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In cooperation with  
United States Department of  
Agriculture, Forest Service;  
Washington State  
Department of Natural  
Resources; and Washington  
State University, Agricultural  
Research Center

# Soil Survey of Wenatchee National Forest, Naches Area, Washington, Parts of Kittitas and Yakima Counties





# How To Use This Soil Survey

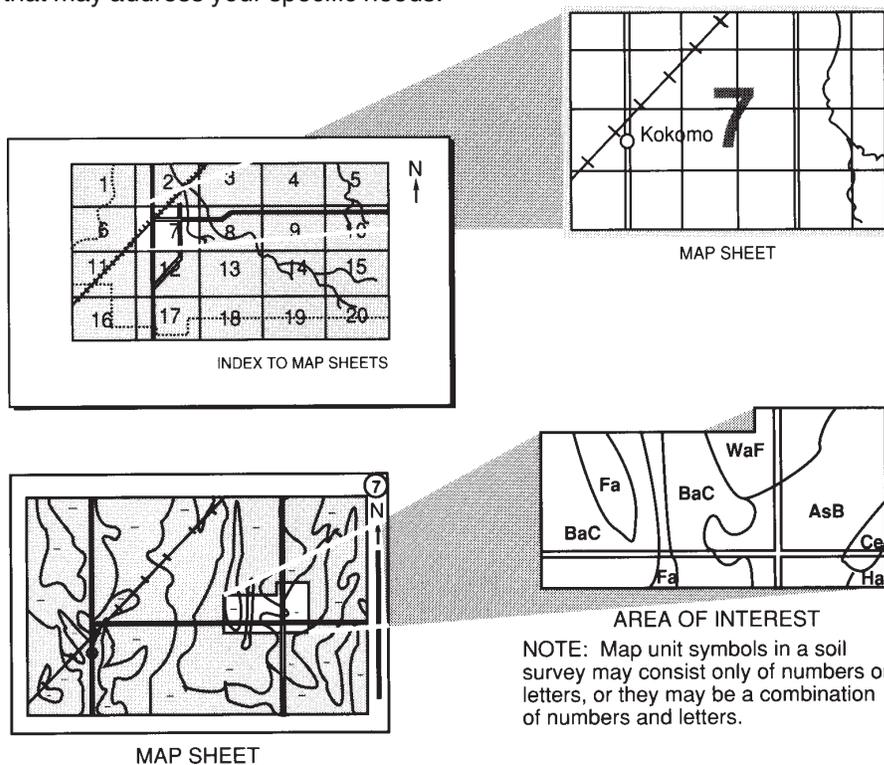
## Detailed Soil Maps

The detailed soil 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](#). Note the number of the map sheet and turn to that sheet.

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

The [Contents](#) shows which table has data on a specific land use for each detailed soil map unit. Also see the [Contents](#) for sections of this publication that may address your specific needs.



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## National Cooperative Soil Survey

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey. This survey was made cooperatively by the Natural Resources Conservation Service and the Forest Service, Washington State Department of Natural Resources, and Washington State University, Agricultural Research Center.

Major fieldwork for this soil survey was completed in 1996. Soil names and descriptions were approved in 2003. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1996. The most current official data are available on the Internet.

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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## Cover Caption

Naches Ranger District of Wenatchee National Forest. Lost Lake in foreground, and Divide Ridge in background.

*Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov>.*

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# Foreword

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Soil surveys contain information that affects land use planning in survey areas. They include predictions of soil behavior for selected land uses. The surveys highlight soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

Soil surveys are designed for many different users. Ranchers and foresters can use the surveys to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners and engineers can use the surveys to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists and specialists in recreation and wildlife management can use the surveys to help them understand, protect, and enhance the environment.

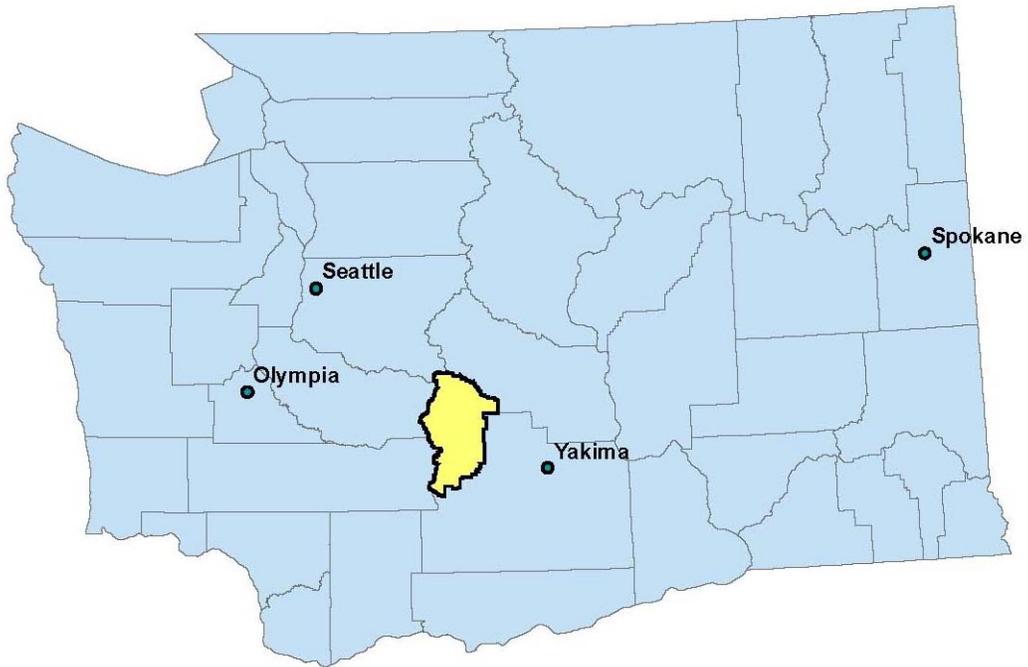
Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report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

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

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Roylene Rides at the Door  
State Conservationist  
Natural Resources Conservation Service

Soil Survey of Wenatchee National Forest, Naches Area, Washington



Location of Wenatchee National Forest, Naches Area, in Washington.

# Soil Survey of Wenatchee National Forest, Naches Area, Washington, Parts of Kittitas and Yakima Counties

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By Christopher S. Miller, Natural Resources Conservation Service

Fieldwork by Christopher S. Miller, Alan F. Walters, Ronald A. Peyton, and Patrick A. Davis, Natural Resources Conservation Service, and John G. Durkee, Forest Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with  
United States Department of Agriculture, Forest Service; Washington State Department of Natural Resources; and Washington State University, Agricultural Research Center

This survey was conducted under a Memorandum of Understanding between the United States Department of Agriculture, Forest Service and Natural Resources Conservation Service, and Washington State University. The Forest Service provided funding, and the Natural Resources Conservation Service provided project leadership in soil mapping and correlation. The mapping and digitizing was completed at a scale of 1:24,000.

WENATCHEE NATIONAL FOREST, NACHES AREA, is in the central part of Washington. The area is in the northwest part of Yakima County and the southwest part of Kittitas County. It extends from the crest of the Cascade Mountains to the west to the Yakima Indian Nation land to the south, the Wenatchee National Forest boundary to the east, and Manastash Ridge to the north. The area includes the Naches Ranger District of the Wenatchee National Forest as well as some State and private land. The survey area comprises approximately 520,000 acres. A soil survey was completed on State land in the area during the late 1970's and early 1980's by the Soil Conservation Service and the Washington State Department of Natural Resources. The Forest Service completed a Soil Resource Inventory in 1970, which included all of the Naches Ranger District. The present survey updates these earlier surveys. It provides additional information, is in greater detail, and has more current maps, which give users a better picture of the soils and landscape patterns.

Approximately 225,000 acres of the survey area is designated as wilderness areas. These areas were mapped at a lower intensity (Order 3 level of field investigation). The non-wilderness areas were mapped at a higher intensity (Order 2 level of field investigation). The information needed to make management decisions for the wilderness areas is minimal as compared to the remainder of the survey area, which is more intensively managed for timber production and recreational uses. The map units in the wilderness areas of the survey area are identified with two asterisks (\*\*) at the end of the map unit name.

## **General Nature of the Survey Area**

This section provides general information about the survey area. It describes history and development; physiography, relief, and drainage; geologic history; and climate.

### **History and Development**

The survey area was inhabited by nomadic Native American tribes in ancient times. Cultural sites and remnants of trails used by these people are still evident in the area. These tribes eventually joined together as the Yakama Indian Nation.

The modern history of the area began with use by the Yakama Indian Nation. Two-thirds of what is now the State of Washington was considered by these people to be part of their ancestral homeland. The Treaty of 1855 ceded most of that land, including the area covered by this survey, to the Federal government.

The first white men to come to the area were hunters, fur traders, and explorers. Wagon train scouts searching for a more direct route over the Cascade Mountains rebuilt an old Indian trail over Naches Pass in 1853. The trail was used by wagons for a short time before an easier route over Snoqualmie Pass was found. The trail over Naches Pass was used by cattlemen through the 1880's. As early as 1860, settlers grazed herds of cattle and sheep on the alluvial bottoms in winter and the higher meadows and ridges in summer. By 1890, the large herds of cattle on the open range gave way to even larger bands of sheep. Because of the damage done to the resources, however, grazing by these large bands of sheep was almost completely phased out by 1950. The effects of overgrazing and annual use of bedding grounds are still evident, particularly in the high alpine meadows that were opened by burning in fall. Today only one band of sheep still grazes in the Naches Ranger District.

A survey of the area was completed by the Pacific Railroad in the 1880's. Some of the early settlers were attracted to the area by the prospect of striking it rich. Mining activities started during the 1850's and continued sporadically through the 1970's. They were concentrated in the Bumping Lake District and the Chinook Pass area. Historical mining sites that are still evident in the Bumping Lake District include Copper City; Richmond, Black Jack, and Keystone Mines; and Clara Mine on Miners Ridge. There are still remnants of the Blue Bell Mine in the Fog City area of Chinook Pass. Many of the early trails in the survey area were pioneered by miners.

Commercial logging began in about 1900. At one point, as many as 25 portable sawmills were operating in the area. Running water provided the power for the mills prior to 1925, when steam power became dominant. Introduction of the logging truck and chain saw in the 1940's and 1950's was the main factor responsible for changing the face of the survey area. Increased construction of roads for easier access to logging areas allowed for clearcutting of many native stands. Logging accelerated after 1960, and timber production remains a major economic industry in the survey area. Beginning in 1991, logging in some areas of the survey area was restricted because of environmental considerations.

The survey area has several irrigation projects that serve the lower Naches Basin. The Tieton Canal was completed in 1910 and is considered a remarkable engineering feat. The canal, which includes five tunnels, hugs sheer cliffs and talus slopes for 12 miles along the Tieton River Canyon. In 1911, a reservoir was completed on the Bumping River southwest of Goose Prairie. Clear Creek Dam was constructed in the Tieton Valley in 1918. This dam was breached in 1989 because of safety concerns and was rebuilt in 1992. In 1925, the largest reservoir in the survey area was completed. The Tieton Dam and the impounded water forming Rimrock

Lake contain about 200,000 acre-feet of water. At the time of completion, the Tieton Dam was the largest earth-filled dam in the world.

In addition to the many logging roads that crisscross the survey area, two major highways traverse the area and cross the Cascade Range. The Chinook Pass Highway (State Route 410) was completed in 1931, and the White Pass Highway (U.S. Highway 12) was completed in 1951.

## **Physiography, Relief, and Drainage**

The survey area is part of the Cascade Mountain Range. The low elevations (foothills) are characterized by rounded ridgetops, narrow valleys and canyons, and gently sloping to very steep side slopes. The middle elevations have some broad ridgetops and narrow valleys with generally long and steep or very steep slopes. The high elevations have rugged alpine topography modified somewhat by alpine glaciation and some broad ridgetops and plateaus with gently rolling to hilly topography. Drainageways generally are steep-sided and relatively straight. A significant portion of the survey area exhibits evidence of old land flows of various magnitudes. Hummocky topography and deranged drainage patterns, typical of areas with unstable slopes, are especially prominent in the lower portion of the Milk Creek and Fish Creek drainageways. Several slopes in these drainageways are active.

Of geologic interest in the survey area are the extinct, eroded Goat Rocks Volcano, which is thought to have equaled Mount Rainer in height (14,000 feet or more); the extinct Tieton and Edgar Rock Volcanoes through which the Tieton and Naches Rivers flow, respectively; Tumac Mountain and Spiral Butte; and post-glacial cinder cones. Columbia River flood basalt, originating in eastern Washington, is evident in the eastern half of the survey area.

The most prominent peaks in the area are Mount Gilbert, 8,184 feet in elevation; Tieton Peak, 7,768 feet; Mount Aix, 7,768 feet; Ives Peak, 7,760 feet; and Old Snowy, 7,680 feet. The average elevation of the ridgetops ranges from about 5,000 to 6,500 feet. The lowest elevation in the survey area is about 2,240 feet, which is at the eastern boundary along the Naches River.

The two major watersheds in the survey area are those of the Tieton and Naches Rivers, which are tributaries of the Yakima River and Columbia River systems. These drainageways are separated by Bethel Ridge and the Tumac Plateau. The north and south forks of the Tieton River originate in the Goat Rocks area and flow into Rimrock Lake to form the Tieton River, which flows east from the lake. The Naches River flows east and is formed from the confluence of the Little Naches River and the Bumping River, west of the community of Cliffdell. Rattlesnake Creek, a major tributary of the Naches River, has its headwaters on the Tumac Plateau, and it flows east into the Naches River, near the community of Nile. Tumac Mountain and Spiral Butte are examples of post-glacial volcanism.

## **Geologic History**

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### **Introduction**

The survey area is in the Cascade Range physiographic province. U.S. Interstate 90 is the approximate divide of the Cascades into north and south halves. In general, the northern Cascades consist of an assemblage of older, fault-bounded blocks of Paleozoic and Mesozoic submarine sedimentary and volcanic rock attached to the edge of North America. The southern Cascades, which includes all of the survey area, is considered to be mostly a thick "pile" of younger Cenozoic volcanoes and lava flows with related pyroclastic and volcaniclastic sediment that was erupted and

deposited on the land. The following is a simplified discussion of the complex events that determined the geologic history of the survey area.

### **Pre-Tertiary**

Pre-Tertiary rock is older than that of the Cenozoic (more than 65 million years ago) and is poorly exposed in the southern Cascades. The only known pre-Tertiary rock is in the vicinity of Rimrock Lake and is known as the Rimrock Inlier. This rock, comprising the “basement” of the southern Cascades, includes the Russell Ranch and Indian Creek complexes (100 to 155 million years ago). The rock is similar to that in the northern Cascades, consisting of slices of sedimentary and volcanic suboceanic rock plastered onto the west-moving North American Continent. It is also similar to pre-Tertiary rock in the Klamath Mountains. There is some evidence that the rock moved in a northward direction along a large strike-slip fault (Straight Creek Fault) after being attached to the North America Continent. During the pre-Tertiary, the survey area probably was under water; the southern Cascades were not present and the shoreline was probably somewhere east of the area. Docking or sliding blocks of older rock were building the continental shoreline westward across the area.

### **Early Cenozoic**

During the early Cenozoic (Eocene to Oligocene; 30 to 50 million years ago), the survey area was very near to the edge of the continent and was probably part of a flat coastal plain. Streams meandering across the area deposited fluvial sediment, mostly sand and clay. There were perhaps also some deltaic deposits. Volcanic activity was mostly pyroclastic in nature, but some flows were deposited. At least some of the ash, tuff, and flows were subaqueous. The area remained flat and low coastal during this period. Faulting, folding, and uplifting were limited. The weight of the accumulation of thousands of feet of sediment and pyroclastic material depressed the crust, keeping the topography low. In the survey area, the Naches Formation, Lookout Creek Sandstone, and Spencer Creek Sandstone, all stream deposits, are examples of rocks that formed on the low coastal plain. The overlying volcanoclastic rock (Ohanapecosh Formation and Wildcat Creek facies) is evidence that the area received large amounts of pyroclastic rock. This rock is exposed mainly in the western part of the area, but deep wells in the Yakima area exhibit evidence that it extends eastward beyond the present-day Cascade Range.

### **Middle Cenozoic**

In the middle Cenozoic (Miocene and early Pliocene; 10 to 28 million years ago), the area was marked by intense volcanic activity and building of volcanic cones. Initially, a chain of large volcanoes called the Fife's Peak Cones built up along the eastern crest of the present-day Cascade Mountains. Fife's Peak, Edgar Rock, Mount Aix Cone, Timber Wolf Mountain, and the area around Trout Lodge all contain remnants of cones or calderas that existed in the area. Parts of these cones still remain today.

Later volcanic activity originated from two areas. Flood lava of the Columbia River Basalt Group erupted from vents in the Pullman, Washington, area and spread westward across the present-day Columbia Basin. These flows spread across older rock in the area, reaching nearly the present-day crest of the Cascade Range. In at least two places, Bethel Ridge and the Little Naches River area, the basalt lava flowed around old cones of the Fife's Peak Formation.

At the same time flows of the Columbia River Basalt Group were erupting, large-scale pyroclastic eruptions began in the Bumping Lake area. Although the original cone is gone, a large volume of pumice and tuff that was deposited in mudflows and stream slurries remains and is known as the Ellensburg Formation. Layers of

Ellensburg Formation sediment, which are sandwiched between basalt flows, are known as interbeds and are important in landslide development. The Ellensburg Formation continued to be deposited long after eruptions of the Columbia River Basalt Group ceased. Exposures of the upper Ellensburg Formation are visible in the lower Rattlesnake and Nile Creek areas. Small masses of intrusive rock, including volcanic plugs, stocks, dikes, and sills, that were volcanic feeders from the magma chambers are below outcroppings in areas where erosion has removed the overlying rock. The large number of these masses of intrusive rock suggests that many more volcanoes existed during this period.

Faulting, folding, and uplift during the Middle Cenozoic was just beginning in most of the survey area. A major fault system was developing along the Little Naches River and Naches River drainageway. This feature, known as the Olympic-Wallowa Line (OWL), divides the survey area into two structural units. It extends from the Olympic Mountains in Washington across the Cascades and into the Wallowa Mountains in Oregon. North of the OWL, rocks are folded and faulted in a northwest to southeast trend and faults have affected rock as old as the pre-Tertiary. South of the OWL, maps of the topography and drainage clearly show the differences in structure across the OWL.

