



**United States  
Department of  
Agriculture**

Forest Service

Pacific  
Southwest  
Region

In cooperation with:

U.S.D.A. Soil  
Conservation Service

Regents of the  
University of California  
(Agricultural Experiment  
Station)

# **Soil Survey of Lassen National Forest Area California**





# How To Use This Soil Survey

## General Soil Map

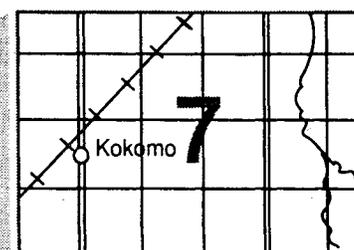
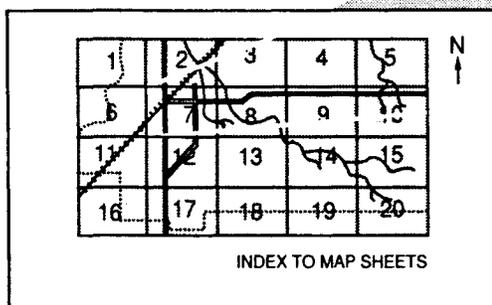
The general soil map, which is the small scale map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

## Detailed Soil Maps

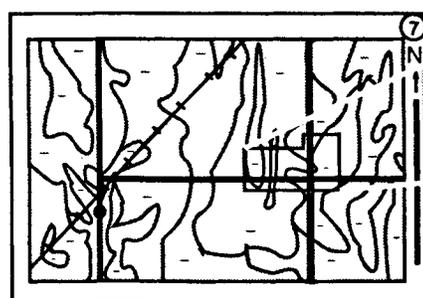
The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

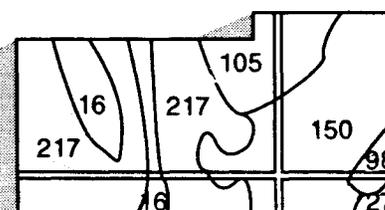


MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

## Lassen National Forest Area, California

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This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and state agencies including the Agricultural Experiment Stations. The fieldwork and technical quality control for this survey were conducted by the Forest Service. The correlation of the soils was conducted by the Soil Conservation Service in consultation with the Forest Service. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1975-82. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statement in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Forest Service and the Soil Conservation Service. The soil survey area consists of the Lassen National Forest Area except for that portion in Tehama County which is covered by the Tehama County Soil Survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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## Foreword

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This soil survey is dedicated to the memory of George F. Kliewer, who served with the USDA, US Conservation Service and Forest Service for 30 years. He was Lassen National Forest Soil Scientist from 1968 to 1993.

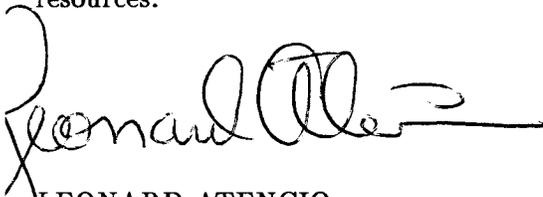
The Soil Survey of Lassen National Forest Area, California, was designed to facilitate broad forest wide resource management planning and to increase the knowledge of our environment. It contains predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil.

This soil survey has been prepared primarily for forest resource planners and managers. It is useful for preliminary project planning, for identifying general soil management considerations, and for evaluation of more intensive soil survey needs. The survey should be used for detailed resource management planning and project level planning and design only after field verification.

Great differences in soil properties can occur even within short distances. Soil may be shallow to bedrock and incapable of producing commercial timber. They may be seasonally wet or subject to flooding. A low available water capacity makes a soil poorly suited to reforestation. A high water table makes a soil suitable for uses such as summer range.

These and many other soil properties that affect land uses are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each soil map unit is shown on detailed soil maps. Each kind of soil in the survey area is described, and information is given about each soil for specific uses.

This soil survey can be useful in the conservation, improvement, and productive use of soil, water, and other resources.



LEONARD ATENCIO  
Forest Supervisor  
Lassen National Forest



Location of the Lassen National Forest  
Area, California

# Soil Survey of Lassen National Forest Area, California

By George F. Kliewer, Forest Service

Soils surveyed by George F. Kliewer, Ken Johnson, and Lorrie Stehle, Forest Service and Roger Abraham, Timothy Reilly and Kim Hayes, North State Resources

Soil Survey Report and Soil Maps edited by James P. O'Hare

The Lassen National Forest Area Soil Survey covers an area of 1,162,204 acres or about 1,816 square miles. At its widest point it is 55 to 60 miles wide, (east to west), and at its longest point is about 100 miles in length (north to south). The survey area is generally located in northeastern California. It ranges from the foothills of the northern Central Valley to the Great Basin on the east. The soil survey area is bounded on the east by Honey Lake Valley and high desert country; on the south by Plumas National Forest, on the west by the foothills of the Central Valley and on the north by the Shasta-Trinity and Modoc National Forests. The town of Susanville is just east of the Forest and Chico, Red Bluff and Redding are all a few miles west of the Forest.

Most of the soils in the survey area are used for timber production with lumber being a major product of the Forest. Livestock grazing occurs intermixed with the timber and on large, open, high elevation, "dry" meadows on the eastern side of the Forest. Wildlife abounds throughout the Forest.

## General Nature of the Survey Area

This section provides general information about the Lassen National Forest. It discusses physiography, relief, and drainage; natural vegetation; water supply; and climate.

### Physiography, Relief, and Drainage

The Lassen National Forest soil survey area is located generally in the southern Cascade Mountain Range and the Modoc Plateau geomorphic provinces. Minor portions are in the northern Sierra Nevada Range. The western and southern sections of the survey are mountainous with gently sloping to steep side slopes. The eastern and northern sections are relatively level

with low hills of volcanic origin dotting the landscape. Elevations range from 2500 feet near Lake Britton to 9000 feet on some of the higher mountains - with the majority of the area ranging between 4500 and 7000 feet. The very highest peak within the survey boundary is 10,457 foot Lassen Peak. However, this occurs within Lassen Volcanic National Park - which was not surveyed during this current work. That portion of the Lassen National Forest that occurs in Tehama County was surveyed in the 1950's and is published in the Tehama County Soil Survey Report.

The Cascade Mountain Range and the Modoc Plateau are both of volcanic origin. The principle igneous rocks found on these provinces on the Lassen are andesite, basalt and rhyolite. Tephra (cinder) cones occur in this area (5). Ash deposits are also widespread over the survey area. Very recent ash deposits can be observed just north of Lassen Volcanic National Park in the general area of Butte Creek.

The Sierra Nevada Range is of minor extent on the Lassen. It is generally composed of granitics, nonmarine sediments, metamorphosed rocks and some volcanics. The soils forming in this area are usually less productive than those forming over the balance of the survey area. The nonmarine sediments in the area will often slump, especially when they have been undercut by road construction.

The western and southern portions of the survey area are gently sloping to steep. Some of the drainage ways - such as the North Fork Feather River, Deer Creek and Mill Creek - are deeply incised. Their canyon walls often are at 70 to 80 percent slopes. These and other rivers start in the high elevation conifer zone of the Lassen and flow out into the Great Central Valley.

The eastern and northern portions of the survey area

are relatively level with low hills and gently sloping topography. Many of the drainageways end in playas and only a few streams flow year around. Large semi-dry meadows occur in this area. They often have a relatively small stream flowing through them that keeps a small portion of the meadow wet while the rest of the meadow dries out in early summer. It is in this area that the majority of the range land occurs on the Lassen.

### **Natural Vegetation (6)**

The Lassen Forest has a wide diversity in natural vegetation because of the wide range in elevation and in precipitation. This results in vegetation that can survive in a low elevation hot climate and a high elevation cool climate, in dry climate and in a wet climate.

The foothills above the central valley floor generally are hot and dry. The soils are usually shallow or moderately deep. The vegetation that has adapted to this area is the live oaks, blue oak, black oak, digger pine, ceanothus and annual grasses. Maple, alder, willows and dogwood will grow on the wetter sites along streams and on the better soils.

As we move up the slope to a higher elevation the precipitation increases and the soils become deeper and more productive. This is the mixed conifer zone with vegetation such as ponderosa and Jeffrey pine, sugar pine, incense cedar, white fir, black oak at the lower elevations, dogwood, manzanita and ceanothus. Lodgepole pine, alder and maple will occur on the wetter sites as will annual grasses. Some douglas fir can be found in the cool canyons. Elevations range from about 3500 feet to 6500 feet and includes the most productive land on the Forest for growing timber.

The highest elevation land is the true fir zone. The main conifers found are red and white fir. At the highest elevations western white pine will occur. Manzanita, snowbrush, ceanothus, willow, alder, lodgepole pine, and annual grasses also occur in this zone.

The eastside pine zone is mostly composed of Jeffrey pine with some ponderosa pine. White fir occurs on the higher points and where enough precipitation occurs to maintain it. Lodgepole pine occurs in most wet areas. Manzanita and ceanothus occurs where the precipitation is high enough. The precipitation drops rapidly as you move east across this zone and the dominant vegetation becomes mahogany, western juniper and basin sagebrush. Large meadows occur in this area with both annual and perennial grasses. At slightly higher elevations in the meadows - if the soils are shallow to a restrictive layer - low sagebrush occurs.

Silversage occurs on the deeper clay soils if grass is not growing on them.

### **Water Supply**

Water of good to excellent quality is available to the soil survey area from streams, rivers, springs and precipitation. The natural source is runoff of rainfall and snowfall at the higher elevations. Winter accumulation of snow in the higher mountains provides a seasonal reservoir of water.

The survey area can be divided into two major drainage basins. The Lahontan Basin covers the eastern third of the Forest. The Eagle Lake Ranger District covers the majority of this basin. The balance of the Forest is in the Central Valley Basin. The Almanor and Hat Creek Ranger Districts are in this basin.

Water flows out of the survey area through several streams and rivers. The Susan River and Pine Creek are the major drainage ways in the Lahontan Basin. The Susan River flows southeast, through the town of Susanville and out into the Honey Lake Valley where it is used for irrigation. It finally ends up in Honey Lake - an alkali sink. Pine Creek flows east into Eagle Lake. It is the major overland flow of water to Eagle Lake. Eagle Lake is a major wildlife and recreational body of water in Lassen County. It has no natural outlet so salts are slowly accumulating in the Lake. Therefore it is very critical for Pine Creek waters to be kept very pure.

Hat Creek is the major stream in the northern portion of the Forest. It flows north to the Pit River, which flows west to the Sacramento River. The Pit River originates on the Modoc Forest and flows westward cutting through the Lassen. Hat Creek gets the majority of its water from large springs. It is very pure water for that reason. Large areas of the northeastern portion of the Forest have no major streams flowing from it. However, this portion of the Forest must be one of the major groundwater recharge areas that feed many large springs in Hat Creek Valley and the area around Fall River Mills and McArthur.

Many streams drain the west side of the Forest. A few of the major ones are: Battle Creek, Bailey Creek, Antelope Creek, Mill Creek and Deer Creek. Their waters are used for generating electricity and for irrigation in the Sacramento Valley.

The southern portion of the Forest is drained by Butte Creek and the West and North Forks of the Feather River. Their waters also are used to generate electricity and for irrigation in the Sacramento Valley.

Much of the water that originates on the Forest and flows to the Sacramento Valley ends up being stored in Lake Shasta or Lake Oroville. At both locations it is used to generate electricity, for irrigation of farm lands and for urban uses. Very little of the water that originates on the Lassen Forest is actually used by the Forest.

## Climate

The Lassen Forest has cool moist winters and warm dry summers. The majority of the precipitation occurs from about late October to early May. At elevations above 5000 feet the majority of the precipitation occurs as snow. During the summer months very little rainfall occurs. However, thundershowers are fairly common during the summer, especially over the eastern portion of the Forest. While these thundershowers provide little moisture they often cause lightning fires.

The amount of moisture that occurs varies widely over the Forest. It ranges from a low of 16 inches along the eastern boundary of the Forest and the Little Valley area to a high of 80 to 90 inches in and near Lassen Volcanic National Park, Philbrook Reservoir area and Snow Mountain Area. The median precipitation is about

30 to 50 inches.

Most storms that reach the Forest come out of the west. A few come out of the southwest. The cold storms that bring low temperatures to the area come from the north. These storms usually do not carry much moisture with them. The north-south mountain range that runs through the Forest rings out most of the moisture that comes with the storms from the west. This results in the large amount of precipitation that occurs at Snow Mountain, Mt. Lassen, and the Philbrook areas. Once you get to the east side of the mountains the amount of precipitation drops rapidly as you move east to the Forest boundary. East of the Forest boundary is the high desert country with only 6 to 10 inches of precipitation.

At all locations on the Forest freezing temperatures occur at some time during the year. At elevations above about 5200 feet freezing occurs fairly often. The growing season at these higher elevations is only about 90 days with even shorter growing seasons at the highest elevations. At the very highest elevations freezing has probably occurred during every month of the year. The very lowest elevations of the Forest has a growing season of 140 to 180 days.

## How This Survey Was Made

This Order 3 soil survey (1) has followed the directives and guidelines in the Forest Service Manual and Handbooks. It has also followed the concepts, procedures, and guidelines of the National Cooperative Soil Survey as specified in the *Soil Survey Manual* (2), the *National Soils Handbook* (3), and the soil classification system as stated in *Soil Taxonomy* (4).

Soil Scientists begin the inventory by collecting, studying, and correlating all the existing data and information concerning the survey area (National Forest) that is related to soil genesis and morphology. This includes lithological, geomorphological, topographical and elevation, climatic, vegetative, and existing soil survey data both within and adjoining the survey area.

This data and information was assimilated and transferred to a single base map of suitable scale and accuracy forming the beginning soil map unit delineations or a schematic map. With the schematic map and aerial photo field sheets (stereo-pair coverage) in hand, the soil scientist made a reconnaissance study of the survey area. At this time, the delineations on the schematic map are checked for accuracy of content and location. The aerial photos were studied stereoscopically and the photo images were compared to the conditions found on the ground to insure that later recognition by photo interpretation would be credible. Lithologic, geomorphic, soil, and vegetative characteristics were recognized and recorded in field notes, on the schematic map, and on the aerial photo field sheets.

Using the augmented and corrected schematic map, field notes, and an understanding of how the photo images relate to actual conditions on the ground, the soil scientist delineated map units on the aerial photographs. The map units corresponded to segments of the landscape having similar landform, vegetative cover, and soils as determined by a knowledge of ground conditions and by stereoscopic aerial photo interpretation. These aerial photos with the delineated map units and delineation symbols became the exploratory or preliminary soils map.

With the aerial photo (exploratory soils maps) and a field stereoscope in hand, the soil scientist examined on the ground as many delineations of each map unit as was feasibly possible, considering the access and time allowed to complete the survey. In this way, each different map unit was examined, studied, and described by aerial photo interpretations and on-the-ground investigation. However, because of the design of the survey, Order 3 in intensity (1), and the time allotted for its completion, every delineation of each different map unit was not

visited and examined on the ground. Those delineations with no easy access were rarely visited other than by aerial photo interpretation. In this way, possibly one-third of the delineations on the field sheets and maps would not have been entered and examined by an on-the-ground investigation. This is one of the *main aspects of this survey that limits its reliability. It is one reason that the survey is not suitable for project planning without field verification.*

As each map unit was visited and examined, individual soils were recognized, studied, described, classified, and enough data was collected to furnish the information needed to make interpretations and predictions concerning the use and management of each soil. However, the exact location of each soils was not delineated. The map units usually consist of a group of soils that occupy a particular portion of the landscape which has been delineated on the aerial photo field sheets. Depending on the area location and extent of the individual soils that are components of the delineated map unit, a map unit is called an association or complex of soil components. The soil scientist makes a field and aerial photo examination to estimate the soil component percentage composition for each map unit. These map units *do not* necessarily consist of similar soils. They consist of geographically associated soils that may be, and usually are, quite different in their characteristics and their suitability for use and management. *These are other aspects of the survey that limit its reliability and make it not suitable for project planning without field verification.*

This field examination and study, and the associated correction and refinement of the aerial photo field sheets, produces the Order 3 intensity soil maps called for in this system of survey.

The interpretations and prediction concerning use and management found in this report are based on the soil scientist's knowledge and understanding of the conditions recognized and measured in the time allotted to this inventory. By classifying the soils, the soil scientist can also, with acceptable reliability, bring information concerning use and management of a particular soil from other survey areas where this same soil occurs and has been recognized and studied. Because of the time allocation for the completion of this survey, these use and management interpretations and predictions should be considered as first or second approximations due to the relatively few examinations and measurements that have been made. *This is still another aspect of the survey that limits its reliability and makes it not suitable for project planning without field verification.*

Despite the cautions that have been made in the above paragraphs concerning the use of this survey information or project level planning, it is adequate and reliable for

its intended and designed purpose: a base for a Forest-wide system of land management planning.

## General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for project level management of forest or range land or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described below.

### 1. Pass Canyon-Los Gatos-Lithic Haploxeralfs

Sloping to steep, shallow to deep, well to somewhat excessively drained, sandy loam to loam soils, on mountain sideslopes, fans and benches.

This map unit occurs along the boundaries of the survey area where it joins lower elevation areas. In some locations the landscape has prominent relief while in other locations the topography is almost flat. On the steep slopes rock outcrops and rubble land is common. Elevations range from 2500 feet to 5000 feet and mean annual precipitation ranges from 18 to 35 inches.

Typical vegetation for this map unit is juniper, bitterbrush, buckbrush, black oak, annual and perennial grasses and scattered Jeffrey and ponderosa pine. Locally this unit is known as "Front Country".

This map unit makes up approximately 2 percent of the survey area. It is about 30 percent Pass Canyon soils, 25 percent Los Gatos soils, and 20 percent Lithic Haploxeralfs. The remaining 25 percent is made up of the minor soils Keating, Aikman, and Durixerolls, and the miscellaneous land type Rubble land.

Pass Canyon soils are shallow and well drained. Slopes are usually less than 35 percent but it can range up to 50 percent. Typically the soil has a sandy loam surface overlying a loam or sandy clay loam subsoil. They are underlain by rhyolite.

Lithic Haploxeralfs are shallow over bedrock and are somewhat excessively drained. Slopes are usually less than 35 percent. The soil has a gravelly sandy loam surface overlying a very gravelly loam. Bedrock is hard andesite, basalt or rhyolite.

Los Gatos soils are moderately deep to deep, well drained soils. Slopes are usually less than 35 percent. The soil has a loam surface and a clay loam subsoil. Andesite and basalt bedrock is usually deeper than 30 inches.

The soils in this unit are suitable for grass. They will also provide brush suitable for wildlife winter range. Their natural productivity is moderate to low, generally because of the shallow soil depths. Erosion can be a problem on these soils.

### 2. Aquolls-Durixerolls-Lithic Haploxerolls

Gently sloping, shallow to deep, well to poorly drained, sandy loam to silt loam soils, on alluvial fans, valleys and basins.

The majority of this map unit occurs on the eastern portion of the survey area. The topography is generally flat with slopes of less than 15 percent. Elevations generally range from 5000 to 6500 feet but minor amounts of this unit occur at both higher and lower elevations. Mean annual precipitation ranges from 16 to 40 inches with a few locations getting up to 50 inches precipitation.

Typical vegetation for this map unit is perennial and annual grasses, big sage, silver sage, lodgepole pine, aspen, willow and black sage. The majority of this unit is the high elevation summer range land.

This map unit makes up approximately 6 percent of the survey area. It is about 35 percent Aquolls, 30 percent Durixerolls and 20 percent Lithic Haploxerolls. The remaining 15 percent is made up of the minor soils Rouen, De Masters, Wintoner and Patio.

Aquolls are deep, somewhat poorly or poorly drained. These soils usually occur at the lowest elevations in a given map unit and usually are covered with grass, silver sage or lodgepole. Typically the soil has a silt loam surface and a silty clay loam subsoil. It is underlain by alluvial deposits.

Durixerolls are shallow, well to somewhat poorly drained soils. They usually occur around the basins just above the Aquolls with typical vegetation of stunted big sage and black sage. The soil has a sandy loam surface and a clay subsoil, overlying a hardpan at depths less than 20 inches.

Lithic Haploxerolls are shallow, well drained soils on basalt flows. They occur above the Durixerolls and on slightly weathered basalt flows. Sparse brush and grass grows on these soils. The soil has a sandy loam surface and a cobbly loam subsoil underlain by slightly weathered basalt at depths of less than 20 inches.

The majority of the soils in the map unit are suitable for grass and are capable of providing good summer range land. Their natural productivity ranges from high on the Aquolls to low on the Lithic Haploxerolls. Erosion is usually not a problem but compaction can be on the Aquolls and Durixerolls.

### 3. Holland-Bobbitt-Skalan

Flat to sloping, moderately deep to deep, well to somewhat excessively drained, sandy loam to loam soils, on volcanic flats and gently sloping hills.

This map unit occurs at the lower elevations of the forested area within the survey area. The topography is less than 35 percent and often it is below 20 percent. Elevations range from 3000 feet to 5200 feet and mean annual precipitation ranges from approximately 20 to 65 inches.

Typically vegetation for this map unit is Jeffrey pine, ponderosa pine, sugar pine, incense cedar, black oak, white fir, mountain whitethorn, deerbrush, and greenleaf manzanita.

This map unit makes up approximately 14 percent of the survey area. It is about 30 percent Holland, 25 percent Bobbitt, and 25 percent Skalan. The remaining 20 percent is made up of the minor soils Washougal, Neer, Brownlee, Sadie and Alicel. Very minor amounts of the miscellaneous land types Rock Outcrop and Rubble Land also occur.

Holland soils are moderately deep to deep and well drained. The soil has a gravelly loam surface and a gravelly clay loam subsoil. It is usually underlain by andesite and basalt flow rocks but in a few minor areas it is underlain by diatomaceous earth.

Bobbitt soils are moderately deep to deep and well drained. Typically the soil has a gravelly loam surface

and a very gravelly clay loam subsoil. These soils are forming in material weathering from andesite and basalt.

Skalan soils are deep and well to somewhat excessively drained. Typically the soil has a gravelly sandy loam surface and a very cobbly clay loam subsoil. They are forming in material weathering from andesite and basalt.

The soils in this map unit are suitable for growing timber and are among the most productive in the survey area. Erosion potential is low to moderate but these soils are susceptible to compaction if equipment is operated on them while moist or wet.

### 4. Skalan-Holland-Bobbitt

Steep, moderately deep to deep, well to somewhat excessively drained, sandy loam to loam soils, on ridges and mountain sideslopes.

This map unit occurs at the lower elevations of the steep forested area within the survey area. The topography is over 35 percent and ranging up to 70 percent. Rubble Land and Rock Outcrop occurs on the steeper slopes. Elevations range from 3000 feet to 5200 feet and mean annual precipitation ranges from approximately 20 to 65 inches.

Typical vegetation for this map unit is Jeffrey pine, ponderosa pine, sugar pine, incense cedar, black oak, white fir, mountain whitethorn, deerbrush, and greenleaf manzanita.

This map unit makes up approximately 4 percent of the survey area. It is about 30 percent Skalan, 25 percent Holland, and 15 percent Bobbitt. The remaining 30 percent is made up of the minor soils Neer, Washougal, Sadie and the miscellaneous land types Rubble Land and Rock Outcrop.

Skalan soils are deep and well to somewhat excessively drained. Typically the soil has a gravelly sandy loam surface and a very cobbly clay loam subsoil. They are forming in material weathering from andesite and basalt.

Holland soils are moderately deep to deep and well drained. The soil has a gravelly loam surface and a gravelly clay loam subsoil. It is usually underlain by andesite and basalt flow rocks but in a few minor areas it is underlain by metasediments and diatomaceous earth.

Bobbitt soils are moderately deep to deep and well drained. Typically the soil has a gravelly loam surface and a very gravelly clay loam subsoil. These soils are forming in material weathering from andesite and basalt.

The soils in this map unit are suitable for growing timber. The major management problem with this unit is the slopes over 35 percent. The steep slopes give this unit a high erosion potential. The natural productivity of this unit is moderate to high.

### 5. Sheld-Yallani-Inville

Flat to gently sloping, moderately deep to deep, well to excessively drained, sandy loam soils, on upland flats, mountain sideslopes and ridges.

This map unit occurs on the gently sloping upland areas within the survey area. Slopes usually range from about 5 to 35 percent. Rock Outcrop and Lava Flow occurs in a few areas. Elevations range from 5,200 to 8,000 feet and mean annual precipitation ranges from 40 to 80 inches. Much of the precipitation occurs as snow during the winter months.

Typical vegetation for this map unit is white fir, red fir, Jeffrey pine, ponderosa pine, sugar pine, lodgepole pine, mountain hemlock, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and squaw carpet. The "True Fir" zone occurs in the map unit.

