 0.5 | 62 | NP |
| | | 34–48" | 100 | 88 | 68 | 55 | 50 | 28.6 | 17.8 | 5.5 | 0.4 | 45 | NP |
| | NW¼, SW¼, Sec. 21, T.7S., R.7E | 0–6" | 100 | 97 | 83 | 67 | 58 | 26.3 | 16.9 | 7.4 | 0.4 | 52 | NP |
| | | 6–19" | 100 | 89 | 81 | 64 | 54 | 26.3 | 12.6 | 6.1 | 1.2 | 52 | NP |
| | | 19–31" | 100 | 100 | 78 | 60 | 47 | 24.2 | 20.6 | 13.1 | 4.9 | 45 | NP |
| | | 31–60" | 100 | 94 | 77 | 64 | 53 | 22.9 | 22.2 | 14.3 | 4.8 | 44 | NP |
| 310 | NW¼, SE¼, Sec. 22, T.8S., R.8E | 0–12" | 100 | 100 | 89 | 78 | 66.8 | 23.2 | 13.3 | 6.2 | 1.8 | 55 | NP |
| | | 12–30" | 100 | 93 | 82 | 67 | 50.0 | 16.5 | 11.4 | 3.6 | 2.4 | 67 | NP |
| | | 30–60" | 100 | 76 | 62 | 44 | 29.6 | 15.8 | 8.3 | 3.5 | 0.5 | 39 | NP |

## TABLE 7—ENGINEERING TEST DATA

| Mapping Unit Number | Location | Depth | Sieve Size—Percent Passing | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3″ | 1″ | 1/2″ | #4 | #10 | #200 | .034 | .009 | .0034 | LL | PI |
| 306 | SE¼ , SW¼ , Sec. 18, T.7S., R.8E | 0–13″ | 100 | 96 | 82 | 66 | 52.1 | 16.6 | 7.9 | 4.8 | 1.4 | 46 | NP |
| | | 13–25″ | 100 | 86 | 66 | 53 | 43.9 | 15.1 | 9.2 | 3.3 | — | 56 | NP |
| | | 25–60″ | 100 | 98 | 81 | 62 | 49 | 18.9 | 12.7 | 4.7 | — | 45 | NP |
| | NE¼ , SE¼ , Sec. 30, T.6S., R.8E | 0–10″ | 100 | 100 | 98 | 92 | 75 | 34.5 | 17.2 | 6.6 | 1.7 | 39 | NP |
| | | 10–21″ | 100 | 100 | 98 | 86 | 70 | 31.8 | 21.2 | 15.0 | 4.3 | 46 | NP |
| | | 21–60″ | 100 | 93 | 89 | 81 | 67 | 29.2 | 17.7 | 10.0 | 0.7 | 50 | NP |
| | SW¼ , NW¼ , Sec. 25, T.7S., R.7E | 5–25″ | 100 | 100 | 97 | 84 | 67 | 26.2 | 20.9 | 4.6 | 2.0 | 42 | NP |
| | | 25–43″ | 100 | 100 | 97 | 90 | 77 | 29.0 | 23.2 | 4.5 | 0.3 | 45 | NP |
| | | 43–60″ | 100 | 100 | 99 | 94 | 82 | 26.9 | 19.6 | 2.3 | — | 52 | NP |
| | SW¼ , NW¼ , Sec. 28, T.6S., R.7E | 0–8″ | 100 | 89 | 71 | 66 | 52 | 27.8 | 21.6 | 16.3 | 7.0 | 40 | NP |
| | | 8–16″ | 100 | 94 | 90 | 83 | 55 | 25.6 | 18.2 | 10.9 | 2.8 | 42 | NP |
| | | 16–30″ | 100 | 100 | 96 | 85 | 64 | 49.1 | 43.9 | 33.3 | 20.1 | 50 | 10 |
| | | 30–60″ | 100 | 100 | 96 | 82 | 63 | 50.6 | 43.9 | 33.4 | 18.9 | 53 | NP |
| 307 | NW¼ , SE¼ , Sec. 30, T.6S., R.8E | 0–9″ | 100 | 90 | 82 | 70 | 42 | 15.9 | 11.6 | 8.4 | 4.1 | 48 | NP |
| | | 9–13″ | 100 | 100 | 96 | 87 | 68 | 34.4 | 33.2 | 18.3 | 5.4 | 43 | NP |
| | | 13–41″ | 100 | 89 | 78 | 65 | 53 | 27.6 | 22.2 | 14.5 | 4.3 | 40 | NP |
| | | 41–87″ | 100 | 85 | 77 | 69 | 59 | 38.2 | 19.4 | 12.6 | 5.0 | 44 | NP |
| 309 | SW¼ , NE¼ , Sec. 27, T.8S., R.7E | 0–9″ | 100 | 100 | 83 | 69 | 58.7 | 27.8 | 11.6 | 4.5 | 1.9 | 56 | NP |
| | | 9–21″ | 100 | 84 | 69 | 56 | 46.7 | 18.7 | 10.5 | 2.2 | 1.5 | 61 | NP |
| | | 21–34″ | 100 | 67 | 45 | 35 | 28.0 | 12.6 | 7.2 | 2.6 | 0.5 | 62 | NP |
| | | 34–48″ | 100 | 88 | 68 | 55 | 50 | 28.6 | 17.8 | 5.5 | 0.4 | 45 | NP |
| | NW¼ , SW¼ , Sec. 21, T.7S., R.7E | 0–6″ | 100 | 97 | 83 | 67 | 58 | 26.3 | 16.9 | 7.4 | 0.4 | 52 | NP |
| | | 6–19″ | 100 | 89 | 81 | 64 | 54 | 26.3 | 12.6 | 6.1 | 1.2 | 52 | NP |
| | | 19–31″ | 100 | 100 | 78 | 60 | 47 | 24.2 | 20.6 | 13.1 | 4.9 | 45 | NP |
| | | 31–60″ | 100 | 94 | 77 | 64 | 53 | 22.9 | 22.2 | 14.3 | 4.8 | 44 | NP |
| 310 | NW¼ , SE¼ , Sec. 22, T.8S., R.8E | 0–12″ | 100 | 100 | 89 | 78 | 66.8 | 23.2 | 13.3 | 6.2 | 1.8 | 55 | NP |
| | | 12–30″ | 100 | 93 | 82 | 67 | 50.0 | 16.5 | 11.4 | 3.6 | 2.4 | 67 | NP |
| | | 30–60″ | 100 | 76 | 62 | 44 | 29.6 | 15.8 | 8.3 | 3.5 | 0.5 | 39 | NP |

# TABLE 7—ENGINEERING TEST DATA

| Mapping Unit Number | Location | Depth | Sieve Size—Percent Passing 3" | 1" | 1/2" | #4 | #10 | #200 | .034 | .009 | .0034 | LL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 312 | NE¼ , SE¼ , Sec. 19, T.4S., R.6E | 0–19" | 100 | 95 | 87 | 57 | 28.6 | 15.2 | 12.8 | 8.6 | 2.5 | 39 | NP |
| | | 19–27" | 100 | 100 | 84 | 63 | 42.2 | 22.8 | 17.0 | 12.7 | 3.4 | 37 | NP |
| | | 27–40" | 100 | 98 | 86 | 63 | 40.4 | 19.7 | 15.1 | 10.5 | 2.7 | 36 | 4 |
| | | 40–60" | 100 | 92 | 78 | 58 | 45.5 | 23.0 | 17.3 | 10.0 | 3.2 | 35 | NP |
| | NW¼ , NE¼ , Sec. 17, T.3S., R.6E | 7–15" | 100 | 100 | 96 | 78 | 46 | 22.1 | 14.6 | 10.5 | 2.7 | 46 | NP |
| | | 15–27" | 100 | 94 | 80 | 58 | 31 | 10.0 | 4.3 | 2.6 | 0.6 | — | — |
| | | 27–45" | 100 | 95 | 87 | 71 | 57 | 32.4 | 27.3 | 20.0 | 7.6 | 36 | NP |
| | SW¼ , NW¼ , Sec. 25, T.4S., R.5E | 0–10" | 100 | 100 | 99 | 80 | 38 | 25.0 | 17.0 | 13.1 | 7.5 | 53 | NP |
| | | 10–27" | 100 | 100 | 99 | 94 | 39 | 28.1 | 19.5 | 16.1 | 9.3 | 44 | NP |
| | | 27–49" | 100 | 100 | 99 | 87 | 53 | 40.3 | 35.6 | 27.2 | 16.5 | 45 | NP |
| | | 49–70" | 100 | 99 | 94 | 73 | 51 | 37 | 32.3 | 24.9 | 15.2 | 42 | 1 |
| | SW¼ , NW¼ , Sec. 25, T.4S., R.5E | 0–10" | 100 | 89 | 79 | 68 | 43.7 | 11.8 | 9.8 | 5.1 | 1.6 | 37 | NP |
| | | 10–27" | 100 | 94 | 91 | 83 | 57 | 20 | 15 | 8.2 | 2.9 | — | — |
| | | 27–53" | 100 | 100 | 90 | 82 | 74 | 37 | 30.6 | 19.0 | 3.7 | 43 | NP |
| | | 53–72" | 100 | 91 | 70 | 58 | 52 | 22 | 17.5 | 10.7 | 1.9 | 39 | NP |
| 315 | SW¼ , SE¼ , Sec. 16, T.4S., R.6E | 0–13" | 100 | 100 | 92 | 77 | 58 | 31.4 | 20.6 | 9.7 | 2.1 | 40 | NP |
| | | 13–36" | — | — | — | — | — | — | — | — | — | — | — |
| | | 36–60" | 100 | 100 | 86 | 79 | 73 | 38.5 | 29.3 | 12.3 | 1.6 | 33 | NP |
| | NW¼ , SE¼ , Sec. 6, T.4S., R.6E | 0–5" | 100 | 100 | 100 | 93 | 74 | 41.6 | 26.8 | 18.3 | 4.4 | 44 | NP |
| | | 5–13" | 100 | 98 | 94 | 82 | 59 | 32.4 | 23.1 | 15.4 | 4.7 | — | — |
| | | 13–32" | 100 | 99 | 89 | 73 | 59 | 26.5 | 19.6 | 12.0 | 2.1 | 53 | NP |
| | | 32–42" | 100 | 100 | 94 | 77 | 60 | 16.0 | 11.8 | 8.7 | 2.7 | 43 | NP |
| 317 | SE¼ , NE¼ , Sec. 23, T.5S., R.4E | 0–9" | 100 | 100 | 94 | 82 | 56 | 26.2 | 11.8 | 3.3 | 0.5 | — | — |
| | | 9–22" | 100 | 100 | 92 | 79 | 56 | 28.2 | 17.4 | 8.2 | 0.4 | 52 | NP |
| | | 22–36" | 100 | 94 | 88 | 80 | 73 | 34.6 | 30.0 | 19.4 | 5.1 | 41 | NP |
| | | 36–65" | 100 | 100 | 98 | 91 | 83 | 41.1 | 34.2 | 22.2 | 3.6 | 44 | NP |

## TABLE 7—ENGINEERING TEST DATA

| Mapping Unit Number | Location | Depth | Sieve Size—Percent Passing | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3″ | 1″ | 1/2″ | #4 | #10 | #200 | .034 | .009 | .0034 | LL | PI |
| 320 | NE¼, SE¼, Sec. 13, T.5S., R.6E | 0–9″ | 100 | 86 | 77 | 64 | 52 | 20.1 | 10.2 | 2.7 | 0.4 | 55 | NP |
| | | 9–21″ | 100 | 100 | 85 | 69 | 57 | 21.7 | 12.8 | 9.5 | 4.5 | 54 | NP |
| | | 21–31″ | 100 | 94 | 88 | 75 | 62 | 25.3 | 16.6 | 5.8 | 1.3 | 42 | NP |
| | | 31–60″ | 100 | 93 | 77 | 67 | 57 | 31.5 | 21.7 | 8.4 | 0.4 | 42 | NP |
| | SW¼, NE¼, Sec. 19, T.5S., R.5E | 0–11″ | 100 | 100 | 87 | 59 | 29 | 17.6 | 12.2 | 7.1 | 2.4 | 62 | NP |
| | | 11–24″ | 100 | 73 | 67 | 49 | 27 | 16.0 | 12.3 | 7.2 | 2.1 | 52 | NP |
| | | 29–41″ | 100 | 100 | 63 | 43 | 25 | 15.8 | 13.2 | 8.0 | 2.8 | 47 | NP |
| 323 | SE¼, NW¼, Sec. 21, T.6S., R.8E | 0–11″ | 100 | 100 | 89 | 78 | 62 | 23.7 | 17.6 | 9.5 | 2.3 | 39 | NP |
| | | 11–22″ | 100 | 100 | 89 | 82 | 73 | 52.3 | 31.5 | 17.6 | 5.9 | 42 | NP |
| | | 22–60″ | 100 | 90 | 75 | 63 | 54 | 34.1 | 24.8 | 19.3 | 7.5 | 30 | NP |
| | SW¼, NE¼, Sec. 1, T.5S., R.8E | 0–8″ | 100 | 100 | 86 | 55 | 17 | 7.8 | 5.2 | 2.7 | 0.6 | 78 | NP |
| | | 8–17″ | 100 | 98 | 94 | 69 | 27 | 14.0 | 10.6 | 5.4 | 1.4 | 43 | NP |
| | | 17–31″ | 100 | 100 | 98 | 87 | 64 | 46 | 37.7 | 24.0 | 9.9 | 48 | NP |
| | | 31–60″ | 100 | 97 | 82 | 69 | 56 | 37.8 | 32.6 | 21.0 | 8.7 | 44 | NP |
| | SE¼, NW¼, Sec. 21, T.6S., R.8E | 0–8″ | 100 | 100 | 91 | 75 | 53 | 28.0 | 16.1 | 11.4 | 5.1 | 46 | NP |
| | | 8–17″ | 100 | 100 | 96 | 83 | 65 | 43.1 | 35.3 | 24.0 | 11.8 | 45 | NP |
| | | 17–60″ | 100 | 100 | 91 | 81 | 60 | 41 | 33.0 | 22.0 | 11.0 | 43 | 8 |
| 327 | NW¼, SE¼, Sec. 32, T.7S., R.5E | 0–6″ | 100 | 100 | 90 | 68 | 51 | 11.1 | 7.8 | 3.3 | 0.4 | 63 | NP |
| | | 6–26″ | 100 | 97 | 82 | 65 | 49 | 12.0 | 7.0 | 5.0 | 1.0 | 52 | NP |
| | | 26–33″ | 100 | 100 | 90 | 71 | 55 | 14.5 | 9.4 | 4.5 | 0.4 | 53 | NP |
| | | 33–60″ | 100 | 93 | 64 | 39 | 26 | 7.6 | 5.7 | 2.9 | 0.6 | 49 | NP |
| 330 | SE¼, NE¼, Sec. 34, T.1N., R.8E | 0–9″ | 100 | 87 | 77 | 66 | 48 | 20.7 | 11.1 | 3.2 | — | 47 | NP |
| | | 9–19″ | 100 | 91 | 81 | 69 | 52 | 20.0 | 14.1 | 5.7 | 1.1 | 48 | NP |
| | | 19–37″ | 100 | 98 | 80 | 65 | 51 | 17.6 | 12.2 | 4.6 | 0.4 | 50 | NP |
| | | 37–60″ | 100 | 84 | 69 | 58 | 48 | 16.6 | 12.8 | 2.9 | — | 46 | NP |