### **Late Cenozoic**

Volcanic activity during this time (late Pliocene to early Pleistocene; 2 to 10 million years ago) was intense, and it shifted toward the western and southern edges of the survey area. Volcanoes produced andesite lava and pyroclastic rock, thickening the volcanic "pile" that formed the southern Cascades. Volcanic centers existed in the Goat Rocks and upper Rattlesnake Creek drainageway. Although many of the original cones that formed during this time were later removed by glacial erosion, small intrusions and lava and pyroclastic remnants remain. Perhaps the best example is the Devil's Horns intrusion and associated tuff deposits.

### **Quaternary to Present**

During this period (present to 2 million years ago), most of the topographic and geologic features of the survey area developed. Volcanic activity continued along the western edge of the area. Although Mount Rainier and Mount Adams are dominant on the landscape outside of the survey area, smaller volcanoes are in the area, especially in the White Pass area.

Spiral Butte and Tumac Mountain are small but complete volcanic cones that formed after glaciation. Other partial cones, or lava and pyroclastic rock related to this age, are in the Goat Rocks at Ives Peak and Hogback Mountain; the area near White Pass at Round Mountain, Russell Ridge, Pear Lake, and Deer Lake; and the Bumping Lake area at Deep Creek.

Glaciation during the Ice Age, particularly the last 30,000 years, eroded volcanic cones, cut deep U-shaped valleys, sharpened the topography, and transported large volumes of sand and gravel downslope. Glaciation uncovered older rock, exposing a profile of the depositional sequence in the survey area. Glacial deposits do not extend downriver beyond Rimrock Dam on the Tieton River or beyond the Bumping River-American Fork confluence of the Naches River drainageway.

Uplift, faulting, and folding continued throughout this period. Although the intensity of deformation may have decreased somewhat after about 1 million years ago, structural activity continues at present at a reduced rate. Earthquakes still occur in the area and modern fault scarps may exist west of Clear Lake.

Uplift and subsequent glacial and stream erosion exposed older layers of volcanic and sedimentary rock in many places in the survey area. When tilted, softer sedimentary and pyroclastic rock layers are exposed. These incompetent layers fail, creating landslides. Interbeds in the Columbia River Basalt Group and Fife's Peak

Volcanics, shaley and ashy layers in the Naches Formation, and weakly indurated tuff in the Ohanapecosh Formation are all major contributors to sliding. Examples of active landslides are in the upper Milk Creek drainageway and southeast of Rimrock Dam.

## Climate

Climate data are provided in [tables 1 through 3](#). The data were recorded at Cle Elum, Washington, in the period 1961 to 1990. The climate station at Cle Elum is about 20 miles north of the northern boundary of the survey area, but it is in the eastern slope region of the Cascade Mountains. Additional climatic data were obtained from the Parameter-elevation Regressions on Independent Slopes Model (PRISM) precipitation and temperature climate maps of Washington.

Thunderstorm days, relative humidity, percent sunshine, and wind information are estimated from data collected at the First Order station at Yakima, Washington.

In winter, the average temperature at Cle Elum is 29.8 degrees F and the average daily minimum temperature is 22.2 degrees. The lowest temperature on record, which occurred at Cle Elum on January 31, 1950, was -33 degrees. In summer, the average temperature is 63.4 degrees and the average daily maximum temperature is 77.4 degrees. The average maximum temperature in summer ranges from the middle to upper 60's along the crest of the Cascades to the lower 80's in the easternmost and driest part of the survey area. The highest temperature, which occurred at Cle Elum on August 15, 1967, was 105 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The average annual precipitation ranges from more than 80 inches along the crest of the Cascades to less than 15 inches in the extreme eastern portion of the survey area. The northern part of the area is the wettest; most of it receives 30 to 60 inches of precipitation annually. In the southern part, the average annual precipitation ranges from 25 to 50 inches over the largest section along the east slope of the Cascades, which is at an elevation of 1,500 to 3,500 feet. At Cle Elum, the average annual precipitation is 22.46 inches. Of this, about 2.6 inches, or 12 percent, usually falls in June through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 3.67 inches at Cle Elum on December 9, 1933. Thunderstorms occur on about 7 days each year, and most occur between May and August.

The average seasonal snowfall is quite variable, ranging from more than 200 inches annually along the Cascade crest to less than 30 inches along the eastern border. At Cle Elum, the average annual snowfall is 78.5 inches. The greatest snow depth at any one time during the period of record was 85 inches recorded at Cle Elum on December 29, 1996. On an average, 70 days per year at Cle Elum have at least 1 inch of snow on the ground, but near the crest of the Cascades snow typically covers the ground from November through June. The heaviest 1-day snowfall on record was 30 inches at Cle Elum on December 29, 1996.

The average relative humidity in midafternoon is about 45 percent, but it ranges from 25 percent in midsummer to 75 percent in December. Humidity is higher at night, and the average at dawn is about 80 percent, but it ranges from 70 percent in midsummer to more than 85 percent in winter. The sun shines about 70 percent of the time in summer and less than 25 percent of the time in winter. The prevailing wind is from the west for much of the year. Average windspeed is highest, about 9 miles per hour, in April and May.

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Cle Elum, Washington [1504])

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	35.0	20.4	27.7	52	-12	3	4.06	1.79	6.00	9	24.3
February-----	41.7	24.4	33.0	60	-2	9	2.50	1.18	3.64	7	13.3
March-----	49.2	28.3	38.8	70	10	48	1.66	0.86	2.36	5	6.1
April-----	56.6	33.1	44.9	78	20	160	1.21	0.60	1.75	3	0.8
May-----	65.1	39.4	52.2	89	26	379	0.83	0.37	1.23	2	0.2
June-----	72.6	46.9	59.7	94	33	591	0.74	0.29	1.12	2	0.0
July-----	79.7	51.0	65.4	98	36	781	0.37	0.10	0.63	1	0.0
August-----	80.0	50.4	65.2	99	35	776	0.66	0.12	1.15	1	0.0
September---	72.1	41.3	56.7	92	25	500	0.86	0.24	1.36	2	0.0
October-----	59.9	32.8	46.3	81	18	211	1.51	0.44	2.37	4	0.2
November----	43.3	28.6	35.9	61	7	31	3.62	2.07	5.00	9	9.5
December----	35.4	21.9	28.6	51	-10	3	4.44	2.49	6.16	11	24.1
Yearly:											
Average---	57.5	34.9	46.2	---	---	---	---	---	---	---	---
Extreme---	105	-31	---	101	-18	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,492	22.46	17.38	26.39	56	78.5

\*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

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Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Cle Elum, Washington [1504])

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 2	May 16	June 7
2 years in 10 later than--	April 25	May 11	June 2
5 years in 10 later than--	April 10	May 2	May 22
First freezing temperature in fall:			
1 year in 10 earlier than--	September 25	September 10	August 31
2 years in 10 earlier than--	October 1	September 16	September 5
5 years in 10 earlier than--	October 12	September 27	September 13

Table 3.--Growing Season

(Recorded in the period 1961-90 at Cle Elum, Washington [1504])

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	<i>Days</i>	<i>Days</i>	<i>Days</i>
9 years in 10	152	123	91
8 years in 10	163	131	99
5 years in 10	184	147	114
2 years in 10	204	164	129
1 year in 10	215	172	137

## How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the native plants; and the kinds of bedrock. They described and studied the soil profiles, which are the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). The MLRA for each map unit is given in the section "Detailed Soil Map Units." Soil survey areas typically consist of parts of one or more MLRA. This survey area is comprised of parts of MLRA 3 (Olympic and Cascade Mountains) and MLRA 6 (Cascade Mountains, Eastern Slope).

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

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

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

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses. Soil scientists interpret the data from these analyses as well as the field-observed characteristics and the soil properties to

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determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management.

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, roads, and rivers, all of which help in locating boundaries accurately.

This soil survey area was mapped at two levels of intensity. The level of intensity was determined by the level of detail needed for making resource management decisions. The orders of intensity for soil mapping and documentation are discussed in the National Soil Survey Handbook (<http://soils.usda.gov>). The three wilderness areas—Goat Rocks, William O. Douglas, and Norse Peak—were mapped at an Order 3 level of intensity. These wilderness areas require less intensive resource management, and less detailed information is needed for making management decisions. The components in the detailed soil map units of the wilderness areas are identified to the subgroup level of Soil Taxonomy (Soil Survey Staff, 1999). An example is Typic Vitricryands. These map units are identified by two asterisks (\*\*) at the end of the map unit name. The non-wilderness areas were mapped at an Order 2 level of intensity. These areas are managed for timber production and recreational uses, and more detailed information is needed for resource management decisions. The components in the detailed soil map units of the non-wilderness areas are identified to the series level of Soil Taxonomy (Soil Survey Staff, 1999). An example is the Fiscus series. The units mapped at the Order 2 level of intensity extend into the Order 3 wilderness areas to a logical break in the landform or landscape. Thus, the Order 2 and Order 3 map units are interfingered or blended along the boundaries of the wilderness and non-wilderness areas.

# Detailed Soil Map Units

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The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the soil maps, soil properties tables, and interpretative tables, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. The soil properties and interpretative tables are not included in this report. They can be accessed on the Web Soil Survey website at <http://websoilsurvey.nrcs.usda.gov/app/>.

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called similar soils. They are not identified in the map unit descriptions. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called dissimilar minor components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The dissimilar minor components are mentioned in the map unit descriptions.

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

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses. Two asterisks (\*\*) after the map unit name indicates that the unit is in the wilderness areas and was mapped at the Order 3 level of intensity.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. The soils of a given series can differ in texture of the surface layer, slope, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil

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maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Fiscus ashy sandy loam, 25 to 55 percent slopes, is a phase of the Fiscus series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Bearrun-Bograp complex, 3 to 15 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Rock outcrop and Rubble land, 20 to 90 percent slopes, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rubble land is an example.

Each detailed soil map unit is assigned to a major land resource area (MLRA) (USDA Agriculture Handbook 296). The MLRA for each detailed soil map unit is given in this section under the heading "Map Unit Setting." Some map units, such as Rock outcrop, Water, and other miscellaneous areas, may not be assigned to a single MLRA because the unit can occur in any MLRA.

Table 4 gives the acreage and proportionate extent of each map unit. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Kittitas County	Yakima County	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
1	Ainsley gravelly ashy sandy loam, 5 to 30 percent slopes-----	1,137	---	1,137	0.2
2	Ainsley gravelly ashy sandy loam, 30 to 55 percent slopes-----	3,564	---	3,564	0.7
3	Alfic Vitrixerands, 20 to 60 percent slopes**	---	1,213	1,213	0.2
4	Andic Haplocryods, 10 to 30 percent slopes**	---	575	575	0.1
5	Andic Haplocryods, 20 to 60 percent slopes**	---	17,958	17,958	3.4
6	Andic Haplocryods-Rock outcrop-Chutes complex, 45 to 90 percent slopes**-----	---	2,912	2,912	0.6
7	Aquic Haploxererts, 0 to 3 percent slopes----	22	266	288	*
8	Aquic Vitricryands-Cryaquands complex, 1 to 3 percent slopes**-----	133	1,762	1,895	0.4
9	Badland, 5 to 30 percent slopes**-----	303	277	580	0.1
10	Bearrun ashy sandy loam, 15 to 30 percent slopes-----	1,641	340	1,981	0.4
11	Bearrun ashy sandy loam, cold, 30 to 55 percent slopes-----	---	2,551	2,551	0.5
12	Bearrun-Aquic Haploxererts complex, cold, 0 to 30 percent slopes-----	---	385	385	*
13	Bearrun-Bograp complex, 3 to 15 percent slopes-----	1	1,909	1,910	0.4
14	Bertolotti gravelly ashy loamy sand, 30 to 55 percent slopes-----	741	---	741	0.1
15	Bocker-Gidwin complex, 0 to 25 percent slopes	670	90	760	0.1

See footnotes at end of table.

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Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Kittitas County	Yakima County	Total	
				Area	Extent
		<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Pct</i>
16	Bocker-Gidwin-McDanielake complex, 0 to 15 percent slopes-----	1,295	14	1,309	0.3
17	Bocker-Naxing complex, 5 to 25 percent slopes	---	678	678	0.1
18	Bocker-Stemilt complex, 0 to 25 percent slopes-----	7	677	684	0.1
19	Bograp ashy fine sandy loam, 10 to 35 percent slopes-----	176	4,069	4,245	0.8
20	Bograp-McDanielake complex, 15 to 45 percent slopes-----	---	289	289	*
21	Bograp-Singh complex, 30 to 55 percent slopes	1	2,683	2,684	0.5
22	Haplocryolls, 0 to 3 percent slopes-----	1,437	3,762	5,199	1.0
23	Cryosaprists-Cryaquands complex, 0 to 5 percent slopes**-----	---	834	834	0.2
24	Darland very gravelly ashy fine sandy loam, 5 to 15 percent slopes-----	649	9	658	0.1
25	Darland very gravelly ashy fine sandy loam, 30 to 70 percent slopes-----	722	1,167	1,889	0.4
26	Darland-Naxing complex, 15 to 55 percent slopes-----	2,267	3,343	5,610	1.1
27	Fifesridge-Pileup-Fiscus complex, 10 to 30 percent slopes-----	2	10,286	10,288	2.0
28	Fiscus ashy sandy loam, 25 to 55 percent slopes-----	---	2,811	2,811	0.5
29	Fiscus ashy sandy loam, 55 to 70 percent slopes-----	---	454	454	*
30	Fiscus-Pileup-Fifesridge complex, 30 to 55 percent slopes-----	1,201	8,494	9,695	1.9
31	Ghormley-Bearrun complex, 30 to 55 percent slopes-----	---	3,696	3,696	0.7
32	Ghormley-Bearrun-Aquic Haploxererts complex, 0 to 30 percent slopes-----	---	5,575	5,575	1.1
33	Gilpar ashy sandy loam, 5 to 30 percent slopes-----	1,705	586	2,291	0.4
34	Gilpar ashy sandy loam, 30 to 55 percent slopes-----	6,471	317	6,788	1.3
35	Gilpar-Haywire complex, 5 to 30 percent slopes-----	574	---	574	0.1
36	Gilpar-Walupt complex, 25 to 45 percent slopes-----	1,944	1,073	3,017	0.6
37	Icksix gravelly ashy sandy loam, 5 to 30 percent slopes-----	---	3,013	3,013	0.6
38	Icksix gravelly ashy sandy loam, 30 to 55 percent slopes-----	---	4,172	4,172	0.8
39	Icksix gravelly ashy sandy loam, 55 to 80 percent slopes-----	---	1,067	1,067	0.2
41	Icksix gravelly ashy sandy loam, 20 to 80 percent slopes**-----	---	2,244	2,244	0.4
42	Icksix-Rock outcrop-Rubble land complex, 20 to 90 percent slopes**-----	---	3,487	3,487	0.7
43	Jumpe stony ashy loam, 5 to 25 percent slopes	---	79	79	*
44	Jumpe stony ashy loam, 25 to 45 percent south slopes-----	6	102	108	*
45	Jumpe stony ashy loam, 25 to 45 percent north slopes-----	---	114	114	*
46	Jumpe stony ashy loam, 45 to 65 percent north slopes-----	---	8	8	*
47	Kaner gravelly ashy sandy loam, 5 to 30 percent slopes-----	19	712	731	0.1
48	Kaner gravelly ashy sandy loam, 30 to 55 percent slopes-----	1,207	1,503	2,710	0.5

See footnotes at end of table.

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Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Kittitas County	Yakima County	Total	
				Area	Extent
		<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Pct</i>
49	Kaner-Rubble land complex, 40 to 75 percent slopes-----	1,628	7,806	9,434	1.8
50	Keechelus-Bearrun complex, 5 to 30 percent slopes-----	978	---	978	0.2
51	Keechelus-Bearrun complex, 30 to 55 percent slopes-----	2,993	---	2,993	0.6
52	Littlebald medial sandy loam, 0 to 15 percent slopes-----	---	1,196	1,196	0.2
53	Littlebald-Millerpoint complex, 5 to 25 percent slopes-----	---	6,693	6,693	1.3
54	Littlebald-Millerpoint complex, 25 to 40 percent slopes-----	---	2,378	2,378	0.5
55	Loneridge-Stemilt complex, 15 to 45 percent slopes-----	2,716	997	3,713	0.7
56	Loneridge-Stemilt complex, 45 to 65 percent slopes-----	284	599	883	0.2
57	McDanielake ashy sandy loam, 15 to 30 percent slopes-----	392	1,403	1,795	0.3
58	McDanielake ashy sandy loam, 30 to 55 percent slopes-----	3,362	3,369	6,731	1.3
59	McDanielake ashy sandy loam, 5 to 25 percent south slopes-----	646	---	646	0.1
60	McDanielake ashy sandy loam, 25 to 40 percent south slopes-----	1,261	8	1,269	0.2
61	McDanielake-Bearrun-Bograp complex, 10 to 30 percent slopes-----	---	2,088	2,088	0.4
62	McDanielake-Bearrun-Bograp complex, 30 to 55 percent slopes-----	---	1,462	1,462	0.3
63	McDanielake-Bograp complex, 35 to 55 percent slopes-----	1,577	4,311	5,888	1.1
64	McDanielake-Fiscus complex, 15 to 35 percent slopes-----	---	1,180	1,180	0.2
65	McDanielake-Rock outcrop complex, 30 to 55 percent slopes-----	1,828	406	2,234	0.4
66	McDanielake-Rock outcrop complex, 55 to 90 percent slopes-----	187	2,143	2,330	0.4
67	McDanielake-Rock outcrop complex, 30 to 70 percent south slopes-----	2,679	3,396	6,075	1.2
68	McDanielake-Singh complex, 15 to 30 percent slopes-----	---	3,197	3,197	0.6
69	McDanielake-Singh complex, 30 to 55 percent slopes-----	---	7,273	7,273	1.4
70	Millerpoint ashy sandy loam, 5 to 35 percent slopes-----	---	2,571	2,571	0.5
71	Mippon-Xerofluvents complex, 0 to 5 percent slopes-----	401	4,549	4,950	1.0
72	Naxing very gravelly ashy sandy loam, 5 to 25 percent slopes-----	1,219	485	1,704	0.3
73	Naxing very gravelly ashy sandy loam, 25 to 45 percent slopes-----	1,290	1,727	3,017	0.6
74	Naxing very gravelly ashy sandy loam, 45 to 65 percent slopes-----	1,338	5,474	6,812	1.3
75	Naxing-Darland-Cryaquolls complex, 0 to 50 percent slopes-----	---	543	543	0.1
76	Naxing-Snowplow complex, 5 to 25 percent slopes-----	---	2,274	2,274	0.4
77	Naxing-Snowplow complex, 25 to 45 percent slopes-----	---	1,292	1,292	0.2
78	Nile ashy sandy loam, 30 to 55 percent slopes	---	5,055	5,055	1.0
79	Nile ashy sandy loam, 55 to 70 percent slopes	---	1,275	1,275	0.2
80	Nile-Snilec complex, 10 to 30 percent slopes	---	1,290	1,290	0.2

See footnotes at end of table.