This map unit makes up approximately 21 percent of the survey area. It is about 30 percent Sheld soils, 25 percent Yallani soils, and 15 percent Inville soils. The remaining 30 percent is made up of the minor soils Portola, Wintoner, Klicker and De Masters and the miscellaneous land types of Rock Outcrop and Lava Flow.

Sheld soils are moderately deep to deep and well to excessively drained. Slopes are less than 35 percent. Typically the soil has a stony sandy loam surface and a very stony sandy loam subsoil. They are forming in material weathering from andesite or basalt or in glacial outwash from volcanic origin.

Yallani soils are moderately deep to deep and well drained. Slopes are less than 35 percent. The soil has a gravelly fine sandy loam surface and a very gravelly fine sandy loam subsoil. It is underlain by rhyolite, andesite, or basalt.

Inville soils are deep and well drained. Slopes usually range from 5 to 35 percent. It has a sandy loam surface and a very gravelly clay loam subsoil. It is underlain by andesite, basalt or rhyolitic flows.

The soils in the unit are suitable for timber production and are among the most productive in the survey area. Much of the timber harvested in this survey area is produced in this unit. Their natural productivity is

moderate to high except for the areas of rhyolite where it is low to moderate. The erosion potential is low to moderate except for the rhyolitic areas where it is moderate to high.

### 7. Trojan-Inville-Klicker

Gently sloping, moderately deep to deep, well drained, sandy loam to loam soils, on flats, gently sloping hills and mountain sideslopes.

This map unit occurs on the northeastern portion of the survey area. The topography is generally flat to gently sloping. In some areas lava flows have broken through the soil but have not flowed over large areas. Elevations range from 5,000 to about 7,000 feet and mean annual precipitation ranges from 16 to 35 inches.

Typical vegetation for this map unit is Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany. Locally this unit is known as "Eastside Pine".

This map unit makes up approximately 29 percent of the survey area. It is about 30 percent Trojan soils, 25 percent Inville soils, and 20 percent Klicker soils. The remaining 25 percent is made up of the minor soils Patio, Wintoner, De Masters, and Boomtown. Very minor amounts of Lithic Haploxerolls and Rock Outcrop also occur.

Trojan soils are deep and well drained. Slopes are less than 35 percent and often less than 20 percent. Typically, the soil has a loam surface and a gravelly clay loam subsoil. The substrata is usually andesite or basalt but in a few areas it is rhyolite.

Inville soils are deep and well drained. Slopes are less than 35 percent. The soil has a sandy loam surface and a very gravelly clay loam subsoil. The substrata is generally basalt or andesite flow rocks but in some areas it is rhyolite.

Klicker soils are moderately deep to deep and well drained. Slopes are less than 35 percent. The soil has a loam surface and a very cobbly loam to clay loam subsoil. The substrata is generally basalt.

The soils in this unit are suited to growing timber, especially Jeffrey pine. This unit also provides summer range for livestock and wildlife. The natural productivity is moderate with the limiting factor being precipitation. The erosion potential is generally low and the compaction potential is moderate.

## 8. Klicker-Inville-Patio

Steep to very steep, moderately deep to deep, well to somewhat excessively drained, sandy loam to loam soils, on mountain sideslopes and escarpments.

This map unit occurs on the steep slopes of the "Eastside Pine" zone of the survey area. The slopes range from 35 to 50 percent with a few areas up to 70 percent. Some rock outcrop and rubbleland occurs on the steep slopes. Elevations range from 5,000 to 7,000 feet and mean annual precipitation ranges from 16 to 35 inches.

Typical vegetation for the map unit is Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany.

This map unit makes up approximately 2 percent of the survey area. It is about 35 percent Klicker soils, 25 percent Inville soils and 25 percent Patio soils. The remaining 15 percent is made up of the minor soils Trojan and Wintoner and the miscellaneous land types Rock Outcrop and Rubble Land.

Klicker soils are moderately deep to deep and well drained. Slopes range from 35 to 50 percent. This soil has a loam surface and a very cobbly loam to clay loam subsoil. The substrata is generally basalt.

Inville soils are deep and well drained. Slopes range from 35 to 50 percent. The soil has a sandy loam surface and a very gravelly clay loam subsoil. The substrata is generally basalt or andesite flow rocks but in some areas it is rhyolite.

Patio soils are moderately deep to deep and well to somewhat excessively drained. Slopes range from 35 to 70 percent. Typically this soil has a cobbly sandy loam surface and a very cobbly loam subsoil. It is usually underlain by platy basalt.

The soils in this unit are suited to growing timber and brush. The natural productivity is low to moderate with the limiting factors being the low precipitation and the large amounts of rock fragments in the soil profile. The erosion potential is moderate to high.

## 9. Xeric Durandepts-Typic Xerorthents

Gently sloping to steep, moderately deep to deep, moderately well to excessively drained, sandy loam soils, on glacial ridges, ground moraines and cinder cones.

This map unit occurs in and around the Caribou Wilderness and cinder cones north and east of the Wilderness.

The majority of the topography is gently sloping except for the cinder cones which are steep. Elevations range from 3000 feet to 8000 feet with the majority of this unit occurring above 5000 feet. Mean annual precipitation ranges from about 30 to 55 inches.

Typical vegetation for this map unit consist of red fir, white fir, Jeffrey pine, ponderosa pine, lodgepole pine, greenleaf manzanita, pinemat manzanita, chinquapin, and annual and perennial grasses.

This map unit makes up approximately 3 percent of the survey area. It is about 50 percent Xeric Durandepts and 30 percent Typic Xerorthents. The remaining 20 percent is made up of the minor soils Yallani and Zynbar.

Xeric Durandepts are moderately deep, moderately well to well drained soils that occur on glaciated areas. Slopes are usually less than 35 percent and often below 15 percent. Typically the soil has a sandy loam surface and a gravelly loamy sand subsoil. The substrata is a compacted glacial till.

Typic Xerorthents are deep somewhat excessively drained soils that occur on cinder cones. Slopes are usually greater than 35 percent although they will be less than 35 percent around the base of the cones. This soil has a gravelly sandy loam surface and a very gravelly loamy coarse sand subsoil. The substrata is cinders.

The soils in this unit are suitable for growing conifers. Their natural productivity is moderate to low because of an apparent low AWC. The erosion hazard is moderate.

## 10. Gerle-Klicker, sedimentary

Sloping to very steep, moderately deep to deep, well drained, sandy loam to loam soils, on mountain sideslopes and escarpments.

This map unit occurs around Fredonyer Pass, the Diamond Mountains and south of High Lakes along the southern border of the survey area. The topography ranges from gently sloping in Bear Flat to very steep on the east facing escarpment of Diamond Mountain. Elevations range from 5000 to 8000 feet and mean annual precipitation is about 20 to 45 inches.

Typical vegetation for the map unit is white fir, red fir, Jeffrey Pine, ponderosa pine, incense cedar, greenleaf manzanita and snowbrush.

This map unit makes up approximately 2 percent of the survey area. It is about 40 percent Gerle and 40 percent Klicker, sedimentary. The remaining 20 percent is made up of the minor soils Lithic Ultic Gixerolls and Inville.

Gerle soils are moderately deep and slopes range from 0 to 70 percent. Typically the soil has a sandy loam surface and a sandy loam subsoil. It is underlain by weathered granite.

Klicker, sedimentary soils are moderately deep to deep. Slopes are usually 5 to 50 percent. The soil has a cobbly loam surface and a very cobbly clay loam subsoil. It is weathering from nonmarine sediments.

The soils in this unit are suitable for timber production. The Klicker, sedimentary soils provide brush suitable for wildlife. The natural productivity of this unit is moderate. The Gerle soils are moderate to highly erosive including a high potential for gully erosion. Klicker, sedimentary soils are subject to slumping and compaction.

#### **11. Lava Flow-Rock Outcrop-Rubble Land**

Flat to steep, excessively drained, miscellaneous land type.

This map unit occurs in large delineations near Wiley Ranch, in Hat Creek Valley, the Brockman Flat Lava

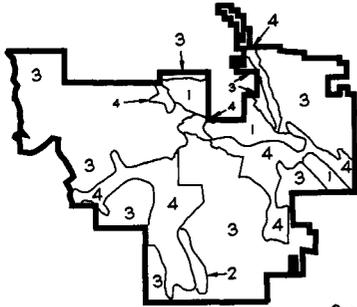
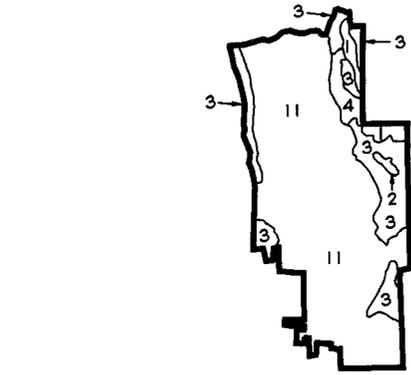
Beds west of Eagle Lake and High Lakes at the southern end of the survey area. Minor delineations occur at other locations. Areas of Lava Flow are generally flat but may have strongly contrasting local relief. Rock Outcrop and Rubble Land usually occur on steeper slopes. This map unit is found at all elevations in the survey area and precipitation ranges from 16 to 80 inches.

Typical vegetation for this map unit is basically barren with sparse juniper, mountain mahogany, greenleaf manzanita, big sage, and a few conifers growing in pockets of soil.

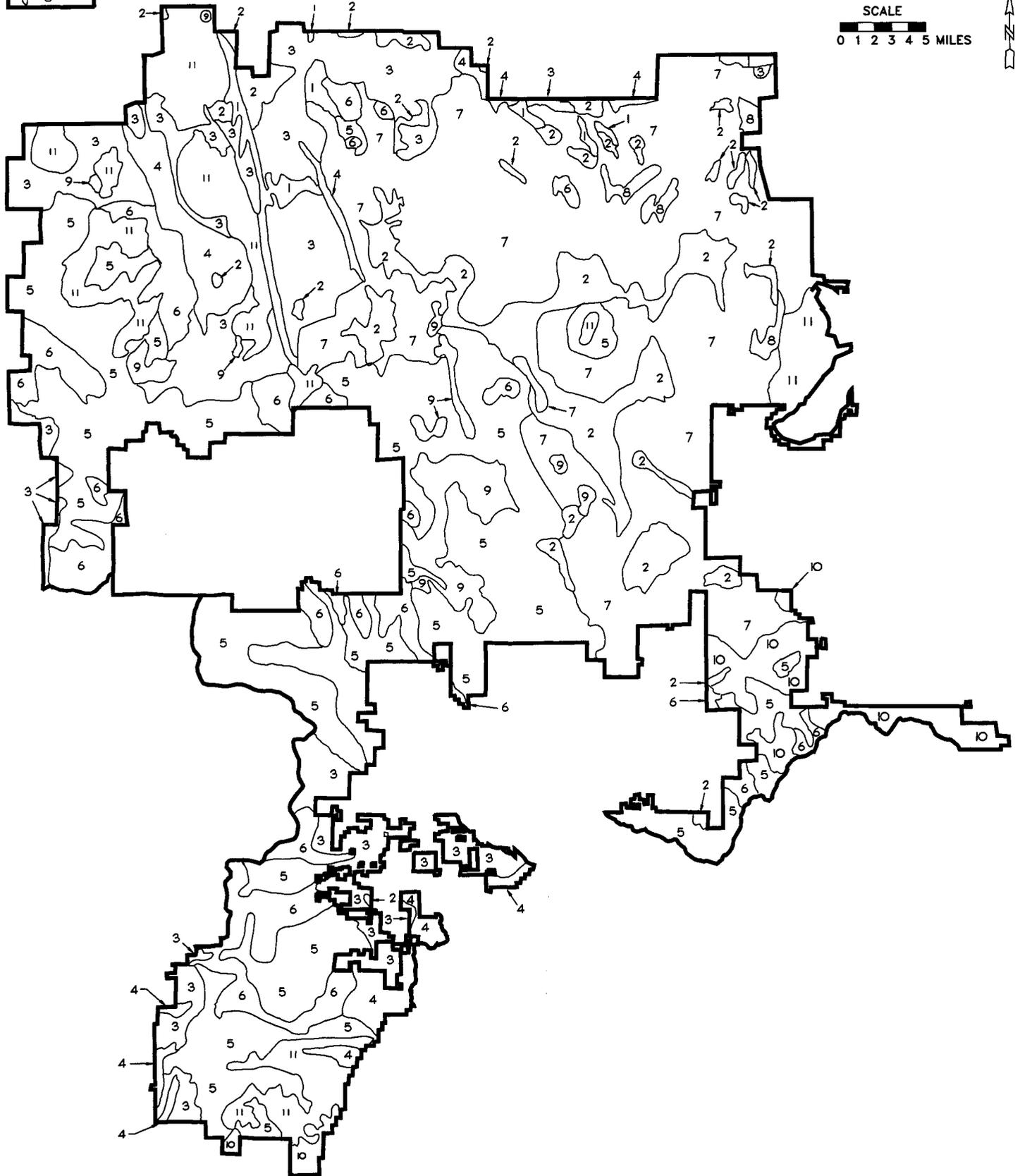
This map unit makes up approximately 10 percent of the survey area. It is about 60 percent Lava Flow, 20 percent Rock Outcrop, and 10 percent Rubble Land. The remaining 10 percent is made up of the minor soils Lithic Xerumbrepts, Lithic Xerochrepts, and Lithic Haploxerolls.

This map unit is suitable for watershed and some minor use for wildlife. Erosion can be a problem where pockets of shallow soils occur on the Rock Outcrop.

# GENERAL SOIL MAP LASSEN NATIONAL FOREST



1. Pass Canyon—Los Gatos—Lithic Haploxeralfs
2. Aquolls—Durixerolls—Lithic Haploxerolls
3. Holland—Bobbitt—Skalan
4. Skalan—Holland—Bobbitt
5. Sheld—Yallani—Inville (Gently Sloping)
6. Sheld—Yallani—Inville (Steep)
7. Trojan—Inville—Klicker
8. Klicker—Inville—Patio
9. Xeric Durandepts—Typic Xerorthents
10. Gerle—Klicker
11. Lava—Flow—Rock Outcrop—Rubble Land



## Detailed Soil Map Units

The map units on the soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management need for those uses.

Each map unit on the soil maps represents an area on the landscape and consists of one or more soils for which the unit is named. A symbol identifying the soil precedes the map unit name in the map unit descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

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

Soils of one family or phases of families can differ in texture of the surface layer or of the underlying material. They also can differ in slope, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series or family is divided into soil phases. Most of the areas shown on the soil maps are soil families.

Many map units are made up of two or more major soils. These map units are called soil complexes or soil associations.

Soil complex consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Bobbitt-Brownlee-Alicel families complex, 0 to 35 percent slopes, is an example.

Soil association is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Klicker-Trojan families association, 0 to 35 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management

of the soils in the map unit. The included soils are identified in each map unit description.

### Definitions and Criteria

The following are explanations of entries used in detailed soil map unit descriptions.

**Map unit symbol and name.** A numerical symbol is used to designate areas of each map unit on the soil maps. The symbol corresponds to the symbol preceding the map unit name in the map unit descriptions. The map unit name consists of soil components or miscellaneous areas or both.

**Soil map unit components** consist mostly of soil families but may include subgroups or higher soil taxa and miscellaneous land types.

**Approximate proportion** is the approximate percentage of each soil component or miscellaneous land type making up the map unit.

**Landscape position** describes the type of landform or surface on which the components are found.

**A typical vegetation series** is listed for each soil component. A series is a natural vegetation unit that has a common dominant species or set of species. Vegetation series are part of a hierarchical stratification used in the Vegetation Classification system for southern California. (U.S. Forest Service and California Department of Fish and Game, April 1978.)

**Soil profile description** is an abridged version of the more detailed soil profile descriptions in the section "Taxonomic Unit Descriptions". Included are the following layers:

**Surface layer.** The uppermost part of the soil, ordinarily moved in tillage, or its equivalent in uncultivated soils; ranging in depth from 3 to 10 inches. Frequently designated as the "A horizon."

**Subsoil.** The soil between the surface layer and the uppermost substratum. The subsoil consists of all parts of the B horizon above a depth of 2 meters and any part of the A or C horizon between the surface layer and a depth of 1 meter or a more shallow substratum.

**Substratum.** A layer below a depth of 1 meter, or beneath the solum if the lower part of the solum is between 1 and 2 meters deep. Any part of the solum below 2 meters is considered substratum. Bedrock, hardpan, and unconsolidated geologic materials that

are in contrasting particle-size classes relative to the surface soil or solum are substratum regardless of depth, even within 1 meter of the ground surface.

**Included areas** comprise the other kinds of soils in the map unit that are not named as a component part because they constitute too small a percentage of the unit.

**Effective rooting depth** is the range of depth that the main body of plant roots extend to, generally to shallow bedrock or to a maximum depth of 60 inches. Other limiting layers include hardpans, claypans, or weathered bedrock.

**Erosion factor K** indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K in the survey area range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

### **Maximum Erosion Hazard**

Many land use activities have the potential to cause erosion rates to exceed natural soil erosion or soil formation rates. Potential consequences of accelerated erosion include reductions in the productive capacity of the soil and adverse effects on water quality. Many interrelated factors are evaluated in an EHR system to determine whether land use activities would cause accelerated erosion, and to what degree accelerated erosion would cause adverse effects. It is designed to appraise the relative risk of accelerated sheet and rill erosion. The system does not rate gully erosion, dry ravel, wind erosion, or mass wasting.

The adjective erosion hazard ratings are described below in terms of the likelihood and consequences of accelerated erosion. As the risk of accelerated erosion increases, so does the likelihood that accelerated erosion will exceed soil formation rates. The risk and consequence becomes especially critical for shallow and moderately deep soils over consolidated materials.

The maximum EHR are based on little or no vegetative cover present and on the long-term average occurrence of 2-year, 6-hour storm events. Erosion hazard risks are greater when storm frequency, intensity and/or duration

exceed long-term average occurrence, and risks are less when occurrence is below "average". The risks and consequences for adjective erosion hazard ratings are described below.

**Low EHR.** Accelerated erosion is not likely to occur, except in the upper part of the Low EHR numerical range, or during periods of above average storm occurrence. If accelerated erosion does occur, adverse effects on soil productivity and to nearby water quality are not expected. Erosion control measures are usually not needed for these areas.

**Moderate EHR.** Accelerated erosion is likely to occur in most years. Adverse effects on soil productivity (especially to shallow and moderately deep soils) and to nearby water quality may occur for the upper part of the Moderate EHR numerical range, or during periods of above average storm occurrence. The need for erosion control should be evaluated for these areas. A wide selection of measures and application methods are available.

**High EHR.** Accelerated erosion will occur in most years. Adverse effects on soil productivity (especially to shallow and moderately deep soils) and to nearby water quality are likely to occur, especially during periods of above average storm occurrence. Erosion control is necessary for these areas to prevent accelerated erosion. The selection of measures and methods of application are somewhat limited.

**Very high EHR.** Accelerated erosion will occur in most years. Adverse effects on soil productivity and to nearby water quality are very likely to occur, even during periods of below average storm occurrence. Erosion control is essential for these areas to prevent accelerated erosion. The selection of measures and methods of application are limited.

**Available Water-Holding Capacity (AWC)** is the capacity of a soil to hold water in a form available to plants. This is approximately the moisture content between field capacity and permanent wilting point. The amount of water a soil can hold depends primarily upon its texture, depth and amount of rock fragments. Rock fragments generally do not hold moisture and will therefore reduce the water-holding capacity of a soil.

The following table is a guide for calculating available water holding capacities of soils (Soil Conservation Service, TN-Soils-15, March 1968).

Textural Classes	AWC	
	Fraction	Percent
	0.033	3.3
gravelly sand, coarse sand	0.048	4.8
	0.063	6.3
sand, fine sand, loamy coarse sand	0.073	7.3
	0.083	8.3
loamy fine sand, sandy loam, fine sandy loam	0.104	10.4
	0.125	12.5
very fine sandy loam, loam, silt loam, sandy clay, silty clay, clay	0.146	14.6
	0.167	16.7
sandy clay loam, clay loam, silty clay loam	0.177	17.7
	0.192	19.2

Soils forming in pyroclastic materials may hold approximately 25 to 50% more water than the textural class would indicate. For the Lassen National Forest Survey Area the AWC was increased by 40% for ashy-skeletal, cindery, medial and medial-skeletal families.

AWC is given in inches for total soil profile and for the top 20 inches of soil or to a root limiting depth less than 20 inches. The values shown in parentheses ( ) are for the top 20 inches or root limiting depth less than 20 inches.

**Soil manageability.** Certain features of the land affect the relative ease of management with mechanized equipment. Soil manageability classification rates soils and their topography on the basis of features that reduce the ease of equipment operation and features that increase the need for soil protection measures.

Soil manageability classes are ratings that are applied to the individual components of a soil map unit. Manageability classes are useful for providing specific information about individual soils. Because map units may contain soils with contrasting class ratings, soil manageability groups are used to provide general ratings that apply to an entire map unit. Manageability groups are useful for providing general information for large areas.

Soil manageability classes are represented by the numerals 1 to 4. Class 1 is the easiest to manage and class 4 is the most difficult. Letter symbols are added to classes 2, 3, and 4 to identify specific soil problems affecting management. Soil manageability classes are described as follows:

**Class 1 - Easy to manage.** Soils in this class are on stable slopes with gradients ranging up to about 30 percent. They are moderately deep or deep and do not have more than slight management problems. No management option modifiers apply to this class.

**Class 2 - Readily manageable.** Soils in this class are mostly on slopes of less than 30 percent and have one or more moderate management limitations, such as a moderate erosion hazard.

**Class 3 - Moderately difficult to manage.** Soils in this class are on steep slopes that are mostly between 30 and 60 percent, or they have a major management limitation, or both.

**Class 4 - Very difficult to manage.** Soils in this class are on very steep slopes (more than 60 percent), or they have two or more other major management limitations.

Letter symbols are used to express the severity of potential problems in soil management. Major management option modifiers are identified by capital letters and moderate management modifiers are indicated by

lowercase letters. The criteria and symbols for management option modifiers for each soil characteristic or topographic feature are listed in Table 1.

**TABLE 4. - Soil Features Affecting Management**

Soil features	Major modifiers	Moderate modifiers
Slope gradient	G..Mostly more than 60 percent	g..Mostly between 30 and 60 percent
Slope stability	S..Low	s..Moderate
Maximum erosion hazard	E..High or very high	e..Moderate
Soil depth	D..Less than 10 inches	d..10 to 20 inches
AWC, upper 20 inches	P..Less than 1.2 inches	p..1.2 to 2.4 inches
Wetness	W..Poorly drained	w..Somewhat poorly drained
Rock outcrop or surface boulders	X..More than 15 percent of surface	x..3 to 15 percent of surface area

Management option modifiers are chosen in the order in which they are listed. One symbol can be chosen from each of the following groups: (1) symbols G, S, and E (and their lowercase forms); (2) symbols D and P; and (3) symbols W and X. Within each group, symbols for major management limitations take precedence over moderate limitations.

Soil manageability groups are defined by the mix of soil manageability classes that occurs in a soil map unit. They are designated by Roman numerals to distinguish them from soil manageability classes. Only one group applies to a soil map unit, whereas as many classes may apply as there are major components in the map unit. The soil manageability groups in the survey area are defined as follows:

Group I - Map unit is predominantly class 1. Less

than 20 percent of the unit is class 3 or class 4. The unit may be no more than 50 percent class 2, or combinations of classes 2, 3, and 4.

Group II - Map unit is predominantly class 2. Less than 20 percent of the unit is class 4. Less than 50 percent of the unit is class 3 or a combination of classes 3 and 4.

Group III - Map unit is predominantly class 3. Less than 40 percent of the unit is class 4.

Group IV - Map unit is at least 40 percent class 4.

A soil map unit is placed in the group with the lowest numeral if group definitions allow the unit to be placed in more than one soil manageability group.

## Range Sites

The following information is adapted from work done by Ken Luckow, Soil Scientist, Modoc National Forest.

Soils used for range have been grouped into range sites. A range site is a distinctive kind of range that has a certain potential for producing range plants. Different range sites are recognized because of differences in the kinds of vegetation or in the amounts of herbage produced. A range site is the product of all environmental factors responsible for its development including such things as: soil type and depth, surface rock fragments, drainage, annual precipitation, elevation, and growing season.

Soils and land types not used for range were not placed in range sites but were given a Forest Survey Site class for commercial timber soils, or not applicable (N/A) if a land type. A few soils have ratings for both timber and range. Three range sites are recognized in this survey area and are described in the following pages.

Each range site description contains three parts which are:

**I. Physiographic Feature.** A brief description of where this range site occurs including elevation, slopes, and climatic conditions.

**II. Soil Characteristics.** A broad overview of some of the more important soil characteristics and interpretations from the various soil types that have been placed in this range site.