# TABLE 7—ENGINEERING TEST DATA

| Mapping Unit Number | Location | Depth | Sieve Size—Percent Passing 3″ | 1″ | 1/2″ | #4 | #10 | #200 | .034 | .009 | .0034 | LL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 331 | SW¼, NE¼, Sec. 33, T.5S., R.7E | 0–6″ | 100 | 95 | 83 | 69 | 56.1 | 24.1 | 13.9 | 7.0 | 0.9 | 54 | NP |
| | | 6–12″ | 100 | 88 | 69 | 53 | 39.4 | 14.4 | 6.5 | 2.2 | 0.9 | 57 | NP |
| | | 24–60″ | 100 | 96 | 82 | 62 | 42.4 | 13.1 | 7.9 | 2.7 | 0.7 | 46 | NP |
| 333 | SE¼, NW¼, Sec. 25, T.1S., R.8½E | 4–13″ | 100 | 92 | 90 | 83 | 66 | 29.7 | 14.0 | 4.3 | 0.5 | 42 | NP |
| | | 13–60″ | 100 | 91 | 84 | 78 | 65 | 33.6 | 18.2 | 6.5 | 2.3 | 45 | NP |
| 335 | SW¼, SW¼, Sec. 26, T.5S., R.7E | 2–11″ | 100 | 100 | 96 | 88 | 73.8 | 31.1 | 14.3 | 8.8 | 5.6 | 34 | NP |
| | | 11–19″ | 100 | 84 | 79 | 71 | 60.3 | 25.5 | 17.8 | 9.8 | 3.2 | 33 | NP |
| | | 19–31″ | 100 | 82 | 78 | 68 | 57.0 | 28.3 | 23.3 | 18.3 | 3.1 | 30 | NP |
| | | 31–60″ | 100 | 100 | 91 | 75 | 60.5 | 30.3 | 24.6 | 14.1 | 4.2 | 32 | NP |
| 337 | SW¼, SW¼, Sec. 26, T.5S., R.7E | 0–10″ | 100 | 95 | 80 | 64 | 49 | 18.4 | 12.5 | 4.9 | 1.1 | 33 | NP |
| | | 10–20″ | 100 | 100 | 83 | 65 | 49 | 16.9 | 10.1 | 3.1 | 0.5 | 46 | NP |
| | | 20–31″ | 100 | 93 | 82 | 60 | 45 | 10.2 | 5.6 | 1.0 | 0.6 | 49 | NP |
| | | 31–60″ | 100 | 90 | 79 | 56 | 39 | 12.3 | 7.6 | 5.0 | 1.9 | 49 | NP |
| 347 | SW¼, SE¼, Sec. 1, T.1S., R.10E | 1–4″ | 100 | 98 | 95 | 86 | 70 | 35.5 | 19.0 | 8.4 | 3.1 | 29 | NP |
| | | 4–11″ | 100 | 100 | 97 | 90 | 73 | 34.7 | 18.9 | 8.7 | 3.2 | 29 | NP |
| | | 11–26″ | 100 | 100 | 97 | 81 | 58 | 28.3 | 19.3 | 10.6 | 1.8 | 28 | NP |
| | | 26–60″ | 100 | 100 | 95 | 86 | 72 | 38.6 | 25.9 | 14.1 | 3.2 | 24 | NP |
| 352 | NE¼, SW¼, Sec. 13, T.5S., R.10E | 0–12″ | 100 | 100 | 99 | 93 | 80 | 30.8 | 17.5 | 10.5 | 2.9 | 35 | NP |
| | | 12–37″ | 100 | 100 | 99 | 89 | 77 | 30.7 | 20.3 | 3.5 | 0.1 | 44 | NP |
| | NE¼, NW¼, Sec. 22, T.4S., R.11E | 0–10″ | 100 | 100 | 98 | 94 | 85 | 42.5 | 35.2 | 22.0 | 7.0 | 24 | NP |
| | | 10–29″ | 100 | 100 | 99 | 96 | 87 | 54.0 | 39.4 | 20.0 | 9.1 | 22 | NP |
| | | 29–60″ | 100 | 100 | 100 | 83 | 52 | 36.5 | 32.3 | 21.7 | 14.2 | 35 | 7 |
| 370 | SW¼, NW¼, Sec. 28, T.2N., R.9E | 1–8″ | 100 | 98 | 87 | 80 | 59 | 25.2 | 20.2 | 8.2 | 1.3 | 43 | NP |
| | | 8–14″ | 100 | 95 | 88 | 78 | 58 | 24.6 | 20.9 | 7.2 | 1.3 | 42 | NP |
| | | 14–25″ | 100 | 100 | 89 | 79 | 70 | 41.3 | 24.0 | 7.7 | 1.5 | 49 | NP |
| | | 25–60″ | 100 | 93 | 80 | 74 | 67 | 38.1 | 24.8 | 11.2 | 3.4 | 38 | NP |

The laboratory data contained in this section of the Soil Resource Inventory report was obtained from samples collected at over 100 soil sample sites. Samples were analyzed at the Oregon State University Soil Testing Laboratory. It is hoped that the data contained herein will provide the forest land manager with some reliable benchmark information regarding forest soil fertility status on the Mt. Hood National Forest. It is also hoped that this data base can be supplemented in the future, with more data to be obtained from other locations.

As the user of this report scans through the laboratory data in this section, he should observe the trends in various nutrient analyses as the geographic location (i.e., eastside-westside, high vs. low elevation) changes. He should also be cognizant of the trends in soil nutrient content as soil depth increases. Such observations will emphasize the importance of soil conservation practices on the maintenance of soil fertility.

''Soil fertility'' is a general term use to describe the ability of a soil to store and supply the mineral elements essential for plant growth. The discussion of soil fertility is relative only to the type of crop grown as soils that are fertile for one plant species may be infertile for another. Various plant species differ in their nutrient requirements as well as their ability to extract certain nutrient elements from the soil.

Soil fertility is not something which remains constant. It may fluctuate slightly about an average value over long periods of time or it may change drastically after some type of disturbance. Soil fertility can either demonstrate increases or decreases over time depending on management practices.

The impacts of forest management practices on soil fertility status can often be great. A large quantity of the available soil nutrients is contained in the top six inches of the soil profile. This is especially true in many forest soils, which are often immature, stony, and lack profile development. Management practices such as machine piling of slash and mechanical site preparation can disturb or remove surface soil layers, and can significantly reduce soil fertility.

Soil fertility has a large impact on forest productivity. However, total forest productivity (i.e. cu. ft. of wood/acre/year) is determined by the interaction of soil fertility with other physical factors such as available soil moisture, soil temperature, soil aeration, and light; as well as biologic factors such as species being managed and genotypic variation within species.

There are sixteen mineral elements that are required by plants (including trees) for growth and development. Some of these elements are required in relatively large quantities while others are required for growth but only in very small amounts. These elements are termed ''macronutrients'' and ''micronutrients'' respectively (Table 8).

Table 8[1] Plant Nutrients and the forms in which they are absorbed

| Macronutrients: | Absorbed as | Micronutrients: | Absorbed as |
|---|---|---|---|
| Carbon (C) | $CO_2$[2] | Iron (Fe) | $Fe^{2+}$, $Fe^{3+}$ |
| Hydrogen (H) | $H^+$, $H_2O$ | Manganese (Mn) | $Mn^{2+}$ |
| Oxygen (O) | $O^{2-}$, $OH^-$, $CO_3^-$, $SO_4^{2-}$ | Copper (Cu) | $Cu^{2+}$ |
| Nitrogen (N) | $NH_4^+$, $NO_2^-$, $NO_3^-$ | Zinc (Zn) | $Zn^{2+}$ |
| Phosphorus (P) | $H_2PO_4^-$ | Molybdenum (Mo) | $MoO_4^{2-}$ |
| Potassium (K) | $K^+$ | Boron (B) | $BO_3^{3-}$ |
| Calcium (Ca) | $Ca^{2+}$ | Chlorine (Cl) | $Cl^-$ |
| Magnesium (Mg) | $Mg^{2+}$ | | |
| Sulfur (S) | $SO_4^{2-}$ | | |

In this soil survey, only data on macronutrient status were obtained. Micronutrient status of selected areas will be determined in the future.

Water is also considered as a plant nutrient[3] and available soil water influences soil fertility. It is essential to all phases of plant growth and accounts for approximately 80 to 90 percent of a plant's live weight. Water is necessary for the photosynthetic production of sugar which provides the energy for cell metabolism. Water is also necessary for transpiration; the process by which water is moved from the soil to the atmosphere through the plant.

Nitrogen is probably the most important mineral element in the soil in terms of volume consumed and the frequency at which it is a growth limiting factor.

Elemental nitrogen (N) is found in large quantities in the atmosphere and in combination with organic materials in the soil. Unfortunately, plants cannot utilize N in elemental or organic forms. The usual forms of N absorbed by plant roots are the ammonium ($NH_4^+$) and nitrate ($NO_3^-$) ions. Generally, speaking, more $NO_3^-$ is utilized by plants than is $NH_4^+$ because is occurs in greater concentration and is more mobile in the soil. However, trees frequently utilize more $NH_4^+$ than $NO_3^-$.

[1] From Powers, R.F. 1976. Principles and concepts of forest soil fertility. In Earth Science Symposium, 1st Annual Earth Science Symposium, California Region, Fresno, Calif. No. 8-12, 1976. 33p.

[2] Absorption mainly by leaves.

[3] Segments of this Section from Hausenbuiller, R.L. 1972, Soil Science, Principles and Practice. Wm. C. Brown Publishers Co., Dubuque, Iowa. 504p.

Atmospheric nitrogen ($N_2$ gas) is converted to the organic and inorganic form of N found in soils by microorganisms through a process known as fixation. These organisms, usually bacteria, convert $N_2$ gas to protein and give off $NH_4^+$ as a waste product.

N in plants occurs primarily in amino acids and protein which is concentrated in the protoplasm of plant cells. N is also a component of chlorophyll, the green pigment responsible for photosynthesis.

Phosphorus (P) is essential to several processes within the plant. P is a major component of chromosomes in plant cell nuclei; P also is important in the energy transfer processes within the plant.

The exact function of potassium (K) in plants is not known. K appears to be important in the synthesis of proteins, carbohydrates, and chlorophyll. K is also important in the absorption of $NO_3^-$, $H_2PO_4^-$ and $HPO_4^{2-}$; and the translocation and storage of carbohydrates.

Calcium occurs largely in plants as a pectate, a constituent of the cell wall. Ca content is particularly high in woody vegetation.

Ca content in soils is also important because it can affect the availability of other nutrients, especially magnesium. A high level of exchangeable Ca tends to maintain a more nearly ideal, intermediate range of pH in soils. Because extremes in pH are often identified with severe nutrient deficiencies or excesses of ions that may be toxic to plants, an undesirable Ca status should always be suspect in soils of abnormally high or low pH.

Magnesium (Mg) is a component of chlorophyll and is thought to aid both the translocation of starch and the formation of fats and oils. Mg also appears to affect the absorption and movement of P within the plant.

Sulfur (S) is necessary for chlorophyll synthesis and for the production of oil in seeds. When the supply of S-bearing amino acids is restricted, protein synthesis is restricted.

The other micronutrients make their major contribution to plant growth as constituents of enzyme or hormone systems that control a wide range of biochemical processes. Included in these processes are respiration, energy exchange, and the synthesis of chlorophyll, carbohydrates, and proteins.

In the tables of soil chemical laboratory data, important soil properties other than macronutrient status are also listed. These include: pH, organic matter percent, cation-exchange capacity, percent base saturation, carbon-nitrogen ratio, and calcium-magnesium ration.

pH:

One of the more important properties of a soil is its reaction or pH. Many biological processes in the soil, including plant growth, are highly dependent on pH. Extremes in reaction, either strong acidity or strong alkalinity, interfere with these processes and may be considered undersirable.

The pH value expresses the concentration of hydrogen ions in the soil solution. Values range from 1 to 14 with 7 being neutral. Acid reactions occur at pH values below 7 which alkaline reactions occur at pH values above 7.

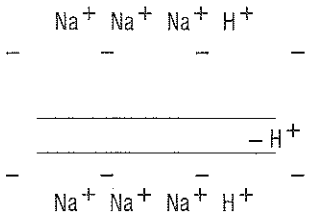
Organic Matter Percent:

The organic matter content of soil is important as it is a source of slowly mineralizable N, P, and S. The amount of organic matter found in soils is usually expressed on a weight percentage basis. In theory, the content can be determined as the loss of weight of a sample when its organic matter is removed, however this is often difficult. Most often organic carbon is determined because C is an essential component of organic matter and C makes up an almost constant fraction of organic matter.

Organic matter aids in the formation of soil structural units which is important in aeration and drainage. Organic matter has a high cation exchange capacity which reduces leaching losses of K, Ca, and Mg.

Cation-Exchange Capacity:

Soil materials consist of many small particles which have net negative charges at their surfaces. Cations (positively charged ions) are attracted to and are held at these sites of negative charge.