Soil Survey of Wenatchee National Forest, Naches Area, Washington

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Kittitas County	Yakima County	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
81	Nile-Snilec complex, 30 to 55 percent slopes	---	463	463	*
82	Nomlas gravelly ashy sandy loam, 10 to 30 percent slopes-----	214	3,373	3,587	0.7
83	Nomlas gravelly ashy sandy loam, 30 to 55 percent slopes-----	---	6,829	6,829	1.3
84	Nomlas gravelly ashy sandy loam, 55 to 90 percent slopes-----	---	519	519	*
85	Osborn ashy sandy loam, 30 to 55 percent slopes-----	1,225	---	1,225	0.2
86	Pachic Argixerolls, 5 to 12 percent slopes---	8	256	264	*
87	Ravensroost ashy sandy loam, 5 to 15 percent slopes-----	---	71	71	*
88	Ravensroost ashy sandy loam, 10 to 30 percent slopes-----	---	661	661	0.1
89	Retep-McDanielake complex, 25 to 55 percent slopes-----	---	2,017	2,017	0.4
90	Rock outcrop and Rubble land, 20 to 90 percent slopes**-----	3,684	25,039	28,723	5.5
91	Rock outcrop-Rubble land-Glaciers complex, 30 to 90 percent slopes-----	---	6,943	6,943	1.3
92	Rock outcrop-Rubble land-Typic Vitricryands complex, 20 to 65 percent slopes**-----	---	8,210	8,210	1.6
93	Rock outcrop-Xeric Vitricryands complex, 45 to 90 percent slopes**-----	---	2,409	2,409	0.5
94	Rock outcrop-Xeric Vitricryands-Lithic Vitricryands complex, 30 to 90 percent slopes-----	---	2,306	2,306	0.4
95	Sapkin very stony loam, 10 to 45 percent slopes-----	126	24	150	*
96	Sapkin very stony loam, 45 to 75 percent slopes-----	10	20	30	*
97	Sapkin-Rubble land complex, 30 to 75 percent slopes-----	52	---	52	*
98	Saydab cobbly ashy loam, 0 to 5 percent slopes-----	---	133	133	*
99	Seeburg ashy loamy sand, 15 to 35 percent slopes-----	---	362	362	*
100	Seeburg-Snilec-Rock outcrop complex, 55 to 70 percent slopes-----	---	1,437	1,437	0.3
101	Singh ashy sandy loam, 5 to 30 percent slopes	---	1,661	1,661	0.3
102	Singh ashy sandy loam, 30 to 55 percent slopes-----	---	5,639	5,639	1.1
103	Singh-Bograp complex, 20 to 35 percent slopes	---	1,929	1,929	0.4
104	Snilec ashy sandy loam, 30 to 55 percent slopes-----	---	1,421	1,421	0.3
105	Snilec-Seeburg complex, 15 to 30 percent slopes-----	---	2,152	2,152	0.4
106	Snilec-Seeburg complex, 30 to 55 percent slopes-----	---	6,544	6,544	1.3
107	Snowplow ashy fine sandy loam, 10 to 30 percent slopes-----	---	984	984	0.2
108	Stemilt ashy sandy loam, 25 to 45 percent slopes-----	500	379	879	0.2
109	Stemilt ashy sandy loam, 45 to 65 percent slopes-----	99	---	99	*
110	Stemilt ashy sandy loam, 20 to 75 percent slopes**-----	---	389	389	*
111	Stemilt-Rock outcrop complex, 25 to 75 percent slopes-----	978	2,614	3,592	0.7
113	Stilgar gravelly ashy sandy loam, 30 to 55 percent slopes-----	3,015	2,063	5,078	1.0

See footnotes at end of table.

Soil Survey of Wenatchee National Forest, Naches Area, Washington

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Kittitas County	Yakima County	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
116	Sutkin stony loam, 25 to 45 percent slopes---	241	2	243	*
117	Sutkin stony loam, 45 to 65 percent slopes---	4	93	97	*
118	Terence gravelly ashy fine sandy loam, 0 to 30 percent slopes-----	443	3,347	3,790	0.7
119	Terence gravelly ashy fine sandy loam, 30 to 50 percent slopes-----	6,122	3,626	9,748	1.9
120	Terence-Spexarth complex, 30 to 55 percent slopes-----	1,565	---	1,565	0.3
121	Terence-Stilgar-Spexarth complex, 30 to 55 percent slopes-----	1,493	---	1,493	0.3
122	Tumac gravelly ashy sandy loam, 30 to 55 percent slopes-----	---	6,177	6,177	1.2
123	Twolakes-Gilpar complex, 45 to 65 percent slopes-----	4,856	2,992	7,848	1.5
124	Twolakes-Walupt complex, 30 to 55 percent slopes-----	1	5,295	5,296	1.0
125	Typic Vitricryands, 90 to 120 percent slopes	---	928	928	0.2
126	Typic Vitricryands, 10 to 30 percent slopes**	---	6,112	6,112	1.2
127	Typic Vitricryands, 5 to 15 percent slopes**	---	2,283	2,283	0.4
128	Typic Vitricryands, 45 to 90 percent slopes**	---	58,406	58,406	11.2
129	Typic Vitricryands-Aquic Vitricryands complex, 0 to 15 percent slopes-----	38	8,142	8,180	1.6
130	Typic Vitricryands-Lithic Vitricryands complex, 20 to 90 percent slopes**-----	---	442	442	*
131	Typic Vitricryands-Lithic Vitricryands-Rock outcrop complex, 10 to 30 percent slopes**---	---	170	170	*
132	Typic Vitricryands-Rock outcrop complex, 10 to 30 percent slopes**-----	---	386	386	*
133	Typic Vitricryands-Rock outcrop-Lithic Vitricryands complex, 45 to 90 percent slopes**-----	---	10,234	10,234	2.0
134	Typic Vitricryands-Rubble land-Rock outcrop complex, 20 to 60 percent slopes**-----	---	21,755	21,755	4.2
135	Walupt-Twolakes-Ravensroost complex, 5 to 30 percent slopes-----	---	4,624	4,624	0.9
136	Weirman gravelly fine sandy loam, 0 to 2 percent slopes-----	---	8	8	*
137	Weirman sandy loam, 0 to 5 percent slopes----	---	9	9	*
138	Xeralfs, 5 to 45 percent slopes-----	---	7,588	7,588	1.5
139	Xeric Vitricryands, 10 to 30 percent slopes**	---	1,863	1,863	0.4
140	Xeric Vitricryands, 20 to 90 percent slopes**	---	19,266	19,266	3.7
141	Xeric Vitricryands-Rock outcrop complex, 20 to 90 percent slopes**-----	---	10,673	10,673	2.0
142	Yakima silt loam, 0 to 2 percent slopes-----	---	9	9	*
143	Water-----	---	3,370	3,370	0.6
144	Andic Dystrocryepts, 30 to 90 percent slopes	761	---	761	0.1
145	Haywire ashy loamy sand, tuff substratum, 30 to 65 percent slopes-----	214	---	214	*
146	Carmack loam, 0 to 25 percent slopes-----	---	325	325	*
147	Carmack cobbly loam, 25 to 50 percent south slopes-----	---	1,827	1,827	0.4
148	Carmack cobbly loam, 50 to 75 percent north slopes-----	---	645	645	0.1
149	Carmack cobbly loam, 25 to 50 percent north slopes-----	---	388	388	*
150	Carmack-Rock outcrop complex, 40 to 70 percent slopes-----	---	504	504	*
	Total-----	78,323	442,332	520,655	100.0

\* Less than 0.1 percent.

\*\* Map unit is in wilderness areas and was mapped at Order 3 level of intensity.

## **1—Ainsley gravelly ashy sandy loam, 5 to 30 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,800 to 5,400 feet  
*Mean annual precipitation:* 50 to 60 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

### **Map Unit Composition**

*Ainsley and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Ainsley**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southwest  
*Aspect (range):* Southeast to northwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite with a mantle of volcanic ash  
*Slope range:* 5 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 7.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

#### **Typical profile**

0 to 10 inches; gravelly ashy sandy loam  
10 to 60 inches; very gravelly clay loam

### **Dissimilar Minor Components**

#### **Keechelus soils**

*Percentage of map unit:* 10 percent

#### **Pileup soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **2—Ainsley gravelly ashy sandy loam, 30 to 55 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,800 to 5,400 feet  
*Mean annual precipitation:* 50 to 60 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

### **Map Unit Composition**

*Ainsley and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Ainsley**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* West  
*Aspect (range):* South to north (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite with a mantle of volcanic ash  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 7.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

#### **Typical profile**

0 to 10 inches; gravelly ashy sandy loam  
10 to 60 inches; very gravelly clay loam

### **Dissimilar Minor Components**

#### **Keechelus soils**

*Percentage of map unit:* 10 percent

#### **Pileup soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

### **3—Alfic Vitrixerands, 20 to 60 percent slopes\*\***

#### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,400 to 5,000 feet  
*Mean annual precipitation:* 40 to 60 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

#### **Map Unit Composition**

*Alfic Vitrixerands and similar soils:* 80 percent  
*Dissimilar minor components:* 20 percent

#### **Characteristics of Alfic Vitrixerands**

##### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to northeast (clockwise)

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

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 20 to 60 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.7 inches)

##### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/vanillaleaf (CWS524)

##### **Typical profile**

0 to 9 inches; ashy loamy sand  
9 to 18 inches; ashy sandy loam  
18 to 21 inches; gravelly loam  
21 to 60 inches; extremely cobbly loam

#### **Dissimilar Minor Components**

##### **McDanielake soils**

*Percentage of map unit:* 10 percent

##### **Rock outcrop**

*Percentage of map unit:* 5 percent

##### **Rubble land**

*Percentage of map unit:* 5 percent

### **Major Uses**

Wildlife habitat and recreation

## **4—Andic Haplocryods, 10 to 30 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,600 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Andic Haplocryods and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Andic Haplocryods**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from andesite or rhyolite

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.2 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 3 inches; ashy loamy sand

3 to 7 inches; ashy sandy loam

7 to 52 inches; very gravelly ashy sandy loam

52 to 60 inches; extremely gravelly loam

### **Dissimilar Minor Components**

#### **Twolakes soils**

*Percentage of map unit:* 10 percent

#### **Kaner soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Wildlife habitat and recreation

## **5—Andic Haplocryods, 20 to 60 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,600 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Andic Haplocryods and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Andic Haplocryods**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* Southwest to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from andesite or rhyolite

*Slope range:* 20 to 60 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.2 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 3 inches; ashy loamy sand

3 to 7 inches; ashy sandy loam

7 to 52 inches; very gravelly ashy sandy loam

52 to 60 inches; extremely gravelly loam

### **Dissimilar Minor Components**

#### **Twolakes soils**

*Percentage of map unit:* 10 percent

#### **Kaner soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Wildlife habitat and recreation

## **6—Andic Haplocryods-Rock outcrop-Chutes complex, 45 to 90 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,600 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Andic Haplocryods and similar soils:* 40 percent

*Rock outcrop:* 25 percent

*Chutes, avalanche:* 20 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Andic Haplocryods**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* North to south (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from andesite or rhyolite

*Slope range:* 45 to 60 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.2 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry  
(CFS556)

#### **Typical profile**

0 to 3 inches; ashy loamy sand

3 to 7 inches; ashy sandy loam

7 to 52 inches; very gravelly ashy sandy loam

52 to 60 inches; extremely gravelly loam

### ***Characteristics of Rock Outcrop***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* North to south (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Characteristics of Chutes, Avalanche***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* North to south (clockwise)

#### **Properties and qualities**

*Description of areas:* Central channellike corridor, scar, or depression along which an avalanche has moved; may be open path in a forest, with bent and broken trees, or eroded surface marked by pits, scratches, and grooves

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Dissimilar Minor Components***

#### **Aquic Vitricryands**

*Percentage of map unit:* 10 percent

#### **Cryaquands**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Wildlife habitat and recreation

## ***7—Aquic Haploxererts, 0 to 3 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Aquic Haploxererts and similar soils:* 90 percent

*Dissimilar minor components:* 10 percent

### **Characteristics of Aquic Haploxererts**

#### **Setting**

*Landform:* Depressions

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Slackwater sediment mixed with bentonite

*Slope range:* 0 to 3 percent

*Depth to restrictive feature:* 2 to 7 inches to abrupt textural change

*Drainage class:* Somewhat poorly drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Very low

*Frequency of flooding:* None

*Frequency of ponding:* Rare (see Water Features table)

*Seasonal high water table (minimum depth):* About 21 to 44 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 9.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Ecological site:* SEMIWET MEADOW 15+ PZ (R006XY602WA)

#### **Typical profile**

0 to 2 inches; ashy sandy loam

2 to 21 inches; clay

21 to 44 inches; clay loam

44 to 60 inches; clay

### **Dissimilar Minor Components**

#### **Bearrun soils**

*Percentage of map unit:* 5 percent

#### **McDanielake soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Wildlife habitat, livestock grazing, and recreation

## **8—Aquic Vitricryands-Cryaquands complex, 1 to 3 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 4,500 to 6,200 feet

*Mean annual precipitation:* 50 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Aquic Vitricryands and similar soils:* 40 percent

*Cryaquands and similar soils:* 40 percent

*Dissimilar minor components:* 20 percent

### **Characteristics of Aquic Vitricryands**

#### **Setting**

*Landform:* Flood plains and depressions

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Volcanic ash and alluvium

*Slope range:* 1 to 3 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Somewhat poorly drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* Occasional (see Water Features table)

*Frequency of ponding:* Occasional (see Water Features table)

*Seasonal high water table (minimum depth):* About 21 to 31 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 7.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6w

*Forestland plant association:* Subalpine fir/dwarf huckleberry (CES422)

#### **Typical profile**

0 to 6 inches; ashy loam

6 to 31 inches; ashy fine sandy loam

31 to 60 inches; gravelly ashy loam

### **Characteristics of Cryaquands**

#### **Setting**

*Landform:* Flood plains and depressions

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Volcanic ash

*Slope range:* 1 to 3 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Very poorly drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* Occasional (see Water Features table)

*Frequency of ponding:* Occasional (see Water Features table)

*Seasonal high water table (minimum depth):* At the soil surface to a depth of 2 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 10.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7c

*Ecological site:* SUBALPINE WET SHRUB MEADOW (R006XY604WA)

**Typical profile**

0 to 6 inches; ashy loam  
6 to 27 inches; ashy fine sandy loam  
27 to 45 inches; ashy sandy loam  
45 to 60 inches; gravelly ashy loamy sand

***Dissimilar Minor Components***

**Typic Vitricryands**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

**Cryosaprists**

*Percentage of map unit:* 5 percent

***Major Uses***

Wildlife habitat and recreation

**9—Badland, 5 to 30 percent slopes\*\***

*Major land resource area (MLRA):* 6

*Map unit composition:* Badland, slumped—100 percent

*Description of areas:* Earthy and geologic landslide material that is devoid of vegetation and has a hummocky appearance

*Land capability classification:* 8

*Major uses:* Wildlife habitat and recreation

**10—Bearrun ashy sandy loam, 15 to 30 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,150 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*Bearrun and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

**Characteristics of Bearrun**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* North to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash

*Slope range:* 15 to 30 percent

*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change

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*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 7 inches; ashy sandy loam  
7 to 22 inches; ashy loam  
22 to 44 inches; clay  
44 to 60 inches; gravelly clay loam

***Dissimilar Minor Components***

**Bograp soils**

*Percentage of map unit:* 10 percent

**McDanielake soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***11—Bearrun ashy sandy loam, cold, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,150 to 4,800 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Bearrun and similar soils:* 80 percent  
*Dissimilar minor components:* 20 percent

***Characteristics of Bearrun***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash  
*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/vanillaleaf (CWS524)

**Typical profile**

0 to 7 inches; ashy sandy loam  
7 to 22 inches; ashy loam  
22 to 44 inches; clay  
44 to 60 inches; gravelly clay loam

***Dissimilar Minor Components***

**Pileup soils**

*Percentage of map unit:* 15 percent

**Badland**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***12—Bearrun-Aquic Haploxererts complex, cold, 0 to 30 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,150 to 4,800 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Bearrun and similar soils:* 60 percent  
*Aquic Haploxererts and similar soils:* 25 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Bearrun***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to northeast (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash

*Slope range:* 3 to 30 percent

*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/vanillaleaf (CWS524)

**Typical profile**

0 to 7 inches; ashy sandy loam

7 to 22 inches; ashy loam

22 to 44 inches; clay

44 to 60 inches; gravelly clay loam

***Characteristics of Aquic Haploxererts***

**Setting**

*Landform:* Depressions

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Slackwater sediment mixed with bentonite

*Slope range:* 0 to 3 percent

*Depth to restrictive feature:* 2 to 7 inches to abrupt textural change

*Drainage class:* Somewhat poorly drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Very low

*Frequency of flooding:* None

*Frequency of ponding:* Rare (see Water Features table)

*Seasonal high water table (minimum depth):* About 21 to 44 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 9.3 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Ecological site:* SEMIWET MEADOW 15+ PZ (R006XY602WA)