**III. Vegetation.** Percentages of grasses, forbs, and woody plants that occupy the site. Estimates of average available production in pounds per acre per year are provided.

### 1 - Shallow Loam

**I. Physiographic Features:** This range site occurs in scattered areas of the Lassen National Forest at elevations of 4000 to 6000 feet. Slopes normally range from 0 to 25 percent but can go as high as 35 percent. The climate is semi-arid and averages 15 to 20 inches of precipitation.

**II. Soil Characteristics:** The soils are shallow and average 15 to 20 inches in depth to a root limiting contact. The surface is normally a sandy loam or loam. Surface coarse fragments are sometimes present. The subsurface soil ranges from clay loam to clay and

normally less than 35 percent rock fragments. These soils can be over hard bedrock, volcanic tuff, or a duripan. Soil fertility is generally low to moderate and the erosion hazard potential is moderate. The available water holding capacity is low.

**III. Vegetation:** The vegetative composition on this site consists of:

50 - 65%	Grasses
10 - 15%	Forbs
25 - 35%	Woody plants

Average available production is about 400 pounds per acre per year.

### 2 - Loamy

**I. Physiographic Features:** This range site occurs in large delineations in the northeast portion of the Forest at elevations above 5000 feet. It occurs in smaller delineations throughout the forest at all elevations. Slopes range from 0 to 50 percent, but are predominately 0 to 20 percent. The climate is generally cold with long winters and short summers. Annual precipitation is 20 to 45 inches, most of which falls during the winter as snow. A small but significant amount of precipitation falls during the summer growing season from thunder showers in most years.

**II. Soil Characteristics:** The soils are mainly moderately deep (20 to 40 inches) with minor amounts deeper than 40 inches to a root limiting contact. The surface soil is a loam or sandy loam, and is relatively free of surface rock fragments greater than 3 inches in diameter. A few areas will have a high percent of rock fragments. The subsoil is a loam, clay loam, or clay and normally contains between 10 and 50 percent by volume rock fragments. These soils are mainly over alluvium but also can be over basalt or andesite bedrock. The inherent soil fertility is moderate to high and the plant available water holding capacity is moderate. The potential erosion hazard is mainly low to moderate but can be high on the steep slopes.

**III. Vegetation:** The vegetative composition on this site consists of:

50 - 65%	Grasses
10 - 15%	Forbs
15 - 25%	Woody Plants

Average available production is about 700 pounds per acre per year.

### 3 - Semi-Wet Meadow

I. Physiographic Features: This range site usually occurs in conjunction with the loamy range site but at a relative lower position near the drainage ways. Slopes are usually 0 to 5 percent but may range up to 15 percent. The climate is usually cool and precipitation varies from 20 to 45 inches.

II. Soil Characteristics: The soils are somewhat poorly to poorly drained and usually more than 40 inches deep. The surface soil is normally a silt loam or clay loam, dark in color, and relatively free of rock fragments. The subsoil is normally a silty clay loam, clay loam, or clay with 0 to 35 percent rock fragments. The soils commonly have a perched water table within about 2 to 3 feet of the surface. Between the perched water table and the capillary action of the soil water, the soil has a natural sub-irrigation system which greatly affects the plant community and increases production yields. In a few areas gully erosion has interfered with this natural irrigation with a resultant loss of production. The plants in this range site normally stay green and growing throughout the growing season.

III. Vegetation: The vegetative composition on this site consists of:

70 - 80%	Grasses
10 - 20%	Forbs
0 - 35%	Woody plants

Average available production is about 1500 to 2000 pounds per acre per year. Production can be quite variable in this range site, mostly depending on the amount of moisture available.

#### Water Runoff Potential

The water runoff potential rating guideline below was developed by Clare Clark, Soil Scientist, SCS-Montana and later modified by Ken Luckow, Soil Scientist, Modoc National Forest. It is designed to rate the relative velocity of water runoff over a soil type and its associated map unit under natural vegetative conditions. Velocity of runoff directly affects surface soil erosion by water, and, therefore, becomes an important parameter in predicting surface erosion, gullying, and channel scouring. This also becomes an important parameter for proper design of structures such as culverts, bridges, dams, spillways, and roads. The Water Runoff Potential also gives us a good indication of the relative amount of soil water

recharge a soil might receive for plant growth and soil development.

**Hydrologic soil groups** are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. The soils are grouped according to the intake of water when they are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are.

Group A. Low runoff potential. Soils having high rates of infiltration and water transmission when wet. They are mostly deep, well drained to excessively drained sands and gravels.

Group B. Moderately low runoff potential. Soils having moderate rates of infiltration and water transmission when wet. They are mostly moderately deep and deep, moderately well drained and well drained soils, moderately fine to moderately coarse textured and have moderately slow to moderately rapid permeability.

Group C. Moderately high runoff potential. Soils having slow rates of infiltration and water transmission when wet. They belong mostly to one of two general categories. Those in the first category are mostly well drained and moderately well drained soils that have a slowly or very slowly permeable layer (such as a claypan or hardpan or massive bedrock) at moderate depth (20-40 inches). Those soils in the second category generally have moderately fine or fine textures or a moderately high water table and may be somewhat poorly drained. This group also includes shallow soils over hard but highly fractured bedrock that allows moderate water transmission.

Group D. High runoff potential. Soils having very slow rates of infiltration and water transmission when wet. They are mostly fine-textured soils that have high shrink-swell potential, soils that have a permanently high water table, soils that have a claypan or a clay layer near the surface, or shallow soils over impervious material.

Some of the soil subgroups (for example, C-B for Calixerollic Xerochrepts) were given two ratings because of their wide range of characteristics.

### Adjective Rating for Water Runoff Potential

% Slope	Length of Slope	Hydrologic Soil Group			
		D	C	B	A
0- 2	<300'	very slow	very slow	very slow	very slow
	>300'	very slow	very slow	very slow	very slow
2-20	<300'	moderate	slow	very slow	very slow
	>300'	rapid	moderate	slow	very slow
20-40	<300'	rapid	moderate	slow	very slow
	>300'	rapid	rapid	slow	slow
40-60	<300'	rapid	rapid	moderate	slow
	>300'	very rapid	very rapid	moderate	slow
60+	<300'	very rapid	very rapid	rapid	slow
	>300'	very rapid	very rapid	rapid	moderate

Very Slow	Free water lies on the surface for long periods or enters immediately into the soil. Velocity is such that erosion by runoff would be minimal.
Slow	Free water covers the soil for significant periods or enters the soil rapidly; a large part of the water passes through the profile or evaporates into the air. The velocity is such that erosion by runoff would normally be only of slight concern.
Moderate	Surface water flows away at a rate that a moderate proportion of the water enters the soil profile and free water lies on the surface for only short periods. With moderate runoff, the loss of water over the surface does not reduce seriously the supply available for plant growth. The velocity of the runoff is such that erosion by runoff could present a moderate to serious concern.
Rapid	A large proportion of the precipitation moves rapidly over the surface of the soil and a small part moves through the soil profile. Surface water runs off nearly as fast as it is added. The rapid velocity of the runoff would pose a serious concern to soil erosion by runoff.
Very Rapid	A very large part of the water moves very rapidly over the surface of the soil and a very small part goes through the profile. The very rapid velocity of the runoff could result in very severe erosional problems.

#### Forest Survey Site Class

Potential timber site productivity ratings for the Forest Survey Site Class determinations were made using age/height relationships of some representative trees and the species from each soil map unit and soil type. Dunning site curves were used to arrive at the corresponding Forest survey site ratings (Forest survey site classes

and their equivalents in local site classification systems. FSM 2490.6-9, R-5 Supp. 232, dated 5/80). Ponderosa or Jeffrey pine was selected as the site tree if they were present in the stand. White fir was the selected specie if the pines were not present in the stand.

In areas where timber was absent due to wildfire or clearcutting, the soil type and depth and climatic con-

ditions became the overriding influence in determining productivity. In most of these cases, however, there was still some evidence of measurable site productivity in the form of a few standing snags, decomposing stumps and logs, or sparsely populated encroaching timber.

Forest Survey Site Class	Dunning Site Class	Potential Yield (MAI) Cubic ft/acre/yr.
1	1A(WF)	>225
2	1A(P), 1(WF)	165-224
3	1(P), 2(WF)	120-164
4	2(P), 3(WF)	85-119
5	3-4(P), 4-5(WF)	50-84
6	5(P)	20-49
7	Noncommercial	<20

(P)=Ponderosa or Jeffrey pine

(WF)=White fir

### Timber Regeneration Potential

The timber regeneration potential interpretations are divided into two parts. The first part is plantability. This interpretation determines if it is physically possible to plant bare root seedlings. The second portion considers seedling survival potential. This interpretation determines if the seedling will survive the first year after being planted. The two ratings must be considered together before the actual decision to plant is made. If the soil is not considered to be a "timber" soil then no ratings are given for the timber regeneration potential.

#### Plantability

The following information was adapted from guidelines determined by the Shasta-Trinity National Forest.

This interpretation considers three factors to determine a rating. They are: rock fragments over 2 inches in diameter in the top 12 inches of soil, soil depth, and percent slope. There are four ratings: nonplantable, low (planting will be difficult), moderate and high (easy to plant). For practical purposes moderate and high are combined.

#### Nonplantable -

- More than 60% rock fragments.
- Less than 10 inches soil depth.
- Greater than 80% slope.

#### Low -

- 35 to 60% rock fragments.
- 10 to 20 inches soil depth.
- 60 to 80% slopes.

#### Moderate to high -

- <35% rock fragments.
- >20 inches soil depth.

<60% slopes

The rating is determined by the most limiting factor. In actual practice more than one factor is often limiting.

### Seedling Survival Potential

The chance of Seedling Survival rating is a relative rating of the potential for survival of bare root seedlings in clearcut areas the first season following planting. It is distinguished from the plantability rating in that it quantitatively integrates factors responsible for physiological health following planting whereas the latter assesses physical factors related to the feasibility of effective planting operations.

In most areas on the Lassen National Forest adequate moisture appears to be the most limiting factor effecting the biological health and survival of first year planted conifer seedlings. This assessment, therefore, confines itself to those factors directly related to conifer seedling moisture supply and demand.

For purposes of this assessment, moisture supply is expressed in terms of the available water holding capacity (AWC) in that portion of the soil profile potentially utilized by the seedling root system during its first growing season, i.e., the upper 20". Moisture demand by the tree (WR) is expressed as the seasonal evapo-transpiration use expected under the climatic conditions prevailing on the site. Climatic conditions in turn are influenced by geographic location and topographic features of the site. These variables are considered in the computation of water use in inches.

The rating scheme of this matrix is based on a procedure designed and proposed for the Pacific Southwest Region by Earl B. Alexander, Soil Scientist, R-5 RO ( "Relative chance for Survival of Planted Conifer Seedlings based on Physical site factors in California." 2/16/81). In this procedure, AWC was computed according to the criteria exhibited under Available Waterholding Capacity. The computation of WR is based on a formula that integrates latitude, evaluation, aspect, and slope factors in determining the effect of solar radiation and air temperatures upon evapo-transpiration.

Water balance, i.e., the calculated difference in inches between water availability and demand (AWC-WR), is an expression of the relative plant moisture stress experienced by the seedlings. This calculated water balance, based upon the specific soil and site characteristics of each mapping unit, is the basis for relative ratings of survival potential for each soil component of the mapping unit. The relationship between calculated water balance and survival potential is reflected in table 5.

**TABLE 5. - Chance of Conifer Seedling Survival**

Moisture balance (AWC-WR) in inches of water in the top 20 inch soil depth.	Seedling Survival Potential (adjective rating) <sup>1</sup>
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greater than 1.5	High
0.8 - 1.5	Moderate
0.3 - 0.8	Low
less than 0.3	Very low

High - is defined as having a good survival potential and will require none to minor mitigating measures.

Moderate - is defined as having a fair survival potential and may require some mitigating measures on high elevation soils or on sites with high evapotranspiration potentials.

Low - is defined as having a poor survival potential without mitigating measures. It will require considerable effort to change plant moisture stress and/or edaphic conditions to insure adequate survival to meet Regional Minimum Stocking Standards. These soils have one or more severely limiting factors: Low AWC, high stone content, limiting soil depth, southerly exposures and/or high elevation soils.

Very low - is defined as having a very poor survival without mitigating measures. Numerous planting failures are likely. It will require many and expensive measures to modify the plant stress and edaphic conditions to insure adequate survival to meet Regional Minimum Stocking Standards. The cost of the mitigation measures may exceed the future value of the timber. These soils have a number of severely limiting factors which may include: shallow soils, very low AWC, very high stone content, harsh exposure, high elevations.

<sup>1</sup> Not rated if forest survey site class is 7 or Dunnings site is non-commercial.

The following conditions are assumed for these ratings:

1. Species are selected for planting that are properly adapted to the climatic and edaphic conditions prevailing on the site.
2. Seedling health, morphology and physiological condition is acceptable.
3. Good stock handling and planting techniques are employed.
4. Vegetative competition is kept to a minimum.
5. Soil compaction is not in evidence.

**Unified and ASSHTO Soil Classifications**

Two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (abbreviated Unified) and the system used by the American Association of State Highway and Transportation Officials (AASHTO)<sup>1,2</sup>. On the second page of each Map Unit Description and Interpretations for management the soils are classified according to both systems.

<sup>1</sup>Soils Manual for Design of Asphalt Pavement Structures. The Asphalt Institute. Manual Series No. 10 (MS-10), second edition, February 1969.

<sup>2</sup>Soil Conservation Service, National Soils Handbook, July 1983.

The Unified Soil Classification system was established by the U.S. Army Corps of Engineers. It is based on the identification of soils according to their texture and plasticity, and on their performance as engineering construction materials. The Asphalt Institute (1969) provides a discussion of the Unified and AASHTO Soil

#### Classification Systems.

The Unified and AASHTO Soil Classification ratings assigned in this report were developed from field estimates of the U.S.D.A. textures and rock fragment textural modifiers and are intended for use as general guides.

## 1 Aikman family-Durixerolls association, 0 to 35 Percent Slopes

Map Unit Components	<b>Aikman</b>	<b>Durixerolls</b>
Approx. Proportion	60%	30%
Position, Slope, and Elevation	Occurs on lava flows and benches; 0 to 35 percent slopes; 4,000 to 5,500 feet.	Occurs on alluvial fans, terraces and benches; 0 to 25 percent slopes; 4,000 to 6,000 feet.
Typical Vegetation & Precipitation	Annual and perennial grasses, big sage and western juniper; 20 inches ppt.	Sparse Jeffrey pine and western juniper with big sage and annual and perennial grasses; 15 to 20 inches ppt.

### Soil Profile Description

Surface Layer	0 to 12 inches; brown very cobbly clay to clay; granular to angular blocky structure; hard to very hard; pH 7.4.	0 to 7 inches, brown to yellowish brown sandy loam; granular to subangular blocky structure; soft; pH 6.8.
Subsoil	12 to 35 inches; brown clay; angular blocky structure; very hard; pH 7.4.	7 to 11 inches; dark yellowish brown sandy clay loam to clay; blocky to prismatic structure; hard; pH 6.8 to 7.0.
Substrata	35 to 60 inches; strong brown silty clay loam; angular blocky structure; slightly hard; 5 to 15 percent rock fragments; pH 8.0.	11 to 18 inches indurated silica pan underlain by hard basalt.

### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	35 inches; silty clay loam	10 to 20 inches; indurated silica pan.
Erosion Factor (K)	.28	.28
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Very slow	Moderate over very slow.
Soil Manageability Class	3X	2ep
Group	III	III
Range Site	2	1
Water Runoff Potential	Rapid	Moderate to rapid
Hydrologic Soil Group	D	D
Available Water Capacity (AWC) Total (Top 20")	8.7 (2.6)	1.3 (1.3)
Forest Site Class	7 (Noncommercial)	7 (Noncommercial)
Timber Regeneration Potential		
Plantability	N/A	N/A
Seedling Survival	N/A	N/A
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-4; very cobbly clay Unified: CH ASSHTO: A-7	0-7; sandy loam Unified: SM ASSHTO: A-2-4, A-4
	4-35; clay Unified: CH ASSHTO: A-7	7-9; sandy clay loam Unified: SC ASSHTO: A-2-6
	35-60; silty clay loam Unified: CL ASSHTO: A-7	9-11; clay Unified: CL ASSHTO: A-7
		11-18; indurated pan
Included Areas	10% Keating Family	

## 2 Andic Fragiumbrepts-Sheld family moderately deep, glacial association, 0 to 35 Percent Slopes

Map Unit Components	<b>Andic Fragiumbrepts</b>	<b>Sheld, mod.deep, glacial</b>
Approx. Proportion	45%	35%
Position, Slope, and Elevation	Occurs on glacial moraines and outwash; 0 to 35 percent slopes; 5,200 to 6,500 feet.	Occurs on upland flats, mountain sideslopes & ground moraines; 0 to 35 percent slopes; 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Lodgepole pine, white fir, ponderosa pine, greenleaf manzanita and pinemat manzanita; 60 to 80 inches ppt.	Red and white fir, sugar pine, lodgepole pine, mountain hemlock, greenleaf manzanita and chinquapin; 50 to 85 inches ppt.

### Soil Profile Description

Surface Layer	0 to 7 inches; grayish brown to brown gravelly sandy loam; single grain and granular structure; soft; 15 to 30 percent rock fragments; pH 5.5 to 6.0.	0 to 12 inches; dark grayish brown gravelly to very gravelly sandy loam to very cobbly sandy loam; granular structure; soft; 20 to 40 percent rock fragments; pH 6.8 to 6.5.
Subsoil	7 to 20 inches; brown to yellowish brown gravelly to very gravelly sandy loam; subangular blocky structure; slightly hard; 20 to 55 percent rock fragments; pH 6.3.	12 to 33 inches; yellowish brown very cobbly to extremely cobbly sandy loam; granular to subangular blocky structure; 40 to 65 percent rock fragments; pH 6.0 to 5.8.
Substrata	20 inches; indurated pebbles and cobbles.	33 inches; fractured basalt

### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	20 inches; indurated rock fragments	33 inches; basalt
Erosion Factor (K)	.24	.24
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately rapid	Moderate
Soil Manageability Class	2p	3Xp
Soil Manageability Group	II	II
Range Site	N/A	N/A
Water Runoff Potential	Rapid	Slow
Hydrologic Soil Group	D	B
Available Water Capacity (AWC) Total (Top 20")	2.0 (2.0)	2.7 (1.7)
Forest Site Class	6 (V)	5 (III)
Timber Regeneration Potential		
Plantability	Low	Low to moderate
Seedling Survival	Low	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-20; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	0-12; gravelly sandy Unified: GM-GC, SM ASSHTO: A-1, A-2-4,  12-33; very cobbly sandy loam Unified: SM ASSHTO: A-2-4, A-4  33; fractured basalt
Included Areas	20% Sheld Family, glacial; Aquolls and Rock Outcrop	

### 3 Aquolls, 0 to 15 percent slopes

Map Unit Components	<b>Aquolls</b>
Approx. Proportion	80%
Position, Slope, and Elevation	Meadows and valleys over the total forest; 0 to 15 percent slopes; 4,000 to 8,000 feet.
Typical Vegetation & Precipitation	Annual and perennial grasses, sparse lodgepole pine, alder, aspen, willow and thistle, 20 to 80 inches ppt.

#### Soil Profile Description

Surface Layer	0 to 9 inches; grayish brown loam or silt loam; granular and blocky structure, slightly hard; pH 5.8 to 6.0.
Subsoil	9 to 16 inches; grayish brown sandy loam or silty clay loam; blocky structure, slightly hard; pH 6.2 to 7.6.
Substrata	16 to 60 inches; light brownish gray loamy sand to a clay loam; massive; slightly hard; pH 6.2 to 7.6.

#### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	10 to 20 in; gravelly silty clay
Erosion Factor (K)	.17
Max. Erosion Hazard	Low
Soil Permeability	Moderately slow
Soil Manageability Class	3W
Group	III
Range Site	3
Water Runoff Potential	Very slow
Hydrologic Soil Group	C
Available Water Capacity (AWC) Total (Top 20")	8.2 (3.0)
Forest Site Class	N/A
Timber Regeneration Potential	
Plantability	N/A
Seedling Survival	N/A
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-9; silt loam Unified: ML ASSHTO: A-7
	9-16; silty clay loam Unified: ML-CL ASSHTO: A-6
	16-60; gravelly silty clay loam Unified: ML-CL ASSHTO: A-7
Included Areas	20% Riverwash

#### 4 Aquolls-Durixerolls association, 0 to 15 percent slopes

Map Unit Components  
Approx. Proportion  
Position, Slope, and Elevation  
Typical Vegetation & Precipitation

#### Aquolls

60%

Meadows and valleys over the total forest; 0 to 15 percent slopes; 4,000 to 6,000 feet.

Annual and perennial grasses, sparse lodgepole pine, alder, aspen, willow and thistle, 20 to 80 inches ppt.

#### Durixerolls

25%

Occurs on alluvial fans, terraces and benches; 0 to 15 percent slopes; 4,000 to 6,000 feet.

Sparse Jeffrey pine and western juniper with big sage and annual and perennial grasses; 15 to 20 inches ppt.

#### Soil Profile Description

Surface Layer

0 to 9 inches; grayish brown loam or silt loam; granular and blocky structure, slightly hard; pH 5.8 to 6.0.

0 to 7 inches, brown to yellowish brown sandy loam; granular to subangular blocky structure; soft; pH 6.8

Subsoil

9 to 16 inches; grayish brown sandy loam or silty clay loam; blocky structure, slightly hard; pH 6.2 to 7.6.

7 to 11 inches; dark yellowish brown sandy clay loam to clay; blocky to prismatic structure; hard; pH 6.8 to 7.0.

Substrata

16 to 60 inches; light brownish gray loamy sand to a clay loam; massive; slightly hard; pH 6.2 to 7.6.

11 to 18 inches indurated silica pan underlain by hard basalt.

#### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material

10 to 20 in; gravelly silty clay

10 to 20 inches; indurated silica pan.

Erosion Factor (K)

.17

.28

Max. Erosion Hazard

Low

Moderate

Soil Permeability

Moderately slow

Moderate over very slow.

Soil Manageability

Class  
Group

3W  
III

2ep  
III

Range Site

3

1

Water Runoff Potential

Very slow

Moderate to rapid

Hydrologic Soil Group

C

D

Available Water Capacity (AWC)  
Total (Top 20")

8.2 (3.0)

1.3 (1.3)

Forest Site Class

N/A

7 (Noncommercial)

Timber Regeneration Potential

Plantability  
Seedling Survival

N/A  
N/A

N/A  
N/A

Estimated Engineering Properties;  
USDA Texture, Unified, and ASSHTO

0-9; silt loam  
Unified: ML  
ASSHTO: A-7

0-7; sandy loam  
Unified: SM  
ASSHTO: A-2-4, A-4

9-16; silty clay loam  
Unified: ML-CL  
ASSHTO: A-6

7-9; sandy clay loam  
Unified: SC  
ASSHTO: A-2-6

16-60; gravelly silty clay loam  
Unified: ML-CL  
ASSHTO: A-7

9-11; clay  
Unified: CL  
ASSHTO: A-7  
11+; indurated pan

Included Areas

15% Klicker family, stony

## 5 Bobbitt-Brownlee-Alicel families complex, 0 to 35 percent slopes

Map Unit Components	<b>Bobbitt</b>	<b>Brownlee</b>	<b>Alicel</b>
Approx. Proportion	40%	25%	20%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands; 0 to 35 percent slopes; 3,500 to 5,200 feet.	Occurs on flats, mountain sideslopes and fault rims; 0 to 35 percent slopes; 4,000 to 5,200 feet.	Occurs on basalt flows; 0 to 35 percent slopes; 4,000 to 5,200 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, western juniper, black oak, mountain mahogany, squaw carpet and balsam root; 16 to 20 inches ppt.	Jeffrey pine, ponderosa pine, incense cedar, white fir, western juniper, black oak, greenleaf manzanita, mountain mahogany and bitterbrush; 16 to 20 inches ppt.	Jeffrey and ponderosa pine, incense cedar, western juniper, mountain mahogany, big sage and balsam root; 16 to 20 inches ppt.