The cation-exchange capacity (CEC) is the quantity of ions held in exchangeable form. This value represents the total number of negative charges per unit quantity of soil neutralized by easily replaceable cations. Generally speaking, soils with high CEC values are more fertile than soils with low CEC values.

CEC values for mineral soil material are usually less than 60 milliequivalents per 100 grams of soil. Soils with relatively high CEC values are often high in organic matter or expanding lattice clays.

Percent Base Saturation:

The percent base saturation refers to the number of exchange sites occupied by exchangeable bases ($Ca^{2+}$, $Mg^{2+}$, $K^{+}$, and $Na^{+}$). Most exchange sites are usually occupied by $Al^{3-}$ or $H^{+}$ in acid soils. More fertile soils generally have high percent base saturation values. However, this must always be viewed relative to the CEC value of the soil. In areas of high rainfall, such as the Western Cascades, many of the exchangeable bases have been leached from the exchange sites, resulting in low percent base saturation values for many of our soils.

Carbon-Nitrogen Ration:

A consistent relationship exists between decomposition rates and the content of C and N in plant residues, with decay proceeding most rapidly in residues with high N and low C content. Lack of N in plant residues restricts decay by limiting microbial growth.

Because of the above relationships, the potential for decay can be indicated by the ratio of total C to total N. The narrower the ratio in plant tissue, the more rapid is the rate of decay with a consequent release of N With C:N ratios above 30:1 there is an immobilization of nitrogen.

Calcium-Magnesium Ratio:

Ionic interactions affect the uptake and utilization of one more nutrients by plants. Plants appear to have fixed capacity for absorbing nutrient bases, but it seems to make little difference which bases are absorbed. Thus an over abundance of Ca may inhibit Mg uptake to the point where Mg deficiency occurs.

In the tables 9 of soil chemical laboratory data, all units for nutrient analyses (except for P) are milliequivalent weights per 100 grams of soil.

Again it should be emphasized that the analyses of soil samples were conducted at Oregon State University. Since the techniques of soil analysis can vary between laboratories, care should be taken in comparing these test results with those from other laboratories unless the same methods have been used. Information on analysis methods is available in the Supervisor's Office. Laboratory data preceded by an asterisk were taken from the Soil Survey Report, Bull Run-Sandy Area.

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | NW½, NE½, Sec. 24, T.4S., R.9E. | 1–6″ | 5.5 | 1.55 | .02 | 44.2 | 10 | 20 | .05 | .09 | 2.1 | .36 | 3 | 78 | 5.8 |
| | | 6–15″ | 5.7 | 1.00 | .01 | 57.1 | 3 | 8 | .02 | .10 | 1.6 | .20 | 1 | 160 | 8.0 |
| | | 17–30″ | 5.8 | 1.05 | .01 | 60.0 | 14 | 16 | .04 | .07 | 1.5 | .20 | 2 | 108 | 7.5 |
| | | 30–60″ | 6.0 | .95 | .01 | 53.7 | 4 | 8 | .02 | .07 | 1.3 | .16 | 1 | 276 | 8.1 |
| *13 | SE¼, SW¼, Sec. 21, T.1S., R.8E. | 1.5–6″ | 5.5 | 19.3 | .35 | 32.0 | 2 | | .24 | .35 | 1.0 | .50 | 42 | 5 | 2.0 |
| | | 6–13″ | 5.5 | 12.7 | .29 | 25.0 | 1 | | .20 | .30 | 0.7 | .30 | 39 | 4 | 2.3 |
| | | 13–22″ | 5.6 | 11.6 | .24 | 28.0 | 1 | | .12 | .30 | 0.5 | .20 | 39 | 3 | 2.5 |
| | | 22–28″ | 5.5 | 10.8 | .24 | 26.0 | 1 | | .13 | .12 | 0.5 | .20 | 36 | 3 | 2.5 |
| | | 28–38″ | 5.6 | 8.6 | .21 | 24.0 | 1 | | .06 | .12 | 0.4 | .10 | 37 | 2 | 4.0 |
| | | 38–47″ | 5.7 | 6.5 | .13 | 30.0 | 2 | | .02 | .15 | 0.2 | .10 | 37 | 2 | 2.0 |
| 100 | NW¼, SE¼, Sec. 26, T.6S., R.6E. | 0–9″ | 5.8 | 1.93 | .09 | 12.25 | 27 | 636 | 1.63 | .10 | 0.9 | .30 | 29 | 10 | 3.0 |
| | | 9–22″ | 5.7 | .82 | .06 | 7.80 | 4 | 464 | 1.18 | .15 | 0.9 | .30 | 23 | 11 | 3.0 |
| | | 22–42″ | 5.2 | .82 | .03 | 15.62 | 2 | 250 | 0.64 | .49 | 1.8 | .82 | 22 | 17 | 2.2 |
| | | 42–70″ | 5.2 | .35 | .02 | 10.00 | 1 | 208 | 0.53 | .21 | 0.9 | .36 | 23 | 9 | 2.5 |
| 100 | NE¼, SE¼, Sec. 14, T.6S., R.6E. | 0–9″ | 5.2 | 6.00 | .13 | 26.37 | 35 | 388 | .995 | .21 | 5.3 | 1.5 | 26 | 31 | 3.5 |
| | | 9–21″ | 5.3 | 3.84 | .08 | 27.43 | 9 | 444 | 1.138 | .15 | 5.9 | 2.4 | 23 | 42 | 2.5 |
| | | 21–55″ | 5.4 | 3.28 | .05 | 37.39 | 4 | 280 | .718 | .17 | 7.9 | 3.0 | 20 | 58 | 2.6 |
| | | 55–70″ | 5.4 | 3.15 | .03 | 60.00 | 2 | 128 | .328 | .26 | 8.8 | 7.4 | 24 | 70 | 1.2 |
| 101 | NW¼, SE¼, Sec. 12, T.6S., R.6E. | 0–5″ | 5.6 | 5.41 | .03 | 104.80 | 72 | 650 | 1.671 | .17 | 17.7 | 6.4 | 40 | 65 | 2.8 |
| | | 5–15″ | 5.6 | 3.05 | .09 | 19.70 | 46 | 432 | 1.108 | .17 | 16.3 | 6.3 | 40 | 60 | 2.6 |
| | | 15–29″ | 5.6 | 1.55 | .04 | 22.50 | 12 | 280 | .717 | .21 | 17.5 | 6.3 | 38 | 66 | 2.8 |
| | | 29–60″ | 5.7 | 1.18 | .02 | 34.30 | 25 | 208 | .533 | .23 | 24.0 | 9.2 | 39 | 86 | 2.6 |
| 103 | SW¼, NE¼, Sec. 11, T.6S., R.6E. | 0–4″ | 5.2 | 4.40 | .13 | 19.34 | 6 | 524 | 1.34 | .17 | 18.3 | 5.9 | 37 | 69 | 3.1 |
| | | 4–16″ | 4.9 | 2.58 | .07 | 21.06 | 3 | 380 | .97 | .26 | 24.0 | 7.2 | 53 | 61 | 3.3 |
| | | 16–60″ | 4.9 | 3.32 | .03 | 63.24 | 1 | 274 | .70 | .23 | 25.0 | 6.6 | 52 | 62 | 3.8 |
| 104 | SE¼, NE¼, Sec. 36, T.6S., R.6E. | 0–15″ | 5.6 | 4.76 | .09 | 30.75 | 10 | 204 | .52 | .15 | 3.4 | .59 | 24 | 19 | 5.8 |
| | | 15–25″ | 5.9 | 0.75 | .04 | 10.90 | 3 | 524 | 1.34 | .28 | 9.9 | 2.8 | 32 | 44 | 3.5 |
| | | 25–39″ | 6.1 | 0.23 | .02 | 6.68 | 3 | 540 | 1.38 | .33 | 9.3 | 2.6 | 23 | 58 | 3.6 |
| | | 39–53″ | 6.1 | 0.77 | .01 | 44.76 | 4 | 614 | 1.57 | .49 | 8.6 | 2.7 | 22 | 62 | 3.2 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g K Meq/100g | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 104 | SW¼, NE¼, Sec. 22, T.7S., R.5E. | 0–11″ | 5.5 | 4.42 | .07 | 36.71 | 4 | 398 | 1.02 | .10 | 2.4 | 1.7 | 24 | 22 | 1.4 |
| | | 11–27″ | 5.4 | 0.52 | .03 | 10.07 | 6 | 256 | .65 | .13 | 3.8 | 3.6 | 27 | 30 | 1.1 |
| | | 27–60″ | 5.5 | 0.98 | .02 | 28.48 | 5 | 180 | .46 | .13 | 3.2 | 1.4 | 27 | 19 | 2.3 |
| 107 | SW¼, NW¼, Sec. 21, T.4S., R.5E. | 0–8″ | 5.6 | 4.98 | .12 | 23.71 | 3 | 424 | 1.08 | .13 | 5.9 | 4.4 | 25 | 46 | 1.3 |
| | | 8–15″ | 5.9 | 2.05 | .06 | 19.52 | 1 | 286 | .73 | .23 | 3.7 | 3.4 | 21 | 39 | 1.1 |
| | | 15–27″ | 5.6 | 1.17 | .05 | 13.37 | 2 | 116 | .29 | .53 | 2.4 | 3.7 | 21 | 33 | 0.7 |
| | | 27–44″ | 5.8 | 0.70 | .03 | 13.33 | 2 | 54 | .13 | .63 | 3.2 | 4.5 | 23 | 37 | 0.7 |
| 108 | NW¼, SW¼, Sec. 11, T.7S., R.5E. | 0–12″ | 5.2 | 5.36 | .15 | 20.77 | 14 | 398 | 1.02 | .13 | 2.3 | 1.7 | 35 | 15 | 1.35 |
| | | 12–20″ | 5.3 | 2.16 | .07 | 17.94 | 5 | 192 | .49 | .15 | 1.8 | 1.5 | 32 | 12 | 1.20 |
| | | 20–32″ | 5.3 | 1.38 | .03 | 26.74 | 5 | 186 | .47 | .19 | 2.5 | 2.0 | 34 | 15 | 1.25 |
| | | 32–60″ | 5.4 | 0.72 | .01 | 41.86 | 3 | 204 | .52 | .10 | 11.2 | 6.4 | 43 | 42 | 1.75 |
| *112 | NW¼, NW¼, Sec. 27, T.3S., R.7E. | 0–4″ | 5.6 | 4.60 | .15 | 18.00 | 7 | | .36 | .12 | 7.2 | 2.2 | 27 | 36 | 3.3 |
| | | 4–9″ | 5.8 | 6.20 | .13 | 28.00 | 5 | | .28 | .10 | 6.2 | 1.6 | 22 | 38 | 3.9 |
| | | 9–18″ | 6.1 | 2.60 | .07 | 23.00 | 4 | | .19 | .12 | 6.2 | 1.6 | 17 | 49 | 3.9 |
| | | 18–30″ | 5.8 | 2.20 | .05 | 27.00 | 6 | | .14 | .22 | 5.5 | 1.5 | 17 | 42 | 3.7 |
| *112 | SW¼, SW¼, Sec. 15, T.3S., R.7E. | 0–6″ | 5.7 | 11.8 | .27 | 25.0 | 11 | | .87 | .46 | 7.7 | 2.0 | 28 | 39 | 3.9 |
| | | 6–11″ | 5.9 | 6.0 | .16 | 22.0 | 5 | | .67 | .15 | 5.3 | 1.6 | 24 | 32 | 3.3 |
| | | 11–22″ | 5.9 | 3.4 | .09 | 21.0 | 3 | | .57 | .14 | 3.8 | 1.3 | 21 | 27 | 2.9 |
| | | 22–44″ | 6.0 | 2.3 | .06 | 22.0 | 5 | | .57 | .15 | 3.0 | 1.0 | 18 | 16 | 3.0 |
| *112 | SW¼, SW¼, Sec. 22, T.3S., R.7E. | 0–1″ | 5.4 | 15.3 | .50 | 18.0 | 4 | | .46 | .41 | 12.8 | 2.7 | 30 | 54 | 4.7 |
| | | 1–5″ | 5.6 | 7.9 | .15 | 30.0 | 2 | | .31 | .07 | 4.0 | 0.9 | 20 | 27 | 4.4 |
| | | 5–11″ | 5.5 | 4.6 | .12 | 23.0 | 2 | | .30 | .06 | 2.1 | 0.8 | 17 | 19 | 2.6 |
| | | 11–29″ | 5.8 | 1.9 | .05 | 21.0 | 3 | | .20 | .06 | 3.0 | 1.2 | 17 | 26 | 1.2 |
| 115 | NE¼, SW¼, Sec. 2, T.1N., R.9E. | 0–9″ | 5.7 | 6.1 | .11 | 31.6 | 6 | 262 | .67 | .09 | 3.8 | .76 | 18 | 30 | 5.0 |
| | | 9–16″ | 5.7 | 4.9 | .08 | 34.8 | 5 | 222 | .57 | .09 | 3.0 | .53 | 14 | 30 | 5.6 |
| | | 16–34″ | 6.2 | 3.5 | .04 | 50.4 | 3 | 310 | .79 | .10 | 6.1 | .92 | 14 | 58 | 6.6 |
| | | 34–60″ | 6.1 | 3.7 | .03 | 69.7 | 6 | 760 | 1.95 | .15 | 6.2 | 1.6 | 18 | 36 | 3.9 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 115 | SE¼, NW¼, Sec. 2, T.1S., R.9E. | 1–6″ | 6.2 | 2.40 | .08 | 17.14 | 6 | 262 | .67 | .10 | 3.0 | .46 | 12 | 87 | 6.5 |
| | | 6–12″ | 6.3 | 1.52 | .07 | 12.40 | 3 | 292 | .75 | .07 | 2.5 | .53 | 12 | 90 | 4.7 |
| | | 12–24″ | 6.2 | 1.41 | .06 | 13.43 | 3 | 340 | .87 | .10 | 3.0 | .59 | 16 | 78 | 5.0 |
| | | 24–60″ | 6.1 | .64 | .03 | 12.19 | 2 | 292 | .75 | .13 | 1.8 | .69 | 16 | 64 | 2.6 |
| 153 | SW¼, NW¼, Sec. 28, T.3S., R.12E. | 0–10″ | 6.5 | 1.38 | .05 | 15.8 | 19 | 346 | .88 | .13 | 5.8 | 1.8 | 11 | 82 | 3.2 |
| | | 10–21″ | 6.6 | .53 | .03 | 10.1 | 12 | 222 | .56 | .26 | 3.4 | 2.4 | 7 | 90 | 1.4 |
| | | 21–35″ | 6.8 | .37 | .02 | 10.6 | 7 | 180 | .46 | .33 | 3.2 | 2.8 | 8 | 91 | 1.1 |
| | | 35–60″ | 6.9 | .37 | .02 | 10.6 | 9 | 128 | .32 | .70 | 5.8 | 6.0 | 14 | 92 | 1.0 |
| 156 | NW¼, NE¼, Sec. 26, T.3S., R.11E. | 0–3″ | 6.1 | 2.34 | .06 | 22.2 | 29 | 326 | .84 | .17 | 4.8 | .76 | 11 | 61 | 6.3 |
| | | 3–15″ | 6.1 | 1.06 | .04 | 15.1 | 14 | 256 | .66 | .17 | 3.5 | .59 | 10 | 50 | 5.9 |
| | | 15–31″ | 6.2 | .80 | .03 | 15.2 | 9 | 262 | .67 | .19 | 3.2 | .76 | 7 | 71 | 4.2 |
| | | 31–60″ | 6.3 | .33 | .02 | 9.4 | 13 | 216 | .55 | .17 | 4.0 | 1.2 | 18 | 33 | 3.3 |
| 156 | SE¼, SW¼, Sec. 28, T.2S., R.11E. | 0–8″ | 6.0 | 1.29 | .04 | 18.4 | 9 | 228 | .58 | .13 | 3.5 | .9 | 8 | 61 | 3.8 |
| | | 8–19″ | 6.5 | .45 | .02 | 12.9 | 6 | 228 | .58 | .09 | 3.2 | 1.1 | 7 | 72 | 2.9 |
| | | 19–29″ | 6.4 | .73 | .02 | 20.6 | 6 | 198 | .50 | .10 | 3.0 | 1.5 | 7 | 78 | 2.0 |
| | | 29–60″ | 6.4 | 1.18 | .02 | 33.7 | 7 | 216 | .55 | .13 | 3.0 | 1.7 | 7 | 94 | 1.8 |
| 156 | NW¼, SE¼, Sec. 12, T.2S., R.11E. | 0–5″ | 6.1 | 3.36 | .06 | 32.0 | 21 | 228 | .58 | .07 | 5.5 | 1.1 | 12 | 59 | 5.0 |
| | | 5–14″ | 6.1 | 2.24 | .04 | 32.0 | 18 | 244 | .63 | .09 | 4.7 | 1.4 | 11 | 62 | 3.4 |
| | | 14–23″ | 6.3 | 1.46 | .03 | 27.8 | 5 | 304 | .78 | .15 | 5.1 | 2.6 | 12 | 71 | 2.0 |
| | | 23–60″ | 6.6 | 1.40 | .02 | 40.0 | 4 | 380 | .97 | .19 | 5.6 | 2.9 | 14 | 62 | 1.9 |
| 157 | SE¼, NW¼, Sec. 23, T.1S., R.11E. | 0–7″ | 6.4 | 3.35 | .11 | 17.4 | 42 | 404 | 1.03 | .19 | 10.3 | 1.4 | 14 | 91 | 7.4 |
| | | 7–15″ | 6.4 | 1.86 | .06 | 17.7 | 10 | 232 | .59 | .15 | 6.2 | 1.1 | 11 | 72 | 5.6 |
| | | 15–29″ | 6.5 | .96 | .04 | 13.7 | 5 | 262 | .67 | .15 | 6.1 | 1.4 | 10 | 80 | 4.3 |
| | | 29–60″ | 6.5 | .85 | .03 | 16.2 | 5 | 286 | .73 | .21 | 6.9 | 1.7 | 28 | 34 | 4.0 |
| 161 | NE¼, SW¼, Sec. 1, T.2S., R.10E. | 0–5″ | 5.9 | 2.79 | .08 | 19.9 | 16 | 164 | .42 | .30 | 3.8 | .30 | 7 | 67 | 12.7 |
| | | 5–15″ | 6.2 | 1.81 | .05 | 20.7 | 9 | 136 | .34 | .10 | 2.1 | .20 | 6 | 47 | 10.5 |
| | | 15–30″ | 6.3 | 1.60 | .05 | 18.2 | 6 | 268 | .68 | .10 | 2.7 | .25 | 9 | 40 | 10.8 |
| | | 30–60″ | 6.4 | 1.03 | .02 | 29.4 | 12 | 336 | .86 | .15 | 5.5 | 1.10 | 11 | 67 | 5.0 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

## TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 168 | NW¼, SE¼, Sec. 15, T.1S., R.10E. | 0–6″ | 6.5 | 4.01 | .06 | 38.2 | 29 | 244 | .62 | .04 | 4.0 | .30 | 10 | 48 | 13.3 |
| | | 6–18″ | 6.6 | 3.62 | .05 | 41.3 | 12 | 316 | .81 | .07 | 3.8 | .30 | 10 | 48 | 12.7 |
| | | 18–32″ | 6.6 | 2.92 | .04 | 41.7 | 9 | 536 | 1.37 | .07 | 5.6 | .59 | 12 | 65 | 9.4 |
| | | 32–60″ | 6.8 | 3.13 | .03 | 59.6 | 7 | 470 | 1.20 | .09 | 7.1 | .92 | 12 | 79 | 7.7 |
| *171 | NW¼, NW¼, Sec. 36, T.1S., R.5E. | 0–3″ | 5.6 | 32.4 | .64 | 29.0 | 5 | | .91 | .45 | 8.4 | 2.6 | 42 | 29 | 3.2 |
| | | 3–7″ | 5.7 | 12.6 | .28 | 26.0 | 1 | | .52 | .36 | 1.6 | 0.6 | 30 | 10 | 3.0 |
| | | 7–13″ | 5.7 | 7.9 | .22 | 21.0 | 2 | | .40 | .28 | 0.3 | 0.2 | 23 | 5 | 4.6 |
| | | 13–23″ | 5.8 | 4.3 | .13 | 19.0 | 2 | | .38 | .34 | 0.4 | 0.2 | 22 | 6 | 3.7 |
| | | 23–36″ | 5.7 | 2.2 | .07 | 17.0 | 2 | | .38 | .34 | 0.6 | 0.3 | 16 | 10 | 1.6 |
| | | 36–54″ | 5.8 | 1.4 | .06 | 13.0 | 2 | | .26 | .28 | 0.1 | | 16 | 4 | 4.0 |
| | | 54–73″ | 5.8 | 1.3 | .04 | 18.0 | 2 | | .32 | .30 | 0.4 | 0.2 | 21 | 6 | 3.5 |
| *204 | NE¼, SW¼, Sec. 36, T.2N., R.6E. | 0–7″ | 5.9 | 16.0 | .26 | 36.0 | 34 | | 1.17 | .45 | 14.4 | 3.2 | 39 | 50 | 4.5 |
| | | 7–13″ | 6.2 | 5.4 | .14 | 22.0 | 6 | | 0.94 | .45 | 10.1 | 2.8 | 31 | 46 | 3.6 |
| | | 13–21″ | 6.3 | 3.7 | .10 | 22.0 | 6 | | 1.09 | .35 | 7.6 | 2.6 | 27 | 43 | 2.9 |
| | | 21–38″ | 6.2 | 0.4 | .04 | 7.0 | 3 | | 1.12 | .43 | 8.1 | 2.6 | 24 | 51 | 3.1 |
| *204 | NE¼, NE¼, Sec. 13, T.1N., R.5E. | 0–5″ | 6.5 | 4.6 | .18 | 15.0 | 15 | | 2.44 | .25 | 28.2 | 16.5 | 63 | 76 | 1.7 |
| | | 5–14″ | 6.9 | 3.0 | .10 | 17.0 | 4 | | 1.72 | .56 | 40.0 | 18.6 | 60 | 102 | 2.2 |
| | | 14–27″ | 6.6 | 1.6 | .05 | 17.0 | 2 | | 1.26 | .31 | 25.6 | 17.7 | 56 | 80 | 1.4 |
| | | 27–40″ | 6.7 | 2.0 | .07 | 16.0 | 4 | | 1.15 | .31 | 25.6 | 17.2 | 57 | 77 | 1.5 |
| 300 | NW¼, SE¼, Sec. 14, T.9S., R.8E. | 0–8″ | 5.4 | 9.3 | .17 | 31.9 | 3 | 48 | .12 | .10 | .4 | .16 | 28 | 7 | 2.5 |
| | | 8–16″ | 5.8 | 5.5 | .02 | 160.2 | 5 | 32 | .08 | .09 | .1 | .10 | 22 | 5 | 10.0 |
| | | 16–40″ | 5.8 | 2.8 | .12 | 13.5 | 5 | 20 | .05 | .07 | .3 | .10 | 12 | 8 | 3.0 |
| 302 | SE¼, NW¼, Sec. 16, T.9S., R.8E. | 0–13″ | 5.8 | 6.4 | .11 | 33.7 | 5 | 72 | .19 | .09 | .7 | .53 | 21 | 15 | 1.3 |
| | | 13–23″ | 5.9 | 4.3 | .08 | 31.3 | 4 | 44 | .11 | .09 | .6 | .46 | 15 | 16 | 1.3 |
| | | 23–60″ | 6.0 | 2.0 | .03 | 38.6 | 7 | 26 | .07 | .09 | .4 | .59 | 14 | 13 | .7 |
| 304 | SW¼, NW¼, Sec. 13, T.9S., R.8E. | 0–13″ | 5.4 | 5.3 | .09 | 33.9 | 11 | 146 | .37 | .09 | .6 | .76 | 19 | 9 | .8 |
| | | 13–25″ | 5.6 | 1.6 | .03 | 31.0 | 4 | 156 | .40 | .10 | 1.0 | .92 | 17 | 15 | 1.1 |
| | | 25–60″ | 5.5 | 0.8 | .02 | 22.4 | 4 | 228 | .58 | .19 | 1.3 | .92 | 16 | 19 | .4 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 304 | NE¼ , SW¼ , Sec. 36, T.4S., R.8½ E. | 0–8″ | 5.2 | 4.65 | .08 | 33.2 | 3 | 124 | .318 | .09 | 0.7 | 0.25 | 19 | 7 | 2.8 |
| | | 8–16″ | 5.6 | 2.07 | .05 | 23.7 | 2 | 156 | .400 | .10 | 0.4 | 0.25 | 16 | 7 | 1.6 |
| | | 16–30″ | 5.6 | 0.98 | .04 | 14.0 | 2 | 352 | .902 | .23 | 1.2 | 0.59 | 17 | 18 | 2.3 |
| | | 30–60″ | 5.7 | 0.40 | .02 | 11.4 | 3 | 960 | 2.460 | .47 | 4.3 | 2.40 | 27 | 35 | 1.8 |
| 304 | NW¼ , SW¼ , Sec. 26, T.4S., R.8½ E. | 0–9″ | 5.5 | 3.50 | .08 | 25.0 | 3 | 152 | .389 | .10 | 0.7 | .20 | 12 | 11 | 3.5 |
| | | 9–28″ | 5.6 | 1.30 | .03 | 24.8 | 2 | 274 | .702 | .28 | 1.0 | .30 | 20 | 11 | 3.3 |
| | | 28–60″ | 5.4 | 1.15 | .03 | 21.9 | 3 | 374 | .959 | .39 | 1.9 | .43 | 21 | 18 | 4.4 |
| 304 | SW¼ , NW¼ , Sec. 1, T.6N., R.8½ E. | 0–10″ | 5.5 | 2.72 | .05 | 31.1 | 4 | 112 | .287 | .13 | 1.5 | .20 | 14 | 15 | 7.5 |
| | | 10–19″ | 5.5 | 1.83 | .03 | 34.9 | 3 | 124 | .318 | .13 | 1.8 | .43 | 13 | 21 | 4.2 |
| | | 19–55″ | 5.7 | 0.72 | .02 | 20.6 | 3 | 128 | .328 | .13 | 2.5 | 1.50 | 12 | 37 | 1.7 |
| | | 55–70″ | 5.6 | 0.83 | .02 | 23.7 | 5 | 48 | .123 | .09 | 1.3 | .43 | 23 | 8 | 3.0 |
| *304 | NE¼ , SW¼ , Sec. 35, T.4S., R.8E. | 0–8″ | 5.8 | 5.0 | .08 | 35.0 | 3 | | .40 | .15 | .40 | .30 | 22 | 6 | 1.3 |
| | | 8–16″ | 5.8 | 2.6 | .06 | 28.0 | 2 | | .36 | .16 | .10 | .30 | 21 | 4 | .3 |
| | | 16–30″ | 5.6 | 1.4 | .02 | 34.0 | 4 | | .14 | .10 | .30 | .10 | 18 | 4 | 3.0 |
| 304 | SW¼ , SW¼ , Sec. 35, T.6S., R.8½ E. | 1–12″ | 6.0 | 2.52 | .08 | 18.0 | 9 | 208 | .533 | .10 | 1.2 | .36 | 18 | 12 | 3.3 |
| | | 12–35″ | 5.7 | 0.82 | .03 | 15.6 | 4 | 232 | .595 | .13 | .9 | .69 | 14 | 17 | 1.3 |
| 304 | NE¼ , NE¼ , Sec. 25, T.4S., R.8½ E. | 0–5″ | 5.3 | 3.77 | .01 | 215.4 | 3 | 54 | .138 | .09 | 1.3 | .20 | 14 | 12 | 6.5 |
| | | 5–20″ | 5.5 | 2.61 | .06 | 24.9 | 4 | 72 | .185 | .10 | 1.2 | .16 | 12 | 14 | 7.5 |
| | | 20–32″ | 5.4 | 1.00 | .02 | 28.6 | 4 | 54 | .138 | .10 | 1.2 | .16 | 11 | 14 | 7.5 |
| | | 32–60″ | 5.4 | 1.28 | .02 | 36.7 | 3 | 60 | .154 | .07 | 1.2 | .16 | 11 | 15 | 7.5 |
| 304 | SW¼ , SE¼ , Sec. 7, T.6S., R.8E. | 0–9″ | 5.5 | 3.48 | .07 | 28.9 | 7 | 174 | .446 | .10 | 1.0 | 1.4 | 19 | 15 | 0.7 |
| | | 9–25″ | 5.6 | 2.49 | .05 | 29.0 | 5 | 320 | .820 | .15 | 1.0 | 1.7 | 18 | 21 | 0.6 |
| | | 25–60″ | 5.8 | 0.44 | .01 | 25.6 | 4 | 326 | .835 | .77 | 4.3 | 3.8 | 22 | 43 | 1.1 |
| 304 | SW¼ , NW¼ , Sec. 14, T.8S., R.8E. | 0–8″ | 5.7 | 6.48 | .04 | 94.19 | 5 | 116 | .297 | .09 | .3 | .16 | 26 | 3 | 1.9 |
| | | 8–28″ | 5.6 | 2.20 | .12 | 10.65 | 6 | 54 | .138 | .13 | .7 | .36 | 14 | 9 | 1.9 |
| | | 28–60″ | 5.9 | 0.80 | .04 | 11.62 | 7 | 60 | .153 | .13 | .4 | .20 | 16 | 6 | 2.0 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

## TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | K ppm | Extractable Cations MEQ/100g K Meq/100g | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 304 | SW¼, SE¼, Sec. 3, T.8S., R.7E. | 0–4″ | 5.4 | 4.07 | .08 | 29.57 | 4 | 146 | .374 | .10 | 0.9 | .30 | 17 | 10 | 3.0 |
| | | 4–17″ | 5.4 | 3.27 | .03 | 63.37 | 3 | 186 | .476 | .10 | 0.4 | .25 | 18 | 7 | 1.6 |
| | | 17–28″ | 5.5 | 0.52 | .01 | 30.23 | 2 | 580 | 1.487 | .19 | 1.6 | .76 | 61 | 7 | 2.1 |
| | | 28–60″ | 5.5 | 0.46 | .31 | 0.26 | 2 | 496 | 1.271 | .30 | 4.2 | 2.0 | 25 | 31 | 2.1 |
| 305 | NE¼, SE¼, Sec. 3, T.7S., R.7E. | 1–9″ | 5.5 | 4.92 | .07 | 40.16 | 4 | 286 | .733 | .10 | 1.3 | .69 | 22 | 13 | 1.9 |
| | | 9–21″ | 5.7 | 3.87 | .07 | 31.59 | 2 | 270 | .615 | .13 | 1.3 | .69 | 24 | 11 | 1.9 |
| | | 21–47″ | 5.8 | 0.59 | .02 | 16.85 | 3 | 274 | .702 | .15 | 3.5 | 2.60 | 18 | 39 | 1.4 |
| 306 | SW¼, NW¼, Sec. 28, T.6S., R.7E. | 0–8″ | 5.5 | 8.29 | .15 | 31.58 | 5 | 404 | 1.035 | .17 | 3.4 | .89 | 22 | 25 | 3.8 |
| | | 8–16″ | 5.5 | 6.43 | .13 | 28.26 | 3 | 140 | .359 | .13 | 2.3 | .73 | 19 | 18 | 5.4 |
| | | 16–30″ | 5.7 | 3.67 | .04 | 52.43 | 6 | 380 | .974 | .10 | 3.2 | .92 | 17 | 31 | 3.5 |
| | | 30–60″ | 5.5 | 3.11 | .02 | 88.86 | 3 | 216 | .554 | .21 | 1.8 | 1.10 | 16 | 23 | 1.6 |
| 306 | SW¼, NW¼, Sec. 25, T.7S., R.7E. | 0–5″ | 5.9 | 4.12 | .11 | 21.77 | 6 | 228 | .584 | .09 | 3.7 | .76 | 18 | 29 | 4.9 |
| | | 5–23″ | 6.1 | 1.07 | .05 | 12.44 | 2 | 180 | .461 | .09 | 2.5 | .76 | 13 | 28 | 3.3 |
| | | 23–41″ | 6.0 | 1.28 | .03 | 24.80 | 2 | 116 | .297 | .09 | 1.9 | .63 | 13 | 23 | 3.0 |
| | | 41–60″ | 6.0 | 1.39 | .03 | 26.93 | 3 | 96 | .246 | .09 | 1.3 | .36 | 15 | 14 | 3.6 |
| 306 | SE¼, SW¼, Sec. 18, T.7S., R.8E. | 0–13″ | 5.8 | 4.87 | .09 | 31.45 | 4 | 84 | .215 | .09 | .9 | .36 | 22 | 7 | 2.5 |
| | | 13–25″ | 5.9 | 3.69 | .09 | 23.83 | 3 | 60 | .154 | .09 | .6 | .30 | 20 | 6 | 2.0 |
| | | 25–60″ | 6.0 | 1.93 | .03 | 37.40 | 2 | 30 | .077 | .09 | .4 | .25 | 17 | 5 | 1.6 |
| 306 | NE¼, SE¼, Sec. 30, T.6S., R.8E. | 0–10″ | 6.0 | 2.27 | .07 | 18.85 | 3 | 164 | .421 | .09 | 1.8 | .92 | 17 | 19 | 2.0 |
| | | 10–21″ | 6.0 | 1.55 | .06 | 15.02 | 3 | 152 | .389 | .09 | 3.2 | 1.3 | 16 | 32 | 2.5 |
| | | 21–60″ | 6.3 | 1.00 | .04 | 14.53 | 3 | 124 | .317 | .07 | 3.8 | 1.1 | 18 | 29 | 3.5 |
| 307 | NW¼, SE¼, Sec. 30, T.6S., R.8E. | 0–9″ | 5.4 | 6.61 | .09 | 41.97 | 15 | 228 | .585 | .15 | 1.0 | .36 | 22 | 9 | 2.8 |
| | | 9–13″ | 5.3 | 4.79 | .11 | 24.88 | 7 | 244 | .625 | .15 | 0.7 | .43 | 21 | 9 | 1.6 |
| | | 13–41″ | 6.0 | 1.28 | .03 | 24.80 | 6 | 136 | .297 | .09 | 1.0 | .59 | 18 | 11 | 1.7 |
| | | 41–60″ | 5.6 | 3.11 | .02 | 88.85 | 6 | 398 | 1.020 | .26 | 2.5 | 1.30 | 24 | 21 | 1.9 |
| 309 | NW¼, SW¼, Sec. 21, T.7S., R.7E. | 0–6″ | 5.3 | 5.91 | .13 | 26.43 | 3 | 152 | .388 | .15 | 0.4 | .20 | 26 | 4 | 2.0 |
| | | 6–19″ | 5.4 | 3.21 | .10 | 18.66 | 2 | 152 | .388 | .15 | 0.4 | .16 | 19 | 6 | 2.5 |
| | | 19–31″ | 5.3 | 1.66 | .06 | 16.08 | 2 | 216 | .554 | .26 | 1.6 | .46 | 25 | 7 | 3.5 |
| | | 31–60″ | 5.4 | 0.80 | .03 | 15.50 | 4 | 256 | .656 | .35 | 2.7 | 1.10 | 50 | 10 | 2.5 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | K ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 309 | SW¼ , NE¼ , Sec. 27, T.8S., R.7E. | 0–9″ | 5.5 | 7.40 | .15 | 28.68 | 6 | 124 | .317 | .15 | .7 | .20 | 26 | 5 | 3.5 |
| | | 9–21″ | 5.5 | 6.48 | .15 | 25.11 | 3 | 96 | .246 | .10 | .4 | .16 | 24 | 4 | 2.5 |
| | | 21–34″ | 5.5 | 4.98 | .14 | 20.47 | 3 | 100 | .256 | .09 | .3 | .16 | 27 | 3 | 1.9 |
| | | 34–48″ | 5.5 | 2.64 | .08 | 19.18 | 3 | 100 | .256 | .10 | .3 | .10 | 20 | 4 | 3.0 |
| 310 | NW¼ , SE¼ , Sec. 22, T.8S., R.8E. | 0–12″ | 5.8 | 4.50 | .07 | 37.37 | 2 | 88 | .225 | .13 | .7 | .25 | 18 | 7 | 2.8 |
| | | 12–30″ | 5.9 | 4.28 | .10 | 24.88 | 4 | 64 | .164 | .13 | .6 | .16 | 18 | 6 | 3.6 |
| | | 30–60″ | 5.9 | 2.57 | .05 | 29.88 | 6 | 96 | .46 | .15 | .9 | .16 | 15 | 10 | 5.6 |
| 312 | NW¼ , NE¼ , Sec. 17, T.3S., R.6E. | 0–7″ | 5.0 | 10.99 | .21 | 29.90 | 7 | 116 | .97 | .17 | 1.6 | .30 | 31 | 8 | 5.3 |
| | | 7–15″ | 5.3 | 6.16 | .15 | 23.47 | 5 | 72 | .84 | .15 | 1.3 | .20 | 24 | 8 | 6.5 |
| | | 15–27″ | 5.3 | 4.39 | .11 | 22.80 | 3 | 60 | .54 | .13 | 1.3 | .20 | 20 | 9 | 6.5 |
| | | 27–45″ | 5.4 | 1.23 | .04 | 17.57 | 3 | 84 | .15 | .10 | 1.5 | .20 | 19 | 10 | 7.5 |
| 312 | SW¼ , NW¼ , Sec. 25, T.4S., R.5E. | 0–10″ | 5.1 | 9.71 | .18 | 30.83 | 2 | 106 | .71 | .13 | 3.5 | 1.8 | 33 | 17 | 1.9 |
| | | 10–27″ | 5.3 | 5.05 | .13 | 22.20 | 2 | 72 | .85 | .21 | 3.8 | 1.6 | 26 | 22 | 2.4 |
| | | 27–49″ | 5.6 | 1.67 | .04 | 23.86 | 1 | 64 | .64 | .42 | 3.2 | 2.2 | 23 | 27 | 1.5 |
| | | 49–60″ | 5.6 | 4.06 | .03 | 77.33 | 2 | 100 | .56 | .45 | 3.2 | 2.7 | 26 | 26 | 1.2 |
| 312 | NE¼ , SE¼ , Sec. 19, T.4S., R.6E. | 0–19″ | 5.5 | 2.58 | .05 | 30.00 | 3 | 88 | .225 | .10 | 1.0 | .25 | 13 | 12 | 4.0 |
| | | 19–27″ | 5.7 | 1.78 | .04 | 25.87 | 3 | 84 | .215 | .17 | 1.2 | .30 | 12 | 16 | 4.0 |
| | | 27–40″ | 5.9 | 0.92 | .02 | 26.74 | 3 | 60 | .153 | .15 | 1.2 | .36 | 11 | 18 | 3.3 |
| | | 40–60″ | 6.0 | 0.46 | .02 | 13.37 | 3 | 88 | .225 | .37 | 1.6 | .36 | 15 | 17 | 4.4 |
| 312 | NE¼ , SE¼ , Sec. 19, T.4S., R.6E. | 0–10″ | 5.9 | 4.76 | .12 | 22.7 | 6 | 152 | .39 | .13 | 1.9 | .36 | 16 | 17 | 5.3 |
| | | 10–27″ | 5.9 | 2.43 | .08 | 17.3 | 2 | 170 | .43 | .13 | 1.8 | .43 | 17 | 19 | 4.2 |
| | | 27–53″ | 5.8 | 1.24 | .04 | 17.7 | 3 | 192 | .49 | .17 | 2.5 | 1.3 | 19 | 23 | 1.9 |
| | | 53–70″ | 5.9 | 1.55 | .04 | 22.1 | 4 | 174 | .44 | .19 | 4.8 | 1.7 | 20 | 36 | 2.8 |
| 322 | SE¼ , NW¼ , Sec. 6, T.6S., R.5E. | 0–9″ | 5.2 | 9.48 | .31 | 17.77 | 3 | 128 | .328 | .23 | 1.8 | .36 | 51 | 5 | 5.0 |
| | | 9–19″ | 5.5 | 7.01 | .16 | 25.47 | 1 | 76 | .194 | .17 | .6 | .20 | 39 | 3 | 3.0 |
| | | 19–29″ | 5.7 | 2.84 | .08 | 20.63 | 1 | 48 | .123 | .17 | .7 | .25 | 92 | 1 | 2.8 |
| | | 29–44″ | 5.6 | 1.18 | .06 | 11.43 | 1 | 44 | .112 | .23 | .7 | .25 | 41 | 3 | 2.8 |
| 323 | NW¼ , NE¼ , Sec. 17, T.6S., R.7E. | 0–8″ | 5.2 | 3.69 | .07 | 30.64 | 5 | 96 | .246 | .15 | .9 | .43 | 19 | 9 | 2.1 |
| | | 8–12″ | 5.3 | 1.89 | .04 | 26.45 | 3 | 112 | .287 | .13 | .7 | .43 | 15 | 10 | 1.6 |
| | | 17–60″ | 5.4 | 1.23 | .01 | 71.51 | 8 | 88 | .226 | .17 | .4 | 1.20 | 15 | 13 | 0.3 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | K ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 323 | SE¼, NW¼, Sec. 21, T.6S., R.8E. | 0–11″ | 5.6 | 3.61 | .09 | 23.32 | 5 | 228 | .585 | .10 | 1.3 | .36 | 26 | 9 | 3.6 |
| | | 11–22″ | 5.5 | 1.43 | .05 | 16.62 | 3 | 310 | .795 | .13 | 1.2 | .43 | 20 | 13 | 2.8 |
| | | 22–60″ | 5.6 | 0.34 | .01 | 19.76 | 4 | 524 | 1.343 | .43 | 2.1 | .82 | 22 | 22 | 2.6 |
| 323 | SW¼, NE¼, Sec. 1, T.5S., R.4E. | 0–8″ | 5.5 | 11.76 | .31 | 22.05 | 8 | 232 | .595 | .19 | 3.5 | 1.10 | 35 | 15 | 3.2 |
| | | 8–17″ | 5.5 | 6.94 | .20 | 20.17 | 5 | 164 | .420 | .17 | 1.2 | .59 | 30 | 8 | 2.0 |
| | | 17–31″ | 5.6 | 1.43 | .07 | 11.87 | 2 | 128 | .328 | .21 | 2.1 | .99 | 23 | 16 | 2.1 |
| | | 31–60″ | 5.5 | 0.92 | .04 | 13.37 | 3 | 164 | .420 | .26 | 1.8 | .69 | 22 | 14 | 2.6 |
| *326 | NW¼, NW¼, Sec. 35, T.1N., R.7E. | 0–3″ | 5.2 | 48.8 | .97 | 29.0 | 14 | | .80 | .65 | 9.3 | 4.8 | 75 | 21 | 1.9 |
| | | 3–13″ | 5.4 | 24.5 | .49 | 29.0 | 3 | | .34 | .42 | 3.5 | 1.0 | 50 | 10 | 3.5 |
| | | 13–18″ | 5.4 | 20.4 | .38 | 32.0 | 2 | | .19 | .24 | 0.5 | 0.2 | 41 | 3 | 2.5 |
| 327 | SW¼, NE¼, Sec. 19, T.7S., R.7S. | 0–4″ | 5.5 | 8.43 | .14 | 35.00 | 4 | 352 | .902 | .17 | 6.4 | .99 | 22 | 38 | 6.5 |
| | | 4–10″ | 5.6 | 2.98 | .07 | 24.75 | 2 | 304 | .780 | .10 | 2.5 | .76 | 19 | 22 | 3.3 |
| | | 10–27″ | 5.5 | 0.63 | .02 | 18.31 | 1 | 64 | .164 | .19 | 3.8 | 1.70 | 24 | 24 | 2.2 |
| 327 | SE¼, NE¼, Sec. 17, T.6S., R.5E. | 0–4″ | 6.0 | 7.66 | .22 | 20.24 | 4 | 128 | .328 | .26 | 18.5 | 9.9 | 50 | 53 | 1.9 |
| | | 4–11″ | 6.1 | 4.71 | .21 | 13.03 | 1 | 136 | .348 | .28 | 18.5 | 10.0 | 32 | 90 | 1.9 |
| | | 11–60″ | 6.1 | 3.69 | .14 | 15.32 | 2 | 140 | .358 | .28 | 19.0 | 11.0 | 33 | 93 | 1.7 |
| 327 | NW¼, SE¼, Sec. 32, T.7S., R.5E. | 0–6″ | 5.5 | 7.46 | .15 | 28.91 | 20 | 262 | .671 | .13 | 5.5 | 2.5 | 30 | 29 | 2.2 |
| | | 6–26″ | 5.7 | 3.32 | .08 | 24.12 | 9 | 256 | .656 | .15 | 6.1 | 3.8 | 31 | 34 | 1.6 |
| | | 26–33″ | 5.8 | 1.93 | .05 | 22.44 | 7 | 204 | .523 | .19 | 9.0 | 5.0 | 40 | 37 | 1.8 |
| | | 33–60″ | 5.8 | 1.44 | .03 | 27.90 | 12 | 208 | .533 | .26 | 27.0 | 11.0 | 51 | 77 | 2.5 |
| 329 | NE¼, SE¼, Sec. 6, T.6S., R.5E. | 0–10″ | 5.1 | 6.59 | .12 | 31.92 | 1 | 96 | .246 | .15 | 0.1 | .20 | 32 | 2 | 0.5 |
| | | 10–21″ | 5.1 | 5.30 | .09 | 34.23 | 1 | 72 | .184 | .15 | 0.1 | .16 | 31 | 2 | 0.6 |
| | | 21–26″ | 5.3 | 3.00 | .06 | 29.06 | 1 | 100 | .256 | .19 | 0.3 | .16 | 29 | 3 | 1.9 |
| *330 | SE¼, SW¼, Sec. 20, T.1S., R.8E. | 0–1″ | 4.0 | 6.3 | .13 | 28 | 19 | | .56 | .41 | 1.2 | 0.8 | 9 | 33 | 1.5 |
| | | 1–12″ | 5.2 | 5.6 | .07 | 44 | 3 | | .15 | .34 | 1.7 | 0.3 | 24 | 10 | 5.7 |
| | | 12–28″ | 5.5 | 2.5 | .05 | 31 | 3 | | .15 | .30 | 0.8 | 0.3 | 26 | 6 | 2.7 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 330 | SE¼, NE¼, Sec. 34, T.1N., R.8E. | 0–9″ | 5.7 | 5.60 | .15 | 21.3 | 15 | 106 | .27 | .10 | 0.9 | 0.3 | 22 | 7 | 3.0 |
| | | 9–19″ | 5.7 | 4.53 | .14 | 18.4 | 14 | 116 | .29 | .09 | 0.4 | 0.2 | 22 | 5 | 2.0 |
| | | 19–37″ | 5.9 | 2.24 | .08 | 16.0 | 8 | 116 | .29 | .09 | 0.4 | 0.2 | 20 | 5 | 2.0 |
| | | 37–60″ | 6.3 | 0.84 | .04 | 12.0 | 6 | 140 | .35 | .15 | 1.0 | 0.3 | 18 | 10 | 3.3 |
| 331 | SE¼, NW¼, Sec. 18, T.1S., R.9E. | 0–3″ | 6.1 | 5.49 | .13 | 24.1 | 9 | 174 | .46 | .10 | 2.9 | .69 | 16 | 27 | 4.2 |
| | | 3–19″ | 5.9 | 3.69 | .06 | 35.1 | 6 | 96 | .25 | .13 | 0.6 | .25 | 11 | 12 | 2.4 |
| | | 19–30″ | 5.9 | 4.81 | .10 | 27.5 | 4 | 72 | .18 | .09 | 0.6 | .16 | 19 | 5 | 3.8 |
| | | 30–60″ | 5.8 | 3.19 | .08 | 22.8 | 5 | 64 | .16 | .07 | 0.6 | .20 | 19 | 5 | 3.0 |
| 331 | SW¼, NE¼, Sec. 33, T.5S., R.7S. | 0–6″ | 5.4 | 6.37 | .07 | 52.90 | 3 | 186 | .476 | .10 | 0.3 | .43 | 27 | 5 | 0.7 |
| | | 6–12″ | 5.5 | 4.82 | .07 | 40.03 | 2 | 240 | .615 | .09 | 0.3 | .20 | 26 | 5 | 1.5 |
| | | 12–24″ | 5.5 | 4.55 | .06 | 44.09 | 2 | 156 | .400 | .15 | 0.4 | .20 | 27 | 4 | 2.0 |
| | | 24–60″ | 5.5 | 1.71 | .03 | 33.14 | 3 | 106 | .272 | .26 | 0.4 | .16 | 23 | 5 | 2.5 |
| *333 | NE¼, SW¼, Sec. 1, T.4S., R.8½ E. | 0–1″ | 4.3 | 4.1 | .05 | 51 | | | .19 | .19 | 0.8 | .20 | 8 | 20 | 4.0 |
| | | 1–8″ | 5.3 | 4.4 | .06 | 45 | 2 | | .19 | .19 | 0.7 | .20 | 16 | 9 | 3.5 |
| | | 8–16″ | 5.7 | 3.5 | .06 | 33 | 2 | | .20 | .20 | 0.8 | .30 | 15 | 11 | 2.7 |
| | | 16–30″ | 5.8 | 1.3 | .04 | 21 | 2 | | .15 | .15 | 1.0 | .20 | 15 | 11 | 5.0 |
| *333 | SE¼, NW¼, Sec. 15, T.3S., R.8E. | 0–1″ | 4.8 | 1.1 | .02 | 28 | 22 | | .08 | .44 | 0.7 | .30 | 4 | 40 | 2.3 |
| | | 1–7″ | 5.1 | 1.3 | .02 | 39 | 18 | | .05 | .40 | 0.7 | .30 | 4 | 38 | 2.3 |
| | | 7–25″ | 5.6 | 0.8 | .02 | 19 | 9 | | .03 | .31 | 0.3 | .20 | 2 | 40 | 1.5 |
| | | 25–50″ | 5.6 | 0.6 | .01 | 36 | 5 | | .03 | .33 | 0.7 | .20 | 3 | 48 | 3.5 |
| 333 | SE¼, NW¼, Sec. 25, T.1S., R.8½ E. | 1–4″ | 5.1 | 6.44 | .13 | 28.3 | 26 | 84 | .215 | .13 | 1.3 | .25 | 24 | 8 | 5.2 |
| | | 4–13″ | 5.5 | 4.27 | .10 | 24.4 | 6 | 36 | .092 | .10 | 1.2 | .16 | 21 | 7 | 7.5 |
| | | 13–20″ | 5.7 | 3.16 | .07 | 25.7 | 5 | 26 | .067 | .13 | 1.2 | .16 | 18 | 9 | 7.5 |
| | | 20–60″ | 5.8 | 2.00 | .05 | 22.9 | 5 | 32 | .082 | .19 | 1.0 | .20 | 21 | 7 | 5.0 |
| 333 | NE¼, SW¼, Sec. 11, T.4S., R.8½ E. | 0–10″ | 5.5 | 2.78 | .06 | 26.48 | 4 | 88 | .226 | .09 | 1.2 | .30 | 14 | 13 | 4.0 |
| | | 10–15″ | 5.3 | 5.22 | .07 | 42.61 | 6 | 88 | .226 | .10 | 1.3 | .25 | 17 | 11 | 5.2 |
| | | 15–29″ | 5.4 | 1.55 | .03 | 29.52 | 5 | 100 | .256 | .10 | 1.3 | .36 | 14 | 15 | 3.6 |
| | | 29–60″ | 5.6 | 1.00 | .02 | 28.57 | 3 | 88 | .256 | .13 | 1.3 | 1.1 | 16 | 18 | 1.2 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

## TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 335 | SW¼, SW¼, Sec. 20, T.4S., R.9E. | 2–11″ | 5.6 | 3.99 | .03 | 76.0 | 5 | 352 | .902 | .19 | 1.5 | .69 | 19 | 17 | 2.2 |
| | | 11–19″ | 5.7 | 2.29 | .05 | 26.2 | 3 | 280 | .717 | .10 | 1.2 | .82 | 15 | 19 | 1.5 |
| | | 19–31″ | 5.9 | 0.88 | .02 | 25.1 | 2 | 484 | 1.241 | .27 | 2.9 | 2.8 | 14 | 52 | 1.0 |
| | | 31–60″ | 5.8 | 0.70 | .02 | 20.0 | 2 | 556 | 1.426 | .17 | 3.2 | 3.0 | 16 | 49 | 1.0 |
| 337 | SE¼, SW¼, Sec. 26, T.5S., R.7E. | 0–10″ | 5.5 | 3.16 | .08 | 22.96 | 5 | 170 | .435 | .09 | 1.0 | .63 | 19 | 11 | 1.6 |
| | | 10–20″ | 5.7 | 1.78 | .06 | 17.24 | 3 | 140 | .358 | .09 | 0.9 | .59 | 19 | 10 | 1.5 |
| | | 20–31″ | 5.9 | 1.43 | .05 | 16.62 | 4 | 64 | .164 | .10 | 0.9 | .53 | 19 | 9 | 1.7 |
| | | 31–60″ | 6.0 | 0.75 | .03 | 14.53 | 6 | 84 | .215 | .10 | 0.4 | .25 | 16 | 6 | 1.6 |
| *338 | NE¼, SE¼, Sec. 30, T.1S., R.6E. | 1–8″ | 5.4 | 15.0 | .29 | 30 | 2 | | .44 | .34 | .2 | .2 | 27 | 4 | 1.0 |
| | | 8–15″ | 5.6 | 8.2 | .18 | 27 | 3 | | .36 | .30 | .4 | .3 | 25 | 6 | 1.3 |
| | | 15–22″ | 6.7 | 4.0 | .12 | 19 | 3 | | .34 | .36 | .4 | .4 | 21 | 7 | 1.0 |
| | | 22–38″ | 5.8 | 1.9 | .06 | 18 | 2 | | .28 | .57 | .2 | .2 | 21 | 7 | 0.4 |
| *338 | SE¼, SW¼, Sec. 27, T.1N., R.6E. | 1–9″ | 4.9 | 14.2 | .20 | 40 | 4 | | .15 | .22 | .2 | .2 | 19 | 4 | 1.0 |
| | | 9–13″ | 5.2 | 6.8 | .12 | 32 | 2 | | .08 | .26 | .4 | .2 | 16 | 6 | 2.0 |
| | | 13–16″ | 5.1 | 3.2 | .07 | 27 | 2 | | .07 | .26 | .2 | .2 | 20 | 4 | 1.0 |
| | | 16–30″ | 5.2 | 1.5 | .04 | 23 | 2 | | .08 | .30 | .3 | .2 | 23 | 4 | 1.5 |
| *340 | NE¼, SE¼, Sec. 26, T.1S., R.5E. | 0–7″ | 6.3 | 8.0 | .22 | 21 | 10 | | 1.00 | .17 | 8.2 | 2.5 | 33 | 36 | 3.3 |
| | | 7–13″ | 6.0 | 7.8 | .19 | 24 | 5 | | .72 | .15 | 4.0 | 1.4 | 32 | 19 | 2.9 |
| | | 13–24″ | 6.0 | 3.7 | .10 | 21 | 5 | | .58 | .17 | 3.0 | 1.6 | 27 | 10 | 1.8 |
| | | 24–38″ | 6.0 | 1.4 | .04 | 20 | 4 | | .90 | .34 | 4.0 | 2.7 | 24 | 33 | 1.5 |
| | | 38–50″ | 6.0 | 1.5 | .03 | 32 | 3 | | 1.42 | .55 | 4.7 | 3.4 | 28 | 36 | 1.4 |
| | | 50–60″ | 6.2 | 1.0 | .03 | 20 | 4 | | .56 | .77 | 9.0 | 4.8 | 33 | 46 | 2.0 |
| *340 | NW¼, NW¼, Sec. 17, T.1S., R.6E. | 0–6″ | 5.7 | 15.8 | .32 | 29 | 3 | | .20 | .25 | 1.8 | 0.3 | 38 | 8 | 6.0 |
| | | 6–12″ | 5.8 | 11.5 | .25 | 26 | 2 | | .12 | .17 | 1.8 | 0.5 | 33 | 8 | 3.6 |
| | | 12–23″ | 5.9 | 6.7 | .16 | 25 | 2 | | .10 | .21 | 0.8 | 0.2 | 26 | 5 | 4.0 |
| | | 23–34″ | 6.0 | 4.3 | .11 | 23 | 3 | | .22 | .35 | 0.8 | 1.6 | 30 | 10 | 0.5 |
| | | 34–46″ | 6.2 | 4.1 | .04 | 54 | 2 | | .28 | .20 | 2.6 | 1.1 | 27 | 16 | 2.4 |
| *341 | NW¼, NW¼, Sec. 13, T.2S., R.6E. | 1–6″ | 5.6 | 6.7 | .13 | 30 | 5 | | .36 | .30 | .6 | .3 | 17 | 10 | 2.0 |
| | | 6–15″ | 5.7 | 4.1 | .10 | 24 | 5 | | .22 | .28 | .3 | .3 | 11 | 10 | 1.0 |
| | | 15–28″ | 5.8 | 1.2 | .04 | 21 | 2 | | .22 | .32 | .4 | .5 | 16 | 9 | 0.8 |
| | | 28–38″ | 5.8 | 1.2 | .04 | 18 | 1 | | .19 | .26 | .4 | .4 | 14 | 9 | 1.0 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | K ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *343 | SE¼, NE¼, Sec. 32, T.1N., R.6E. | 0–3″ | 5.6 | 13.6 | .28 | 28 | 3 | | .39 | .12 | .4 | .5 | 35 | 4 | 0.8 |
| | | 3–10″ | 5.5 | 2.9 | .06 | 27 | 1 | | .39 | .22 | .3 | .3 | 22 | 6 | 1.0 |
| | | 10–34″ | 5.2 | 0.6 | .02 | 13 | 1 | | .21 | .80 | .7 | .5 | 25 | 9 | 1.4 |
| | | 34–40″ | 5.1 | 0.7 | .02 | 19 | 2 | | .22 | 1.02 | .5 | .5 | 25 | 9 | 1.0 |
| *343 | NE¼, SW¼, Sec. 29, T.1S., R.8E. | 0–3″ | 4.3 | 2.6 | .08 | 20 | 7 | | .30 | .39 | 1.2 | 0.5 | 23 | 10 | 2.4 |
| | | 3–17″ | 5.1 | 14.3 | .23 | 36 | 2 | | .22 | .24 | 0.2 | 0.2 | 45 | 2 | 1.0 |
| | | 17–28″ | 5.4 | 3.6 | .08 | 27 | 2 | | .13 | .22 | 0.4 | 0.2 | 23 | 4 | 2.0 |
| *344 | NW¼, SW¼, Sec. 19, T.3S., R.8E. | 0–13″ | 4.4 | 10.5 | .18 | 34 | 3 | | .11 | .15 | 2.5 | 0.6 | 21 | 16 | 4.2 |
| | | 13–25″ | 5.7 | 6.4 | .10 | 36 | 2 | | .11 | .15 | 2.0 | 0.5 | 21 | 13 | 4.0 |
| | | 25–30″ | 5.8 | 4.8 | .09 | 33 | 2 | | .08 | .15 | 1.1 | 0.2 | 19 | 8 | 5.5 |
| | | 30–36″ | 5.9 | 5.8 | .11 | 31 | 2 | | .08 | .16 | 1.8 | 0.5 | 23 | 11 | 3.6 |
| *344 | SW¼, NW¼, Sec. 25, T.3S., R.8½ E. | 0–1″ | 5.4 | 1.8 | .05 | 23 | 13 | | .15 | .35 | 1.8 | 0.2 | 6 | 43 | 9.0 |
| | | 1–9″ | 5.9 | 2.3 | .06 | 29 | 5 | | .17 | .28 | 1.2 | 0.2 | 11 | 17 | 6.0 |
| | | 9–23″ | 6.0 | 1.6 | .05 | 21 | 5 | | .12 | .23 | 1.0 | 0.2 | 11 | 15 | 5.0 |
| | | 23–40″ | 6.1 | 1.2 | .03 | 24 | 4 | | .13 | .30 | 1.3 | 0.2 | 12 | 16 | 6.5 |
| *346 | SW¼, NW¼, Sec. 3, T.3S., R.7E. | 0–2″ | 5.2 | 5.7 | .22 | 15 | 11 | | .24 | .48 | 5.1 | 1.1 | 21 | 33 | 4.6 |
| | | 2–9″ | 5.5 | 4.0 | .09 | 27 | 5 | | .10 | .58 | 1.2 | 0.6 | 12 | 22 | 2.0 |
| | | 9–19″ | 5.6 | 2.7 | .05 | 31 | 5 | | .05 | .07 | 0.6 | 0.3 | 10 | 10 | 2.0 |
| | | 19–32″ | 5.5 | 2.7 | .05 | 34 | 7 | | .05 | .10 | 0.3 | 0.3 | 8 | 10 | 1.0 |
| *346 | SW¼, NW¼, Sec. 20, T.2S., R.8E. | 0–4″ | 5.9 | 2.3 | .08 | 26 | 6 | | .30 | .26 | 1.7 | 0.4 | 16 | 17 | 4.3 |
| | | 4–10″ | 5.8 | 1.5 | .06 | 25 | 2 | | .19 | .26 | 0.8 | 0.3 | 13 | 12 | 2.7 |
| | | 10–20″ | 5.5 | 1.2 | .07 | 19 | 3 | | .17 | .37 | 0.7 | 0.3 | 14 | 11 | 2.3 |
| *346 | SE¼, SW¼, Sec. 18, T.3S., R.8E. | 0–1″ | 4.8 | 3.9 | .06 | 38 | 18 | | .40 | .42 | 1.0 | 0.5 | 8 | 30 | 2.0 |
| | | 1–3″ | 5.2 | 3.0 | .03 | 67 | 24 | | .24 | .26 | 0.4 | 0.2 | 4 | 28 | 2.0 |
| | | 3–8″ | 5.6 | 3.6 | .03 | 74 | 15 | | .20 | .26 | 0.3 | 0.2 | 5 | 19 | 1.5 |
| | | 8–14″ | 5.9 | 1.9 | .02 | 45 | 5 | | .17 | .21 | 0.2 | 0.1 | 3 | 23 | 2.0 |
| | | 14–16″ | 6.1 | 0.7 | .02 | 26 | 3 | | .17 | .26 | 0.3 | 0.1 | 2 | 40 | 3.0 |
| *346 | SE¼, SE¼, Sec. 19, T.2S., R.8E. | 0–1″ | 5.9 | 9.8 | .27 | 21 | 23 | | .31 | .44 | 2.6 | 0.6 | 32 | 12 | 4.3 |
| | | 1–10″ | 5.8 | 6.1 | .18 | 20 | 3 | | .21 | .35 | 0.9 | 0.3 | 26 | 7 | 3.0 |
| | | 10–23″ | 5.8 | 3.1 | .09 | 21 | 4 | | .23 | .33 | 0.9 | 0.3 | 20 | 9 | 3.0 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *346 | NW¼, NE¼, Sec. 20, T.2S., R.8E. | 0–1″ | 5.3 | 1.6 | .02 | 42 | 13 | | .22 | .32 | .6 | .4 | 2 | 91 | 1.5 |
| | | 1–10″ | 5.5 | 1.1 | .01 | 59 | 13 | | .12 | .32 | .2 | .3 | 1 | 72 | 0.7 |
| | | 10–28″ | 5.9 | 0.4 | .01 | 26 | 5 | | .12 | .26 | .2 | .2 | 1 | 69 | 1.0 |
| 347 | SW¼, SE¼, Sec. 1, T.1S., R.10E. | 1–4″ | 6.4 | 2.56 | .09 | 16.2 | 9 | 336 | 0.9 | .19 | 5.8 | .53 | 13 | 57 | 10.9 |
| | | 4–11″ | 6.6 | 2.01 | .09 | 12.8 | 5 | 392 | 1.0 | .17 | 5.3 | .46 | 14 | 51 | 11.5 |
| | | 11–26″ | 6.6 | 1.09 | .05 | 12.4 | 5 | 484 | 1.2 | .21 | 5.3 | .36 | 10 | 72 | 14.7 |
| | | 26–60″ | 7.0 | 3.09 | .03 | 58.9 | 6 | 564 | 1.4 | .10 | 6.1 | .99 | 11 | 77 | 6.1 |
| 352 | NE¼, NW¼, Sec. 22, T.4S., R.11E. | 0–10″ | 6.5 | 2.44 | .07 | 19.9 | 9 | 398 | 1.02 | .15 | 7.4 | 1.1 | 16 | 62 | 6.7 |
| | | 10–29″ | 6.7 | 1.49 | .04 | 21.2 | 6 | 464 | 1.18 | .21 | 5.5 | 1.5 | 12 | 71 | 3.7 |
| | | 29–60″ | 6.7 | 1.01 | .03 | 19.2 | 5 | 720 | 1.84 | .19 | 4.5 | 1.7 | 15 | 56 | 2.6 |
| 352 | NE¼, SW¼, Sec. 13, T.5S., R.10E. | 0–12″ | 6.1 | 3.22 | .09 | 20.4 | 12 | 840 | 2.153 | .10 | 5.6 | 1.7 | 22 | 43 | 3.3 |
| | | 12–37″ | 6.2 | 0.82 | .03 | 15.6 | 4 | 640 | 1.641 | .10 | 5.6 | 2.6 | 18 | 53 | 2.1 |
| 353 | NE¼, SE¼, Sec. 8, T.4S., R.10E. | 0–8″ | 6.3 | 5.32 | .11 | 27.6 | 3 | 186 | .48 | .09 | 2.5 | .20 | 14 | 24 | 12.5 |
| | | 8–17″ | 6.4 | 4.88 | .09 | 30.9 | 3 | 156 | .40 | .04 | 2.3 | .20 | 15 | 19 | 11.5 |
| | | 17–29″ | 6.3 | 4.10 | .07 | 33.4 | 5 | 228 | .58 | .07 | 2.7 | .25 | 13 | 27 | 10.8 |
| | | 29–60″ | 6.4 | 3.44 | .05 | 39.3 | 3 | 352 | .90 | .04 | 2.5 | .30 | 13 | 29 | 8.3 |
| 353 | SE¼, NW¼, Sec. 8, T.4S., R.10E. | 0–6″ | 6.4 | 1.14 | .03 | 21.7 | 2 | 116 | .29 | .13 | 0.6 | .20 | 6 | 22 | 3.0 |
| | | 6–14″ | 5.8 | 2.64 | .06 | 25.1 | 4 | 72 | .18 | .15 | 0.6 | .16 | 15 | 7 | 3.8 |
| | | 14–27″ | 5.7 | 1.29 | .03 | 24.5 | 3 | 36 | .09 | .17 | 0.6 | .20 | 12 | 9 | 3.0 |
| | | 27–60″ | 6.1 | 1.09 | .03 | 20.7 | 3 | 60 | .15 | .17 | 0.7 | .16 | 20 | 6 | 4.4 |
| 360 | SW¼, NE¼, Sec. 24, T.4S., R.9E. | 0–4″ | 5.6 | 3.11 | .07 | 25.39 | 14 | 100 | .256 | .07 | 2.5 | .25 | 14 | 23 | 10.0 |
| | | 4–12″ | 6.0 | 1.67 | .05 | 19.09 | 5 | 136 | .349 | .10 | 2.3 | .30 | 12 | 24 | 7.7 |
| | | 12–24″ | 6.1 | 1.39 | .04 | 19.86 | 4 | 170 | .436 | .13 | 2.3 | .36 | 13 | 26 | 6.4 |
| | | 24–60″ | 6.0 | 1.11 | .03 | 21.14 | 3 | 140 | .359 | .10 | 2.7 | .53 | 10 | 35 | 5.1 |
| 370 | SW¼, NW¼, Sec. 28, T.2N., R.9E. | 1–8″ | 5.9 | 7.65 | .20 | 21.9 | 3 | 84 | .21 | .17 | 1.5 | .25 | 21 | 10 | 6.0 |
| | | 8–14″ | 5.9 | 4.76 | .16 | 17.0 | 3 | 76 | .19 | .15 | 0.7 | .20 | 20 | 6 | 3.5 |
| | | 14–25″ | 5.8 | 3.53 | .10 | 20.1 | 3 | 54 | .14 | .23 | 0.6 | .16 | 16 | 7 | 3.8 |
| | | 25–60″ | 5.7 | 2.59 | .08 | 18.5 | 3 | 54 | .14 | .17 | 0.7 | .16 | 17 | 7 | 4.4 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# TABLE 9—CHEMICAL LABORATORY DATA