**Typical profile**

0 to 2 inches; ashy sandy loam

2 to 21 inches; clay

21 to 44 inches; clay loam

44 to 60 inches; clay

### ***Dissimilar Minor Components***

#### **Pileup soils**

*Percentage of map unit: 5 percent*

#### **Fiscus soils**

*Percentage of map unit: 5 percent*

#### **Badland**

*Percentage of map unit: 5 percent*

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***13—Bearrun-Bograp complex, 3 to 15 percent slopes***

### ***Map Unit Setting***

*Major land resource area (MLRA): 6*

*Elevation: 2,150 to 4,800 feet*

*Mean annual precipitation: 25 to 50 inches*

*Mean annual air temperature: 43 to 45 degrees F*

*Frost-free period: 70 to 100 days*

### ***Map Unit Composition***

*Bearrun and similar soils: 50 percent*

*Bograp and similar soils: 30 percent*

*Dissimilar minor components: 20 percent*

### ***Characteristics of Bearrun***

#### **Setting**

*Landform: Mountain slopes*

*Downslope shape: Linear*

*Across-slope shape: Convex*

*Aspect (range): All aspects*

#### **Properties and qualities**

*Parent material: Colluvium derived from basalt and bentonite with a mantle of volcanic ash*

*Slope range: 3 to 15 percent*

*Depth to restrictive feature: 8 to 23 inches to abrupt textural change*

*Drainage class: Well drained*

*Capacity of the most limiting soil layer to transmit water (Ksat): Moderately low*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Seasonal high water table (minimum depth): More than 72 inches*

*Salinity (maximum): Nonsaline*

*Sodicity (maximum): Nonsodic*

*Available water capacity (entire profile): Moderate (about 6.8 inches)*

#### **Interpretive groups**

*Land capability subclass (nonirrigated): 3e*

*Forestland plant association: Grand fir/Cascade Oregongrape/pinegrass (CWS226)*

#### **Typical profile**

0 to 7 inches; ashy sandy loam

7 to 22 inches; ashy loam

22 to 44 inches; clay  
44 to 60 inches; gravelly clay loam

### **Characteristics of Bograp**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash

*Slope range:* 3 to 15 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 10.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 9 inches; ashy fine sandy loam

9 to 14 inches; fine sandy loam

14 to 47 inches; loam

47 to 60 inches; silty clay loam

### **Dissimilar Minor Components**

#### **McDanielake soils**

*Percentage of map unit:* 10 percent

#### **Ghormley soils**

*Percentage of map unit:* 5 percent

#### **Singh soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **14—Bertolotti gravelly ashy loamy sand, 30 to 55 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,000 to 4,800 feet

*Mean annual precipitation:* 40 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Bertolotti and similar soils:* 90 percent  
*Dissimilar minor components:* 10 percent

### **Characteristics of Bertolotti**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southwest  
*Aspect (range):* Southeast to west (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from rhyolite with a mantle of volcanic ash  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 3.6 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 5 inches; gravelly ashy loamy sand  
5 to 11 inches; very gravelly ashy sandy loam  
11 to 28 inches; very gravelly sandy loam  
28 to 60 inches; extremely gravelly sandy loam

### **Dissimilar Minor Component**

#### **McDanielake soils**

*Percentage of map unit:* 10 percent

#### **Major Uses**

Timber production, recreation, and wildlife habitat

## **15—Bocker-Gidwin complex, 0 to 25 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,100 to 4,200 feet  
*Mean annual precipitation:* 20 to 40 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Bocker and similar soils:* 50 percent  
*Gidwin and similar soils:* 30 percent  
*Dissimilar minor components:* 20 percent

### **Characteristics of Bocker**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Residuum derived from basalt and mixed with loess and a small amount of volcanic ash  
*Slope range:* 0 to 25 percent  
*Depth to restrictive feature:* 6 to 10 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Very low (about 0.5 inch)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7s  
*Ecological site:* VERY SHALLOW 15+ PZ (R006XY301WA)

#### **Typical profile**

0 to 1 inch; extremely gravelly sandy loam  
1 to 8 inches; extremely gravelly loam  
8 to 18 inches; unweathered bedrock

### **Characteristics of Gidwin**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Residuum and colluvium derived from basalt and mixed with loess and a small amount of volcanic ash  
*Slope range:* 0 to 25 percent  
*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Very low (about 1.7 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6s  
*Ecological site:* VERY SHALLOW 15+ PZ (R006XY301WA)

**Typical profile**

0 to 5 inches; gravelly loam  
5 to 12 inches; gravelly loam  
12 to 15 inches; very gravelly clay loam  
15 to 25 inches; unweathered bedrock

***Dissimilar Minor Components***

**McDanielake soils**

*Percentage of map unit:* 10 percent

**Stemilt soils**

*Percentage of map unit:* 10 percent

***Major Uses***

Wildlife habitat and recreation

***16—Bocker-Gidwin-McDanielake complex, 0 to 15 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,100 to 4,200 feet  
*Mean annual precipitation:* 20 to 40 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*Bocker and similar soils:* 35 percent  
*Gidwin and similar soils:* 35 percent  
*McDanielake and similar soils:* 25 percent  
*Dissimilar minor components:* 5 percent

**Characteristics of Bocker**

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Residuum derived from basalt and mixed with loess and a small amount of volcanic ash  
*Slope range:* 0 to 15 percent  
*Depth to restrictive feature:* 6 to 10 inches to lithic bedrock  
*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 0.5 inch)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7s

*Ecological site:* VERY SHALLOW 15+ PZ (R006XY301WA)

#### **Typical profile**

0 to 1 inch; extremely gravelly sandy loam

1 to 8 inches; extremely gravelly loam

8 to 18 inches; unweathered bedrock

### ***Characteristics of Gidwin***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Residuum and colluvium derived from basalt and mixed with loess  
and a small amount of volcanic ash

*Slope range:* 0 to 15 percent

*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 1.7 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Ecological site:* VERY SHALLOW 15+ PZ (R006XY301WA)

#### **Typical profile**

0 to 5 inches; gravelly loam

5 to 12 inches; gravelly loam

12 to 15 inches; very gravelly clay loam

15 to 25 inches; unweathered bedrock

### ***Characteristics of McDanielake***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic  
ash

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Slope range:* 0 to 15 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 3e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

***Dissimilar Minor Component***

**Stemilt soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Wildlife habitat and recreation

***17—Bocker-Naxing complex, 5 to 25 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 4,000 to 6,000 feet

*Mean annual precipitation:* 30 to 40 inches

*Mean annual air temperature:* 39 to 45 degrees F

*Frost-free period:* 30 to 100 days

***Map Unit Composition***

*Bocker and similar soils:* 45 percent

*Naxing and similar soils:* 40 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Bocker soils***

**Setting**

*Landform:* Grass- and shrub-covered mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Residuum derived from basalt and mixed with loess and a small amount of volcanic ash

*Slope range:* 5 to 25 percent

## Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Depth to restrictive feature:* 6 to 10 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Very low (about 0.5 inch)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7s  
*Ecological site:* VERY SHALLOW 15+ PZ (R006XY301WA)

### **Typical profile**

0 to 1 inch; extremely gravelly sandy loam  
1 to 8 inches; extremely gravelly loam  
8 to 18 inches; unweathered bedrock

## ***Characteristics of Naxing***

### **Setting**

*Landform:* Forested mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to south (clockwise)

### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite mixed with volcanic ash  
*Slope range:* 5 to 25 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 3.5 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

### **Typical profile**

0 to 13 inches; very gravelly ashy sandy loam  
13 to 34 inches; very gravelly ashy sandy loam  
34 to 60 inches; extremely cobbly sandy loam

## ***Dissimilar Minor Components***

### **Darland soils**

*Percentage of map unit:* 10 percent

### **Stemilt soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **18—Bocker-Stemilt complex, 0 to 25 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,100 to 5,500 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Bocker and similar soils:* 50 percent

*Stemilt and similar soils:* 35 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Bocker**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* South to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Residuum derived from basalt and mixed with loess and a small amount of volcanic ash

*Slope range:* 0 to 25 percent

*Depth to restrictive feature:* 6 to 10 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 0.5 inch)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7s

*Ecological site:* VERY SHALLOW 15+ PZ (R006XY301WA)

#### **Typical profile**

0 to 1 inch; extremely gravelly sandy loam

1 to 8 inches; extremely gravelly loam

8 to 18 inches; unweathered bedrock

### **Characteristics of Stemilt**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash and loess  
*Slope range:* 0 to 25 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

**Typical profile**

0 to 3 inches; ashy sandy loam  
3 to 15 inches; gravelly ashy sandy loam  
15 to 22 inches; very gravelly loam  
22 to 60 inches; extremely cobbly clay loam

***Dissimilar Minor Components***

**Gidwin soils**

*Percentage of map unit:* 10 percent

**McDanielake soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**19—Bograp ashy fine sandy loam, 10 to 35 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,150 to 4,200 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*Bograp and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Bograp**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash

*Slope range:* 10 to 35 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 10.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 9 inches; ashy fine sandy loam

9 to 14 inches; fine sandy loam

14 to 47 inches; loam

47 to 60 inches; silty clay loam

### **Dissimilar Minor Components**

#### **Bearrun soils**

*Percentage of map unit:* 5 percent

#### **McDanielake soils**

*Percentage of map unit:* 5 percent

#### **Singh soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **20—Bograp-McDanielake complex, 15 to 45 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,150 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Bograp and similar soils:* 45 percent  
*McDanielake and similar soils:* 40 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Bograp**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash  
*Slope range:* 15 to 45 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* High (about 10.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 9 inches; ashy fine sandy loam  
9 to 14 inches; fine sandy loam  
14 to 47 inches; loam  
47 to 60 inches; silty clay loam

### **Characteristics of McDanielake**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash  
*Slope range:* 15 to 45 percent  
*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Bearrun soils**

*Percentage of map unit:* 10 percent

**Singh soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***21—Bograp-Singh complex, 30 to 55 percent slopes***

***Map Unit Setting***

*Major land resource area (MLRA):* 6

*Elevation:* 2,150 to 4,800 feet

*Mean annual precipitation:* 30 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Bograp and similar soils:* 45 percent

*Singh and similar soils:* 40 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Bograp***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* Southwest to southeast (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 10.3 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 9 inches; ashy fine sandy loam

9 to 14 inches; fine sandy loam

14 to 47 inches; loam

47 to 60 inches; silty clay loam

***Characteristics of Singh***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* Southwest to southeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 3 inches; ashy sandy loam

3 to 22 inches; ashy fine sandy loam

22 to 46 inches; very cobbly loam

46 to 60 inches; extremely cobbly loam

***Dissimilar Minor Components***

**McDanielake soils**

*Percentage of map unit:* 10 percent

**Bearrun soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

## **22—Haplocryolls, 0 to 3 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,000 to 5,200 feet  
*Mean annual precipitation:* 35 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 80 days

### **Map Unit Composition**

*Haplocryolls and similar soils:* 80 percent  
*Dissimilar minor components:* 20 percent

### **Characteristics of Haplocryolls**

#### **Setting**

*Landform:* Flood plains  
*Downslope shape:* Concave  
*Across-slope shape:* Concave  
*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Recent alluvium mixed with volcanic ash  
*Slope range:* 0 to 3 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* Occasional (see Water Features table)  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* About 36 to 60 inches (see Water Features table)  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7c  
*Forestland plant association:* Western hemlock/deerfoot vanillaleaf (CHF223)

#### **Typical profile**

0 to 3 inches; ashy sandy loam  
3 to 10 inches; ashy loamy sand  
10 to 24 inches; gravelly loamy sand  
24 to 35 inches; extremely gravelly sandy loam  
35 to 65 inches; gravelly sandy loam

### **Dissimilar Minor Components**

#### **Mippon soils**

*Percentage of map unit:* 10 percent

#### **Xerofluvents**

*Percentage of map unit:* 10 percent

### **Major Uses**

Wildlife habitat and recreation

## **23—Cryosaprists-Cryaquands complex, 0 to 5 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 4,700 to 6,100 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Cryosaprists and similar soils:* 55 percent  
*Cryaquands and similar soils:* 45 percent

### **Characteristics of Cryosaprists**

#### **Setting**

*Landform:* Flood plains and depressions  
*Downslope shape:* Concave  
*Across-slope shape:* Concave  
*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Organic deposits from grasses and sedges  
*Slope range:* 0 to 3 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Very poorly drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* Occasional (see Water Features table)  
*Frequency of ponding:* Occasional (see Water Features table)  
*Seasonal high water table (minimum depth):* At the soil surface to a depth of 3 inches  
(see Water Features table)  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Very high (about 26.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7c  
*Ecological site:* SUBALPINE WET SHRUB MEADOW (R006XY604WA)

#### **Typical profile**

0 to 3 inches; mucky peat  
3 to 14 inches; mucky peat  
14 to 60 inches; muck

### **Characteristics of Cryaquands**

#### **Setting**

*Landform:* Flood plains and depressions  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Volcanic ash  
*Slope range:* 0 to 5 percent

*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Very poorly drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* Occasional (see Water Features table)  
*Frequency of ponding:* Occasional (see Water Features table)  
*Seasonal high water table (minimum depth):* At the soil surface to a depth of 2 inches  
(see Water Features table)  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* High (about 10.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7c  
*Ecological site:* SUBALPINE WET SHRUB MEADOW (R006XY604WA)

**Typical profile**

0 to 6 inches; ashy loam  
6 to 27 inches; ashy fine sandy loam  
27 to 45 inches; ashy sandy loam  
45 to 60 inches; gravelly ashy loamy sand

**Major Uses**

Wildlife habitat and recreation

**24—Darland very gravelly ashy fine sandy loam, 5 to 15 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 4,600 to 6,300 feet  
*Mean annual precipitation:* 25 to 45 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 30 to 60 days

**Map Unit Composition**

*Darland and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

**Characteristics of Darland**

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Colluvium mixed with loess and volcanic ash  
*Slope range:* 5 to 15 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Ecological site:* COOL LOAMY 15+ PZ (R006XY103WA)

#### **Typical profile**

0 to 3 inches; very gravelly ashy fine sandy loam

3 to 8 inches; very gravelly ashy loam

8 to 27 inches; very gravelly loam

27 to 43 inches; very cobbly loam

43 to 60 inches; very cobbly loam

#### ***Dissimilar Minor Components***

#### **Naxing soils**

*Percentage of map unit:* 10 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### ***Major Uses***

Wildlife habitat and recreation

### ***25—Darland very gravelly ashy fine sandy loam, 30 to 70 percent slopes***

#### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 25 to 45 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 30 to 60 days

#### ***Map Unit Composition***

*Darland and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

#### ***Characteristics of Darland***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium mixed with loess and volcanic ash

*Slope range:* 30 to 70 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7s

*Ecological site:* COOL LOAMY 15+ PZ (R006XY103WA)

#### **Typical profile**

0 to 3 inches; very gravelly ashy fine sandy loam

3 to 8 inches; very gravelly ashy loam

8 to 27 inches; very gravelly loam

27 to 43 inches; very cobbly loam

43 to 60 inches; very cobbly loam

### ***Dissimilar Minor Components***

#### **Naxing soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Rubble land**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Wildlife habitat and recreation

## ***26—Darland-Naxing complex, 15 to 55 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 25 to 45 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 30 to 60 days

### ***Map Unit Composition***

*Darland and similar soils:* 45 percent

*Naxing and similar soils:* 40 percent

*Dissimilar minor components:* 15 percent

### ***Characteristics of Darland***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium mixed with loess and volcanic ash

*Slope range:* 15 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Ecological site:* COOL LOAMY 15+ PZ (R006XY103WA)

**Typical profile**

0 to 3 inches; very gravelly ashy fine sandy loam

3 to 8 inches; very gravelly ashy loam

8 to 27 inches; very gravelly loam

27 to 43 inches; very cobbly loam

43 to 60 inches; very cobbly loam

***Characteristics of Naxing***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite mixed with volcanic ash

*Slope range:* 15 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

**Typical profile**

0 to 13 inches; very gravelly ashy sandy loam

13 to 34 inches; very gravelly ashy sandy loam

34 to 60 inches; extremely cobbly sandy loam

### ***Dissimilar Minor Components***

#### **Snowplow soils**

*Percentage of map unit:* 10 percent

#### **Aquic Vitricryands**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***27—Fifesridge-Pileup-Fiscus complex, 10 to 30 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,000 to 5,400 feet

*Mean annual precipitation:* 40 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

### **Map Unit Composition**

*Fifesridge and similar soils:* 30 percent

*Pileup and similar soils:* 25 percent

*Fiscus and similar soils:* 25 percent

*Dissimilar minor components:* 20 percent

### **Characteristics of Fifesridge**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 9.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 7 inches; ashy sandy loam  
7 to 40 inches; loam  
40 to 51 inches; gravelly sandy clay loam  
51 to 60 inches; gravelly loam

***Characteristics of Pileup***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* Northeast to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash  
*Slope range:* 10 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.3 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 3 inches; ashy sandy loam  
3 to 12 inches; gravelly ashy sandy loam  
12 to 21 inches; very cobbly loam  
21 to 60 inches; very cobbly loam

***Characteristics of Fiscus***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* Northwest to northeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 10 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.6 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 14 inches; gravelly ashy sandy loam  
14 to 20 inches; very gravelly ashy sandy loam  
20 to 28 inches; very gravelly ashy sandy loam  
28 to 67 inches; very gravelly fine sandy loam

***Dissimilar Minor Components***

**McDanielake soils**

*Percentage of map unit:* 10 percent

**Singh soils**

*Percentage of map unit:* 10 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***28—Fiscus ashy sandy loam, 25 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,000 to 6,200 feet  
*Mean annual precipitation:* 40 to 60 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

***Map Unit Composition***

*Fiscus and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Fiscus***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 25 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.6 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 14 inches; gravelly ashy sandy loam  
14 to 20 inches; very gravelly ashy sandy loam  
20 to 28 inches; very gravelly ashy sandy loam  
28 to 67 inches; very gravelly fine sandy loam

***Dissimilar Minor Components***

**Pileup soils**

*Percentage of map unit:* 10 percent

**Ainsley soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**29—*Fiscus* ashy sandy loam, 55 to 70 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,000 to 6,200 feet  
*Mean annual precipitation:* 40 to 60 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