### Soil Profile Description

Surface Layer	0 to 12 inches; grayish brown gravelly loam to very gravelly loam; subangular blocky structure; soft, pH 6.8 to 6.6.	0 to 16 inches; brown loam; granular and blocky structure; slightly hard; pH 7.2.	0 to 16 inches; brown loam; granular to subangular blocky structure, slightly hard; 5 to 10 percent rock fragments; pH 6.5 to 6.8.
Subsoil	12 to 22 inches; brown extremely gravelly loam; subangular block structure; hard; 60% rock fragments; pH 6.5.	16 to 45 inches; clay loam to gravelly clay loam; subangular blocky structure; hard; pH 7.2 to 7.0.	16 to 42 inches; brown gravelly loam; subangular blocky structure; slightly hard; 20 to 35 percent rock fragments; pH 7.0 to 7.3.
Substrata	22 to 44 inches; brown extremely gravelly sandy loam; massive; 70 percent rock fragments; pH 6.6; underlain by volcanic rock.	45 inches, slightly weathered vesicular basalt.	42 inches; basalt

### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	40 to 50 inches; andesite, basalt and pumice.	45 inches; basalt.	
Erosion Factor (K)	.24	.28	.28
Max. Erosion Hazard	Moderate	Moderate	Moderate
Soil Permeability	Moderate to moderately slow.	Moderate to moderately slow.	Moderate
Soil Manageability Class	2x	2e	1
Soil Manageability Group	II	II	II
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Slow	Slow
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	2.7 (1.9)	5.2 (2.7)	4.7 (2.6)
Forest Site Class	5-6 (IV-V)	6 (V)	5 (IV)
Timber Regeneration Potential			
Plantability	Moderate to high	High	High
Seedling Survival	Low	Moderate	Moderate

**5 Bobbitt-Brownlee-Alicel families complex (continued)**

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-12; loam Unified: ML ASSHTO: A-7	0-16; loam Unified: ML-CL ASSHTO: A-6	0-16; loam Unified: Ml-CL ASSHTO: A7
12-22; gravelly clay loam Unified: 1GM-GC, CL ASSHTO: A-2, A-6, A-7	16-22; clay loam Unified: CL ASSHTO: A-6, A-7	16-42 gravelly loam GM-GC, ML ASSHTO: A-1, A-7
22-44; very gravelly sandy loam Unified: GM-GC, SM ASSHTO: 1A-1, A-2-4, 1A-4	22-45; gravelly clay loam Unified: GM-GC, Cl ASSHTO: A-1, A-2, A-6, A-7	41; basalt
44; andesite	45; weathered basalt	

Included Areas

15% Bobbitt family, moderately deep, durixerolls and Rubble Land

## 6 Bobbitt family, Durixerolls association, 0 to 35 percent slope

Map Unit Components	<b>Bobbitt</b>	<b>Durixerolls</b>
Approx. Proportion	50%	35%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands and ridge tops. 35 to 60% of the surface is covered with rock fragments. 0 to 35 percent slopes; 3,500 to 5,200 feet.	Occurs on alluvial fans, terraces and benches; 0 to 25 percent slopes; 4,000 to 6,000 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, digger pine, juniper, bitterbrush, mountain mahogany, rabbit brush, 16 to 20 inches ppt.	Sparse Jeffrey pine and western juniper with big sage and annual and perennial grasses; 15 to 20 inches ppt.
Soil Profile Description		
Surface Layer	0 to 8 inches; grayish brown very gravelly loam; blocky structure; soft; 40% rock fragments; pH 7.5.	0 to 7 inches, brown to yellowish brown sandy loam; granular to subangular blocky structure; soft; pH 6.8.
Subsoil	8 to 25 inches; brown very gravelly clay loam; subangular blocky structure; very hard; 40% rock fragments; pH 7.0 to 7.5.	7 to 11 inches; dark yellowish brown sandy clay loam to clay; blocky to prismatic structure; hard; pH 6.8 to 7.0.
Substrata	Slightly weathered basalt with soil in the cracks.	11 to 18 inches; indurated silica pan underlain by hard basalt.
Soil Properties & Management Interpretations		
Rooting Depth (in.), Underlying Material	22 to 40 inches; andesite, basalt and pumice.	10 to 20 inches; indurated silica pan.
Erosion Factor (K)	.32	.28
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate to moderately slow.	Moderate over very slow.
Soil Manageability Class	3X	2ep
Group	III	III
Range Site	N/A	1
Water Runoff Potential	Slow	Moderate to rapid
Hydrologic Soil Group	B	D
Available Water Capacity (AWC) Total (Top 20")	2.4 (1.9)	1.3 (1.3)
Forest Site Class	6 (V)	7 (Noncommercial)
Timber Regeneration Potential		
Plantability	Moderate to Low (Rocks)	N/A
Seedling Survival	Low	N/A
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-8; loam Unified: ML ASSHTO: A-7	0-7; sandy loam Unified: SM ASSHTO: A-2-4, A-4
	8-25; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	7-9; sandy clay loam Unified: SC ASSHTO: A-2-6
	25; slightly weathered basalt	9-11; clay Unified: CL ASSHTO: A-7
		11; indurated pan
Included Areas	15% Brownlee family and Rubble land	

## 7 Bobbitt family, moderately deep-Gwin families association, 0 to 35 percent slopes

Map Unit Components	<b>Bobbitt, Mod. Deep</b>	<b>Gwin</b>
Approx. Proportion	60%	25%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands and ridge tops. 0 to 35 percent slopes; 3,500 to 5,200 feet.	Occurs on flat lava flows and mountain sideslopes; 0 to 35 percent slopes; 3,500 to 5,400 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, digger pine, juniper, bitterbrush, mountain mahogany, rabbit brush, 16 to 20 inches ppt.	Sparse Jeffrey and ponderosa pine, digger pine, western juniper, mountain whitethorn, bitterbrush, greenleaf manzanita and big sage; 15 to 20 inches.
<b>Soil Profile Description</b>		
Surface Layer	0 to 8 inches; grayish brown loam, blocky structure; soft; pH 7.5.	0 to 4 inches; grayish brown loam; granular structure; soft; pH 7.3.
Subsoil	8 to 25 inches; brown very gravelly clay loam; subangular blocky structure; very hard; 40% rock fragments; pH 7.0 to 7.5.	4 to 17 inches; grayish brown very cobbly loam to extremely cobbly clay loam; granular structure; slightly hard; 40 to 65 percent rock fragments; pH 7.0 TO 6.8.
Substrata	Slightly weathered basalt with soil in the cracks.	17 inches; slightly weathered basalt grading to hard basalt.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.), Underlying Material	22 to 40 inches; andesite, basalt and pumice.	17 inches; basalt.
Erosion Factor (K)	.32	.28
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate to moderately slow.	Moderate
Soil Manageability Class Group	3X III	2px III
Range Site	N/A	N/A
Water Runoff Potential	Slow	Rapid
Hydrologic Soil Group	B	D
Available Water Capacity (AWC) Total (Top 20")	2.4 (1.9)	1.4 (1.4)
Forest Site Class	6 (V)	7 (Noncommercial)
Timber Regeneration Potential		
Plantability	Moderate to Low (Rocks)	N/A
Seedling Survival	Low	N/A
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-8; loam Unified: ML ASSHTO: A-7	0-4; loam Unified: ML ASSHTO: A-7
	8-25; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	4-10; very cobbly loam Unified: GM-GC, ML ASSHTO: A-2, A-7
	25; slightly weathered basalt	10-17; extremely cobbly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-7
		17; slightly weathered basalt
Included Areas	15% Brownlee family, Bobbitt family, stoney	

## 8 Bobbitt family, Moderately Deep - Gwin Family Association, 35 to 50 Percent Slopes

Map Unit Components	<b>Bobbitt, Mod. Deep</b>	<b>Gwin</b>
Approx. Proportion	45%	30%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands and ridge tops. When located on lava ridges it often has 35 to 60% of the surface covered with rock fragments. 35 to 50 percent slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes; 35 to 50 percent slopes; 3,500 to 5,400 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, digger pine, juniper, bitterbrush, mountain mahogany, rabbit brush, 16 to 20 inches ppt.	Jeffrey and ponderosa pine, digger pine, western juniper, mountain whitethorn, bitterbrush, greenleaf manzanita and big sage; 15 to 25 inches.

### Soil Profile Description

Surface Layer	0 to 8 inches; grayish brown loam, blocky structure; soft; pH 7.5.	0 to 4 inches; grayish brown loam; granular structure; soft; pH 7.3.
Subsoil	8 to 25 inches; brown very gravelly clay loam; subangular blocky structure; very hard; 40% rock fragments; pH 7.0 to 7.5.	4 to 17 inches; grayish brown very cobbly loam to extremely cobbly clay loam; granular structure; slightly hard; 40 to 65 percent rock fragments; pH 7.0 to 6.8.
Substrata	Slightly weathered basalt with soil in the cracks.	17 inches; slightly weathered basalt grading to hard basalt.

### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	22 to 40 inches; andesite, basalt and pumice.	17 inches; basalt.
Erosion Factor (K)	.32	.28
Max. Erosion Hazard	Moderate to high	Moderate to high
Soil Permeability	Moderate to moderately slow.	Moderate
Soil Manageability Class	3X	3px
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Moderate	Very rapid
Hydrologic Soil Group	B	D
Available Water Capacity (AWC) Total (Top 20")	2.4 (1.9)	1.4 (1.4)
Forest Site Class	6 (V)	7 (Noncommercial)
Timber Regeneration Potential		
Plantability	Moderate to Low (Rocks)	N/A
Seedling Survival	Low	N/A
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-8; loam Unified: ML ASSHTO: A-7	0-4; loam Unified: ML ASSHTO: A-7
	8-25; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	4-10; very cobbly loam Unified: GM-GC, ML ASSHTO: A-2, A-7
	25; slightly weathered basalt	10-17; extremely cobbly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-7
		17; slightly weathered basalt
Included Areas	25% Rock Outcrop, Rubbleland and Brownlee family	

## 9 Bobbitt-Holland-Brownlee families association, 35 to 50 Percent Slopes

Map Unit Components	<b>Bobbitt</b>	<b>Holland</b>	<b>Brownlee</b>
Approx. Proportion	40%	20%	20%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands and ridgetops. When located on lava ridges it often has 35 to 60% of the surface covered with rock fragments. 35 to 50% slopes; 3,500 to 5,200 feet.	Occurs on large volcanic ridges and mountain sideslopes; 35 to 50 percent slopes; 3,500 to 5,200 feet.	Occurs on flats, mountain sideslopes and fault rims; 35 to 50 percent slopes; 4,000 to 5,200 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, western juniper, black oak, mountain mahogany and squaw carpet. 20 to 35 inches ppt.	Jeffrey and ponderosa pine, white fir, douglas fir, sugar pine, incense cedar, mountain whitethorn, chinquapin, deerbrush, buckbrush, service berry, greenleaf manzanita and squaw carpet, 25 to 35 inches ppt.	Jeffrey pine, ponderosa pine, incense cedar, white fir, western juniper, black oak, greenleaf manzanita, mountain mahogany and bitterbrush; 20 to 35 inches ppt.
Soil Profile Description			
Surface Layer	0 to 12 inches; grayish brown gravelly loam to very gravelly loam; subangular blocky structure; soft; pH 6.8 to 6.6.	0 to 10 inches, reddish brown loam to gravelly loam, granular structure; soft; pH 6.5 to 6.2.	0 to 16 inches; brown loam; granular and blocky structure; slightly hard; pH 7.2.
Subsoil	12 to 22 inches, brown extremely gravelly clay loam; subangular blocky structure; hard; 60% rock fragments; pH 6.5.	10 to 44 inches; brown to yellowish red gravelly loam to gravelly clay loam; subangular blocky structure; hard; pH 6.2 to 6.4.	16 to 45 inches; clay loam to gravelly clay loam; subangular blocky structure; hard; pH 7.2 to 7.0.
Substrata	22 to 44 inches; brown extremely gravelly sandy loam; massive; 70 percent rock fragments; pH 6.6; underlain by volcanic rock.	44 to 60 inches; yellowish brown gravelly silty clay loam; massive structure; hard; pH 6.2.	45 inches, slightly weathered vesicular basalt.
Soil Properties & Management Interpretations			
Rooting Depth (in.), Underlying Material	40 to 50 inches; andesite and basalt.	60+ inches.	45 inches; basalt.
Erosion Factor (K)	.32	.28	.28
Max. Erosion Hazard	Moderate to high	Moderate	Moderate to high
Soil Permeability	Moderate to moderately slow.	Moderate	Moderate to moderately sl
Soil Manageability Class	3x	3g	3g
Group	III	III	III
Range Site	N/A	N/A	N/A
Water Runoff Potential	Moderate	Moderate	Moderate
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	2.7 (1.9)	7.7 (2.6)	5.2 (2.7)
Forest Site Class	5-6 (IV-V)	3 (II)	6 (V)
Timber Regeneration Potential			
Plantability	Moderate to low (Rocks)	High	High
Seedling Survival	Low to moderate	Moderate	Moderate

**9 Bobbitt-Holland-Brownlee families association (continued)**

Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO

0-12; loam Unified: ML ASSHTO: A-7	0-10; loam Unified: ML-CL ASSHTO: A-6	0-16; loam Unified: ML-CL ASSHTO: A-6
12-22; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	10-24; gravelly loam Unified: GM-GC, CL ASSHTO: A-2, A-6	16-22; clay loam Unified: CL ASSHTO: A-6, A-7
22-44; very gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	24-44; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	22-45; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-1, A-2, A-6, A-7
44; andesite	44-60; gravelly silty clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6	45; basalt

Included Areas

20% Skalan family and Lithic Haploxerafs

## 10 Bobbitt-Holland families-Lithic Haploxeralfs association, 0 to 15 percent slopes

Map Unit Components	<b>Bobbitt</b>	<b>Holland</b>	<b>Lithic Haploxeralfs</b>
Approx. Proportion	35%	25%	25%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands; 0 to 15 percent slopes; 3,500 to 5,200 feet.	Occurs on large volcanic flats, ridges and mountain sideslopes; 0 to 15 percent slopes; 3,500 to 5,200 feet.	Occurs on andesite, basalt and rhyolitic flows and mountain sideslopes; 0 to 15 percent slopes; 4,000 to 5,600 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, western juniper, black oak, mountain mahogany, squaw carpet and balsam root; 16 to 35 inches ppt.	Jeffrey and ponderosa pine, white fir, douglas fir, sugar pine, incense cedar, mountain whitethorn, chinquapin, deerbrush, buckbrush, service berry, greenleaf manzanita and squaw carpet; 25 to 35 inches ppt.	Ponderosa pine, incense cedar, juniper, black oak, squaw carpet, bitterbrush, buckbrush and mule's ear; 18 to 35 inches ppt.

### Soil Profile Description

Surface Layer	0 to 12 inches; grayish brown gravelly loam to very gravelly loam; subangular blocky structure; soft, pH 6.8 to 6.6.	0 to 10 inches, reddish brown loam to gravelly loam; granular structure; soft; pH 6.5 to 6.2.	0 to 6 inches; light gray gravelly to extremely gravelly sandy loam; granular to subangular blocky structure; soft; 15 to 60 percent rock fragments; pH 6.3.
Subsoil	12 to 22 inches; brown extremely gravelly clay loam; subangular blocky structure; hard; 60% rock fragments; pH 6.5.	10 to 44 inches; brown to yellowish red gravelly loam to gravelly clay loam; subangular blocky structure; hard; pH 6.2 to 6.4.	6-18 inches; pinkish gray very gravelly loam; subangular blocky structure; 50 percent rock fragments; pH 6.0.
Substrata	22 to 44 inches; brown extremely gravelly sandy loam; massive; 70 percent rock fragments; pH 6.6; underlain by volcanic rock.	44 to 60 inches; yellowish brown gravelly silty clay loam; massive; hard; pH 6.2.	18 inches; hard rhyolitic tuff.

### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	40 to 50 inches; andesite, basalt and pumice.	60+ inches.	18 inches; hard rhyolitic tuff
Erosion Factor (K)	.24	.28	.20
Max. Erosion Hazard	Moderate	Low	Low to moderate
Soil Permeability	Moderate to moderately slow.	Moderate	Moderate rapid
Soil Manageability Class	2x	1	3P
Group	II	II	II
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Slow	Very slow
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	2.7 (1.9)	7.7 (2.6)	1.2 (1.2)
Forest Site Class	5-6 (IV-V)	3 (II)	6-7 (V-)
Timber Regeneration Potential			
Plantability	Moderate to high	High	Low
Seedling Survival	Low	Moderate	Very low

## 10 Bobbitt-Holland families-Lithic Haploxeralfs association (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-12; loam  
Unified: ML  
ASSHTO: A-7

0-10; loam  
Unified: ML-CL  
ASSHTO: A-6

0-2; gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

12-22; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

10-24; gravelly loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6

2-6; very gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

22-44; very gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

24-44; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

6-18; very gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-4

44; andesite

44-60; gravelly silty clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6

18; hard rhyolitic tuff

Included Areas

15% Skalan family, moderately deep and Aquolls

## 11 Bobbitt-Holland-Skalan families association, 0 to 15 percent slopes

Map Unit Components	<b>Bobbitt</b>	<b>Holland</b>	<b>Skalan</b>
Approx. Proportion	40%	30%	20%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands; 0 to 15 percent slopes; 3,500 to 5,200 feet.	Occurs on large volcanic flats, ridges and mountain sideslopes; 0 to 15 percent slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes; gently sloping hills and undulating flats; 0 to 15 percent slopes, 3,000 to 5,200 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, western juniper, black oak, mountain mahogany, squaw carpet and balsam root; 16 to 25 inches ppt.	Jeffrey and ponderosa pine, white fir, douglas fir, sugar pine, incense cedar, mountain whitethorn, chinquapin, deerbrush, buckbrush, service berry, greenleaf manzanita and squaw carpet; 25 to 35 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 20 to 35 inches ppt.
<b>Soil Profile Description</b>			
Surface Layer	0 to 12 inches; grayish brown gravelly loam to very gravelly loam; subangular blocky structure; soft, pH 6.8 to 6.6.	10 to 44 inches; brown to yellowish red gravelly loam to gravelly clay loam; subangular blocky structure; hard; pH 6.2 to 6.4.	0 to 14 inches; brown gravelly sandy loam to loam; granular to subangular blocky structure soft; 15 to 30 percent rock fragments; pH 6.5 to 6.7.
Subsoil	12 to 22 inches; brown extremely gravelly clay loam; subangular blocky structure; hard; 60% rock fragments; pH 6.5.	10 to 44 inches; brown to yellowish red gravelly loam to gravelly clay loam; subangular blocky structure; hard; pH 6.2 to 6.4.	14 to 31 inches; brown very gravelly loam to clay loam; subangular blocky structure; slightly hard; 40 to 50 percent rock fragments; PH 6.7.
Substrata	22 to 44 inches; brown extremely gravelly sandy loam; massive; 70 percent rock fragments; pH 6.6; underlain by volcanic rock.	44 to 60 inches; yellowish brown gravelly silty clay loam; massive; hard; pH 6.2.	31 to 60 inches; yellowish brown very gravelly to extremely gravelly clay loam; subangular blocky structure; hard; 50 to 60 percent rock fragments; pH 6.7; underlain by andesite and basalt.
<b>Soil Properties &amp; Management Interpretations</b>			
Rooting Depth (in.), Underlying Material	40 to 50 inches; andesite, basalt and pumice.	60+ inches.	60 inches; weathered basalt.
Erosion Factor (K)	.24	.28	.20
Max. Erosion Hazard	Moderate	Low	Low
Soil Permeability	Moderate to moderately slow.	Moderate	Moderate
Max. Erosion Hazard		Low	
Soil Permeability		Moderate	
Soil Manageability Class	2x	1	2p
Soil Manageability Group	II	II	II
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Slow	Slow
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	2.7 (1.9)	7.7 (2.6)	5.1 (1.7)
Forest Site Class	5-6 (IV-V)	4 (II)	4(II)

## 11 Bobbitt-Holland-Skalan families association (continued)

Timber Regeneration  
Potential  
Plantability  
Seedling Survival  
Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

Moderate to high  
Low

0-12; loam  
Unified: ML  
ASSHTO: A-7

12-22; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

22-44; very gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

44; andesite

High  
Moderate

0-10; loam  
Unified: ML-CL  
ASSHTO: A-6

10-24; gravelly loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6

24-44; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

44-60; gravelly silty clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6

Moderate  
Very low to low

0-8; gravelly sandy loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-2-4, A-4

8-14; gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-7

14-23; very gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-4

23-60; very gravelly clay loam  
Unified: GM-GC, ML-CL

Included Areas

10% Bobbitt and Skalan families, moderately deep

## 12 Bobbitt-Skalan families-Rock Outcrop association, 0 to 15 percent slopes

Map Unit Components	<b>Bobbitt</b>	<b>Skalan</b>	<b>Rock Outcrop</b>
Approx. Proportion	35%	35%	20%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands; 0 to 15 percent slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes; gently sloping hills and undulating flats; 0 to 15 percent slopes, 3,000 to 5,200 feet.	Miscellaneous land type on mountain sideslopes and ridgetops; 4,000 to 9,000 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, western juniper, black oak, mountain mahogany, squaw carpet and balsam root; 16 to 35 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 20 to 35 inches ppt.	Barren except for widely scattered brush that occurs in fractures in the rock or in small colluvial pockets of soil; 16 to 35 inches ppt.
Soil Profile Description			
Surface Layer	0 to 12 inches; grayish brown gravelly loam to very gravelly loam; subangular blocky structure; soft, pH 6.8 to 6.6.	0 to 14 inches; brown gravelly sandy loam to loam; granular to subangular blocky structure; soft; 15 to 30 percent rock fragments; pH 6.5 to 6.7.	N/A
Subsoil	12 to 22 inches; brown extremely gravelly clay loam; subangular blocky structure; hard; 60% rock fragments; pH 6.5.	14 to 31 inches; brown very gravelly loam to clay loam; subangular blocky structure; slightly hard; 40 to 50 percent rock fragments; pH 6.7.	N/A
Substrata	22 to 44 inches; brown extremely gravelly sandy loam; massive; 70 percent rock fragments; pH 6.6; underlain by volcanic rock.	31 to 60 inches; yellowish brown very gravelly to extremely gravelly clay loam; subangular blocky structure; hard; 50 to 60 percent rock fragments; pH 6.7; underlain by andesite and basalt.	Protruding bedrock that has all soil eroded off.
Soil Properties & Management Interpretations			
Rooting Depth (in.), Underlying Material	40 to 50 inches; andesite, basalt and pumice.	60 inches; weathered basalt	Nil; Any competent hard bedrock
Erosion Factor (K)	.24	.20	N/A
Max. Erosion Hazard	Moderate	Low	N/A
Soil Permeability	Moderate to moderately slow.	Moderate	N/A
Soil Manageability Class	2x	2p	N/A
Soil Manageability Group	II	II	N/A
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Slow	Very rapid
Hydrologic Soil Group	B	B	N/A
Available Water Capacity (AWC) Total (Top 20")	2.7 (1.9)	5.1 (1.7)	N/A
Forest Site Class	5-6 (IV-V)	4 (II)	N/A
Timber Regeneration Potential			
Plantability	Moderate to high	Moderate	N/A
Seedling Survival	Low	Very low to low	N/A

**12 Bobbitt-Skalan families-Rock Outcrop association (continued)**

Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO

0-12; loam Unified: ML ASSHTO: A-7	0-8; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	N/A
12-22; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	8-14; gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-7	
22-44; very gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	14-23; very gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-4	
44; andesite	23-60; very gravelly clay loam Unified: GM-GC, ML-CL ASSHTO: A-2, A-6	

Included Areas

10% Lithic Haploxeralfs and Aquolls

### 13 Bobbitt-Skalan families-Rubble Land association, 15 to 35 percent slopes

Map Unit Components	<b>Bobbitt</b>	<b>Skalan</b>	<b>Rubble Land</b>
Approx. Proportion	40%	35%	15%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands; 15 to 35 percent slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes; gently sloping hills and undulating flats; 15 to 35 percent slopes, 3,000 to 5,200 feet.	Miscellaneous land type on mountain sideslopes and steep escarpments.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, western juniper, black oak, mountain mahogany, squaw carpet and balsam root; 16 to 35 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 20 to 35 inches ppt.	Somewhat barren, but vegetation may grow up through the rock fragments. the vegetation is growing in soil that is buried by the rock fragments; 16 to 35 inches ppt.

#### Soil Profile Description

Surface Layer	0 to 12 inches; grayish brown gravelly loam to very gravelly loam; subangular blocky structure; soft, ph 6.8 to 6.6.	0 to 14 inches; brown gravelly sandy loam to loam; granular to subangular blocky structure; soft; 15 to 30 percent rock fragments; ph 6.5 to 6.7.	N/A
Subsoil	12 to 22 inches; brown extremely gravelly clay loam; subangular blocky structure; hard; 60% rock fragments; ph 6.5.	14 to 31 inches; brown very gravelly loam to clay loam; subangular blocky structure; slightly hard; 40 to 50 percent rock fragments; ph 6.7.	N/A
Substrata	22 to 44 inches; brown extremely gravelly sandy loam; massive; 70 percent rock fragments; ph 6.6; underlain by volcanic rock.	31 to 60 inches; yellowish brown extremely gravelly clay loam; subangular blocky structure; hard; 50 to 60 percent rock fragments; ph 6.7; underlain by andesite and basalt.	Detached rock fragments ranging in size from 3 inches to about 5 feet in diameter.

#### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	40 to 50 inches; andesite, basalt and pumice.	60 inches; weathered basalt	Nil; May be underlain by bedrock or soil
Erosion Factor (K)	.24	.20	N/A
Max. Erosion Hazard	Moderate	Low	N/A
Soil Permeability	Moderate to moderately slow	Moderate	N/A
Soil Manageability Class	2x	2p	N/A
Group	II	II	N/A
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Slow	Very slow to moderate
Hydrologic Soil Group	B	B	N/A
Available Water Capacity (AWC) Total (Top 20")	2.7 (1.9)	5.1 (1.7)	N/A
Forest Site Class	5-6 (IV-V)	4 (II)	N/A
Timber Regeneration Potential			
Plantability	Moderate to high	Moderate	N/A
Seedling Survival	Low	Very low to low	N/A

### 13 Bobbitt-Skalan families-Rubble Land association (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-12; loam unified: ML ASSHTO: A-7	0-8; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	N/A
12-22; gravelly clay loam unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	8-14; gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-7	
22-44; very gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	14-23; very gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-4	
44; andesite	23-60; very gravelly clay loam Unified: GM-GC, ML-CL ASSHTO: A-2, A-6	

Included Areas

10% Lithic Xerumbrepts and Lithic Xerochrepts

## 14 Bobbitt-Skalan families-Rubble Land association, 35 to 50 percent slopes

Map Unit Components	<b>Bobbitt</b>	<b>Skalan</b>	<b>Rubble Land</b>
Approx. Proportion	35%	30%	15%
Position, Slope, and Elevation	Occurs on all aspects of mountainous uplands and ridgetops. When located on lava ridges it often has 35 to 60% of the surface covered with rock fragments. 35 to 50% slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes and steeply sloping hills; 35 to 50 percent slopes, 3,000 to 5,200 feet.	Miscellaneous land type on mountain sideslopes and steep escarpments.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, western juniper, black oak, mountain mahogany and squaw carpet. 16 to 35 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 20 to 35 inches ppt.	Somewhat barren, but vegetation may grow up through the rock fragments. The vegetation is growing in soil that is buried by the rock fragments; 16 to 35 inches ppt.
Soil Profile Description			
Surface Layer	0 to 12 inches; grayish brown gravelly loam to very gravelly loam; subangular blocky structure; soft; pH 6.8 to 6.6.	0 to 14 inches; brown gravelly sandy loam to loam; granular to subangular blocky structure; soft; 15 to 30 percent rock fragments; pH 6.5 to 6.7.	N/A
Subsoil	12 to 22 inches, brown extremely gravelly clay loam; subangular blocky structure; hard; 60% rock fragments; pH 6.5.	14 to 31 inches; brown very gravelly loam to clay loam; subangular blocky structure; slightly hard; 40 to 50 percent rock fragments; pH 6.7.	N/A
Substrata	22 to 44 inches; brown extremely gravelly sandy loam; massive; 70 percent rock fragments; pH 6.6; underlain by volcanic rock.	31 to 60 inches; yellowish brown very gravelly to extremely gravelly clay loam; subangular blocky structure; hard; 50 to 60 percent rock fragments; pH 6.7; underlain by andesite and basalt.	Detached rock fragments ranging in size from 3 inches to about 5 feet in diameter.
Soil Properties & Management Interpretations			
Rooting Depth (in.), Underlying Material	40 to 50 inches; andesite and basalt.	60 inches; weathered basalt	Nil; May be underlain by bedrock or soil
Erosion Factor (K)	.32	.20	N/A
Max. Erosion Hazard	Moderate to high	Moderate	N/A
Soil Permeability	Moderate to moderately slow.	Moderate	N/A
Soil Manageability Class	3x	3gp	N/A
Soil Manageability Group	III	III	N/A
Range Site	N/A	N/A	N/A
Water Runoff Potential	Moderate	Moderate	Very slow to moderate
Hydrologic Soil Group	B	B	N/A
Available Water Capacity (AWC) Total (Top 20")	2.7 (1.9)	5.1 (1.7)	N/A
Forest Site Class	5-6 (IV-V)	4 (II)	N/A

**14 Bobbitt-Skalan families-Rubble Land association (continued)**

Timber Regeneration  
Potential  
Plantability  
Seedling Survival

Moderate to low (Rocks)	Moderate	N/A
Low to moderate	Very low to low	N/A

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-12; loam Unified: ML ASSHTO: A-7	0-8; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	N/A
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12-22; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	8-14; gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-7	
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22-44; very gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	14-23; very gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-4	
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44; andesite	23-60; very gravelly clay loam Unified: GM-GC, ML-CL ASSHTO: A-2, A-6	
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Included Areas

20% Lithic Xerumbrepts and Lithic Xerochrepts

## 15 Brownlee-Bobbitt families association, 0 to 35 percent slopes

Map Unit Components	Brownlee	Bobbitt
Approx. Proportion	65%	25%
Position, Slope, and Elevation	Occurs on flats, mountain sideslopes and fault rims; 0 to 35 percent slopes; 4,000 to 5,200 feet.	Occurs on all aspects of mountainous uplands; 0 to 35 percent slopes; 3,500 to 5,200 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, incense cedar, white fir, western juniper, black oak, greenleaf manzanita, mountain mahogany and bitterbrush; 20 to 35 inches ppt.	Jeffrey pine, ponderosa pine, western juniper, black oak, mountain mahogany, squaw carpet and balsam root; 16 to 35 inches ppt.

### Soil Profile Description

Surface Layer	0 to 16 inches; brown loam; granular and blocky structure; slightly hard; pH 7.2.	0 to 12 inches; grayish brown gravelly loam to very gravelly loam; subangular blocky structure; soft, pH 6.8 to 6.6.
Subsoil	16 to 45 inches; clay loam to gravelly clay loam; subangular blocky structure; hard; pH 7.2 to 7.0.	12 to 22 inches; brown extremely gravelly clay loam; subangular blocky structure; hard; 60% rock fragments; pH 6.5.
Substrata	45 inches, slightly weathered vesicular basalt.	22 to 44 inches; brown extremely gravelly sandy loam; massive; 70 percent rock fragments; pH 6.6; underlain by volcanic rock.

### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	45 inches; basalt.	40 to 50 inches; andesite, basalt and pumice.
Erosion Factor (K)	.28	.24
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate to moderately slow.	Moderate to moderately slow.
Soil Manageability Class	2e	2x
Group	II	II
Range Site	N/A	N/A
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	5.2 (2.7)	2.7 (1.9)
Forest Site Class	6 (V)	5-6 (IV-V)
Timber Regeneration Potential		
Plantability	High	Moderate to high
Seedling Survival	Moderate	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-16; loam Unified: ML-CL ASSHTO: A-6	0-12; loam Unified: ML ASSHTO: A-7
	16-22; clay loam Unified: CL ASSHTO: A-6, A-7	12-22; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7
	22-45; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-1, A-2, A-6, A-7	22-44; very gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
	45; basalt	44; andesite
Included Areas	10% Durixerolls; Alicel family and Rock Outcrop	

## 16 Brownlee-Skalan families association, 0 to 35 percent slopes

	<b>Brownlee</b>	<b>Skalan</b>
Map Unit Components		
Approx. Proportion	45%	35%
Position, Slope, and Elevation	Occurs on flats, mountain sideslopes and fault rims; 0 to 35 percent slopes; 4,000 to 5,200 feet.	Occurs on mountain sideslopes; gently sloping hills and undulating flats; 0 to 35 percent slopes, 3,000 to 5,200 feet.
Typical Vegetation & Precipitation	Jeffrey pine, ponderosa pine, incense cedar, white fir, western juniper, black oak, greenleaf manzanita, mountain mahogany and bitterbrush; 20 to 25 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 20 to 35 inches ppt.
<b>Soil Profile Description</b>		
Surface Layer	0 to 16 inches; brown loam; granular and blocky structure; slightly hard; pH 7.2.	0 to 14 inches; brown gravelly sandy loam to loam; granular to subangular blocky structure; soft; 15 to 30 percent rock fragments; pH 6.5 to 6.7.
Subsoil	16 to 45 inches; clay loam to gravelly clay loam; subangular blocky structure; hard; pH 7.2 to 7.0.	14 to 31 inches; brown very gravelly loam to clay loam; subangular blocky structure; slightly hard; 40 to 50 percent rock fragments; pH 6.7.
Substrata	45 inches, slightly weathered vesicular basalt.	31 to 60 inches; yellowish brown very gravelly to extremely gravelly clay loam; subangular blocky structure; hard; 50 to 60 percent rock fragments; pH 6.7; underlain by andesite and basalt.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.)	45 inches; basalt.	60 inches; weathered basalt
Erosion Factor (K)	.28	.20
Max. Erosion Hazard	Moderate	Low
Soil Permeability	Moderate to moderately slow.	Moderate
Soil Manageability Class	2e	2p
Group	II	II
Range Site	N/A	N/A
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	5.2 (2.7)	5.1 (1.7)
Forest Site Class	6 (V)	4 (II)
Timber Regeneration Plantability	High	Moderate
Seedling Survival	Moderate	Very low to low

**16 Brownlee-Skalan families association (continued)**

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-16; loam  
Unified: ML-CL  
ASSHTO: A-6

0-8; gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

16-22; clay loam  
Unified: CL  
ASSHTO: A-6, A-7

8-14; gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-7

22-45; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-1, A-2, A-6, A-7

14-23; very gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-4

45; basalt

23-60; very gravelly clay loam  
Unified: GM-GC, ML-CL  
ASSHTO: A-2, A-6

Included Areas

20% Skalan Family, moderately deep, Holland family and Rubble Land

## 17 De Masters-Klicker families association, 0 to 35 percent slopes

Map Unit Components	<b>De Masters</b>	<b>Klicker</b>
	Approx. Proportion	60%
Position, Slope, and Elevation	Occurs mainly on old, relatively flat lava flows; 0 to 35 percent slopes; 5,200 to 6,500 feet.	Occurs on mountain slopes and flats; 5 to 35 percent slopes; 6,500 to 7,300 feet.
Typical Vegetation & Precipitation	Ponderosa and Jeffrey pine, white and red fir, incense cedar, western juniper, mountain mahogany, greenleaf manzanita, pinemat manzanita, desert mountain mahogany and big sage; 20 to 25 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 18 to 25 inches ppt.
Soil Profile Description		
Surface Layer	0 to 24 inches; dark brown sandy loam to loam; granular and blocky structure; soft to slightly hard; pH 6.5 to 6.3.	0 to 11 inches, dark brown loam or cobbly loam, granular structure; slightly hard; 18 percent rock fragments; pH 7.0 to 6.8.
Subsoil	24 to 55 inches; brown clay loam; subangular blocky structure; slightly hard to hard; pH 6.3.	11 to 48 inches; brown to yellowish red very cobbly to extremely cobbly loam; subangular blocky structure; slightly hard; 45 to 80 percent rock fragments; pH 6.5.
Substrata	55 to 60 inches; weathered basalt.	48 inches; weathered basalt rock.
Soil Properties & Management Interpretations		
Rooting Depth (in.), Underlying Material	55 inches; basalt.	48 inches; weathered basalt rock.
Erosion Factor (K)	.28	.28
Max. Erosion Hazard	Moderate to low	Moderate
Soil Permeability	Moderate.	Moderate
Soil Manageability Class	2e	2px
Group	II	II
Range Site	N/A	N/A
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	7.8 (2.6)	4.3 (2.0)
Forest Site Class	4 (II-III)	5 (III-IV)
Timber Regeneration Potential		
Plantability	High	Moderate
Seedling Survival	Moderate	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-4; sandy loam Unified: SM ASSHTO: A-2-4, A-4	0-11; cobbly loam Unified: GM-GC, ML ASSHTO: A-1, A-4
	4-24; loam Unified: ML ASSHTO: A-7	11-28; very cobbly loam Unified: GM-GC, ML-CL ASSHTO: A-1, A-6
	24-55; clay loam Unified: CL ASSHTO: A-6, A-7	28-48; extremely gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-7
	55; weathered basalt	48; weathered basalt rock
Included Areas	10% Wintoner and Rubble Land	

## 18 De Masters family-Lithic Haploxerolls-Wintoner family association, 0 to 35 percent slopes

Map Unit Components	<b>De Masters</b>	<b>Lithic Haploxerolls</b>	<b>Wintoner</b>
Approx. Proportion	30%	30%	25%
Position, Slope, and Elevation	Occurs mainly on old, relatively flat lava flows; 0 to 35 percent slopes; 5,200 to 6,500 feet.	Occurs on relatively flat basalt flows; 0 to 25 percent slopes; 5,200 to 6,500 feet.	Occurs on gently to steeply sloping mountain sideslopes, ridges and canyons; 5 to 35 percent slopes; 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Ponderosa and Jeffrey pine, white and red fir, incense cedar, western juniper, mountain mahogany, greenleaf manzanita, pinemat manzanita, desert mountain mahogany and big sage; 20 to 25 inches ppt.	Sparse Jeffrey and ponderosa pine, juniper, digger pine, white oak, black oak, greenleaf manzanita, big sage, mountain mahogany, western redbud, yerba santa and chokecherry; 20 to 35 inches ppt.	Red and white fir, sugar pine, ponderosa pine, Jeffrey pine, incense cedar and chinquapin; 20 to 35 inches ppt.
<b>Soil Profile Description</b>			
Surface Layer	0 to 24 inches; dark brown sandy loam to loam; granular and blocky structure; soft to slightly hard; pH 6.5 to 6.3.	0 to 9 inches; brown gravelly fine sandy loam to very gravelly sandy loam; granular structure; soft; 30 to 40 percent rock fragments; pH 6.8.	0 to 22 inches; yellowish brown to brown gravelly sandy loam to loam; granular structure; soft; 10 to 15 percent rock fragments; pH 7.0 to 6.2.
Subsoil	24 to 55 inches; brown clay loam; subangular blocky structure; slightly hard to hard; pH 6.3.	9 to 17 inches; yellowish brown cobbly to very cobbly loam; subangular blocky to massive structure; slightly hard; 25 to 45 percent rock fragments; pH 7.2 to 7.5.	22 to 43 inches; brown to yellowish brown loam to clay loam; subangular blocky to massive structure; slightly hard; 5 to 12 percent rock fragments; pH 6.0 to 5.5.
Substrata	55 to 60 inches; weathered basalt.	17 inches; hard basalt rock.	43 to 50 inches; strongly weathered andesite bedrock.
<b>Soil Properties &amp; Management Interpretations</b>			
Rooting Depth (in.), Underlying Material	55 inches; basalt.	17 inches; basalt.	43 inches; andesite.
Erosion Factor (K)	.28	.28	.20
Max. Erosion Hazard	Moderate to low	Moderate	Low to moderate
Soil Permeability	Moderate.	Moderate	Moderate
Soil Manageability Class	2e	3Xp	1
Group	II	II	II
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Moderate	Slow
Hydrologic Soil Group	B	D	B
Available Water Capacity (AWC) Total (Top 20")	7.8 (2.6)	1.3 (1.3)	5.6 (2.4)
Forest Site Class	4 (II-III)	7 (Noncommercial)	4 (II)
Timber Regeneration Potential			
Plantability	High	N/A	High
Seedling Survival	Moderate	N/A	Moderate

**18 De Masters family-Lithic Haploxerolls-Wintoner family association (continued)**

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-4; sandy loam  
Unified: SM  
ASSHTO: A-2-4, A-4

0-4; fine sandy loam  
Unified: SM  
ASSHTO: A-4

0-5; gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

4-24; loam  
Unified: ML  
ASSHTO: A-7

4-9; very gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

5-34; loam  
Unified: ML  
ASSHTO: A-7

24-55; clay loam  
Unified: CL  
ASSHTO: A-6, A-7

9-17; very cobbly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-7

34-43; clay loam  
Unified: CL  
ASSHTO: A-6, A-7

55; weathered basalt

17; hard basalt

43; weathered andesite

Included Areas

15% Aquolls

## 19 Durixerolls, 0 to 15 percent slopes

Map Unit Components  
 Approx. Proportion  
 Position, Slope, and  
 Elevation  
 Typical Vegetation &  
 Precipitation

### Durixerolls

75%

Occurs on alluvial fans, terraces and benches; 0 to 15 percent slopes; 4,000 to 6,000 feet.

Sparse Jeffrey pine and western juniper with big sage and annual and perennial grasses; 15 to 20 inches ppt.

### Soil Profile Description

Surface Layer

0 to 7 inches, brown to yellowish brown sandy loam; granular to subangular blocky structure; soft; pH 6.8.

Subsoil

7 to 11 inches; dark yellowish brown sandy clay loam to clay; blocky to prismatic structure; hard; pH 6.8 to 7.0.

Substrata

11 to 18 inches indurated silica pan underlain by hard basalt.

### Soil Properties & Management Interpretations

Rooting Depth (in.),  
 Underlying Material

10 to 20 inches; indurated silica pan.

Erosion Factor (K)

.28

Max. Erosion Hazard

Moderate

Soil Permeability

Moderate over very slow.

Soil Manageability

Class

2ep

Group

II

Range Site

1

Water Runoff Potential

Moderate to rapid

Hydrologic Soil Group

D

Available Water  
 Capacity (AWC)

Total (Top 20")

1.3 (1.3)

Forest Site Class

7 (Noncommercial)

Timber Regeneration  
 Potential

Plantability

N/A

Seedling Survival

N/A

Estimated Engineering  
 Properties;

USDA Texture,

Unified, and ASSHTO

0-7; sandy loam  
 Unified: SM  
 ASSHTO: A-2-4, A-4

7-9; sandy clay loam  
 Unified: SC  
 ASSHTO: A-2-6

9-11; clay  
 Unified: CL  
 ASSHTO: A-7

11; indurated pan

Included Areas

25% Keating and Aikman families

## 20 Durixerolls-Bobbitt family, moderately deep association, 0 to 35 percent slopes

Map Unit Components	<b>Durixerolls</b>	<b>Bobbitt, mod. deep</b>
Approx. Proportion	45%	40%
Position, Slope, and Elevation	Occurs on alluvial fans, terraces and benches; 0 to 25 percent slopes; 4,000 to 6,000 feet.	Occurs on all aspects of mountainous uplands and ridge tops. When located on lava ridges it often has 35 to 60% of the surface covered with rock fragments. 0 to 35 percent slopes; 3,500 to 5,200 feet.
Typical Vegetation & Precipitation	Sparse Jeffrey pine and western juniper with big sage and annual and perennial grasses; 15 to 30 inches ppt.	Jeffrey pine, ponderosa pine, digger pine, juniper, bitterbrush, mountain mahogany, rabbit brush, 16 to 30 inches ppt.
Soil Profile Description		
Surface Layer	0 to 7 inches, brown to yellowish brown sandy loam; granular to subangular blocky structure; soft; pH 6.8.	0 to 8 inches; grayish brown loam, blocky structure; soft; pH 7.5.
Subsoil	7 to 11 inches; dark yellowish brown sandy clay loam to clay; blocky to prismatic structure; hard; pH 6.8 to 7.0.	8 to 25 inches; brown very gravelly clay loam; subangular blocky structure; very hard; 40% rock fragments; pH 7.0 to 7.5.
Substrata	11 to 18 inches indurated silica pan underlain by hard basalt.	Slightly weathered basalt with soil in the cracks.
Soil Properties & Management Interpretations		
Rooting Depth (in.), Underlying Material	10 to 20 inches; indurated silica pan.	22 to 40 inches, andesite, basalt and pumice.
Erosion Factor (K)	.28	.32
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate over very slow.	Moderate to moderately slow.
Soil Manageability Class	2ep	3X
Group	III	III
Range Site	1	N/A
Water Runoff Potential	Moderate to rapid	Slow
Hydrologic Soil Group	D	B
Available Water Capacity (AWC) Total (Top 20")	1.3 (1.3)	2.4 (1.9)
Forest Site Class	7 (Noncommercial)	6 (V)
Timber Regeneration Potential		
Plantability	N/A	Moderate to Low (Rocks)
Seedling Survival	N/A	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-7; sandy loam Unified: SM ASSHTO: A-2-4, A-4	0-8; loam Unified: ML ASSHTO: A-7
	7-9; sandy clay loam Unified: SC ASSHTO: A-2-6	8-25; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7
	9-11; clay Unified: CL ASSHTO: A-7	25; slightly weathered basalt
	11; indurated pan	
Included Areas	15% Lithic Xerochrepts and Rock Outcrop	

## 21 Gerle family-Klicker family sedimentary association, 0 to 35 percent slopes

Map Unit Components	<b>Gerle</b>	<b>Klicker, sed.</b>
Approx. Proportion	60%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes, rolling hills and flats; 0 to 35 percent slopes; 5,500 to 7,000 feet.	Occurs on mountain sideslopes and terraces; 0 to 35 percent slopes; 5,200 to 6,500 feet.
Typical Vegetation & Precipitation	White fir, red fir, Jeffrey pine, ponderosa pine, greenleaf manzanita, and snowbrush; 20 to 45 inches ppt.	Jeffrey pine, douglas fir, white fir, incense cedar, greenleaf manzanita and annual and perennial grasses; 18 to 35 inches ppt.
Soil Profile Description		
Surface Layer	0 to 18 inches; grayish brown to brown sandy loam; subangular blocky structure; soft; pH 7.0 to 6.4.	0 to 10 inches; brown gravelly to very gravelly loam; subangular blocky structure; soft to slightly hard; 20 to 40 percent rock fragments; pH 5.8 to 6.0.
Subsoil	18 to 36 inches; brownish gray to pale brown loamy sand; subangular blocky to single grain structure; soft; pH 6.2 to 6.0.	10 to 36 inches; dark brown very cobbly clay loam to extremely cobbly sandy clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.2.
Substrata	36 inches; weathered granitic rock	36 inches; slightly weathered Eocene nonmarine sediments.
Soil Properties & Management Interpretations		
Rooting Depth (in.), Underlying Material	36 inches; granite	36 inches; sediments
Erosion Factor (K)	.28	.32
Max. Erosion Hazard	Moderate	Moderate to high
Soil Permeability	Moderately rapid	Moderately slow
Soil Manageability Class	2ep	3Xp
Group	II	II
Range Site	N/A	2
Water Runoff Potential	Very slow	Slow
Hydrologic Soil Group	A	B
Available Water Capacity (AWC) Total (Top 20")	3.1 (1.9)	3.1 (2.1)
Forest Site Class	5 (III)	5 (III-IV)
Timber Regeneration Potential		
Plantability	High	Low
Seedling Survival	Low	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-18; sandy loam Unified: SM ASSHTO: A-2-4, A-4	0-10; gravelly loam Unified: GM-GC, ML ASSHTO: A-2, A-7
	18-36; loamy sand Unified: SM ASSHTO: A-2-4	10-18; cobbly clay loam Unified: GM-GC, ML-CL ASSHTO: A-2, A-6
	36; weathered granite	18-36; very cobbly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6
		36; nonmarine sediments
Included Areas	20% Aquolls; Inville family, cobbly and Sheld family	

## 22 Gerle family-Klicker family sedimentary association, 35 to 70 percent slopes

Map Unit Components	<b>Gerle</b>	<b>Klicker, sed.</b>
Approx. Proportion	55%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes, and steep escarpments; 35 to 70 percent; 5,500 to 7,000 feet.	Occurs on mountain sideslopes and terraces; 35 to 70 percent slopes; 5,200 to 6,500 feet. Willard Creek area of the Eagle Lake District.
Typical Vegetation & Precipitation	White fir, red fir, Jeffrey pine, ponderosa pine, greenleaf manzanita, and snowbrush; 20 to 45 inches ppt.	Jeffrey pine, douglas fir, white fir, incense cedar, greenleaf manzanita and annual and perennial grasses; 18 to 35 inches ppt.

### Soil Profile Description

Surface Layer	0 to 18 inches; grayish brown to brown sandy loam; subangular blocky structure; soft; pH 7.0 to 6.4.	0 to 10 inches; brown gravelly to very gravelly loam; subangular blocky structure; soft to slightly hard; 20 to 40 percent rock fragments; pH 5.8 to 6.0.
Subsoil	18 to 36 inches; brownish gray to pale brown loamy sand; subangular blocky to single grain structure; soft; pH 6.2 to 6.0.	10 to 36 inches; dark brown very cobbly clay loam to extremely cobbly sandy clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.2.
Substrata	36 inches; weathered granitic rock	36 inches; slightly weathered Eocene nonmarine sediments.

### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	36 inches; granite	36 inches; sediments
Erosion Factor (K)	.28	.32
Max. Erosion Hazard	High	High
Soil Permeability	Moderately rapid	Moderately slow
Soil Manageability Class	3gp	3EX
Group	III	III
Range Site	N/A	2
Water Runoff Potential	Slow	Moderate
Hydrologic Soil Group	A	B
Available Water Capacity (AWC) Total (Top 20")	3.1 (1.9)	3.1 (2.1)
Forest Site Class	5 (III)	5 (III-IV)
Timber Regeneration Potential		
Plantability	High	Low
Seedling Survival	Low	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-18; sandy loam Unified: SM ASSHTO: A-2-4, A-4	0-10; gravelly loam Unified: GM-GC, ML ASSHTO: A-2, A-7
	18-36; loamy sand Unified: SM ASSHTO: A-2-4	10-18; cobbly clay loam Unified: GM-GC, ML-CL ASSHTO: A-2, A-6
	36; weathered granite	18-36; very cobbly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6
		36; nonmarine sediments
Included Areas	25% Rock Outcrop and Inville family, cobbly	

## 23 Holland family, 0 to 35 percent slopes

Map Unit Components  
 Approx. Proportion  
 Position, Slope, and  
 Elevation  
 Typical Vegetation &  
 Precipitation

### Holland

90%

Occurs on large volcanic flats, ridges and mountain sideslopes; 0 to 35 percent slopes; 3,500 to 5,200 feet.

Jeffrey and ponderosa pine, white fir, douglas fir, sugar pine, incense cedar, mountain whitethorn, chinquapin, deerbrush, buckbrush, service berry, greenleaf manzanita and squaw carpet; 30 to 65 inches ppt.

### Soil Profile Description

Surface Layer

0 to 10 inches, dark reddish brown loam to gravelly loam; granular structure; soft; pH 6.5 to 6.2.

Subsoil

10 to 44 inches; brown to yellowish red gravelly loam to gravelly clay loam; subangular blocky structure; hard; pH 6.2 to 6.4.

Substrata

44 to 60 inches; yellowish brown gravelly silty clay loam; massive; hard; pH 6.2.

### Soil Properties & Management Interpretations

Rooting Depth (in.),  
 Underlying Material

60+ inches.

Erosion Factor (K)

.28

Max. Erosion Hazard

Low

Soil Permeability

Moderate

Soil Manageability

Class

1

Group

I

Range Site

N/A

Water Runoff Potential

Slow

Hydrologic Soil Group

B

Available Water  
 Capacity (AWC)

Total (Top 20")

7.7 (2.6)

Forest Site Class

3 (I)

Timber Regeneration  
 Potential

Plantability

High

Seedling Survival

Moderate

Estimated Engineering  
 Properties;

USDA Texture,

Unified, and ASSHTO

0-10; loam  
 Unified: ML-CL  
 ASSHTO: A-6

10-24; gravelly loam  
 Unified: GM-GC, CL  
 ASSHTO: A-2, A-6

24-44; gravelly clay loam  
 Unified: GM-GC, CL  
 ASSHTO: A-2, A-6, A-7

44-60; gravelly silty clay loam  
 Unified: GM-GC, CL  
 ASSHTO: A-2, A-6

Included Areas

10% Skalan family and Aquolls

## 24 Holland-Skalan families association, 0 to 35 percent slopes

### Map Unit Components

#### Approx. Proportion

#### Position, Slope, and Elevation

#### Typical Vegetation & Precipitation

### Holland

60%

Occurs on large volcanic flats, ridges and mountain sideslopes; 0 to 35 percent slopes; 3,500 to 5,200 feet.

Jeffrey and ponderosa pine, white fir, douglas fir, sugar pine, incense cedar, mountain whitethorn, chinquapin, deerbrush, buckbrush, service berry, greenleaf manzanita and squaw carpet; 30 to 65 inches ppt.

### Skalan

30%

Occurs on mountain sideslopes; gently sloping hills and undulating flats; 0 to 35 percent slopes, 3,000 to 5,200 feet.

Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 30 to 65 inches ppt.

### Soil Profile Description

#### Surface Layer

0 to 10 inches, reddish brown loam to gravelly loam; granular structure; soft; pH 6.5 to 6.2.

0 to 14 inches; brown gravelly sandy loam to loam; granular to subangular blocky structure; soft; 15 to 30 percent rock fragments; pH 6.5 to 6.7.

#### Subsoil

10 to 44 inches; brown to yellowish red gravelly loam to gravelly clay loam; subangular blocky structure; hard; pH 6.2 to 6.4.

14 to 31 inches; brown very gravelly loam to clay loam; subangular blocky structure; slightly hard; 40 to 50 percent rock fragments; pH 6.7.

#### Substrata

44 to 60 inches; yellowish brown gravelly silty clay loam; massive; hard; pH 6.2.

31 to 60 inches; yellowish brown very gravelly to extremely gravelly clay loam; subangular blocky structure; hard; 50 to 60 percent rock fragments; pH 6.7; underlain by andesite and basalt.

### Soil Properties & Management Interpretations

#### Rooting Depth (in.), Underlying Material

60+ inches.

60 inches; weathered basalt

#### Erosion Factor (K)

.28

.20

#### Max. Erosion Hazard

Low

Low

#### Soil Permeability

Moderate

Moderate

#### Soil Manageability

##### Class

1

2p

##### Group

I

I

#### Range Site

N/A

N/A

#### Water Runoff Potential

Slow

Slow

#### Hydrologic Soil Group

B

B

#### Available Water

#### Capacity (AWC)

##### Total (Top 20")

7.7 (2.6)

5.1 (1.7)

#### Forest Site Class

3 (I)

4 (II)

#### Timber Regeneration Potential

##### Plantability

High

Moderate

##### Seedling Survival

Moderate

Very low to low

## 24 Holland-Skalan families association (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-10; loam  
Unified: ML-CL  
ASSHTO: A-6

0-8; gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

10-24; gravelly loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6

8-14; gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-7

24-44; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

14-23; very gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-4

44-60; gravelly silty clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6

23-60; very gravelly clay loam  
Unified: GM-GC, ML-CL  
ASSHTO: A-2, A-6

Included Areas

10% Skalan family, moderately deep; Aquolls and Rock Outcrop

## 25 Holland-Skalan families association, 35 to 50 percent slopes

	<b>Holland</b>	<b>Skalan</b>
Map Unit Components		
Approx. Proportion	50%	40%
Position, Slope, and Elevation	Occurs on large volcanic ridges and mountain sideslopes; 35 to 50 percent slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes and steeply sloping hills; 35 to 50 percent slopes, 3,000 to 5,200 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine , white fir, douglas fir, sugar pine, incense cedar, mountain whitethorn, chinquapin, deerbrush, buckbrush, service berry, greenleaf manzanita and squaw carpet, 30 to 65 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 30 to 65 inches ppt.
<b>Soil Profile Description</b>		
Surface Layer	0 to 10 inches, reddish brown loam to gravelly loam, granular structure; soft; pH 6.5 to 6.2.	0 to 14 inches; brown gravelly sandy loam to loam; granular to subangular blocky structure; soft; 15 to 30 percent rock fragments; pH 6.5 to 6.7.
Subsoil	10 to 44 inches; brown to yellowish red gravelly loam to gravelly clay loam; subangular blocky structure; hard; pH 6.2 to 6.4.	14 to 31 inches; brown very gravelly loam to clay loam; subangular blocky structure; slightly hard; 40 to 50 percent rock fragments; pH 6.7.
Substrata	44 to 60 inches; yellowish brown gravelly silty clay loam; massive; hard; pH 6.2.	31 to 60 inches; yellowish brown very gravelly to extremely gravelly clay loam; subangular blocky structure; hard; 50 to 60 percent rock fragments; pH 6.7; underlain by andesite and basalt.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.), Underlying Material	60+ inches.	60 inches; weathered basalt
Erosion Factor (K)	.28	.20
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate	Moderate
Soil Manageability Class	3g	3gp
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Moderate	Moderate
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	7.7 (2.6)	5.1 (1.7)
Forest Site Class	3 (I)	4 (II)
Timber Regeneration Potential		
Plantability	High	Moderate
Seedling Survival	Moderate	Very low to low

## 25 Holland-Skalan families association (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-10; loam  
Unified: ML-CL  
ASSHTO: A-6

0-8; gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

10-24; gravelly loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6

8-14; gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-7

24-44; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

14-23; very gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-4

44-60; gravelly silty clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6

23-60; very gravelly clay loam  
Unified: GM-GC, ML-CL  
ASSHTO: A-2, A-6

Included Areas

10% Skalan family, moderately deep and Rock Outcrop

**26 Holland family-Skalan family, moderately deep association, diatomaceous, 15 to 35 percent slopes**

Map Unit Components	<b>Holland</b>	<b>Skalan, mod. deep</b>
Approx. Proportion	45%	30%
Position, Slope, and Elevation	Occurs on flats, ridgetops and mountain sideslopes; 15 to 35 percent slopes; 3,500 to 5,200 feet.	Occur on mountain sideslopes; steeply sloping hills; 15 to 35 percent slopes, 3,000 to 5,200 feet.
Typical Vegetation & Precipitation	Ponderosa pine, incense cedar, douglas fir, white fir, greenleaf manzanita and squaw carpet; 25 to 35 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 20 to 35 inches ppt.

**Soil Profile Description**

Surface Layer	0 to 11 inches; brown to yellowish brown loam; granular structure; slightly hard; 5 percent pebbles; pH 6.0 to 5.8.	0 to 8 inches; brown cobbly sandy loam; granular structure; loose; 25 percent rock fragments; pH 7.3.
Subsoil	11 to 53 inches; yellowish brown gravelly sandy clay loam to very gravelly sandy clay loam; subangular blocky structure; slightly hard; 15 to 35 percent pebbles; pH 5.5 to 6.0.	8 to 34 inches; brown very gravelly sandy clay loam; subangular blocky structure; slightly hard; 35 to 50 percent rock fragments; pH 7.0 to 6.8.
Substrata	53 inches; diatomaceous earth	34 inches; diatomaceous earth

**Soil Properties & Management Interpretations**

Rooting Depth (in.), Underlying Material	53 inches; diatomaceous earth	34 inches; diatomaceous earth
Erosion Factor (K)	.28	.24
Max. Erosion Hazard	Moderate	Low to moderate
Soil Permeability	Moderate	Moderate
Soil Manageability Class	2e	2p
Group	II	II
Range Site	N/A	N/A
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	7.0 (2.9)	3.5 (2.1)
Forest Site Class	4 (II)	5 (III)
Timber Regeneration Potential		
Plantability	High	Moderate
Seedling Survival	Moderate	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-11; loam Unified: ML ASSHTO: A-7	0-8; cobbly sandy loam Unified: SM ASSHTO: A-2-4, A-4
	11-53; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6	8-34; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-1, A-2-6
	53; diatomaceous earth	34; diatomaceous earth
Included Areas	25% Brownlee and Skalan families	

**27 Holland family-Skalan family, moderately deep association, diatomaceous 35 to 50 percent slopes**

Map Unit Components	Holland	Skalan, mod. deep
Approx. Proportion	40%	40%
Position, Slope, and Elevation	Occurs on ridgetops and mountain sideslopes; 35 to 50 percent slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes; steeply sloping hills; 35 to 50 percent slopes, 3,000 to 5,200 feet.
Typical Vegetation & Precipitation	Ponderosa pine, incense cedar, douglas fir, white fir, greenleaf manzanita and squaw carpet; 25 to 35 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 20 to 35 inches ppt.

**Soil Profile Description**

Surface Layer	0 to 11 inches; brown to yellowish brown loam; granular structure; slightly hard; 5 percent pebbles; pH 6.0 to 5.8.	0 to 8 inches; brown cobbly sandy loam; granular structure; loose; 25 percent rock fragments; pH 7.3.
Subsoil	11 to 53 inches; yellowish brown gravelly sandy clay loam to very gravelly sandy clay loam; subangular blocky structure; slightly hard; 15 to 35 percent pebbles; pH 5.5 to 6.0	8 to 34 inches; brown very gravelly sandy clay loam; subangular blocky structure; slightly hard; 35 to 50 percent rock fragments; pH 7.0 to 6.8.
Substrata	53 inches; diatomaceous earth	34 inches; diatomaceous earth

**Soil Properties & Management Interpretations**

Rooting Depth (in.), Underlying Material	53 inches; diatomaceous earth	34 inches; diatomaceous earth
Erosion Factor (K)	.28	.24
Max. Erosion Hazard	High	Moderate to high
Soil Permeability	Moderate	Moderate
Soil Manageability Class	3E	3gp
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Moderate	Moderate
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	7.0 (2.9)	3.5 (2.1)
Forest Site Class	4 (II)	5 (III)
Timber Regeneration Potential		
Plantability	High	Moderate
Seedling Survival	Moderate	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-11; loam Unified: ML ASSHTO: A-7	0-8; cobbly sandy loam Unified: SM ASSHTO: A-2-4, A-4
	11-53; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6	8-34; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-1, A-2-6
	53; diatomaceous earth	34; diatomaceous earth
Included Areas	20% Brownlee and Skalan families	

**28 Holland family metasedimentary-Skalan family, moderately deep association, 0 to 35 percent slopes**

	<b>Holland, metased</b>	<b>Skalan, mod. deep</b>
Map Unit Components		
Approx. Proportion	50%	30%
Position, Slope, and Elevation	Occurs on flats, ridgetops and mountain sideslopes; 0 to 35 percent slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes; steeply sloping hills; 0 to 35 percent slopes, 3,000 to 5,200 feet.
Typical Vegetation & Precipitation	Ponderosa pine, incense cedar, douglas fir, white fir, greenleaf manzanita and squaw carpet; 40 to 65 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 40 to 65 inches ppt.
<b>Soil Profile Description</b>		
Surface Layer	0 to 11 inches; brown to yellowish brown loam; granular structure; slightly hard; 5 percent pebbles; pH 6.0 to 5.8.	0 to 8 inches; brown cobbly sandy loam; granular structure; loose; 25 percent rock fragments; pH 7.3.
Subsoil	11 to 53 inches; yellowish brown gravelly sandy clay loam to very gravelly sandy clay loam; subangular blocky structure; slightly hard; 15 to 35 percent pebbles; pH 5.5 to 6.0.	8 to 34 inches; brown very gravelly sandy clay loam; subangular blocky structure; slightly hard; 35 to 50 percent rock fragments; pH 7.0 to 6.8.
Substrata	53 inches; weathered metasediments.	34 inches; slightly weathered basalt.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.), Underlying Material	53 inches; weathered metasediments	34 inches; weathered basalt
Erosion Factor (K)	.28	.24
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate	Moderate
Soil Manageability Class	2e	2gp
Group	II	II
Range Site	N/A	N/A
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	7.0 (2.9)	3.5 (2.1)
Forest Site Class	4 (II)	5 (III)
Timber Regeneration Potential		
Plantability	High	Moderate
Seedling Survival	Moderate	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-11; loam Unified: ML ASSHTO: A-7	0-8; cobbly sandy loam Unified: SM ASSHTO: A-2-4, A-4
	11-53; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6	8-34; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-1, A-2-6
	53; weathered metasediments	34; weathered basalt
Included Areas	20% Deadwood family and Aquolls	

**29 Holland family, metasedimentary-Skalan family, moderately deep association,  
35 to 70 percent slopes**

	<b>Holland, metased</b>	<b>Skalan, mod. deep</b>
Map Unit Components	<b>Holland, metased</b>	<b>Skalan, mod. deep</b>
Approx. Proportion	45%	40%
Position, Slope, and Elevation	Occurs on ridgetops and mountain sideslopes; 35 to 70 percent slopes; 3,500 to 5,200 feet.	Occurs on mountain sideslopes; steeply sloping hills; 35 to 70 percent slopes, 3,000 to 5,200 feet.
Typical Vegetation & Precipitation	Ponderosa pine, incense cedar, douglas fir, white fir, greenleaf manzanita and squaw carpet; 40 to 65 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, incense cedar, black oak, huckleberry oak, western serviceberry, pinemat manzanita and chokecherry; 40 to 65 inches ppt.
<b>Soil Profile Description</b>		
Surface Layer	0 to 11 inches; brown to yellowish brown loam; granular structure; slightly hard; 5 percent pebbles; pH 6.0 to 5.8.	0 to 8 inches; brown cobbly sandy loam; granular structure; loose; 25 percent rock fragments; pH 7.3.
Subsoil	11 to 53 inches; yellowish brown gravelly sandy clay loam to very gravelly sandy clay loam; subangular blocky structure; slightly hard; 15 to 35 percent pebbles; pH 5.5 to 6.0.	8 to 34 inches; brown very gravelly sandy clay loam; subangular blocky structure; slightly hard; 35 to 50 percent rock fragments; pH 7.0 to 6.8.
Substrata	53 inches; weathered metasediments.	34 inches; slightly weathered basalt.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.), Underlying Material	53 inches; weathered metasediments	34 inches; weathered basalt
Erosion Factor (K)	.28	.24
Max. Erosion Hazard	High	Moderate to high
Soil Permeability	Moderate	Moderate
Soil Manageability Class	3e	3gp
Group	iii	III
Range Site	N/A	N/A
Water Runoff Potential	Moderate	Moderate
Hydrologic Soil Group	b	B
Available Water Capacity (AWC) Total (Top 20")	7.0 (2.9)	3.5 (2.1)
Forest Site Class	4 (II)	5 (III)
Timber Regeneration Potential		
Plantability	High	Moderate
Seedling Survival	Moderate	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-11; loam Unified: ML ASSHTO: A-7	0-8; cobbly sandy loam Unified: SM ASSHTO: A-2-4, A-4
	11-53; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6	8-34; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-1, A-2-6
	53; weathered metasediments	34; weathered basalt
Included Areas	15% Deadwood family, and Rock Outcrop	

### 30 Inville-Klicker-Wintoner families association, 0 to 35 percent slopes

Map Unit Components	Inville	Klicker	Wintoner
Approx. Proportion	45%	25%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 0 to 35 percent slopes, 5,200 to 7,000 feet.	Occurs on mountain slopes and flats; 0 to 35 percent slopes; 5,200 to 7,300 feet.	Occurs on gently to steeply sloping mountain sideslopes, ridges and canyons; 0 to 35 percent slopes; 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 25 to 45 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 25 to 45 inches ppt.	Red and white fir, sugar pine, ponderosa pine, Jeffrey pine, incense cedar and chinquapin; 25 to 45 inches ppt.

#### Soil Profile Description

Surface Layer	0 to 13 inches, brown sandy loam to gravelly loam; granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.	0 to 11 inches, dark brown loam or cobbly loam; granular structure; slightly hard; 18 percent rock fragments; pH 7.0 to 6.8.	0 to 22 inches; yellowish brown to brown gravelly sandy loam to loam; granular structure; soft; 10 to 15 percent rock fragments; pH 7.0 to 6.2.
Subsoil	13 to 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.	11 to 48 inches; brown to yellowish red very cobbly to extremely cobbly loam; subangular blocky structure; slightly hard; 45 to 80 percent rock fragments; pH 6.5.	22 to 43 inches; brown to yellowish brown loam to clay loam; subangular blocky to massive structure; slightly hard; 5 to 12 percent rock fragments; pH 6.0 to 5.5.
Substrata	N/A	48 inches; weathered basalt rock.	43 to 50 inches; strongly weathered andesite bedrock.

#### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	60+ inches.	48 inches; weathered basalt rock.	43 inches; andesite.
Erosion Factor (K)	.20	.28	.20
Max. Erosion Hazard	Low	Moderate	Low to moderate
Soil Permeability	Moderate	Moderate	Moderate
Soil Manageability Class	1	2px	1
Group	I	I	I
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Slow	Slow
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	6.8 (2.2)	4.3 (2.0)	5.6 (2.4)
Forest Site Class	5 (III)	5 (III-IV)	4 (II)
Timber Regeneration Potential			
Plantability	Moderate	Moderate	High
Seedling Survival	Moderate	Low	Moderate

**30 Inville-Klicker-Wintoner families association (continued)**

Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO

0-7; sandy loam  
Unified: SM  
ASSHTO: A-2-4, A-4

0-11; cobbly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-4

0-5; gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

7-13; loam  
Unified: ML  
ASSHTO: A-7

11-28; very cobbly loam  
Unified: GM-GC, ML-CL  
ASSHTO: A-1, A-6

5-34; loam  
Unified: ML  
ASSHTO: A-7

13-60; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

28-48; extremely gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-7

34-43; clay loam  
Unified: CL  
ASSHTO: A-6, A-7

48; weathered basalt rock

43; weathered andesite

Included Areas

10% Klicker family, sedimentary

### 31 Inville-Klicker-Wintoner families association, 35 to 50 percent slopes

Map Unit Components	Inville	Klicker	Wintoner
Approx. Proportion	40%	30%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 35 to 50 percent slopes, 5,200 to 7,000 feet.	Occurs on mountain sideslopes and flats; 35 to 50 percent slopes; 5,200 to 7,300 feet.	Occurs on gently to steeply sloping mountain sideslopes, ridges and canyons; 35 to 50 percent slopes; 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 25 to 45 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 25 to 45 inches ppt.	Red and white fir, sugar pine, ponderosa pine, Jeffrey pine, incense cedar and chinquapin; 25 to 45
Soil Profile Description			
Surface Layer	0 to 13 inches, brown gravelly sandy loam to loam, granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.	0 to 11 inches, dark brown loam or cobbly loam, granular structure; slightly hard; 18 percent rock fragments; pH 7.0 to 6.8.	0 to 22 inches; yellowish brown to brown gravelly sandy loam to loam; granular structure; soft; 10 to 15 percent rock fragments; pH 7.0 to 6.2.
Subsoil	13 to 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.	11 to 48 inches; brown to yellowish brown very cobbly to extremely cobbly loam; subangular blocky structure; slightly hard; 45 to 80 percent rock fragments; pH 6.5.	22 to 43 inches; brown to yellowish brown loam to clay loam; subangular blocky to massive structure; slightly hard; 5 to 12 percent rock fragments; pH 6.0 to 5.5.
Substrata	N/A	48 inches; weathered basalt rock.	43 to 50 inches; strongly weathered andesite bedrock.
Soil Properties & Management Interpretations			
Rooting Depth (in.), Underlying Material	60+ inches.	48 inches; weathered basalt rock.	43 inches; andesite.
Erosion Factor (K)	.20	.28	.20
Max. Erosion Hazard	Moderate	Moderate to high	Moderate
Soil Permeability	Moderate	Moderate	Moderate
Soil Manageability Class	3e	3gp	3e
Group	III	III	III
Range Site	N/A	N/A	N/A
Water Runoff Potential	Moderate	Moderate	Moderate
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	6.8 (2.2)	4.3 (2.0)	5.6 (2.4)
Forest Site Class	5 (III)	5 (III-IV)	4 (II)
Timber Regeneration Potential			
Plantability	Moderate	Moderate	High
Seedling Survival	Moderate	Low	Moderate

### 31 Inville-Klicker-Wintoner families association (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-7; sandy loam  
Unified: SM  
ASSHTO: A-2-4, A-4

0-11; cobbly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-4

0-5; gravelly sandy loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

7-13; loam  
Unified: ML  
ASSHTO: A-7

11-28; very cobbly loam  
Unified: GM-GC, ML-CL  
ASSHTO: A-1, A-6

5-34; loam  
Unified: ML  
ASSHTO: A-7

13-60; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

28-48; extremely gravelly  
loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-7

34-43; clay loam  
Unified: CL  
ASSHTO: A-6, A-7

43; weathered andesite

48; weathered basalt rock

Included Areas

10% Klicker family, sedimentary

### 32 Inville-Patio families association, 15 to 35 percent slopes

Map Unit Components  
Approx. Proportion  
Position, Slope, and  
Elevation  
Typical Vegetation &  
Precipitation

#### Inville

40%

Occurs on mountain sideslopes, ridges and canyons; 15 to 35 percent slopes, 5,200 to 7,000 feet.

Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 20 to 45 inches ppt.

#### Patio

40%

Occurs on mountain sideslopes, escarpments and gently sloping hillsides; 15 to 35 percent slopes; 5,200 to 7,000 feet.

Jeffrey and ponderosa pine, sugar pine, white fir, red fir, incense cedar, juniper, mountain mahogany, chinquapin, greenleaf manzanita; pinemat manzanita; desert mountain mahogany and big sage; 18 to 45 inches ppt.

### Soil Profile Description

Surface Layer

0 to 13 inches, brown gravelly sandy loam to loam, granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.

0 to 9 inches; brown gravelly or cobbly fine sandy loam; granular structure; soft; 20 percent rock fragments; pH 6.5.

Subsoil

13 To 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.

9 to 29 inches; yellowish brown very cobbly to extremely cobbly loam; subangular blocky structure; soft; 35 to 60 percent rock fragments; pH 6.5.

Substrata

N/A

29 to 38 inches; fractured platy basalt with soil and roots in cracks.