| Mapping Unit Number | Location | Depth | pH | OM% | Total N % | C:N | P ppm | ppm | Extractable Cations MEQ/100g $K_{Meq/100g}$ | Na | Ca | Mg | Cation Exchange Capacity meq/100g | Percent Base Saturation | Ca:Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *379 | Center, Sec. 7, | 0–5″ | 5.1 | 5.6 | .16 | 20 | 6 | | .08 | .07 | .4 | .1 | 10 | 6 | 4 |
| | T.3S., R.9E. | 5–10″ | 5.1 | 6.5 | .14 | 28 | 23 | | .05 | .13 | .6 | .1 | 14 | 6 | 6 |
| | | 10–18″ | 5.2 | 5.2 | .11 | 27 | 14 | | .03 | .19 | .4 | .1 | 9 | 8 | 4 |
| | | 18–26″ | 5.3 | 2.6 | .06 | 24 | 6 | | .01 | .05 | .1 | .1 | 6 | 4 | 1 |
| | | 26–41″ | 5.2 | 2.1 | .05 | 25 | 3 | | .03 | .07 | .1 | .1 | 6 | 5 | 1 |
| | | 41–50″ | 5.6 | 2.2 | .03 | 40 | 3 | | .01 | .05 | .1 | .1 | 9 | 3 | 1 |
| *380 | NE¼, NE¼, Sec. 18, | 0–2″ | 4.7 | 4.0 | .11 | 22 | 15 | | .14 | .33 | .6 | .3 | 7 | 19 | 2 |
| | T.3S., R.9E. | 2–9″ | 5.1 | 6.0 | .12 | 30 | 6 | | .11 | .10 | .1 | .1 | 17 | 2 | 1 |
| | | 9–20″ | 5.4 | 3.2 | .06 | 30 | 6 | | .05 | .05 | .1 | .1 | 8 | 4 | 1 |
| | | 20–30″ | 5.4 | 7.0 | .12 | 33 | 4 | | .04 | .10 | .1 | .1 | 18 | 2 | 1 |