***Map Unit Composition***

*Fiscus and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Fiscus***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* Northwest to east (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 55 to 70 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.6 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 14 inches; gravelly ashy sandy loam  
14 to 20 inches; very gravelly ashy sandy loam  
20 to 28 inches; very gravelly ashy sandy loam  
28 to 67 inches; very gravelly fine sandy loam

***Dissimilar Minor Components***

**Pileup soils**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***30—Fiscus-Pileup-Fifesridge complex, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,000 to 5,400 feet  
*Mean annual precipitation:* 40 to 60 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

***Map Unit Composition***

*Fiscus and similar soils:* 35 percent  
*Pileup and similar soils:* 30 percent  
*Fifesridge and similar soils:* 25 percent  
*Dissimilar minor components:* 10 percent

***Characteristics of Fiscus***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches

## Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.6 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

### **Typical profile**

0 to 4 inches; ashy sandy loam

4 to 14 inches; gravelly ashy sandy loam

14 to 20 inches; very gravelly ashy sandy loam

20 to 28 inches; very gravelly ashy sandy loam

28 to 67 inches; very gravelly fine sandy loam

### **Characteristics of Pileup**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.3 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

### **Typical profile**

0 to 3 inches; ashy sandy loam

3 to 12 inches; gravelly ashy sandy loam

12 to 21 inches; very cobbly loam

21 to 60 inches; very cobbly loam

### **Characteristics of Fifesridge**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 9.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 7 inches; ashy sandy loam

7 to 40 inches; loam

40 to 51 inches; gravelly sandy clay loam

51 to 60 inches; gravelly loam

***Dissimilar Minor Components***

**Terence soils**

*Percentage of map unit:* 5 percent

**Twolakes soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***31—Ghormley-Bearrun complex, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Ghormley and similar soils:* 50 percent

*Bearrun and similar soils:* 35 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Ghormley**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* West

*Aspect (range):* Southeast to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a minor amount of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 16 to 25 inches to abrupt textural change

*Drainage class:* Moderately well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Low

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* About 26 to 60 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 2 inches; ashy sandy loam

2 to 12 inches; ashy loam

12 to 20 inches; gravelly loam

20 to 35 inches; gravelly clay

35 to 62 inches; cobbly clay

### **Characteristics of Bearrun**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* West

*Aspect (range):* Southeast to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 7 inches; ashy sandy loam

7 to 22 inches; ashy loam

22 to 44 inches; clay

44 to 60 inches; gravelly clay loam

***Dissimilar Minor Components***

**Badland**

*Percentage of map unit:* 5 percent

**McDanielake soils**

*Percentage of map unit:* 5 percent

**Singh soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***32—Ghormley-Bearrun-Aquic Haploxererts complex, 0 to 30 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Ghormley and similar soils:* 35 percent

*Bearrun and similar soils:* 30 percent

*Aquic Haploxererts and similar soils:* 20 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Ghormley***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northwest

*Aspect (range):* Southwest to northeast (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a minor amount of volcanic ash

## Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Slope range:* 3 to 30 percent

*Depth to restrictive feature:* 16 to 25 inches to abrupt textural change

*Drainage class:* Moderately well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Low

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* About 26 to 60 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 8 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 2 inches; ashy sandy loam

2 to 12 inches; ashy loam

12 to 20 inches; gravelly loam

20 to 35 inches; gravelly clay

35 to 62 inches; cobbly clay

## ***Characteristics of Bearrun***

### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northwest

*Aspect (range):* Southwest to northeast (clockwise)

### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash

*Slope range:* 3 to 30 percent

*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.8 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 7 inches; ashy sandy loam

7 to 22 inches; ashy loam

22 to 44 inches; clay

44 to 60 inches; gravelly clay loam

### ***Characteristics of Aquic Haploxererts***

#### **Setting**

*Landform:* Depressions

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Slackwater sediment mixed with bentonite

*Slope range:* 0 to 3 percent

*Depth to restrictive feature:* 2 to 7 inches to abrupt textural change

*Drainage class:* Somewhat poorly drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Very low

*Frequency of flooding:* None

*Frequency of ponding:* Rare (see Water Features table)

*Seasonal high water table (minimum depth):* About 21 to 44 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 9.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Ecological site:* SEMIWET MEADOW 15+ PZ (R006XY602WA)

#### **Typical profile**

0 to 2 inches; ashy sandy loam

2 to 21 inches; clay

21 to 44 inches; clay loam

44 to 60 inches; clay

### ***Dissimilar Minor Components***

#### **Bograp soils**

*Percentage of map unit:* 10 percent

#### **Badland**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***33—Gilpar ashy sandy loam, 5 to 30 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Gilpar and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Gilpar**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash and colluvium derived from rhyolite or pyroclastic material

*Slope range:* 5 to 30 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 2.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 5 inches; ashy sandy loam

5 to 16 inches; very cobbly ashy sandy loam

16 to 60 inches; extremely gravelly ashy sandy loam

### **Dissimilar Minor Components**

#### **Stilgar soils**

*Percentage of map unit:* 10 percent

#### **Walupt soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **34—Gilpar ashy sandy loam, 30 to 55 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Gilpar and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Gilpar**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* Northwest to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash and colluvium derived from rhyolite or pyroclastic material

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 2.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 5 inches; ashy sandy loam

5 to 16 inches; very cobbly ashy sandy loam

16 to 60 inches; extremely gravelly ashy sandy loam

### **Dissimilar Minor Components**

#### **Stilgar soils**

*Percentage of map unit:* 10 percent

#### **Walupt soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **35—Gilpar-Haywire complex, 5 to 30 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Gilpar and similar soils:* 65 percent

*Haywire and similar soils:* 25 percent

*Dissimilar minor components:* 10 percent

### **Characteristics of Gilpar**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* North to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash and colluvium derived from rhyolite or pyroclastic material

*Slope range:* 5 to 30 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 2.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 5 inches; ashy sandy loam

5 to 16 inches; very cobbly ashy sandy loam

16 to 60 inches; extremely gravelly ashy sandy loam

### **Characteristics of Haywire**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* North to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over residuum and colluvium derived from extrusive igneous rock

*Slope range:* 5 to 30 percent

*Depth to restrictive feature:* 20 to 40 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.6 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Pacific silver fir/rusty menziesia (rustyleaf) (CFS542)

**Typical profile**

0 to 1 inch; ashy sandy loam  
1 to 17 inches; gravelly medial loam  
17 to 25 inches; very cobbly medial loam  
25 to 36 inches; extremely cobbly loam  
36 to 49 inches; unweathered bedrock

***Dissimilar Minor Component***

**Rock outcrop**

*Percentage of map unit:* 10 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**36—Gilpar-Walupt complex, 25 to 45 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,500 to 6,000 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

***Map Unit Composition***

*Gilpar and similar soils:* 45 percent  
*Walupt and similar soils:* 40 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Gilpar***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* North to southwest (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash and colluvium derived from rhyolite or pyroclastic material  
*Slope range:* 25 to 45 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Very low (about 2.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Pacific silver fir/deerfoot vanillaleaf (CFF254)

**Typical profile**

0 to 5 inches; ashy sandy loam  
5 to 16 inches; very cobbly ashy sandy loam  
16 to 60 inches; extremely gravelly ashy sandy loam

***Characteristics of Walupt***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* North to southwest (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 25 to 45 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 6 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Pacific silver fir/blue (big) huckleberry/queencup  
beadlily (CFS233)

**Typical profile**

0 to 5 inches; ashy loamy sand  
5 to 19 inches; ashy sandy loam  
19 to 34 inches; very cobbly loam  
34 to 60 inches; very gravelly loam

***Dissimilar Minor Components***

**Stilgar soils**

*Percentage of map unit:* 10 percent

**Twolakes soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***37—Icksix gravelly ashy sandy loam, 5 to 30 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,500 feet  
*Mean annual precipitation:* 30 to 50 inches

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*Icksix and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

**Characteristics of Icksix**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt and andesite mixed with volcanic ash

*Slope range:* 5 to 30 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 7 inches; gravelly ashy sandy loam

7 to 34 inches; very gravelly ashy sandy loam

34 to 60 inches; extremely cobbly ashy fine sandy loam

**Dissimilar Minor Components**

**Singh soils**

*Percentage of map unit:* 10 percent

**Tumac soils**

*Percentage of map unit:* 5 percent

**Major Uses**

Timber production, recreation, and wildlife habitat

**38—Icksix gravelly ashy sandy loam, 30 to 55 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 30 to 50 inches

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*Icksix and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

**Characteristics of Icksix**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* Northwest to south (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt and andesite mixed with volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 7 inches; gravelly ashy sandy loam

7 to 34 inches; very gravelly ashy sandy loam

34 to 60 inches; extremely cobbly ashy fine sandy loam

**Dissimilar Minor Components**

**Terence soils**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

**Major Uses**

Timber production, recreation, and wildlife habitat

**39—Icksix gravelly ashy sandy loam, 55 to 80 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 30 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Icksix and similar soils:* 80 percent

*Dissimilar minor components:* 20 percent

### **Characteristics of Icksix**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* West to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and andesite mixed with volcanic ash

*Slope range:* 55 to 80 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 7 inches; gravelly ashy sandy loam

7 to 34 inches; very gravelly ashy sandy loam

34 to 60 inches; extremely cobbly ashy fine sandy loam

### **Dissimilar Minor Components**

#### **Terence soils**

*Percentage of map unit:* 10 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Rubble land**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **41—Icksix gravelly ashy sandy loam, 20 to 80 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 30 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Icksix and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Icksix**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and andesite mixed with volcanic ash  
*Slope range:* 20 to 80 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 7 inches; gravelly ashy sandy loam  
7 to 34 inches; very gravelly ashy sandy loam  
34 to 60 inches; extremely cobbly ashy fine sandy loam

### **Dissimilar Minor Components**

#### **Rock outcrop**

*Percentage of map unit:* 10 percent

#### **Terence soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **42—Icksix-Rock outcrop-Rubble land complex, 20 to 90 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 30 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Icksix and similar soils:* 35 percent  
*Rock outcrop:* 30 percent  
*Rubble land:* 30 percent  
*Dissimilar minor components:* 5 percent

### **Characteristics of Icksix**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and andesite mixed with volcanic ash  
*Slope range:* 20 to 80 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 7 inches; gravelly ashy sandy loam  
7 to 34 inches; very gravelly ashy sandy loam  
34 to 60 inches; extremely cobbly ashy fine sandy loam

### **Characteristics of Rock Outcrop**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to southwest (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Characteristics of Rubble Land***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to southwest (clockwise)

#### **Properties and qualities**

*Description of areas:* Colluvial areas of gravel, cobbles, stones, and boulders; voids between fragments contain little if any soil material; typically underlain by bedrock at a depth of more than 40 inches

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Dissimilar Minor Component***

#### **Terence soils**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***43—Jumpe stony ashy loam, 5 to 25 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,800 to 5,800 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Jumpe and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Jumpe**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

#### **Properties and qualities**

*Parent material:* Residuum and colluvium derived from basalt and a minor amount of loess and volcanic ash

*Slope range:* 5 to 25 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6s  
*Forestland plant association:* Grand fir/pinegrass (CWG124)

**Typical profile**

0 to 3 inches; stony ashy loam  
3 to 19 inches; extremely cobbly ashy loam  
19 to 41 inches; extremely cobbly loam  
41 to 60 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Bocker soils**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***44—Jumpe stony ashy loam, 25 to 45 percent south slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,800 to 5,800 feet  
*Mean annual precipitation:* 20 to 40 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Jumpe and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Jumpe***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to south (clockwise)

**Properties and qualities**

*Parent material:* Residuum and colluvium derived from basalt and a minor amount of loess and volcanic ash  
*Slope range:* 25 to 45 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7s  
*Forestland plant association:* Grand fir/pinegrass (CWG124)

**Typical profile**

0 to 3 inches; stony ashy loam  
3 to 19 inches; extremely cobbly ashy loam  
19 to 41 inches; extremely cobbly loam  
41 to 60 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Sapkin soils**

*Percentage of map unit:* 10 percent

**Bocker soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***45—Jumpe stony ashy loam, 25 to 45 percent north slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,800 to 5,800 feet  
*Mean annual precipitation:* 20 to 40 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Jumpe and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Jumpe***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

**Properties and qualities**

*Parent material:* Residuum and colluvium derived from basalt and a minor amount of loess and volcanic ash  
*Slope range:* 25 to 45 percent  
*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Grand fir/pinegrass (CWG124)

**Typical profile**

0 to 3 inches; stony ashy loam  
3 to 19 inches; extremely cobbly ashy loam  
19 to 41 inches; extremely cobbly loam  
41 to 60 inches; extremely cobbly loam

***Dissimilar Minor Component***

**Rock outcrop**

*Percentage of map unit:* 15 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**46—Jumpe stony ashy loam, 45 to 65 percent north slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,800 to 5,800 feet  
*Mean annual precipitation:* 20 to 40 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Jumpe and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Jumpe***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

**Properties and qualities**

*Parent material:* Residuum and colluvium derived from basalt and a minor amount of loess and volcanic ash  
*Slope range:* 45 to 65 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7s  
*Forestland plant association:* Grand fir/pinegrass (CWG124)

**Typical profile**

0 to 3 inches; stony ashy loam  
3 to 19 inches; extremely cobbly ashy loam  
19 to 41 inches; extremely cobbly loam  
41 to 60 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Rock outcrop**

*Percentage of map unit:* 10 percent

**Rubble land**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***47—Kaner gravelly ashy sandy loam, 5 to 30 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 4,400 to 6,500 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Kaner and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

**Characteristics of Kaner**

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash and colluvium derived from granite or rhyolite  
*Slope range:* 5 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Mountain hemlock/rusty menziesia-blue (big)  
huckleberry (CMS257)

**Typical profile**

0 to 11 inches; gravelly ashy sandy loam  
11 to 37 inches; extremely gravelly ashy loam  
37 to 60 inches; extremely gravelly loam

***Dissimilar Minor Components***

**Rock outcrop**

*Percentage of map unit:* 10 percent

**Rubble land**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***48—Kaner gravelly ashy sandy loam, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 4,400 to 6,500 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Kaner and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

**Characteristics of Kaner**

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* Northeast to west (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash and colluvium derived from granite or rhyolite  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Mountain hemlock/rusty menziesia-blue (big)  
huckleberry (CMS257)

**Typical profile**

0 to 11 inches; gravelly ashy sandy loam  
11 to 37 inches; extremely gravelly ashy loam  
37 to 60 inches; extremely gravelly loam

***Dissimilar Minor Component***

**Rock outcrop**

*Percentage of map unit:* 15 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***49—Kaner-Rubble land complex, 40 to 75 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 4,400 to 6,500 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

***Map Unit Composition***

*Kaner and similar soils:* 55 percent  
*Rubble land:* 30 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Kaner***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* East  
*Aspect (range):* North to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash and colluvium derived from granite or rhyolite  
*Slope range:* 40 to 75 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Mountain hemlock/rusty menziesia-blue (big)  
huckleberry (CMS257)

**Typical profile**

0 to 11 inches; gravelly ashy sandy loam  
11 to 37 inches; extremely gravelly ashy loam  
37 to 60 inches; extremely gravelly loam

***Characteristics of Rubble Land***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* East  
*Aspect (range):* North to south (clockwise)

**Properties and qualities**

*Description of areas:* Colluvial areas of gravel, cobbles, stones, and boulders; voids between fragments contain little if any soil material; typically underlain by bedrock at a depth of more than 40 inches

**Interpretive groups**

*Land capability subclass:* 8

***Dissimilar Minor Component***

**Rock outcrop**

*Percentage of map unit:* 15 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***50—Keechelus-Bearrun complex, 5 to 30 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 5,400 feet  
*Mean annual precipitation:* 35 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Keechelus and similar soils:* 45 percent  
*Bearrun and similar soils:* 40 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Keechelus***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear

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*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to west (clockwise)

### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite mixed with clay deposits with an influence of volcanic ash  
*Slope range:* 5 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.6 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6s  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 5 inches; cobbly ashy sandy loam  
5 to 9 inches; cobbly loam  
9 to 38 inches; very cobbly clay  
38 to 60 inches; gravelly clay

## ***Characteristics of Bearrun Soil***

### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to west (clockwise)

### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash  
*Slope range:* 5 to 30 percent  
*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.8 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 7 inches; ashy sandy loam  
7 to 22 inches; ashy loam

22 to 44 inches; clay  
44 to 60 inches; gravelly clay loam

***Dissimilar Minor Components***

**Bograp soils**

*Percentage of map unit:* 5 percent

**Ghormley soils**

*Percentage of map unit:* 5 percent

**McDanielake soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***51—Keechelus-Bearrun complex, 30 to 55 percent slopes***

***Map Unit Setting***

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 5,400 feet  
*Mean annual precipitation:* 35 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Keechelus and similar soils:* 50 percent  
*Bearrun and similar soils:* 35 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Keechelus***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite mixed with clay deposits with an influence of volcanic ash  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.6 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7s  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 5 inches; cobbly ashy sandy loam  
5 to 9 inches; cobbly loam  
9 to 38 inches; very cobbly clay  
38 to 60 inches; gravelly clay

***Characteristics of Bearrun***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 7 inches; ashy sandy loam  
7 to 22 inches; ashy loam  
22 to 44 inches; clay  
44 to 60 inches; gravelly clay loam

***Dissimilar Minor Components***

**McDanielake soils**

*Percentage of map unit:* 10 percent

**Ghormley soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***52—Littlebald medial sandy loam, 0 to 15 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 4,600 to 6,300 feet  
*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Littlebald and similar soils:* 90 percent  
*Dissimilar minor components:* 10 percent

### **Characteristics of Littlebald Soil**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Volcanic ash over weathered tuff  
*Slope range:* 0 to 15 percent  
*Depth to restrictive feature:* 40 to 60 inches to paralithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Mountain hemlock/beargrass-low huckleberry (CMF131)

#### **Typical profile**

0 to 10 inches; medial sandy loam  
10 to 33 inches; medial sandy loam  
33 to 46 inches; gravelly medial sandy loam  
46 to 60 inches; weathered bedrock

### **Dissimilar Minor Component**

#### **Millerpoint soils**

*Percentage of map unit:* 10 percent

#### **Major Uses**

Timber production, recreation, and wildlife habitat

## **53—Littlebald-Millerpoint complex, 5 to 25 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 4,600 to 6,300 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Littlebald and similar soils:* 50 percent  
*Millerpoint and similar soils:* 45 percent  
*Dissimilar minor components:* 5 percent