### Soil Properties & Management Interpretations

Rooting Depth (in.),  
Underlying Material

60+ inches.

29 inches; basalt

Erosion Factor (K)

.20

.24

Max. Erosion Hazard

Low

Moderate

Soil Permeability

Moderate

Moderate

Soil Manageability

Class

1

2px

Group

II

II

Range Site

N/A

N/A

Water Runoff Potential

Slow

Slow

Hydrologic Soil Group

B

B

Available Water

Capacity (AWC)

Total (Top 20")

6.8 (2.2)

2.3 (1.7)

Forest Site Class

5 (III)

5 (IV)

Timber Regeneration  
Potential

Plantability

Moderate

Moderate

Seedling Survival

Moderate

Low

Estimated Engineering  
Properties;

USDA Texture,  
Unified, and ASSHTO

0-7; sandy loam  
Unified: SM  
ASSHTO: A-2-4, A-4

0-9; gravelly fine sandy loam  
Unified: GM-GC, SM-SC  
ASSHTO: A-1, A-4

7-13; loam  
Unified: ML  
ASSHTO: A-7

9-29; very cobbly loam  
Unified: ML-CL  
ASSHTO: A-4

13-60; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

29; fractured platy basalt

Included Areas

20% Patio family, moderately deep and Yallani family

### 33 Inville-Patio-Trojan families complex, 0 to 35 percent slopes

Map Unit Components	Inville	Patio	Trojan
Approx. Proportion	50%	20%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 5 to 35 percent slopes, 5,200 to 7,000 feet.	Occurs on mountain sideslopes; escarpments and gently sloping hillsides; 0 to 35 percent slopes; 5,200 to 7,000 feet.	Occurs on mountain sideslopes, ridges, flats, and gently sloping hills; 0 to 35 percent slopes, 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 20 to 70 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, red fir, incense cedar, juniper, mountain mahogany, chinquapin, greenleaf manzanita; pinemat manzanita; desert mountain mahogany and big sage; 18 to 50 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 20 to 45 inches ppt.
Soil Profile Description			
Surface Layer	0 to 13 inches, brown gravelly sandy loam to loam; granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.	0 to 9 inches; brown gravelly or cobbly fine sandy loam; granular structure; soft; 20 percent rock fragments; pH 6.5.	0 to 22 inches; yellowish brown to brown loam; granular to subangular blocky structure; soft to slightly hard; 1 to 10 percent rock fragments; pH 6.3 to 6.5.
Subsoil	13 To 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.	9 to 29 inches; yellowish brown very cobbly loam; subangular blocky structure; soft; pH 6.5.	22 to 46 inches; brown gravelly sandy clay loam to gravelly clay loam; subangular blocky structure; slightly hard; 15 to 25 percent rock fragments; pH 6.5.
Substrata	N/A	29 to 38 inches; fractured platy basalt with soil and roots in cracks.	46 to 60 inches; slightly weathered basalt rock.
Soil Properties & Management Interpretations			
Rooting Depth (in.), Underlying Material	60+ inches.	29 inches; basalt	46 inches; basalt
Erosion Factor (K)	.20	.24	.28
Max. Erosion Hazard	Low	Moderate	Moderate
Soil Permeability	Moderate	Moderate	Moderate
Soil Manageability Class	1	2px	2e
Group	I	II	II
Water Runoff Potential	Slow	Slow	Slow
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	6.8 (2.2)	2.3 (1.7)	6.4 (2.7)
Forest Site Class	5 (III)	5 (IV)	5 (IV)
Timber Regeneration Potential			
Plantability	Moderate	Moderate	High
Seedling Survival	Moderate	Low	Moderate

### 33 Inville-Patio-Trojan families complex (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-7; sandy loam  
Unified: SM  
ASSHTO: A-2-4, A-4

0-9; gravelly fine sandy loam  
Unified: GM-GC, SM-SC  
ASSHTO: A-1, A-4

0-22; loam  
Unified: ML  
ASSHTO: A-4, A-6

7-13; loam  
Unified: ML  
ASSHTO: A-7

9-29; very cobbly loam  
Unified: ML-CL  
ASSHTO: A-4

22-34; gravelly sandy clay loam  
Unified: GM-GC, SC  
ASSHTO: A-2, A-2-6

13-60; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

29; fractured platy basalt

34-46; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

46; weathered basalt rock

Included Areas

10% Inville family, moderately deep; Aquolls and Rubble Land

### 34 Inville-Patio-Trojan families association, 35 to 50 percent slopes

Map Unit Components	Inville	Patio	Trojan
Approx. Proportion	35%	30%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 35 to 50 percent slopes, 5,200 to 7,000 feet.	Occurs on mountain sideslopes and escarpments; 35 to 50 percent slopes; 5,200 to 7,000 feet.	Occurs on mountain sideslopes, ridges, and steeply sloping hills; 35 to 50 percent slopes, 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 20 to 45 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, red fir, incense cedar, juniper, mahogany, chinquapin, greenleaf manzanita; pinemat manzanita; desert mountain mahogany and big sage; 18 to 50 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 20 to 45 inches ppt.

#### Soil Profile Description

Surface Layer	0 to 13 inches, brown gravelly sandy loam to loam, granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.	0 to 9 inches; brown gravelly or cobbly fine sandy loam; granular structure; soft; 20 percent rock fragments; pH 6.5.	0 to 22 inches; yellowish brown to brown loam; granular to subangular blocky structure; soft to slightly hard; 2 to 10 percent rock fragments; pH 6.3 to 6.5.
Subsoil	13 to 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.	9 to 29 inches; yellowish brown very cobbly loam; subangular blocky structure; soft; pH 6.5.	22 to 46 inches; brown gravelly sandy clay loam to gravelly clay loam; subangular blocky structure; slightly hard; 15 to 25 percent rock fragments; pH 6.5.
Substrata	N/A	29 to 38 inches; fractured platy basalt with soil and roots in cracks.	46 to 60 inches; slightly weathered basalt rock.

#### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	60+ inches.	29 inches; basalt	46 inches; basalt.
Erosion Factor (K)	.20	.24	.28
Max. Erosion Hazard	Moderate	High	Moderate to high
Soil Permeability	Moderate	Moderate	Moderate
Soil Manageability Class	3e	3Ep	3e
Group	III	III	III
Range Site	N/A	N/A	N/A
Water Runoff Potential	Moderate	Moderate	Moderate
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	6.8 (2.2)	2.3 (1.7)	6.4 (2.7)
Forest Site Class	5 (III)	5 (IV)	5 (IV)
Timber Regeneration Potential			
Plantability	Moderate	Moderate	High
Seedling Survival	Moderate	Low	Moderate

### 34 Inville-Patio-Trojan families association (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-7; sandy loam  
Unified: SM  
ASSHTO: A-2-4, A-4

0-9; gravelly fine sandy loam  
Unified: GM-GC, SM-SC  
ASSHTO: A-1, A-4

0-22; loam  
Unified: ML  
ASSHTO: A-4, A-6

7-13; loam  
Unified: ML  
ASSHTO: A-7

9-29; very cobbly loam  
Unified: ML-CL  
ASSHTO: A-4

22-34; gravelly sandy clay loam  
Unified: GM-GC, SC  
ASSHTO: A-2, A-2-6

13-60; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

29; fractured platy basalt

34-46; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

46; weathered basalt rock

Included Areas

15% Sheld family, moderately deep and Rock Outcrop

**35 Inville family-Sheld family, moderately deep-Rubble Land association, 15 to 50 percent slopes**

Map Unit Components	<b>Inville, very cobbly</b>	<b>Sheld, very, cobbly</b>	<b>Rubble Land</b>
Approx. Proportion	30%	30%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 15 to 50 percent slopes; 5,200 to 7,000 feet.	Occurs on upland flats, mountain sideslopes and ground moraines; 15 to 50 percent slopes; 5,200 to 8,000 feet.	Miscellaneous land type on mountain sideslopes and steep escarpments.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 20 to 70 inches ppt.	Red and white fir, sugar pine, lodgepole pine, mountain hemlock, greenleaf manzanita and chinquapin; 50 to 85 inches ppt.	Somewhat barren, but vegetation may grow up through the rock fragments. The vegetation is growing in soil that is buried by the rock fragments; 50 to 80 inches ppt.
<b>Soil Profile Description</b>			
Surface Layer	0 to 20 inches; brown to yellowish brown very cobbly to extremely cobbly sandy loam; granular structure; soft; 40 to 80 percent rock fragments; pH 6.2.	0 to 12 inches; dark grayish brown gravelly to very gravelly sandy loam to cobbly to extremely cobbly sandy loam; granular structure; soft; 20 to 40 percent rock fragments; pH 6.8 to 6.5; 20 to 50 percent rock fragments on the surface.	N/A
Subsoil	20 to 44 inches; brown extremely cobbly sandy clay loam; subangular blocky structure; slightly hard; 60 to 80 percent rock fragments; pH 6.2 to 5.8.	12 to 33 inches; yellowish brown very cobbly to extremely cobbly sandy loam; granular to subangular blocky structure; 40 to 65 percent rock fragments; pH 6.0 to 5.8.	N/A
Substrata	N/A	33 inches; fractured basalt	Detached rock fragments ranging in size from 3 inches to about 5 feet in diameter.
<b>Soil Properties &amp; Management Interpretations</b>			
Rooting Depth (in.), Underlying Material	44 inches; andesite	33 inches; basalt	Nil; May be underlain by bedrock or soil
Erosion Factor (K)	.20	.24	N/A
Max. Erosion Hazard	Low to moderate	Moderate	N/A
Soil Permeability	Moderate	Moderate	N/A
Soil Manageability Class	3PX	3Xp	N/A
Group	III	III	N/A
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Slow	Very slow to moderate
Hydrologic Soil Group	B	B	N/A
Available Water Capacity (AWC) Total (Top 20")	1.6 (.6)	2.7 (1.7)	N/A
Forest Site Class	5 (III-IV)	5 (III)	N/A
Timber Regeneration Potential			
Plantability	Low to Nonplantable	Low to moderate	N/A
Seedling Survival	Very low	Low	N/A

### 35 Inville family-Sheld family, moderately deep-Rubble Land association (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-20; extremely cobbly sandy  
loam  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

0-12; gravelly sandy loam N/A  
Unified: GM-GC, SM  
ASSHTO: A-1, A-2-4, A-4

20-44; extremely cobbly sandy  
clay loam  
Unified: GM-GC, ML-CL  
ASSHTO: A-2, A-6

12-33; very cobbly sandy loam  
Unified: SM  
ASSHTO: A-2-4, A-4

33; fractured basalt

44; weathered andesite

Included Areas

20% Yallani family, very cobbly and Sheld family very cobbly

### 36 Inville-Wintoner families complex, 0 to 35 percent slopes

Map Unit Components Approx. Proportion Position, Slope, and Elevation	<b>Inville</b>	<b>Wintoner</b>
Typical Vegetation & Precipitation	45%  Occurs on mountain sideslopes, ridges and canyons; 0 to 35 percent slopes, 5,200 to 7,000 feet.  Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 20 to 50 inches ppt.	40%  Occurs on gently to steeply sloping mountain sideslopes, ridges and canyons; 0 to 35 percent slopes; 5,200 to 7,000 feet.  Red and white fir, sugar pine, ponderosa pine, Jeffrey pine, incense cedar and chinquapin; 20 to 50 inches ppt.
<b>Soil Profile Description</b>		
Surface Layer	0 to 13 inches, brown gravelly sandy loam to loam, granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.	0 to 22 inches; yellowish brown to brown gravelly sandy loam to loam; granular structure; soft; 10 to 15 percent rock fragments; pH 7.0 to 6.2.
Subsoil	13 To 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.	22 to 43 inches; brown to yellowish brown loam to clay loam; subangular blocky to massive structure; slightly hard; 5 to 12 percent rock fragments; pH 6.0 to 5.5.
Substrata	N/A	43 to 50 inches; strongly weathered andesite bedrock.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.)	60+ inches.	43 inches; andesite.
Erosion Factor (K)	.20	.20
Max. Erosion Hazard	Low	Low to moderate
Soil Permeability	Moderate	Moderate
Soil Manageability Class Group	1 I	1 I
Range Site	N/A	N/A
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	6.8 (2.2)	5.6 (2.4)
Forest Site Class	5 (III)	4 (II)
Timber Regeneration Plantability Seedling Survival	Moderate Moderate	High Moderate
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-7; sandy loam Unified: SM ASSHTO: A-2-4, A-4  7-13; loam Unified: ML ASSHTO: A-7  13-60; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	0-5; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4  5-34; loam Unified: ML ASSHTO: A-7  34-43; clay loam Unified: CL ASSHTO: A-6, A-7  43; andesite
Included Areas	15% Inville family, moderately deep, Portola and Lithic Ultic Argixerolls	

### 37 Inville-Wintoner families complex, 35 to 50 percent slopes

Map Unit Components	Inville	Wintoner
Approx. Proportion	60%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 35 to 50 percent slopes, 5,200 to 7,000 feet.	Occurs on gently to steeply sloping mountain side-slopes, ridges and canyons; 35 to 50 percent slopes; 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 20 to 50 inches ppt.	Red and white fir, sugar pine, ponderosa pine, Jeffrey pine, incense cedar and chinquapin; 20 to 50 inches ppt.
Soil Profile Description		
Surface Layer	0 to 13 inches, brown gravelly sandy loam to loam, granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.	0 to 22 inches; yellowish brown to brown gravelly sandy loam to loam; granular structure; soft; 10 to 15 percent rock fragments; pH 7.0 to 6.2.
Subsoil	13 to 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.	22 to 43 inches; brown to yellowish brown loam to clay loam; subangular blocky to massive structure; slightly hard; 5 to 12 percent rock fragments; pH 6.0 to 5.5.
Substrata	N/A	43 to 50 inches; strongly weathered andesite bedrock.
Soil Properties & Management Interpretations		
Rooting Depth (in.), Underlying Material	60+ inches.	43 inches; andesite.
Erosion Factor (K)	.20	.20
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate	Moderate
Soil Manageability Class	3e	3e
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Moderate	Moderate
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	6.8 (2.2)	5.6 (2.4)
Forest Site Class	5 (III)	4 (II)
Timber Regeneration Potential		
Plantability	Moderate	High
Seedling Survival	Moderate	Moderate
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-7; sandy loam Unified: SM ASSHTO: A-2-4, A-4	0-5; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
	7-13; loam Unified: ML ASSHTO: A-7	5-34; loam Unified: ML ASSHTO: A-7
	13-60; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	34-43; clay loam Unified: CL ASSHTO: A-6, A-7
Included Areas	20% Inville family, moderately deep, Portola and Lithic Ultic Argixerolls	

### 38 Inville-Yallani families complex, 0 to 35 percent slopes

Map Unit Components  
Approx. Proportion  
Position, Slope, and  
Elevation  
Typical Vegetation &  
Precipitation

#### Inville

50%

Occurs on mountain sideslopes, ridges and canyons; 0 to 35 percent slopes, 5,200 to 7,000 feet.

Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 35 to 70 inches ppt.

#### Yallani

30%

Occurs on mountain sideslopes, ridges and canyons; 0 to 35 percent slopes; 5,200 to 8,000 feet.

Red and white fir, Jeffrey pine, ponderosa pine, sugar pine, lodgepole pine, mountain hemlock, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and squaw carpet; 35 to 70 inches ppt.

### Soil Profile Description

Surface Layer

0 to 13 inches, brown gravelly sandy loam to loam, granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.

0 to 8 inches; brown gravelly fine sandy loam; granular structure; soft; 22 percent rock fragments; pH 6.3.

Subsoil

13 To 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.

8 to 39 inches; brown to yellowish brown gravelly to very gravelly fine sandy loam; blocky and massive structure; slightly hard; 30 to 42 percent rock fragments; pH 6.0

Substrata

39 to 60 inches; yellowish brown very gravelly sandy loam; massive; 35 percent rock fragments; pH 6.0.

### Soil Properties & Management Interpretations

Rooting Depth (in.),  
Underlying Material

60+ inches.

60+ inches; basalt

Erosion Factor (K)

.20

.24

Max. Erosion Hazard

Low

Low to moderate

Soil Permeability

Moderate

Moderately rapid

Soil Manageability

Class

1

2p

Group

I

I

Range Site

N/A

N/A

Water Runoff Potential

Slow

Slow

Hydrologic Soil Group

B

B

Available Water  
Capacity (AWC)

Total (Top 20")

6.8 (2.2)

5.9 (2.1)

Forest Site Class

5 (III)

3 (I)

Timber Regeneration

Plantability

Moderate

High

Seedling Survival

Moderate

Low to moderate

Estimated Engineering  
Properties;

USDA Texture,

Unified, and ASSHTO

0-7; sandy loam

Unified: SM

ASSHTO: A-2-4, A-4

0-24; gravelly fine sandy loam

Unified: GM-GC, SM

ASSHTO: A-1, A-4

7-13; loam

Unified: ML

ASSHTO: A-7

24-39; very gravelly fine sandy loam

Unified: GM-GC, SM

ASSHTO: A-1, A-4

13-60; gravelly clay loam

Unified: GM-GC, CL

ASSHTO: A-2, A-6, A-7

39-60; very gravelly sandy loam

Unified: GM-GC, SM

ASSHTO: A-1, A-2-4, A-4

Included Areas

20% Wintoner family, Portola family and Rubble Land

Map Unit 38

### 39 Inville- Yallani families complex, 35 to 50 percent slopes

Map Unit Components  
Approx. Proportion  
Position, Slope, and  
Elevation  
Typical Vegetation &  
Precipitation

#### Inville

50%

Occurs on mountain sideslopes, ridges and canyons; 35 to 50 percent slopes, 5,200 to 7,000 feet.

Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 35 to 70 inches ppt.

#### Yallani

30%

Occurs on mountain sideslopes, ridges and canyons; 35 to 50 percent slopes; 5,200 to 8,000 feet.

Red and white fir, Jeffrey pine, ponderosa pine, sugar pine, lodgepole pine, mountain hemlock, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and squaw carpet; 35 to 70 inches ppt.

### Soil Profile Description

Surface Layer

0 to 13 inches, brown gravelly sandy loam to loam, granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.

0 to 8 inches; brown gravelly fine sandy loam; granular structure; soft; 22 percent rock fragments; pH 6.3.

Subsoil

13 to 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.

8 to 39 inches; brown to yellowish brown gravelly to very gravelly fine sandy loam; blocky and massive structure; slightly hard; 30 to 42 percent rock fragments; pH 6.0.

Substrata

39 to 60 inches; yellowish brown very gravelly sandy loam; massive; 35 percent rock fragments; pH 6.0.

### Soil Properties & Management Interpretations

Rooting Depth (in.),  
Underlying Material

60+ inches.

60+ inches; basalt

Erosion Factor (K)

.20

.24

Max. Erosion Hazard

Moderate

Moderate

Soil Permeability

Moderate

Moderately rapid

Soil Manageability

Class

3e

3gp

Group

III

III

Range Site

N/A

N/A

Water Runoff Potential

Moderate

Moderate

Hydrologic Soil Group

B

B

Available Water  
Capacity (AWC)

Total (Top 20")

6.8 (2.2)

5.9 (2.1)

Forest Site Class

5 (III)

3 (I)

Timber Regeneration

Plantability

Moderate

Moderate

Seedling Survival

Moderate

Low to moderate

Estimated Engineering

Properties;

USDA Texture,

Unified, and ASSHTO

0-7; sandy loam

Unified: SM

ASSHTO: A-2-4, A-4

0-24; gravelly fine sandy loam

Unified: GM-GC, SM

ASSHTO: A-1, A-4

7-13; loam

Unified: ML

ASSHTO: A-7

24-39; very gravelly fine sandy loam

Unified: GM-GC, SM

ASSHTO: A-1, A-4

13-60; gravelly clay loam

Unified: GM-GC, CL

ASSHTO: A-2, A-6, A-7

39-60; very gravelly sandy loam

Unified: GM-GC, SM

ASSHTO: A-1, A-2-4, A-4

Included Areas

20% Wintoner family, Yallani family, moderately deep and Rock Outcrop

## 40 Inville-Yallani families, cobbly complex, 15 to 50 percent slopes

Map Unit Components	<b>Inville, cobbly</b>	<b>Yallani, cobbly</b>
Approx. Proportion	50%	30%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 15 to 50 percent slopes; 5,200 to 7,000 feet.	Occurs on mountain sideslopes, ridges and canyons; 15 to 50 percent slopes; 5,200 to 8,000 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 35 to 70 inches ppt.	Jeffrey and ponderosa pine, red fir, white fir, sugar pine, lodgepole pine, mountain hemlock, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and squaw carpet; 35 to 70 inches ppt.

### Soil Profile Description

Surface Layer	0 to 20 inches; brown to yellowish brown very cobbly to extremely cobbly sandy loam; granular structure; soft; 40 to 80 percent rock fragments; pH 6.2.	0 to 8 inches; brown cobbly sandy loam; granular structure; soft; 20 to 25 percent rock fragments; pH 6.3.
Subsoil	20 to 44 inches; brown extremely cobbly sandy clay loam; subangular blocky structure; slightly hard; 60 to 80 percent rock fragments; pH 6.2 to 5.8.	8 to 39 inches; brown to yellowish brown very gravelly sandy loam; subangular blocky structure; slightly hard; 35 to 45 percent rock fragments; pH 6.0.
Substrata	44 inches; slightly weathered andesite.	39 to 60 inches; yellowish brown very gravelly to extremely gravelly sandy loam; massive; slightly hard; 40 to 60 percent rock fragments; pH 6.0; underlain by basalt.