*Indicates data obtained from: Soil Survey Report, Bull Run Sandy Area, Mt. Hood National Forest, Pacific Northwest Region U.S.F.S. 1965

# APPENDIX

# GLOSSARY

| | |
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| Alluvium | A general term for all material deposited by streams, including gravel, sand, silt, clay and mixtures of these. Unless otherwise noted alluvium is unconsolidated. Alluvium is usually stratified. |
| Andesite | A dark gray to black, dense, fine-grained extrusive igneous rock. Very similar to basalt. |
| Aeolian | Applied to the erosive action of the wind and deposits which are a result of the transporting action of the wind. |
| Aerial Logging System | Logging systems using helicopters or balloons where logs are lifted vertically and yarded free and clear of the ground. |
| Ash | Uncemented pyroclastic (volcanic ejecta) material consisting of fragments mostly under 4 mm. in diameter. Coarse ash is from 1/4 to 4 mm. in grain size, fine ash is below 1/4 mm. |
| Available Water | The portion of water in a soil that can be absorbed by plant roots, usually considered to be that water held in the soil against a tension of up to 15 bars. |
| Available Water Holding Capacity | The capacity of soil to store water available for use by plants, usually expressed in linear depths of water per unit depth of soil. Commonly defined as the difference between the percentage of soil water at field capacity and the percentage at wilting point. The difference multiplied by the bulk density and divided by 100 gives a value in surface inches of water per inch depth of soil. |
| Basalt | A very dark to black, dense, fine-grained extrusive igneous rock, very similar to andesite. |
| Bedrock | The rock that underlies the soil and other unconsolidated material, or that is locally exposed at the surface. |
| Breccia | A rock composed of coarse angular fragments cemented together in a fine-textured matrix. |
| Cable Yarding (No Suspension) | Yarding method where logs are dragged on the ground to a landing. |
| Cable Yarding (Partial Suspension) | Yarding method where one end of the log is suspended above the ground surface during the yarding operation. |
| Classification | The systematic arrangement of soils into groups or catagories on the basis of their characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the basis of more detailed differences in specific properties. Classification criteria are outlined in Soil Taxonomy, Agriculture Handbook 436, U.S.D.A. Soil Conservation Service, 1975. |
| Clay | A soil separate less than .002 millimeters in diameter. As a soil textural class, less than 45 percent sand and less than 40 percent silt. |
| Coarse Fragments | Rock and mineral particles greater than 2.0 millimeters. Fragments between 2 mm and 3 inches in diameter are called pebbles; fragments between 3 inches and 10 inches are called cobbles; and fragments greater than 10 inches are called stones and boulders. |
| Coarse Texture | The texture exhibited by sands, loamy sands, and sandy loams except very fine sandy loams. A soil containing large quantities of these textural classes. |
| Colluvium | Soil material or rock fragments moved downslope by gravitational forces in the form of soil creep, slides, and local wash. |
| Compaction | The packing together of soil particles by forces exerted at the soil surface resulting in increased soil bulk density. |
| Complex | An association in which two or three land types are so intricately mixed that it is not practical to show them separately at the scale of mapping used. |
| Consistence | (1) The resistance of a material to deformation or rupture. (2) The degree of adhesion or cohesion of the soil mass. Terms used for describing consistency at various soil moisture contents are:<br>Wet Soil—non sticky, slightly sticky, sticky, very sticky, non plastic, slightly plastic, plastic, very plastic.<br>Moist Soil—loose, very friable, friable, firm, very firm, extremely firm.<br>Dry Soil—loose, soft, slightly hard, hard, very hard, extremely hard. |
| Creep | Slow mass movement of soil and soil material down relatively steep slopes primarily under the influence of gravity, but facilitated by saturation with water and by alternate freezing and thawing. |

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| Cirque | A deep, steep-walled, bowl-shaped recess in a mountain caused by glacial erosion. |
| Debris Slide | A rapidly moving slide composed of soil, bedrock, or both. |
| Depth, Effective Soil | The depth of soil material that plant roots can penetrate readily to obtain water and plant nutrients. It is the depth to a layer that differs sufficiently from the overlying material in physical and chemical properties to prevent or seriously retard growth. |
| Dike | A tabular body of igneous rock that cuts across the structure of adjacent rocks or cuts massive rocks. |
| Drainage | The processes of discharge of water from an area of stream or sheet flow and removal of excess water from soil by downward flow. |
| Duff | The more or less firm organic layer on top of the mineral soil, consisting of fallen vegetative matter in the process of decomposition including everything from pure humus below to the litter on the top. Duff is a general, nonspecific term. |
| Erosion | (1) The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. (2) Detachment and movement of soil or rock fragments by water, wind, ice or gravity. The following terms are used to describe different types of erosion.<br>Accelerated Erosion—Erosion much more rapid than normal, natural, or geologic erosion primarily as a result of the influence of the activities of man or in some cases of other animals or natural catastrophies that expose bare surfaces, for example, fire.<br>Geologic Erosion—The normal or natural erosion caused by geological processes acting over long periods and resulting in the wearing away of mountains, the building up of flood plains, coastal plains, etc.<br>Gully Erosion—The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from these narrow areas to considerable depths, ranging from 1 to 2 feet to as much as 75 to 100 feet.<br>Normal Erosion—The gradual erosion of land used by man which does not greatly exceed geologic erosion.<br>Rill Erosion—An erosion process in which numerous small channels only several inches deep are formed; occurs mainly on recently cultivated soils.<br>Sheet Erosion—The removal of a nearly uniform layer of soil from the land surface by runoff water.<br>Splash Erosion—The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles may or may not be subsequently removed by surface runoff. |
| Extrusive Bedrock | This term applies to those igneous rocks derived from volcanic lavas that cooled on the earth's surface. This lava cools rapidly and forms fine-textured rocks such as basalt. |
| Fine Texture | Consisting of or containing large quantities of the fine fractions, particularly of silt and clay. (Includes all clay loams and clays; that is clay loam, sandy clay loam, silty clay loam, sandy clay, silty clay, and clay textural classes.) |
| Friable | Easy to break, crumble, or crush. |
| Glacial Soils | Soils derived from materials transported or influenced by glaciers. |
| Glacial Till | Glacial materials deposited directly by ice with little or no transportation by water. It is generally an unconsolidated, unstratified, compact mixture of clay, silt, sand, gravel, and boulders. |
| Glacial Outwash | Glacial material swept out, sorted, and deposited by water that originated from the melting of glacial ice. |
| Glaciated Valley | U-shaped valley formerly occupied by a glacier. |
| Glaciofluvial Deposits | Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in several forms. |
| Glaciolacustrine Deposits | Soil materials transported by glaciers and deposited by glacial meltwater in glacial lakes. These deposits range in size from fine sand and gravel near the lake shores, to fine silts and clays in the lake bottom. |
| Inclusion | Soil type found within a mapping unit that is not extensive enough to be mapped separately or as part of a complex. |
| Infiltration | The flow of a liquid into a substance through pores or other openings, connoting flow into a soil. Percolation refers to flow through a porous substance. |

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| Intrusive Bedrock | This term applies to those rocks derived from magmas injected into older rocks at depths without reaching the surface. These magmas are slow-cooling and form coarse-textured rocks such as granite. |
| Landform | Structural configuration of the land as a result of past and present geologic activity. |
| Land Type | (1) A group of defined and named taxonomic soil units occurring together in an individual and characteristic pattern over a geographic region, comparable to plant associations in many ways. (2) A mapping unit used in general soil surveys in which two or more defined taxonomic units occurring together in a characteristic pattern are combined because the scale of the map or the purpose for which it is being made does not require delineation of the individual soils. |
| Mapping Unit | Any delineated area shown on a soil map that is identified by a number. A mapping unit may be a soil unit, a miscellaneous land type, or a complex. |
| Mass Movement | All movement of soil and bedrock materials occurring below the soil surface such as landslips, landflows, rock slides, slumps, etc. |
| Mass Wasting | The wearing away of the landscape through the processes of mass movement. |
| Medium Texture | Intermediate between fine-textured and coarse-textured soils. (It includes the following textural classes: very fine sandy loam, loam, silt loam, and silt.) |
| Miscellaneous Landtype | A mapping unit for areas of land that have little or no natural soil, or have properties that are too variable or unpredictable for prediction. |
| Moderately-Coarse Texture | Consisting predominately of coarse particles. (In soil textural classification it includes all the sandy loams except very fine sandy loam.) |
| Moderately-Fine Texture | Consisting predominately of intermediate-size soil particles or with relatively small amounts of fine or coarse particles. (In soil textural classification, it includes clay loam, sandy clay loam, and silty clay loam.) |
| Moisture Tension | The equivalent negative pressure in soil water. It is equal to the equivalent pressure that must be applied to the soil water to bring it to hydraulic equilibrium through a porous permeable wall or membrane with a pool of water of the same composition. The pressures used and the corresponding percentages most commonly determined are:<br>One-third bar percentage–(field capacity)—the percentage of water contained in a soil that has been saturated, subjected to and is in equilibrium with an applied pressure of 15 bars.<br>Fifteen-bar percentage–(wilting point)—the percentage of water contained in a soil that has been saturated, subjected to, and is in equilibrium with an applied pressure of 1/3 bars. |
| Parent Material | The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of soils is developed by pedogenic processes. |
| Percolation, Soil Water | The downward movement of water through soil, especially the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of the order of 1.0 or less. |
| Permeability, Soil | The ease with which gases, liquids, or plant roots penetrate or pass through a bulk mass of soil. Since different horizons vary in permeability, the particular horizon under consideration should be designated. |
| pH, Soil | The negative logarithm of the hydrogen-ion achivity of a soil. The degree of acidity (or alkalinity) of a soil as determined by a glass or other suitable electrode or indicator at a specified moisture content or soil-water ratio, and expressed in terms of the pH scale (1-14). |
| Plastic Soil | A soil capable of being molded or deformed continuously and permanently, by relatively moderate pressure, into various shapes. |
| Porosity | The volume percentage of the total bulk not occupied by solid particles. |
| Pyroclastic | A general term applied to rocks formed from volcanic material that has been explosively or aerially ejected from a volcanic vent. |
| Reaction, Soil | The degree of acidity or alkalinity of a soil, usually expressed as a pH value. Descriptive terms commonly associated with certain ranges of pH are: extremely acid, 4.5; very strongly acid, 4.5-5.0; strongly acid, 5.1-5.5; moderately acid, 5.6-6.0; slightly acid, 6.1-6.5; neutral, 6.6-7.3; slightly alkaline, 7.4-7.8; moderately alkaline, 7.9-8.4; strongly alkaline, 8.5-9.0; and very strongly alkaline, 9.1. |

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| Residuum | Soil material formed by rock weathering in place. |
| Riverwash | Barren alluvial land, usually coarse-textured, exposed along streams at low water and subject to shifting during normal high water. |
| Runoff | That part of precipitation which appears in surface streams of either perennial or intermittent form. |
| Sand | A soil separate between .05 and 2.0 mm in diameter. |
| Sill | An intrusive body of igneous rock of approximately uniform thickness and relatively thin compared with its lateral extent, which has been emplaced parallel to the bedding of the intruded rocks. |
| Silt | A soil separate consisting of particles between .002 and .05 millimeters in diameter. |
| Slump | A deep-seated, slow moving, rotational failure occurring in plastic materials, resulting in vertical and lateral displacement. |
| Soil | (1) The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. (2) The unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of parent material, climate, micro-organisms, and topography, all acting over a period of time. Soils differ from the material from which they are derived in many physical, chemical, biological, and morphological properties and characteristics. |
| Soil Profile | Succession of zones or horizons beginning at the surface that have been altered by normal soil forming processes. |
| Soil Separates | Mineral particles, 2.0 mm in diameter, ranging betwen specified size limits. The names and size limits of separates recognized in the United States are: very coarse sand, 2.0 to 1.0 mm; coarse sand, 1.0 to .5 mm; medium sand, 5 to .25 mm; fine sand, .25 to .10 mm; very fine sand, .1 to .05 mm; silt, .05 to .002 mm; and clay, .002 mm. |
| Soil Texture | The relative proportions of the various soil separates in a soil as described by the classes of soil texture shown in the figure below. The textural classes may be modified by the addition of suitable adjective when coarse fragments are present in substantial amounts; for example stony silt loam. The sand, loamy sand, and sandy loam are further subdivided on the basis of the proportions of the various sand separates present. |
| Spot Symbols | Symbols used on soil maps to represent important landscape features that are too small to delineate. |
| Stratified | Having formed or lying in beds, layers, or strata. In reference to glacial deposits, stratified refer to deposit which have layer of varying textural classifications. |
| Structure, Soil | Refers to the aggregation of primary soil particles into compound particles or clusters of primary particles, which are separated from adjoining aggregates by surfaces of weakness. An individual natural soil aggregate is called a ped. |
| Subsoil | The B horizons of soils with distinct profiles. In soils with weak profile development, the subsoil can be defined as the soil below the plowed soil (or its equivalent of surface soil) in which roots normally grow. Although a common term, it cannot be defined accurately. |
| Subtratum | Any layer lying beneath the soil solum. |
| Surface Soil | The uppermost part of the soil ordinarily moved in tillage or its equivalent in uncultivated soils, ranging in depth from 5 to 8 inches. |
| Topsoil | (1) Earthy materials used as a top dressing for house lots, grounds for large buildings, gardens, roadcuts or similar areas. It has favorable characteristics for production of desired kinds of vegetation or can be made favorable. (2) The original or present A horizon, varying widely among different kinds of soil. |
| Tuff | A rock formed of compacted volcanic fragments generally smaller than 4 mm in diameter. |
| Weathering | The group of processes, such as the chemical action of air and rain water and of plants and bacteria and the mechanical action of changes in temperature, whereby rocks on exposure to the weather change in character and form soil. |

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The following list of selected references is included as a source of some basic soils information which the reader may find useful in dealing with soils related problems. These information sources are not limited specifically to the soils of the Mt. Hood National Forest, but include many general references. It is hoped that as new information becomes available, it can be added to the list.


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