### **Characteristics of Littlebald**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* Northwest to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over weathered tuff  
*Slope range:* 5 to 25 percent  
*Depth to restrictive feature:* 40 to 60 inches to paralithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Mountain hemlock/beargrass-low huckleberry (CMF131)

#### **Typical profile**

0 to 10 inches; medial sandy loam  
10 to 33 inches; medial sandy loam  
33 to 46 inches; gravelly medial sandy loam  
46 to 60 inches; weathered bedrock

### **Characteristics of Millerpoint**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* Northwest to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from andesite  
*Slope range:* 5 to 25 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Mountain hemlock/beargrass-low huckleberry (CMF131)

**Typical profile**

0 to 13 inches; ashy sandy loam

13 to 41 inches; gravelly ashy fine sandy loam

41 to 60 inches; fine sandy loam

***Dissimilar Minor Component***

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***54—Littlebald-Millerpoint complex, 25 to 40 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

***Map Unit Composition***

*Littlebald and similar soils:* 45 percent

*Millerpoint and similar soils:* 40 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Littlebald***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* Northwest to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over weathered tuff

*Slope range:* 25 to 40 percent

*Depth to restrictive feature:* 40 to 60 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Mountain hemlock/beargrass-low huckleberry  
(CMF131)

**Typical profile**

0 to 10 inches; medial sandy loam

10 to 33 inches; medial sandy loam

33 to 46 inches; gravelly medial sandy loam

46 to 60 inches; weathered bedrock

***Characteristics of Millerpoint***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* Northwest to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from andesite

*Slope range:* 25 to 40 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Mountain hemlock/beargrass-low huckleberry  
(CMF131)

**Typical profile**

0 to 13 inches; ashy sandy loam

13 to 41 inches; gravelly ashy fine sandy loam

41 to 60 inches; fine sandy loam

***Dissimilar Minor Components***

**Rock outcrop**

*Percentage of map unit:* 10 percent

**Cryosaprists**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

## **55—Loneridge-Stemilt complex, 15 to 45 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,100 to 5,500 feet  
*Mean annual precipitation:* 20 to 40 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Loneridge and similar soils:* 50 percent  
*Stemilt and similar soils:* 35 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Loneridge**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite with a mantle of volcanic ash  
*Slope range:* 15 to 45 percent  
*Depth to restrictive feature:* 12 to 24 inches to abrupt textural change  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Grand fir/pinegrass (CWG124)

#### **Typical profile**

0 to 5 inches; gravelly ashy sandy loam  
5 to 10 inches; gravelly ashy sandy loam  
10 to 19 inches; very cobbly ashy loam  
19 to 27 inches; very cobbly clay  
27 to 60 inches; very cobbly clay loam

### **Characteristics of Stemilt**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash and loess

*Slope range:* 15 to 45 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

**Typical profile**

0 to 3 inches; ashy sandy loam

3 to 15 inches; gravelly ashy sandy loam

15 to 22 inches; very gravelly loam

22 to 60 inches; extremely cobbly clay loam

***Dissimilar Minor Components***

**McDanielake soils**

*Percentage of map unit:* 10 percent

**Bograp soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**56—Loneridge-Stemilt complex, 45 to 65 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,100 to 5,500 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Loneridge and similar soils:* 50 percent

*Stemilt and similar soils:* 40 percent

*Dissimilar minor components:* 10 percent

***Characteristics of Loneridge***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Aspect (representative):* Southeast

*Aspect (range):* East to south (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 45 to 65 percent

*Depth to restrictive feature:* 12 to 24 inches to abrupt textural change

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/pinegrass (CWG124)

**Typical profile**

0 to 5 inches; gravelly ashy sandy loam

5 to 10 inches; gravelly ashy sandy loam

10 to 19 inches; very cobbly ashy loam

19 to 27 inches; very cobbly clay

27 to 60 inches; very cobbly clay loam

**Characteristics of Stemilt**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* East to south (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash and loess

*Slope range:* 45 to 65 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

**Typical profile**

0 to 3 inches; ashy sandy loam  
3 to 15 inches; gravelly ashy sandy loam  
15 to 22 inches; very gravelly loam  
22 to 60 inches; extremely cobbly clay loam

***Dissimilar Minor Component***

**McDanielake soils**

*Percentage of map unit:* 10 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**57—McDanielake ashy sandy loam, 15 to 30 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,800 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*McDanielake and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of McDanielake***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* East  
*Aspect (range):* Northwest to south (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash  
*Slope range:* 15 to 30 percent  
*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 11 inches; gravelly ashy sandy loam  
11 to 41 inches; extremely cobbly loam  
41 to 61 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Bograp soils**

*Percentage of map unit:* 5 percent

**Stemilt soils**

*Percentage of map unit:* 5 percent

**Singh soils**

*Percentage of map unit:* 3 percent

**Retep soils**

*Percentage of map unit:* 2 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***58—McDanielake ashy sandy loam, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,800 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*McDanielake and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of McDanielake***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* Northeast to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Stemilt soils**

*Percentage of map unit:* 10 percent

**Singh soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**59—McDanielake ashy sandy loam, 5 to 25 percent south slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*McDanielake and similar soils:* 80 percent

*Dissimilar minor components:* 20 percent

**Characteristics of McDanielake**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* North to south (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 5 to 25 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Douglas-fir/common snowberry/pinegrass (CDS638)

**Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 11 inches; gravelly ashy sandy loam  
11 to 41 inches; extremely cobbly loam  
41 to 61 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Bograp soils**

*Percentage of map unit:* 10 percent

**Singh soils**

*Percentage of map unit:* 5 percent

**Stemilt soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**60—McDanielake ashy sandy loam, 25 to 40 percent  
south slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,800 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*McDanielake and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of McDanielake***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Slope range:* 25 to 40 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Douglas-fir/common snowberry/pinegrass (CDS638)

**Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Stemilt soils**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***61—McDanielake-Bearrun-Bograp complex, 10 to 30 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*McDanielake and similar soils:* 35 percent

*Bearrun and similar soils:* 30 percent

*Bograp and similar soils:* 25 percent

*Dissimilar minor components:* 10 percent

***Characteristics of McDanielake***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

## Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

## **Characteristics of Bearrun**

### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.8 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 7 inches; ashy sandy loam

7 to 22 inches; ashy loam

22 to 44 inches; clay  
44 to 60 inches; gravelly clay loam

### ***Characteristics of Bograp***

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to south (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash  
*Slope range:* 10 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* High (about 10.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 9 inches; ashy fine sandy loam  
9 to 14 inches; fine sandy loam  
14 to 47 inches; loam  
47 to 60 inches; silty clay loam

### ***Dissimilar Minor Components***

#### **Pileup soils**

*Percentage of map unit:* 5 percent

#### **Singh soils**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***62—McDanielake-Bearrun-Bograp complex, 30 to 55 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,800 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*McDanielake and similar soils:* 35 percent

*Bearrun and similar soils:* 30 percent

*Bograp and similar soils:* 25 percent

*Dissimilar minor components:* 10 percent

### **Characteristics of McDanielake**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southwest

*Aspect (range):* East to northwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

### **Characteristics of Bearrun**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southwest

*Aspect (range):* East to northwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 8 to 23 inches to abrupt textural change

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low

*Frequency of flooding:* None

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*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.8 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 7 inches; ashy sandy loam  
7 to 22 inches; ashy loam  
22 to 44 inches; clay  
44 to 60 inches; gravelly clay loam

## ***Characteristics of Bograp***

### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southwest  
*Aspect (range):* East to northwest (clockwise)

### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* High (about 10.3 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 9 inches; ashy fine sandy loam  
9 to 14 inches; fine sandy loam  
14 to 47 inches; loam  
47 to 60 inches; silty clay loam

## ***Dissimilar Minor Components***

### **Aquic Vitricryands**

*Percentage of map unit:* 5 percent

### **Singh soils**

*Percentage of map unit:* 5 percent

## ***Major Uses***

Timber production, recreation, and wildlife habitat

## **63—McDanielake-Bograp complex, 35 to 55 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,800 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*McDanielake and similar soils:* 50 percent  
*Bograp and similar soils:* 35 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of McDanielake**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* Southeast to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash  
*Slope range:* 35 to 55 percent  
*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 11 inches; gravelly ashy sandy loam  
11 to 41 inches; extremely cobbly loam  
41 to 61 inches; extremely cobbly loam

### **Characteristics of Bograp**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Southeast to southwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash

*Slope range:* 35 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 10.3 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 9 inches; ashy fine sandy loam

9 to 14 inches; fine sandy loam

14 to 47 inches; loam

47 to 60 inches; silty clay loam

***Dissimilar Minor Components***

**Bearrun soils**

*Percentage of map unit:* 5 percent

**Pileup soils**

*Percentage of map unit:* 5 percent

**Stemilt soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***64—McDanielake-Fiscus complex, 15 to 35 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 41 to 45 degrees F

*Frost-free period:* 40 to 100 days

**Map Unit Composition**

*McDanielake and similar soils:* 45 percent

*Fiscus and similar soils:* 40 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of McDanielake**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to northwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 15 to 35 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

### **Characteristics of Fiscus**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* Southwest to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 15 to 35 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.6 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 4 inches; ashy sandy loam

4 to 14 inches; gravelly ashy sandy loam

14 to 20 inches; very gravelly ashy sandy loam

20 to 28 inches; very gravelly ashy sandy loam

28 to 67 inches; very gravelly fine sandy loam

***Dissimilar Minor Components***

**Pileup soils**

*Percentage of map unit:* 10 percent

**Bograp soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**65—McDanielake-Rock outcrop complex, 30 to 55 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*McDanielake and similar soils:* 50 percent

*Rock outcrop:* 40 percent

*Dissimilar minor components:* 10 percent

**Characteristics of McDanielake**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 11 inches; gravelly ashy sandy loam  
11 to 41 inches; extremely cobbly loam  
41 to 61 inches; extremely cobbly loam

***Characteristics of Rock Outcrop***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (range):* All aspects

**Properties and qualities**

*Description of areas:* Exposures of bare bedrock

**Interpretive groups**

*Land capability subclass:* 8

***Dissimilar Minor Components***

**Rubble land**

*Percentage of map unit:* 5 percent

**Stemilt soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***66—McDanielake-Rock outcrop complex, 55 to 90 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,800 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*McDanielake and similar soils:* 50 percent  
*Rock outcrop:* 35 percent  
*Dissimilar minor components:* 15 percent

### ***Characteristics of McDanielake***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* Southwest to east (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 55 to 70 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

### ***Characteristics of Rock Outcrop***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* Southwest to east (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Dissimilar Minor Components***

#### **Rubble land**

*Percentage of map unit:* 10 percent

#### **Stemilt soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **67—McDanielake-Rock outcrop complex, 30 to 70 percent south slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*McDanielake and similar soils:* 45 percent

*Rock outcrop:* 35 percent

*Dissimilar minor components:* 20 percent

### **Characteristics of McDanielake**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 30 to 70 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Douglas-fir/common snowberry/pinegrass (CDS638)

#### **Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

### ***Characteristics of Rock Outcrop***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Dissimilar Minor Components***

#### **Rubble land**

*Percentage of map unit:* 10 percent

#### **Stemilt soils**

*Percentage of map unit:* 10 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***68—McDanielake-Singh complex, 15 to 30 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*McDanielake and similar soils:* 50 percent

*Singh and similar soils:* 35 percent

*Dissimilar minor components:* 15 percent

### ***Characteristics of McDanielake***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 15 to 30 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

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*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 11 inches; gravelly ashy sandy loam  
11 to 41 inches; extremely cobbly loam  
41 to 61 inches; extremely cobbly loam

## **Characteristics of Singh**

### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to south (clockwise)

### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 15 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.4 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

### **Typical profile**

0 to 3 inches; ashy sandy loam  
3 to 22 inches; ashy fine sandy loam  
22 to 46 inches; very cobbly loam  
46 to 60 inches; extremely cobbly loam

## **Dissimilar Minor Components**

### **Bearrun soils**

*Percentage of map unit:* 10 percent

**Bograp soils**

*Percentage of map unit:* 5 percent

**Major Uses**

Timber production, recreation, and wildlife habitat

**69—McDanielake-Singh complex, 30 to 55 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Map Unit Composition**

*McDanielake and similar soils:* 50 percent

*Singh and similar soils:* 40 percent

*Dissimilar minor components:* 10 percent

**Characteristics of McDanielake**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* North to southwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

### **Characteristics of Singh**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* North to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 3 inches; ashy sandy loam

3 to 22 inches; ashy fine sandy loam

22 to 46 inches; very cobbly loam

46 to 60 inches; extremely cobbly loam

### **Dissimilar Minor Component**

#### **Bearrun soils**

*Percentage of map unit:* 10 percent

#### **Major Uses**

Timber production, recreation, and wildlife habitat

## **70—Millerpoint ashy sandy loam, 5 to 35 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Millerpoint and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### ***Characteristics of Millerpoint***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from andesite

*Slope range:* 5 to 35 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Mountain hemlock/beargrass-low huckleberry  
(CMF131)

#### **Typical profile**

0 to 13 inches; ashy sandy loam

13 to 41 inches; gravelly ashy fine sandy loam

41 to 60 inches; fine sandy loam

### ***Dissimilar Minor Components***

#### **Nomlas soils**

*Percentage of map unit:* 10 percent

#### **Aquic Vitricryands**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***71—Mippon-Xerofluvents complex, 0 to 5 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,150 to 2,900 feet

*Mean annual precipitation:* 20 to 30 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Mippon and similar soils:* 55 percent

*Xerofluvents and similar soils:* 35 percent

*Dissimilar minor components:* 10 percent

### **Characteristics of Mippon**

#### **Setting**

*Landform:* Flood plains

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Recent alluvium

*Slope range:* 0 to 5 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Moderately well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* Frequent (see Water Features table)

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* About 42 to 60 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 1.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

#### **Typical profile**

0 to 4 inches; very cobbly ashy sandy loam

4 to 23 inches; very cobbly loamy sand

23 to 60 inches; extremely cobbly coarse sand

### **Characteristics of Xerofluvents**

#### **Setting**

*Landform:* Flood plains

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Recent alluvium

*Slope range:* 0 to 5 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Moderately well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* Frequent (see Water Features table)

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* About 23 to 38 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 1.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6w

*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

**Typical profile**

0 to 1 inch; gravelly loam

1 to 5 inches; very gravelly sand

5 to 60 inches; extremely cobbly coarse sand

***Dissimilar Minor Component***

**Loneridge soils**

*Percentage of map unit:* 10 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***72—Naxing very gravelly ashy sandy loam, 5 to 25 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 40 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

***Map Unit Composition***

*Naxing and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Naxing***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* North to southeast (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite mixed with volcanic ash

*Slope range:* 5 to 25 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

**Typical profile**

0 to 13 inches; very gravelly ashy sandy loam

13 to 34 inches; very gravelly ashy sandy loam

34 to 60 inches; extremely cobbly sandy loam

***Dissimilar Minor Components***

**Saydab soils**

*Percentage of map unit:* 10 percent

**Aquic Vitricryands**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***73—Naxing very gravelly ashy sandy loam, 25 to 45 percent slopes***

***Map Unit Setting***

*Major land resource area (MLRA):* 6

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 40 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

***Map Unit Composition***

*Naxing and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Naxing***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* Northwest to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite mixed with volcanic ash

*Slope range:* 25 to 45 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

**Typical profile**

0 to 13 inches; very gravelly ashy sandy loam  
13 to 34 inches; very gravelly ashy sandy loam  
34 to 60 inches; extremely cobbly sandy loam

***Dissimilar Minor Components***

**Fiscus soils**

*Percentage of map unit:* 5 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

**Snowplow soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***74—Naxing very gravelly ashy sandy loam, 45 to 65 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 4,600 to 6,300 feet  
*Mean annual precipitation:* 40 to 55 inches  
*Mean annual air temperature:* 39 to 43 degrees F  
*Frost-free period:* 30 to 60 days

***Map Unit Composition***

*Naxing and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Naxing***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northwest  
*Aspect (range):* Southwest to north (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite mixed with volcanic ash  
*Slope range:* 45 to 65 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Very low (about 1.6 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated): 7e*

*Forestland plant association: Subalpine fir/grouse blueberry (huckleberry) (CES426)*

**Typical profile**

0 to 13 inches; very gravelly ashy sandy loam

13 to 34 inches; very gravelly ashy sandy loam

34 to 60 inches; extremely cobbly sandy loam

***Dissimilar Minor Components***

**Fiscus soils**

*Percentage of map unit: 5 percent*

**Snowplow soils**

*Percentage of map unit: 5 percent*

**Rock outcrop**

*Percentage of map unit: 3 percent*

**Rubble land**

*Percentage of map unit: 2 percent*

***Major Uses***

Timber production, recreation, and wildlife habitat

***75—Naxing-Darland-Cryaquolls complex, 0 to 50 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA): 6*

*Elevation: 4,600 to 6,300 feet*

*Mean annual precipitation: 40 to 55 inches*

*Mean annual air temperature: 39 to 43 degrees F*

*Frost-free period: 30 to 60 days*

***Map Unit Composition***

*Naxing and similar soils: 35 percent*

*Darland and similar soils: 30 percent*

*Cryaquolls and similar soils: 25 percent*

*Dissimilar minor components: 10 percent*

***Characteristics of Naxing***

**Setting**

*Landform: Mountain slopes*

*Downslope shape: Linear*

*Across-slope shape: Convex*

*Aspect (representative): Southeast*

*Aspect (range): Northeast to southwest (clockwise)*

**Properties and qualities**

*Parent material: Colluvium and residuum derived from basalt or andesite mixed with volcanic ash*

*Slope range: 3 to 50 percent*

*Depth to restrictive feature: None within a depth of 60 inches*

*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 3.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

**Typical profile**

0 to 13 inches; very gravelly ashy sandy loam  
13 to 34 inches; very gravelly ashy sandy loam  
34 to 60 inches; extremely cobbly sandy loam

**Characteristics of Darland**

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium mixed with loess and volcanic ash  
*Slope range:* 3 to 50 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6s  
*Ecological site:* COOL LOAMY 15+ PZ (R006XY103WA)