### Soil Properties & Management Interpretations

Rooting Depth (in.)	44 inches; andesite	60 inches; basalt
Erosion Factor (K)	.20	.24
Max. Erosion Hazard	Low to moderate	Low
Soil Permeability	Moderate	Moderately rapid
Soil Manageability Class	3PX	3Xp
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	1.6 (.6)	5.9 (2.1)
Forest Site Class	5 (III-IV)	4 (II)
Timber Regeneration Plantability	Low to Nonplantable	Low
Seedling Survival	Very low	Low to moderate
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-20; extremely cobbly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	0-24; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
	20-44; extremely cobbly sandy clay loam Unified: GM-GC, ML-CL ASSHTO: A-2, A-6	24-39; very gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
	44; weathered andesite	39-60; very gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
Included Areas	20% Sheld family, cobbly and Rubble Land	

## 41 Inville-Yallani families, rhyolitic association, 0 to 35 percent slopes

Map Unit Components	<b>Inville, rhyolitic</b>	<b>Yallani, rhyolitic</b>
Approx. Proportion	50%	30%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 0-35 percent slopes, 5,200-7,000 feet.	Occurs on mountain sideslopes, ridges and canyons; 0-35 percent slopes; 5,200-7,300 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, sugar pine, white fir, chinquapin, greenleaf manzanita and pinemat manzanita; 40 to 75 inches ppt.	White fir, red fir, sugar pine, incense cedar chinquapin, pinemat manzanita and greenleaf manzanita; 40 to 75 inches ppt.
<b>Soil Profile Description</b>		
Surface Layer	0 to 25 inches; pale brown very gravelly coarse sandy loam; granular to subangular blocky structure; soft; 35 to 45 percent rock fragments; pH 5.2 to 6.2.	0 to 22 inches; grayish brown to pale brown sandy loam to very gravelly sandy loam; granular structure; soft to slightly hard; 10 to 50 percent rock fragments; pH 5.5.
Subsoil	25 to 58 inches; yellow very gravelly loam; subangular blocky structure; slightly hard; 35 to 55 percent rock fragments; pH 6.0.	22 to 43 inches; light gray to pale brown very gravelly to extremely gravelly coarse sandy loam; subangular blocky structure; slightly hard; 50 to 70 percent rock fragments; pH 5.0.
Substrata	58 inches; slightly weathered rhyolite.	43 to 50 inches; light gray very cobbly to extremely cobbly sandy loam; subangular blocky structure; slightly hard; 55 to 65 percent rock fragments; pH 4.8; underlain by weathered rhyolite.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.)	58 inches; rhyolite	50 inches; rhyolite
Erosion Factor (K)	.28	.28
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately rapid	Moderately rapid
Soil Manageability Class	3Pe	2ep
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Slow	Very slow
Hydrologic Soil Group	B	A
Available Water Capacity (AWC) Total (Top 20")	3.7 (.9)	3.2 (1.8)
Forest Site Class	5 (III-IV)	5-6 (IV-V)
Timber Regeneration Plantability	High	Moderate
Seedling Survival	Very low to low	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-25; very gravelly coarse sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	0-22; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
	25-58; very gravelly loam Unified: GM-GC, ML-CL ASSHTO: A-1, A-6	22-43; extremely gravelly coarse sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
	58; slightly weathered rhyolite	43-50; cobbly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
		50; weathered rhyolite
Included Areas	20% Rock Outcrop; Lithic Xerochrepts and Inville family, rhyolitic moderately deep	

## 42 Inville-Yallani families, rhyolitic association, 35 to 50 percent slopes

Map Unit Components	<b>Inville, rhyolitic</b>	<b>Yallani, rhyolitic</b>
Approx. Proportion	50%	30%
Position, Slope, and Elevation	Occurs on mountain sideslopes, ridges and canyons; 35-50 percent slopes, 5,200-7,000 feet.	Occurs on mountain sideslopes, ridges and canyons; 35-50 percent slopes; 5,200-7,300 feet.
Typical Vegetation & Precipitation	Jeffrey and ponderosa pine, sugar pine, white fir, chinquapin, greenleaf manzanita and pinemat manzanita; 40 to 75 inches ppt.	White fir, red fir, sugar pine, incense cedar chinquapin, pinemat manzanita and greenleaf manzanita; 40 to 75 inches ppt.
<b>Soil Profile Description</b>		
Surface Layer	0 to 25 inches; pale brown very gravelly coarse sandy loam; granular to subangular blocky structure; soft; 35 to 45 percent rock fragments; pH 5.2 to 6.2.	0 to 22 inches; grayish brown to pale brown sandy loam to very gravelly sandy loam; granular structure; soft to slightly hard; 10 to 50 percent rock fragments; pH 5.5.
Subsoil	25 to 58 inches; yellow very gravelly loam; subangular blocky structure; slightly hard; 35 to 55 percent rock fragments; pH 6.0.	22 to 43 inches; light gray to pale brown very gravelly to extremely gravelly coarse sandy loam; subangular blocky structure; slightly hard; 50 to 70 percent rock fragments; pH 5.0.
Substrata	58 inches; slightly weathered rhyolite.	43 to 50 inches; light gray very cobbly to extremely cobbly sandy loam; subangular blocky structure; slightly hard; 55 to 65 percent rock fragments; pH 4.8; underlain by weathered rhyolite.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.)	58 inches; rhyolite	50 inches; rhyolite
Erosion Factor (K)	.28	.28
Max. Erosion Hazard	High	High
Soil Permeability	Moderately rapid	Moderately rapid
Soil Manageability Class	3EP	3Ep
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Moderate	Slow
Hydrologic Soil Group	B	A
Available Water Capacity (AWC) Total (Top 20")	3.7 (.9)	3.2 (1.8)
Forest Site Class	5 (III-IV)	5-6 (IV-V)
Timber Regeneration Plantability	High	Moderate
Seedling Survival	Very low to low	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-25; very gravelly coarse sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	0-22; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
	25-58; very gravelly loam Unified: GM-GC, ML-CL ASSHTO: A-1, A-6	22-43; extremely gravelly coarse sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
	58; slightly weathered rhyolite	43-50; cobbly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4
		50; weathered rhyolite
Included Areas	20% Lithic Xerochrepts; Rock Outcrop and Inville family, rhyolitic, moderately deep	

### 43 Klicker-Keating Families-Durixerolls association, 0 to 35 percent slopes

Map Unit Components	Klicker	Keating	Durixerolls
Approx. Proportion	50%	20%	20%
Position, Slope, and Elevation	Occurs on volcanic flats; mountain sideslopes and escarpments; 0 to 35 percent slopes; 5,200 to 7,300 feet.	Occurs on mountain sideslopes, benches and along streams; 0 to 35 percent slopes; 4,000 to 5,600 feet.	Occurs on alluvial fans, terraces and benches; 0 to 25 percent slopes; 4,000 to 6,000 feet.
Typical Vegetation & Precipitation	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita and desert mountain mahogany; 18 to 25 inches ppt.	Sparse Jeffrey pine and incense cedar with western juniper, black oak, big sage, mahogany, bitterbrush, balsam root and annual and perennial grasses; 15 to 20 inches ppt.	Sparse Jeffrey pine and western juniper with big sage and annual and perennial grasses; 15 to 20 inches ppt.

#### Soil Profile Description

Surface Layer	0 to 11 inches; dark grayish brown to brown very stony sandy loam to loam; subangular blocky structure; soft; 35 to 50 percent rock fragments; pH 7.0 to 6.8.	0 to 13 inches; brown to yellowish brown loam; granular to subangular blocky structure; slightly hard; 5 to 10 percent rock fragments; pH 6.6 to 6.4.	0 to 7 inches, brown to yellowish brown sandy loam; granular to subangular blocky structure; soft; pH 6.8.
Subsoil	11 to 26 inches; dark brown very cobbly to extremely cobbly clay loam; slightly hard; 50 to 70 percent rock fragments; slightly hard; pH 6.5.	13 to 25 inches; brown clay loam to clay; subangular blocky to prismatic structure; hard to very hard; 5 percent rock fragments; pH 6.4.	7 to 11 inches; dark yellowish brown sandy clay loam to clay; blocky to prismatic structure; hard; pH 6.8 to 7.0.
Substrata	26 inches; unweathered basalt.	25 inches; weakly cemented silica duripan over basalt bedrock.	11 to 18 inches indurated silica pan underlain by hard basalt.

#### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	26 inches; basalt	25 inches; basalt.	10 to 20 inches; indurated silica pan.
Erosion Factor (K)	.28	.32	.28
Max. Erosion Hazard	Low	Moderate	Moderate
Soil Permeability	Moderate	Moderate	Moderate over very slow.
Soil Manageability Class	3Xp	2e	2ep
Group	III	III	III
Range Site	N/A	2	1
Water Runoff Potential	Slow	Moderate	Moderate to rapid
Hydrologic Soil Group	B	C	D
Available Water Capacity (AWC) Total (Top 20")	2.1 (1.7)	3.7 (2.9)	1.3 (1.3)
Forest Site Class	5-6 (IV-V)	7 (Noncommercial)	7 (Noncommercial)
Timber Regeneration Potential			
Plantability	Low to nonplantable	N/A	N/A
Seedling Survival	Low	N/A	N/A

### 43 Klicker-Keating Families-Durixerolls association (continued)

Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-3; very stony sandy loam Unified: SM ASSHTO: A-2-4, A-4	0-13; loam Unified: ML-CL ASSHTO: A-6	0-7; sandy loam Unified: SM ASSHTO: A-2-4, A-4
	3-11; very stony loam Unified: ML ASSHTO: A-4	13-17; clay loam Unified: CL ASSHTO: A-6, A-7	7-9; sandy clay loam Unified: SC ASSHTO: A-2-6
	11-26; very cobbly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	17-25; clay Unified: CL ASSHTO: A-7	9-11; clay Unified: CL ASSHTO: A-7
	26; basalt	25; duripan over basalt	11; indurated pan
Included Areas	10% De Masters; Rubble Land and Lithic Ultic Argixerolls		

#### 44 Klicker family-Klicker family, sedimentary-Trojan family complex, 0 to 35 percent slopes

Map Unit Components	Klicker	Klicker, sed	Trojan
Approx. Proportion	30%	30%	20%
Position, Slope, and Elevation	Occurs on mountain slopes and flats; 5 to 35 percent slopes; 5,200 to 7,300 feet.	Occurs on mountain sideslopes and terraces; 0 to 35 percent slopes; 5,200 to 6,500 feet. Willard Creek area of the Eagle Lake District.	Occurs on mountain sideslopes, ridges, flats, and gently sloping hills; 0 to 35 percent slopes, 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 18 to 25 inches ppt.	Jeffrey pine, douglas fir, white fir, incense cedar, greenleaf manzanita and annual and perennial grasses; 18 to 25 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 16 to 25 inches ppt.

#### Soil Profile Description

Surface Layer	0 to 11 inches, dark brown loam or cobbly loam; granular structure; slightly hard; 18 percent rock fragments; pH 7.0 to 6.8.	0 to 10 inches; brown gravelly loam; subangular blocky structure; soft to slightly hard; 20 to 40 percent rock fragments; pH 5.8 to 6.0; 40 percent rock fragments on the surface.	0 to 22 inches; yellowish brown to brown loam; granular to subangular blocky structure; soft to slightly hard; 2 to 10 percent rock fragments; pH 6.3 to 6.5.
Subsoil	11 to 48 inches; brown to yellowish red very cobbly to extremely cobbly loam; subangular blocky structure; slightly hard; 45 to 80 percent rock fragments; pH 6.5.	10 to 36 inches; dark brown cobbly clay loam to very cobbly or extremely cobbly sandy clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.2.	22 to 46 inches; brown gravelly sandy clay loam to gravelly clay loam; subangular blocky structure; slightly hard; 15 to 25 percent rock fragments; pH 6.5.
Substrata	48 inches; weathered basalt rock.	36 inches; slightly weathered Eocene nonmarine sediments.	46 to 60 inches; slightly weathered basalt rock.

#### Soil Properties & Management Interpretations

Rooting Depth (in.), Underlying Material	48 inches; weathered basalt rock.	36 inches; sediments	46 inches; basalt.
Erosion Factor (K)	.28	.32	.28
Max. Erosion Hazard	Moderate	Moderate to high	Moderate
Soil Permeability	Moderate	Moderately slow	Moderate
Soil Manageability Class	2px	3Xp	2e
Group	II	II	II
Range Site	N/A	N/A	N/A
Water Runoff Potential	Slow	Slow	Slow
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC) Total (Top 20")	4.3 (2.0)	3.1 (2.1)	6.4 (2.7)
Forest Site Class	5 (III-IV)	5 (III-IV)	5 (IV)
Timber Regeneration Potential			
Plantability	Moderate	Low	High
Seedling Survival	Low	Low	Moderate

#### 44 Klicker family-Klicker family, sedimentary-Trojan family complex (continued)

Estimated Engineering  
Properties;  
USDA Texture,  
Unified, and ASSHTO

0-11; cobbly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-4

0-10; gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-2, A-7

0-22; loam  
Unified: ML  
ASSHTO: A-4, A-6

11-28; very cobbly loam  
Unified: GM-GC, ML-CL  
ASSHTO: A-1, A-6

10-18; cobbly clay loam  
Unified: GM-GC, ML-CL  
ASSHTO: A-2, A-6

22-34; gravelly sandy clay loam  
Unified: GM-GC, SC  
ASSHTO: A-2, A-2-6

28-48; extremely gravelly loam  
Unified: GM-GC, ML  
ASSHTO: A-1, A-7

18-36; very cobbly sandy clay  
loam  
Unified: GM-GC, SC  
ASSHTO: A-2, A-2-6

34-46; gravelly clay loam  
Unified: GM-GC, CL  
ASSHTO: A-2, A-6, A-7

48; weathered basalt rock

36; nonmarine sediments

46; weathered basalt rock

Included Areas

20% Gerle and Wintoner families

## 45 Klicker family-Klicker family, very stony association, 0 to 35 percent slopes

Map Unit Components	<b>Klicker</b>	<b>Klicker, very stony</b>
Approx. Proportion	50%	30%
Position, Slope, and Elevation	Occurs on mountain slopes and flats; 5 to 35 percent slopes; 5,200 to 7,300 feet.	Occurs on volcanic flats; mountain sideslopes and escarpments; 0 to 35 percent slopes; 5,200 to 7,300 feet.
Typical Vegetation & Precipitation	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 18 to 25 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita and desert mountain mahogany; 18 to 25 inches ppt.
Soil Profile Description		
Surface Layer	0 to 11 inches, dark brown loam or cobbly loam; granular structure; slightly hard; 18 percent rock fragments; pH 7.0 to 6.8.	0 to 11 inches; dark grayish brown to brown very stony sandy loam to loam; subangular blocky structure; soft; 35 to 50 percent rock fragments; pH 7.0 to 6.8.
Subsoil	11 to 48 inches; brown to yellowish red very cobbly to extremely cobbly loam; subangular blocky structure; slightly hard; 45 to 80 percent rock fragments; pH 6.5.	11 to 26 inches; dark brown very cobbly to extremely cobbly clay loam; subangular blocky structure; slightly hard; 50 to 70 percent rock fragments; slightly hard; pH 6.5.
Substrata	48 inches; weathered basalt rock.	26 inches; unweathered basalt.
Soil Properties & Management Interpretations		
Rooting Depth (in.), Underlying Material	48 inches; weathered basalt rock.	26 inches; basalt
Erosion Factor (K)	.28	.28
Max. Erosion Hazard	Moderate	Low
Soil Permeability	Moderate	MODERATE
Soil Manageability Class	2px	3XP
Soil Manageability Group	II	II
Range Site	N/A	N/A
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	4.3 (2.0)	2.1 (1.7)
Forest Site Class	5 (III-IV)	5-6 (IV-V)
Timber Regeneration Potential		
Plantability	Moderate	Low to nonplantable
Seedling Survival	Low	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-11; cobbly loam Unified: GM-GC, ML ASSHTO: A-1, A-4	0-3; very stony sandy loam Unified: SM ASSHTO: A-2-4, A-4
	11-28; very cobbly loam Unified: GM-GC, ML-CL ASSHTO: A-1, A-6	3-11; very stony loam Unified: ML ASSHTO: A-4
	28-48; extremely gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-7	11-26; very cobbly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7
	48; weathered basalt rock	26 basalt
Included Areas	20% Klicker family, moderately deep; Patio family and Rubble Land	

## 46 Klicker family-Klicker family, very stony association, 35 to 50 percent slopes

Map Unit Components	<b>Klicker</b>	<b>Klicker, very stony</b>
Approx. Proportion	50%	30%
Position, Slope, and Elevation	Occurs on mountain sideslopes; 35 to 50 percent slopes; 5,200 to 7,300 feet.	Occurs on mountain sideslopes and escarpments; 35 to 50 percent slopes; 5,200 to 7,300 feet.
Typical Vegetation & Precipitation	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 18 to 25 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita and desert mountain mahogany; 18 to 25 inches ppt.
Soil Profile Description		
Surface Layer	0 to 11 inches, dark brown loam or cobbly loam; granular structure; slightly hard; 18 percent rock fragments; pH 7.0 to 6.8.	0 to 11 inches; dark grayish brown to brown very stony sandy loam to loam; subangular blocky structure; soft; 35 to 50 percent rock fragments; pH 7.0 to 6.8.
Subsoil	11 to 48 inches; brown to yellowish brown very cobbly to extremely cobbly loam; subangular blocky structure; slightly hard; 45 to 80 percent rock fragments; pH 6.5.	11 to 26 inches; dark brown very cobbly to extremely cobbly clay loam; subangular blocky structure; slightly hard; 50 to 70 percent rock fragments; slightly hard; pH 6.5.
Substrata	48 inches; weathered basalt rock.	26 inches; unweathered basalt.
Soil Properties & Management Interpretations		
Rooting Depth (in.), Underlying Material	48 inches; weathered basalt rock.	26 inches; basalt
Erosion Factor (K)	.28	.28
Max. Erosion Hazard	Moderate to high	Moderate
Soil Permeability	Moderate	Moderate
Soil Manageability Class	3gp	3gp
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Moderate	Moderate
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	4.3 (2.0)	2.1 (1.7)
Forest Site Class	5 (III-IV)	5-6 (IV-V)
Timber Regeneration Potential		
Plantability	Moderate	Low to nonplantable
Seedling Survival	Low	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-11; cobbly loam Unified: GM-GC, ML ASSHTO: A-1, A-4	0-3; very stony sand loam Unified: SM ASSHTO: A-2-4, A-4
	11-28; very cobbly loam Unified: GM-GC, ML-CL ASSHTO: A-1, A-6	3-11; very stony loam Unified: ML ASSHTO: A-4
	28-48; extremely gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-7	11-26; very cobbly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7
Included Areas	48; weathered basalt rock	26; basalt
	20% Klicker Family, moderately deep; Patio family and Rubble land	

**47 Klicker family, sedimentary-Lithic Ultic Argixerolls-Inville family association,  
0 to 50 percent slopes**

Map Unit Components	<b>Klicker, sed.</b>	<b>Lithic Ultic Argixerolls</b>	<b>Inville</b>
Approx. Proportion	40%	20%	20%
Position, Slope, and Elevation	Occurs on mountain sideslopes and terraces; 0 to 50 percent slopes; 5,200 to 6,500 feet. Willard Creek area of the Eagle Lake District.	Occurs on mountain sideslopes and old river terraces; 0 to 50 percent slopes; 5,200 to 7,000 feet.	Occurs on mountain sideslopes, ridges and canyons; 5 to 35 percent slopes, 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey pine, douglas fir, white fir, incense cedar, greenleaf manzanita and annual and perennial grasses; 18 to 30 inches ppt.	Generally barren with scattered big sage, silver sage and annual and perennial grasses; 20 to 30 inches ppt.	Jeffrey and ponderosa pine, red and white fir, sugar pine, incense cedar, greenleaf manzanita, pinemat manzanita, chinquapin and desert mountain mahogany; 20 to 30 inches ppt.

**Soil Profile Description**

Surface Layer	0 to 10 inches; brown gravelly to very gravelly loam; subangular blocky structure; soft to slightly hard; 20 to 40 percent rock fragments; pH 5.8 to 6.0.	0 to 4 inches; brown gravelly sandy loam; subangular blocky structure; soft; 20 percent rock fragments; pH 6.5.	0 to 13 inches, brown gravelly sandy loam to loam, granular structure; soft; 10 to 30 percent rock fragments; pH 6.5.
Subsoil	10 to 36 inches; dark brown cobbly clay loam to very cobbly or extremely cobbly sandy clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.2.	4 to 17 inches; brown to yellowish brown gravelly to very gravelly sandy clay loam; slightly hard; 20 to 35 percent rock fragments; pH 7.0 to 7.2.	13 To 60 inches; brown very gravelly to extremely gravelly clay loam; subangular blocky structure; slightly hard; 35 to 65 percent rock fragments; pH 6.0 - 5.5.
Substrata	36 inches; slightly weathered Eocene nonmarine sediments.	17 inches; weathered andesite.	N/A

**Soil Properties & Management Interpretations**

Rooting Depth (in.), Underlying Material	36 inches; sediments	17 inches; andesite	60+ inches.
Erosion Factor (K)	.32	.28	.20
Max. Erosion Hazard	Moderate to high	Moderate to high	Low
Soil Permeability	Moderately slow	Moderate to moderately slow	Moderate
Soil Manageability Class	3Xp	3Xed	1
Group	III	III	III
Range Site	N/A	1	N/A
Water Runoff Potential	Slow	Rapid	Slow
Hydrologic Soil Group	B	D	B
Available Water Capacity (AWC) Total (Top 20")	3.1 (2.1)	2.0 (2.0)	6.8 (2.2)
Forest Site Class	5 (III-IV)	7 (Noncommercial)	5 (III)
Timber Regeneration Potential			
Plantability	Low	N/A	Moderate
Seedling Survival	Low	N/A	Moderate

**47 Klicker family, sedimentary-Lithic Ultic Argixerolls-Inville family association (continued)**

Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-10; gravelly loam Unified: GM-GC, ML ASSHTO: A-2, A-7	0-4; gravelly sandy loam Unified: GM-GC, SM ASSHTO: A-1, A-2-4, A-4	0-7; sandy loam Unified: SM ASSHTO: A-2-4, A-4
	10-18; cobbly clay loam Unified: GM-GC, ML-CL ASSHTO: A-2, A-6	4-14; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6	7-13; loam Unified: ML ASSHTO: A-7
	18-36; very cobbly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6	14-17; very gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-1, A-2-6	13-60; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7
	36; nonmarine sediments	17; weathered andesite	
Included Areas	20% Trojan and Wintoner Families		

## 48 Klicker-Patio families complex, 15 to 70 percent slopes

Map Unit Components	<b>Klicker</b>	<b>Patio</b>
Approx. Proportion	50%	25%
Position, Slope, and Elevation	Occurs on mountain sideslopes and escarpments; 15 to 70 percent slopes; 5,200 to 7,300 feet.	Occurs on volcanic rims and escarpments; 15 to 70 percent slopes; 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita and desert mountain mahogany; 18 to 25 inches ppt.	Jeffrey and ponderosa pine, sugar pine, white fir, red fir, incense cedar, juniper, mahogany, chinquapin, greenleaf manzanita; pinemat manzanita; desert mountain mahogany and big sage; 18 to 50 inches ppt.
Soil Profile Description		
Surface Layer	0 to 11 inches; dark grayish brown to brown very stony sandy loam to loam; subangular blocky structure; soft; 35 to 50 percent rock fragments; pH 7.0 to 6.8.	0 to 9 inches; brown gravelly or cobbly fine sandy loam; granular structure; soft; 20 percent rock fragments; pH 6.5.
Subsoil	11 to 26 inches; dark brown very cobbly to extremely cobbly clay loam; slightly hard; 50 to 70 percent rock fragments; slightly hard; pH 6.5.	9 to 29 inches; yellowish brown very cobbly loam; subangular blocky structure; soft; pH 6.5.
Substrata	26 inches; unweathered basalt.	29 to 38 inches; fractured platy basalt with soil and roots in cracks.
Soil Properties & Management Interpretations		
Rooting Depth (in.), Underlying Material	26 inches; basalt	29 inches; basalt
Erosion Factor (K)	.28	.10
Max. Erosion Hazard	Moderate	Low to moderate
Soil Permeability	Moderate	Moderate
Soil Manageability Class	3gp	3Xp
Group	III	III
Range Site	N/A	N/A
Water Runoff Potential	Moderate	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	2.1 (1.7)	2.3 (1.7)
Forest Site Class	5-6 (IV-V)	5 (IV)
Timber Regeneration Plantability	Low to nonplantable	Low
Seedling Survival	Low	Low
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-3; very stony sand loam Unified: SM ASSHTO: A-2-4, A-4	0-9; gravelly fine sandy loam Unified: GM-GC, SM-SC ASSHTO: A-1, A-4
	3-11; very stony loam Unified: ML ASSHTO: A-4	9-29; very cobbly loam Unified: ML-CL ASSHTO: A-4
	11-26; very cobbly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7	29; fractured platy basalt
	26; basalt	
Included Areas	25% Rock Outcrop and Klicker family moderately deep	

## 49 Klicker-Trojan families association, 0 to 35 percent slopes

	<b>Klicker</b>	<b>Trojan</b>
Map Unit Components		
Approx. Proportion	45%	35%
Position, Slope, and Elevation	Occurs on mountain slopes and flats; 5 to 35 percent slopes; 5,200 to 7,300 feet.	Occurs on mountain sideslopes, ridges, flats, and gently sloping hills; 0 to 35 percent slopes, 5,200 to 7,000 feet.
Typical Vegetation & Precipitation	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 18 to 25 inches ppt.	Jeffrey pine, white fir, incense cedar, western juniper, mountain mahogany, big sage, greenleaf manzanita, pinemat manzanita and desert mountain mahogany; 16 to 25 inches ppt.
<b>Soil Profile Description</b>		
Surface Layer	0 to 11 inches, dark brown loam or cobbly loam; granular structure; slightly hard; 18 percent rock fragments; pH 7.0 to 6.8.	0 to 22 inches; yellowish brown to brown loam; granular to subangular blocky structure; soft to slightly hard; 2 to 10 percent rock fragments; pH 6.3 to 6.5.
Subsoil	11 to 48 inches; brown to yellowish red very cobbly to extremely cobbly loam; subangular blocky structure; slightly hard; 45 to 80 percent rock fragments; pH 6.5.	22 to 46 inches; brown gravelly sandy clay loam to gravelly clay loam; subangular blocky structure; slightly hard; 15 to 25 percent rock fragments; pH 6.5.
Substrata	48 inches; weathered basalt rock.	46 to 60 inches; slightly weathered basalt rock.
<b>Soil Properties &amp; Management Interpretations</b>		
Rooting Depth (in.), Underlying Material	48 inches; weathered basalt rock.	46 inches; basalt.
Erosion Factor (K)	.28	.28
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate	Moderate
Soil Manageability Class	2px	2e
Group	II	II
Range Site	N/A	2
Water Runoff Potential	Slow	Slow
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Total (Top 20")	4.3 (2.0)	6.4 (2.7)
Forest Site Class	5 (III-IV)	5 (IV)
Timber Regeneration Plantability	Moderate	High
Seedling Survival	Low	Moderate
Estimated Engineering Properties; USDA Texture, Unified, and ASSHTO	0-11; cobbly loam Unified: GM-GC, ML ASSHTO: A-1, A-4	0-22; loam Unified: ML ASSHTO: A-4, A-6
	11-28; very cobbly loam Unified: GM-GC, ML-CL ASSHTO: A-1, A-6	22-34; gravelly sandy clay loam Unified: GM-GC, SC ASSHTO: A-2, A-2-6
	28-48; extremely gravelly loam Unified: GM-GC, ML ASSHTO: A-1, A-7	34-46; gravelly clay loam Unified: GM-GC, CL ASSHTO: A-2, A-6, A-7
	48; weathered basalt rock	46; weathered basalt rock
Included Areas	20% Kilmerque family, patio family and Rubble Land	