**Typical profile**

0 to 3 inches; very gravelly ashy fine sandy loam  
3 to 8 inches; very gravelly ashy loam  
8 to 27 inches; very gravelly loam  
27 to 43 inches; very cobbly loam  
43 to 60 inches; very cobbly loam

**Characteristics of Cryaquolls**

**Setting**

*Landform:* Depressions of mountain slopes  
*Downslope shape:* Concave, linear  
*Across-slope shape:* Concave, convex  
*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Lacustrine sediment mixed with a minor amount of volcanic ash

*Slope range:* 0 to 3 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Very poorly drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* Occasional (see Water Features table)

*Frequency of ponding:* Frequent (see Water Features table)

*Seasonal high water table (minimum depth):* At the soil surface to a depth of 4 inches  
(see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 11.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7c

*Ecological site:* SUBALPINE WET SHRUB MEADOW (R006XY604WA)

**Typical profile**

0 to 4 inches; ashy loam

4 to 17 inches; ashy loam

17 to 35 inches; clay loam

35 to 60 inches; clay loam

***Dissimilar Minor Component***

**Fiscus soils**

*Percentage of map unit:* 10 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***76—Naxing-Snowplow complex, 5 to 25 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 40 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

***Map Unit Composition***

*Naxing and similar soils:* 50 percent

*Snowplow and similar soils:* 35 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Naxing***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite mixed with volcanic ash

*Slope range:* 5 to 25 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

**Typical profile**

0 to 13 inches; very gravelly ashy sandy loam

13 to 34 inches; very gravelly ashy sandy loam

34 to 60 inches; extremely cobbly sandy loam

**Characteristics of Snowplow**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or basalt

*Slope range:* 5 to 25 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 7.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

**Typical profile**

0 to 10 inches; ashy fine sandy loam

10 to 22 inches; ashy fine sandy loam

22 to 44 inches; very gravelly ashy fine sandy loam

44 to 60 inches; very gravelly loam

### ***Dissimilar Minor Components***

#### **Fiscus soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Rubble land**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***77—Naxing-Snowplow complex, 25 to 45 percent slopes***

### ***Map Unit Setting***

*Major land resource area (MLRA):* 6

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 40 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

### ***Map Unit Composition***

*Naxing and similar soils:* 50 percent

*Snowplow and similar soils:* 35 percent

*Dissimilar minor components:* 15 percent

### ***Characteristics of Naxing***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt or andesite mixed with volcanic ash

*Slope range:* 25 to 45 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.5 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

**Typical profile**

0 to 13 inches; very gravelly ashy sandy loam  
13 to 34 inches; very gravelly ashy sandy loam  
34 to 60 inches; extremely cobbly sandy loam

***Characteristics of Snowplow***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or basalt  
*Slope range:* 25 to 45 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 7.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

**Typical profile**

0 to 10 inches; ashy fine sandy loam  
10 to 22 inches; ashy fine sandy loam  
22 to 44 inches; very gravelly ashy fine sandy loam  
44 to 60 inches; very gravelly loam

***Dissimilar Minor Components***

**Fiscus soils**

*Percentage of map unit:* 5 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

**Rubble land**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***78—Nile ashy sandy loam, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,000 to 5,200 feet  
*Mean annual precipitation:* 40 to 50 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

### **Map Unit Composition**

*Nile and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Nile**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from conglomerate tuffaceous sandstone

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Somewhat excessively drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 8.2 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

#### **Typical profile**

0 to 8 inches; ashy sandy loam

8 to 16 inches; gravelly ashy sandy loam

16 to 33 inches; gravelly sandy loam

33 to 72 inches; very gravelly sandy loam

### **Dissimilar Minor Components**

#### **Snilec soils**

*Percentage of map unit:* 10 percent

#### **Seeburg soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **79—Nile ashy sandy loam, 55 to 70 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,000 to 5,200 feet

## Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Mean annual precipitation:* 40 to 50 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

### **Map Unit Composition**

*Nile and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Nile**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from conglomerate tuffaceous sandstone  
*Slope range:* 55 to 70 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Somewhat excessively drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 8.2 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

#### **Typical profile**

0 to 8 inches; ashy sandy loam  
8 to 16 inches; gravelly ashy sandy loam  
16 to 33 inches; gravelly sandy loam  
33 to 72 inches; very gravelly sandy loam

### **Dissimilar Minor Components**

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Rubble land**

*Percentage of map unit:* 5 percent

#### **Snilec soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **80—Nile-Snilec complex, 10 to 30 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,000 to 5,200 feet  
*Mean annual precipitation:* 40 to 50 inches  
*Mean annual air temperature:* 41 to 45 degrees F  
*Frost-free period:* 40 to 100 days

### **Map Unit Composition**

*Nile and similar soils:* 50 percent  
*Snilec and similar soils:* 35 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Nile**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* Northwest to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from conglomerate and tuffaceous sandstone  
*Slope range:* 10 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Somewhat excessively drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 8.2 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

#### **Typical profile**

0 to 8 inches; ashy sandy loam  
8 to 16 inches; gravelly ashy sandy loam  
16 to 33 inches; gravelly sandy loam  
33 to 72 inches; very gravelly sandy loam

### **Characteristics of Snilec**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* Northeast to northwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam

4 to 9 inches; gravelly ashy sandy loam

9 to 36 inches; very cobbly loam

36 to 60 inches; very cobbly loam

***Dissimilar Minor Components***

**Seeburg soils**

*Percentage of map unit:* 10 percent

**Singh soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***81—Nile-Snilec complex, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,000 to 5,200 feet

*Mean annual precipitation:* 40 to 50 inches

*Mean annual air temperature:* 41 to 45 degrees F

*Frost-free period:* 40 to 100 days

***Map Unit Composition***

*Nile and similar soils:* 50 percent

*Snilec and similar soils:* 40 percent

*Dissimilar minor components:* 10 percent

***Characteristics of Nile***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

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*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* Northwest to northeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from conglomerate tuffaceous sandstone  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Somewhat excessively drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 8.2 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 8 inches; ashy sandy loam  
8 to 16 inches; gravelly ashy sandy loam  
16 to 33 inches; gravelly sandy loam  
33 to 72 inches; very gravelly sandy loam

**Characteristics of Snilec**

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* Northeast to northwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 9 inches; gravelly ashy sandy loam  
9 to 36 inches; very cobbly loam  
36 to 60 inches; very cobbly loam

***Dissimilar Minor Component***

**Seeburg soils**

*Percentage of map unit:* 10 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**82—*Nomlas gravelly ashy sandy loam, 10 to 30 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,800 to 7,000 feet  
*Mean annual precipitation:* 60 to 100 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

***Map Unit Composition***

*Nomlas and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Nomlas***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or basalt  
*Slope range:* 10 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; gravelly ashy sandy loam  
3 to 25 inches; very gravelly ashy sandy loam  
25 to 40 inches; extremely gravelly sandy loam  
40 to 56 inches; extremely gravelly fine sandy loam  
56 to 60 inches; extremely gravelly fine sandy loam

***Dissimilar Minor Components***

**Gilpar soils**

*Percentage of map unit:* 10 percent

**Walupt soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**83—*Nomlas gravelly ashy sandy loam, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,800 to 7,000 feet  
*Mean annual precipitation:* 60 to 100 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

***Map Unit Composition***

*Nomlas and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Nomlas***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or basalt  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; gravelly ashy sandy loam  
3 to 25 inches; very gravelly ashy sandy loam  
25 to 40 inches; extremely gravelly sandy loam  
40 to 56 inches; extremely gravelly fine sandy loam  
56 to 60 inches; extremely gravelly fine sandy loam

***Dissimilar Minor Components***

**Twolakes soils**

*Percentage of map unit:* 10 percent

**Gilpar soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**84—Nomlas gravelly ashy sandy loam, 55 to 90 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,800 to 7,000 feet  
*Mean annual precipitation:* 60 to 100 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

***Map Unit Composition***

*Nomlas and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Nomlas***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or basalt  
*Slope range:* 55 to 90 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline

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*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; gravelly ashy sandy loam

3 to 25 inches; very gravelly ashy sandy loam

25 to 40 inches; extremely gravelly sandy loam

40 to 56 inches; extremely gravelly fine sandy loam

56 to 60 inches; extremely gravelly fine sandy loam

***Dissimilar Minor Components***

**Rock outcrop**

*Percentage of map unit:* 5 percent

**Rubble land**

*Percentage of map unit:* 5 percent

**Twolakes soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**85—Osborn ashy sandy loam, 30 to 55 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,900 to 4,600 feet

*Mean annual precipitation:* 35 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Osborn and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Osborn***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southwest

*Aspect (range):* Southeast to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from sandstone with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 24 to 40 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.2 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

**Typical profile**

0 to 3 inches; ashy sandy loam  
3 to 9 inches; gravelly ashy sandy loam  
9 to 27 inches; sandy loam  
27 to 37 inches; weathered bedrock

***Dissimilar Minor Components***

**Spexarth soils**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**86—*Pachic Argixerolls, 5 to 12 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,200 to 4,800 feet  
*Mean annual precipitation:* 25 to 45 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Pachic Argixerolls and similar soils:* 90 percent  
*Dissimilar minor components:* 10 percent

***Characteristics of Pachic Argixerolls***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite mixed with minor amounts of loess and volcanic ash  
*Slope range:* 5 to 12 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* High (about 9.5 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Ecological site:* COOL LOAMY 15+ PZ (R006XY103WA)

**Typical profile**

0 to 4 inches; silt loam  
4 to 12 inches; loam  
12 to 20 inches; gravelly loam  
20 to 33 inches; very gravelly clay loam  
33 to 60 inches; gravelly clay loam

***Dissimilar Minor Components***

**Bearrun soils**

*Percentage of map unit:* 5 percent

**McDanielake soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***87—Ravensroost ashy sandy loam, 5 to 15 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,500 to 6,000 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

***Map Unit Composition***

*Ravensroost and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Ravensroost***

**Setting**

*Landform:* Cirque lake basins  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium and residuum derived from basalt, andesite, or saprolitic tuff  
*Slope range:* 5 to 15 percent  
*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 3.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 3e  
*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 8 inches; ashy sandy loam  
8 to 18 inches; ashy fine sandy loam  
18 to 26 inches; cobbly fine sandy loam  
26 to 36 inches; weathered bedrock

***Dissimilar Minor Components***

**Walupt soils**

*Percentage of map unit:* 10 percent

**Aquic Vitricryands**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***88—Ravensroost ashy sandy loam, 10 to 30 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,500 to 6,000 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Ravensroost and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Ravensroost***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium and residuum derived from basalt, andesite, or saprolitic tuff  
*Slope range:* 10 to 30 percent  
*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock

*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 3.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 8 inches; ashy sandy loam  
8 to 18 inches; ashy fine sandy loam  
18 to 26 inches; cobbly fine sandy loam  
26 to 36 inches; weathered bedrock

***Dissimilar Minor Components***

**Walupt soils**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***89—Retep-McDanielake complex, 25 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,400 feet  
*Mean annual precipitation:* 25 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 110 days

***Map Unit Composition***

*Retep and similar soils:* 45 percent  
*McDanielake and similar soils:* 40 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Retep***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium and residuum derived from weathered andesite

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*Slope range:* 25 to 55 percent

*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.5 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/oceanspray/pinegrass (CWS554)

### **Typical profile**

0 to 10 inches; ashy sandy loam

10 to 16 inches; gravelly ashy loam

16 to 30 inches; gravelly ashy loam

30 to 40 inches; weathered bedrock

## **Characteristics of McDanielake**

### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* Northeast to southwest (clockwise)

### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 25 to 55 percent

*Depth to restrictive feature:* 10 to 20 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregonrape/pinegrass (CWS226)

### **Typical profile**

0 to 4 inches; ashy sandy loam

4 to 11 inches; gravelly ashy sandy loam

11 to 41 inches; extremely cobbly loam

41 to 61 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Bograp soils**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***90—Rock outcrop and Rubble land, 20 to 90 percent slopes\*\****

***Map Unit Composition***

*Rock outcrop:* 50 percent

*Rubble land:* 45 percent

*Dissimilar minor components:* 5 percent

***Characteristics of Rock Outcrop***

**Setting**

*Major land resource area (MLRA):* 6

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

**Properties and qualities**

*Description of areas:* Exposures of bare bedrock

**Interpretive groups**

*Land capability subclass:* 8

***Characteristics of Rubble Land***

**Setting**

*Major land resource area (MLRA):* 6

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

**Properties and qualities**

*Description of areas:* Colluvial areas of gravel, cobbles, stones, and boulders; voids between fragments contain little if any soil material; typically underlain by bedrock at a depth of more than 40 inches

**Interpretive groups**

*Land capability subclass:* 8

***Dissimilar Minor Component***

**Lithic Vitricryands**

*Percentage of map unit:* 5 percent

***Major Uses***

Wildlife habitat and recreation

## **91—Rock outcrop-Rubble land-Glaciers complex, 30 to 90 percent slopes**

### **Map Unit Composition**

*Rock outcrop:* 55 percent  
*Rubble land:* 25 percent  
*Glaciers, icefields:* 10 percent  
*Dissimilar minor components:* 10 percent

### **Characteristics of Rock Outcrop**

#### **Setting**

*Major land resource area (MLRA):* 3  
*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### **Characteristics of Rubble Land**

#### **Setting**

*Major land resource area (MLRA):* 3  
*Landform:* Mountain slopes  
*Downslope shape:* Concave  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Description of areas:* Colluvial areas of gravel, cobbles, stones, and boulders; voids between fragments contain little if any soil material; typically underlain by bedrock at a depth of more than 40 inches

#### **Interpretive groups**

*Land capability subclass:* 8

### **Characteristics of Glaciers, Icefields**

#### **Setting**

*Major land resource area (MLRA):* 3  
*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Description of areas:* Barren sheets of compacted and recrystallized snow and ice  
*Size of areas:* Varies with time of year

**Interpretive groups**

*Land capability subclass (nonirrigated): 8*

***Dissimilar Minor Component***

**Lithic Vitricryands**

*Percentage of map unit: 10 percent*

***Major Uses***

Wildlife habitat and recreation

***92—Rock outcrop-Rubble land-Typic Vitricryands complex, 20 to 65 percent slopes\*\****

***Map Unit Setting***

*Major land resource area (MLRA): 3*

*Elevation: 3,900 to 7,200 feet*

*Mean annual precipitation: 60 to 120 inches*

*Mean annual air temperature: 37 to 41 degrees F*

*Frost-free period: 35 to 75 days*

***Map Unit Composition***

*Rock outcrop: 40 percent*

*Rubble land: 30 percent*

*Typic Vitricryands and similar soils: 20 percent*

*Dissimilar minor components: 10 percent*

***Characteristics of Rock Outcrop***

**Setting**

*Landform: Mountain slopes*

*Downslope shape: Linear*

*Across-slope shape: Convex*

*Aspect (representative): South*

*Aspect (range): Northeast to west (clockwise)*

**Properties and qualities**

*Description of areas: Exposures of bare bedrock*

**Interpretive groups**

*Land capability subclass: 8*

***Characteristics of Rubble Land***

**Setting**

*Landform: Mountain slopes*

*Downslope shape: Concave*

*Across-slope shape: Concave*

*Aspect (representative): South*

*Aspect (range): Northeast to west (clockwise)*

**Properties and qualities**

*Description of areas: Colluvial areas of gravel, cobbles, stones, and boulders; voids between fragments contain little if any soil material; typically underlain by bedrock at a depth of more than 40 inches*

**Interpretive groups**

*Land capability subclass: 8*

***Characteristics of Typic Vitricryands***

**Setting**

*Landform: Mountain slopes*

*Downslope shape: Linear*

*Across-slope shape: Convex*

*Aspect (representative): South*

*Aspect (range): Northeast to west (clockwise)*

**Properties and qualities**

*Parent material: Volcanic ash mixed with andesite or pyroclastic rock*

*Slope range: 20 to 65 percent*

*Depth to restrictive feature: 20 to 80 inches to lithic bedrock*

*Drainage class: Well drained*

*Capacity of the most limiting soil layer to transmit water (Ksat): Moderately high*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Seasonal high water table (minimum depth): More than 72 inches*

*Salinity (maximum): Nonsaline*

*Sodicity (maximum): Nonsodic*

*Available water capacity (entire profile): Low (about 5.9 inches)*

**Interpretive groups**

*Land capability subclass (nonirrigated): 7e*

*Forestland plant association: Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)*

**Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

***Dissimilar Minor Components***

**Chutes, avalanche**

*Percentage of map unit: 5 percent*

**Cryaquands**

*Percentage of map unit: 5 percent*

***Major Uses***

Wildlife habitat and recreation

***93—Rock outcrop-Xeric Vitricryands complex, 45 to 90 percent slopes\*\****

**Map Unit Setting**

*Major land resource area (MLRA): 6*

*Elevation: 3,700 to 6,500 feet*

*Mean annual precipitation: 35 to 60 inches*

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

### **Map Unit Composition**

*Rock outcrop:* 45 percent

*Xeric Vitricryands and similar soils:* 35 percent

*Dissimilar minor components:* 20 percent

### **Characteristics of Rock Outcrop**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### **Characteristics of Xeric Vitricryands**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite and pyroclastic rock

*Slope range:* 45 to 90 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

#### **Typical profile**

0 to 3 inches; ashy loamy sand

3 to 17 inches; gravelly ashy loamy sand

17 to 30 inches; very gravelly ashy sandy loam

30 to 60 inches; extremely gravelly sandy loam

### **Dissimilar Minor Components**

#### **Rubble land**

*Percentage of map unit:* 10 percent

**Typic Vitricryands**

*Percentage of map unit:* 10 percent

**Major Uses**

Wildlife habitat and recreation

**94—Rock outcrop-Xeric Vitricryands-Lithic Vitricryands complex, 30 to 90 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,700 to 6,500 feet

*Mean annual precipitation:* 35 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

**Map Unit Composition**

*Rock outcrop:* 50 percent

*Xeric Vitricryands and similar soils:* 30 percent

*Lithic Vitricryands and similar soils:* 15 percent

*Dissimilar minor components:* 5 percent

**Characteristics of Rock Outcrop**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northwest

*Aspect (range):* Southwest to north (clockwise)

**Properties and qualities**

*Description of areas:* Exposures of bare bedrock

**Interpretive groups**

*Land capability subclass:* 8

**Characteristics of Xeric Vitricryands**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northwest

*Aspect (range):* Southwest to north (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite and pyroclastic rock

*Slope range:* 30 to 90 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 3 inches; ashy loamy sand  
3 to 17 inches; gravelly ashy loamy sand  
17 to 30 inches; very gravelly ashy sandy loam  
30 to 60 inches; extremely gravelly sandy loam

***Characteristics of Lithic Vitricryands***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northwest  
*Aspect (range):* Southwest to north (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with residuum and colluvium derived from andesite or pyroclastic rock  
*Slope range:* 30 to 90 percent  
*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Very low (about 1.3 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Mountain hemlock/pink mountainheath-blueleaved huckleberry (CMS354)

**Typical profile**

0 to 7 inches; cobbly ashy loamy sand  
7 to 11 inches; gravelly ashy sandy loam  
11 to 18 inches; very gravelly ashy sandy loam  
18 to 28 inches; unweathered bedrock

***Dissimilar Minor Component***

**Aquic Vitricryands**

*Percentage of map unit:* 5 percent

***Major Uses***

Wildlife habitat and recreation

## **95—Sapkin very stony loam, 10 to 45 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,800 to 5,600 feet  
*Mean annual precipitation:* 20 to 40 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Sapkin and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Sapkin**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to south (clockwise)

#### **Properties and qualities**

*Parent material:* Loess over residuum and colluvium derived from basalt  
*Slope range:* 10 to 45 percent  
*Depth to restrictive feature:* 20 to 40 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.1 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6s  
*Ecological site:* COOL LOAMY 15+ PZ (R006XY103WA)

#### **Typical profile**

0 to 7 inches; very stony loam  
7 to 15 inches; loam  
15 to 27 inches; very cobbly loam  
27 to 35 inches; very cobbly loam  
35 to 45 inches; unweathered bedrock

### **Dissimilar Minor Components**

#### **Jumpe soils**

*Percentage of map unit:* 10 percent

#### **Sutkin soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **96—Sapkin very stony loam, 45 to 75 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,800 to 5,600 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Sapkin and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Sapkin Soil**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Parent material:* Loess over residuum and colluvium derived from basalt

*Slope range:* 45 to 75 percent

*Depth to restrictive feature:* 20 to 40 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.1 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Ecological site:* COOL LOAMY 15+ PZ (R006XY103WA)

#### **Typical profile**

0 to 7 inches; very stony loam

7 to 15 inches; loam

15 to 27 inches; very cobbly loam

27 to 35 inches; very cobbly loam

35 to 45 inches; unweathered bedrock

### **Dissimilar Minor Components**

#### **Jumpe soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Sutkin soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **97—Sapkin-Rubble land complex, 30 to 75 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,800 to 5,600 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Sapkin and similar soils:* 60 percent

*Rubble land:* 30 percent

*Dissimilar minor components:* 10 percent

### **Characteristics of Sapkin**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

#### **Properties and qualities**

*Parent material:* Loess over residuum and colluvium derived from basalt

*Slope range:* 30 to 75 percent

*Depth to restrictive feature:* 20 to 40 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.1 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Ecological site:* COOL LOAMY 15+ PZ (R006XY103WA)

#### **Typical profile**

0 to 7 inches; very stony loam

7 to 15 inches; loam

15 to 27 inches; very cobbly loam

27 to 35 inches; very cobbly loam

35 to 45 inches; unweathered bedrock

### **Characteristics of Rubble Land**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Concave

*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to south (clockwise)

**Properties and qualities**

*Description of areas:* Colluvial areas of gravel, cobbles, stones, and boulders; voids between fragments contain little if any soil material; typically underlain by bedrock at a depth of more than 40 inches

**Interpretive groups**

*Land capability subclass:* 8

***Dissimilar Minor Components***

**Rock outcrop**

*Percentage of map unit:* 5 percent

**Sutkin soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**98—Saydab cobbly ashy loam, 0 to 5 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 5,500 to 7,000 feet  
*Mean annual precipitation:* 20 to 50 inches  
*Mean annual air temperature:* 39 to 43 degrees F  
*Frost-free period:* 40 to 80 days

***Map Unit Composition***

*Saydab and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Saydab***

**Setting**

*Landform:* Mountaintops  
*Geomorphic position (three-dimensional):* Mountaintops  
*Downslope shape:* Linear  
*Across-slope shape:* Linear  
*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash and loess  
*Slope range:* 0 to 5 percent  
*Depth to restrictive feature:* 20 to 40 inches to lithic bedrock  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* About 11 to 15 inches (see Water Features table)  
*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.1 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Forestland plant association:* Grand fir/vanillaleaf (CWS524)

**Typical profile**

0 to 5 inches; cobbly ashy loam

5 to 11 inches; ashy loam

11 to 15 inches; very cobbly ashy loam

15 to 27 inches; very cobbly ashy loam

27 to 37 inches; unweathered bedrock

***Dissimilar Minor Components***

**Darland soils**

*Percentage of map unit:* 10 percent

**Naxing soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**99—Seeburg ashy loamy sand, 15 to 35 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,200 to 4,600 feet

*Mean annual precipitation:* 25 to 45 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Seeburg and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Seeburg***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to west (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash

*Slope range:* 15 to 35 percent

*Depth to restrictive feature:* 14 to 22 inches to strongly contrasting textural stratification

*Drainage class:* Somewhat excessively drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 3.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 9 inches; ashy loamy sand  
9 to 22 inches; gravelly sandy loam  
22 to 60 inches; extremely cobbly sandy loam

***Dissimilar Minor Components***

**Snilec soils**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***100—Seeburg-Snilec-Rock outcrop complex, 55 to 70 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,200 to 4,600 feet  
*Mean annual precipitation:* 25 to 45 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Seeburg and similar soils:* 45 percent  
*Snilec and similar soils:* 40 percent  
*Rock outcrop:* 10 percent  
*Dissimilar minor components:* 5 percent

***Characteristics of Seeburg***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash  
*Slope range:* 55 to 70 percent  
*Depth to restrictive feature:* 14 to 22 inches to strongly contrasting textural stratification

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Drainage class:* Somewhat excessively drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 3.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 9 inches; ashy loamy sand  
9 to 22 inches; gravelly sandy loam  
22 to 60 inches; extremely cobbly sandy loam

***Characteristics of Snilec***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash  
*Slope range:* 55 to 70 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 9 inches; gravelly ashy sandy loam  
9 to 36 inches; very cobbly loam  
36 to 60 inches; very cobbly loam

***Characteristics of Rock Outcrop***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Description of areas:* Exposures of bare bedrock

**Interpretive groups**

*Land capability subclass:* 8

***Dissimilar Minor Component***

**Rubble land**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**101—Singh ashy sandy loam, 5 to 30 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 30 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Singh and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Singh***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 5 to 30 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 3 inches; ashy sandy loam

3 to 22 inches; ashy fine sandy loam

22 to 46 inches; very cobbly loam  
46 to 60 inches; extremely cobbly loam

### ***Dissimilar Minor Components***

#### **Bearrun soils**

*Percentage of map unit:* 5 percent

#### **Bograp soils**

*Percentage of map unit:* 5 percent

#### **Fiscus soils**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## **102—Singh ashy sandy loam, 30 to 55 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,500 to 4,800 feet

*Mean annual precipitation:* 30 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Singh and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Singh**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 3 inches; ashy sandy loam  
3 to 22 inches; ashy fine sandy loam  
22 to 46 inches; very cobbly loam  
46 to 60 inches; extremely cobbly loam

***Dissimilar Minor Components***

**Fiscus soils**

*Percentage of map unit:* 5 percent

**Icksix soils**

*Percentage of map unit:* 5 percent

**McDanielake soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

**103—Singh-Bograp complex, 20 to 35 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,500 to 4,800 feet  
*Mean annual precipitation:* 30 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Singh and similar soils:* 45 percent  
*Bograp and similar soils:* 40 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Singh***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 20 to 35 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated): 4e*

*Forestland plant association: Grand fir/Cascade Oregongrape/pinegrass  
(CWS226)*

**Typical profile**

0 to 3 inches; ashy sandy loam

3 to 22 inches; ashy fine sandy loam

22 to 46 inches; very cobbly loam

46 to 60 inches; extremely cobbly loam

***Characteristics of Bograp***

**Setting**

*Landform: Mountain slopes*

*Downslope shape: Linear*

*Across-slope shape: Convex*

*Aspect (representative): North*

*Aspect (range): West to east (clockwise)*

**Properties and qualities**

*Parent material: Colluvium and residuum derived from basalt mixed with volcanic ash*

*Slope range: 20 to 35 percent*

*Depth to restrictive feature: None within a depth of 60 inches*

*Drainage class: Well drained*

*Capacity of the most limiting soil layer to transmit water (Ksat): Moderately high*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Seasonal high water table (minimum depth): More than 72 inches*

*Salinity (maximum): Nonsaline*

*Sodicity (maximum): Nonsodic*

*Available water capacity (entire profile): High (about 10.3 inches)*

**Interpretive groups**

*Land capability subclass (nonirrigated): 4e*

*Forestland plant association: Grand fir/Cascade Oregongrape/pinegrass  
(CWS226)*

**Typical profile**

0 to 9 inches; ashy fine sandy loam

9 to 14 inches; fine sandy loam

14 to 47 inches; loam

47 to 60 inches; silty clay loam

***Dissimilar Minor Components***

**McDanielake soils**

*Percentage of map unit: 10 percent*

**Bearrun soils**

*Percentage of map unit: 5 percent*

***Major Uses***

Timber production, recreation, and wildlife habitat

## **104—Snilec ashy sandy loam, 30 to 55 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,200 to 4,600 feet  
*Mean annual precipitation:* 25 to 45 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Snilec and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Snilec**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* Northwest to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 9 inches; gravelly ashy sandy loam  
9 to 36 inches; very cobbly loam  
36 to 60 inches; very cobbly loam

### **Dissimilar Minor Components**

#### **Seeburg soils**

*Percentage of map unit:* 10 percent

#### **Singh soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **105—Snilec-Seeburg complex, 15 to 30 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,200 to 4,600 feet  
*Mean annual precipitation:* 25 to 45 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Snilec and similar soils:* 50 percent  
*Seeburg and similar soils:* 40 percent  
*Dissimilar minor components:* 10 percent

### **Characteristics of Snilec**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash  
*Slope range:* 15 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 4 inches; ashy sandy loam  
4 to 9 inches; gravelly ashy sandy loam  
9 to 36 inches; very cobbly loam  
36 to 60 inches; very cobbly loam

### **Characteristics of Seeburg**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash

*Slope range:* 15 to 30 percent

*Depth to restrictive feature:* 14 to 22 inches to strongly contrasting textural stratification

*Drainage class:* Somewhat excessively drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 9 inches; ashy loamy sand

9 to 22 inches; gravelly sandy loam

22 to 60 inches; extremely cobbly sandy loam

***Dissimilar Minor Components***

**McDanielake soils**

*Percentage of map unit:* 5 percent

**Nile soils**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***106—Snilec-Seeburg complex, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,200 to 4,600 feet

*Mean annual precipitation:* 25 to 45 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Map Unit Composition***

*Snilec and similar soils:* 50 percent

*Seeburg and similar soils:* 35 percent

*Dissimilar minor components:* 15 percent

***Characteristics of Snilec***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* Northeast to south (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 4 inches; ashy sandy loam

4 to 9 inches; gravelly ashy sandy loam

9 to 36 inches; very cobbly loam

36 to 60 inches; very cobbly loam

***Characteristics of Seeburg***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* Northeast to south (clockwise)

**Properties and qualities**

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 14 to 22 inches to strongly contrasting textural stratification

*Drainage class:* Somewhat excessively drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

**Typical profile**

0 to 9 inches; ashy loamy sand

9 to 22 inches; gravelly sandy loam

22 to 60 inches; extremely cobbly sandy loam

### ***Dissimilar Minor Components***

#### **McDanielake soils**

*Percentage of map unit:* 5 percent

#### **Nile soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## ***107—Snowplow ashy fine sandy loam, 10 to 30 percent slopes***

### ***Map Unit Setting***

*Major land resource area (MLRA):* 6

*Elevation:* 4,300 to 6,300 feet

*Mean annual precipitation:* 40 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

### ***Map Unit Composition***

*Snowplow and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### ***Characteristics of Snowplow***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* Northwest to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or basalt

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 7.5 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Subalpine fir/grouse blueberry (huckleberry) (CES426)

#### **Typical profile**

0 to 10 inches; ashy fine sandy loam

10 to 22 inches; ashy fine sandy loam

22 to 44 inches; very gravelly ashy fine sandy loam  
44 to 60 inches; very gravelly loam

### ***Dissimilar Minor Components***

#### **Naxing soils**

*Percentage of map unit:* 10 percent

#### **Aquic Vitricryands**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## **108—*Stemilt ashy sandy loam, 25 to 45 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,100 to 5,400 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Stemilt and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Stemilt**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash and loess

*Slope range:* 25 to 45 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

#### **Typical profile**

0 to 3 inches; ashy sandy loam

3 to 15 inches; gravelly ashy sandy loam

15 to 22 inches; very gravelly loam  
22 to 60 inches; extremely cobbly clay loam

### ***Dissimilar Minor Components***

#### **McDanielake soils**

*Percentage of map unit:* 10 percent

#### **Loneridge soils**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## **109—*Stemilt ashy sandy loam, 45 to 65 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,100 to 5,400 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Stemilt and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Stemilt**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* East to south (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash and loess

*Slope range:* 45 to 65 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

#### **Typical profile**

0 to 3 inches; ashy sandy loam

3 to 15 inches; gravelly ashy sandy loam

15 to 22 inches; very gravelly loam  
22 to 60 inches; extremely cobbly clay loam

### ***Dissimilar Minor Components***

#### **McDanielake soils**

*Percentage of map unit:* 10 percent

#### **Loneridge soils**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## **110—*Stemilt ashy sandy loam, 20 to 75 percent slopes*\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,100 to 5,400 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Stemilt and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Stemilt**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* Northeast to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash and loess

*Slope range:* 20 to 75 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.8 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

#### **Typical profile**

0 to 3 inches; ashy sandy loam

3 to 15 inches; gravelly ashy sandy loam

15 to 22 inches; very gravelly loam  
22 to 60 inches; extremely cobbly clay loam

### ***Dissimilar Minor Components***

#### **McDanielake soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Rubble land**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## **111—Stemilt-Rock outcrop complex, 25 to 75 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,100 to 5,400 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Stemilt and similar soils:* 50 percent

*Rock outcrop:* 35 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Stemilt**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash and loess

*Slope range:* 25 to 75 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Grand fir/common snowberry/pinegrass (CWS336)

**Typical profile**

0 to 3 inches; ashy sandy loam

3 to 15 inches; gravelly ashy sandy loam

15 to 22 inches; very gravelly loam

22 to 60 inches; extremely cobbly clay loam

***Characteristics of Rock Outcrop***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

**Properties and qualities**

*Description of areas:* Exposures of bare bedrock

**Interpretive groups**

*Land capability subclass:* 8

***Dissimilar Minor Components***

**Bearrun soils**

*Percentage of map unit:* 5 percent

**Keechelus soils**

*Percentage of map unit:* 5 percent

**Rubble land**

*Percentage of map unit:* 5 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***113—Stilgar gravelly ashy sandy loam, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 4,000 to 6,000 feet

*Mean annual precipitation:* 60 to 80 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

***Map Unit Composition***

*Stilgar and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Stilgar**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or other pyroclastic rock

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.1 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/deerfoot vanillaleaf (CFF254)

#### **Typical profile**

0 to 10 inches; gravelly ashy sandy loam

10 to 15 inches; very gravelly ashy sandy loam

15 to 30 inches; very gravelly ashy sandy loam

30 to 60 inches; extremely gravelly ashy sandy loam

### **Dissimilar Minor Components**

#### **Kaner soils**

*Percentage of map unit:* 10 percent

#### **Millerpoint soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **116—Sutkin stony loam, 25 to 45 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,000 to 4,800 feet

*Mean annual precipitation:* 20 to 30 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 110 days

### **Map Unit Composition**

*Sutkin and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Sutkin**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or pyroclastic material

*Slope range:* 25 to 45 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 7.2 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Douglas-fir/common snowberry/pinegrass (CDS638)

#### **Typical profile**

0 to 10 inches; stony loam

10 to 38 inches; very cobbly loam

38 to 60 inches; extremely cobbly loam

### **Dissimilar Minor Components**

#### **Bocker soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Sapkin soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **117—Sutkin stony loam, 45 to 65 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,000 to 4,800 feet

*Mean annual precipitation:* 20 to 30 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 110 days

### **Map Unit Composition**

*Sutkin and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Sutkin**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or pyroclastic material

*Slope range:* 45 to 65 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 7.2 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Douglas-fir/common snowberry/pinegrass (CDS638)

#### **Typical profile**

0 to 10 inches; stony loam

10 to 38 inches; very cobbly loam

38 to 60 inches; extremely cobbly loam

### **Dissimilar Minor Components**

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Rubble land**

*Percentage of map unit:* 5 percent

#### **Sapkin soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **118—Terence gravelly ashy fine sandy loam, 0 to 30 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,000 to 5,700 feet

*Mean annual precipitation:* 45 to 60 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

### **Map Unit Composition**

*Terence and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Terence**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from basalt, andesite, or rhyolite  
*Slope range:* 0 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregon grape (CHS142)

#### **Typical profile**

0 to 4 inches; gravelly ashy fine sandy loam  
4 to 14 inches; very gravelly ashy fine sandy loam  
14 to 24 inches; gravelly ashy fine sandy loam  
24 to 63 inches; very gravelly ashy loam

### **Dissimilar Minor Components**

#### **Fiscus soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Snowplow soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

**119—Terence gravelly ashy fine sandy loam, 30 to 50 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,000 to 5,700 feet  
*Mean annual precipitation:* 45 to 60 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

**Map Unit Composition**

*Terence and similar soils:* 80 percent  
*Dissimilar minor components:* 20 percent

**Characteristics of Terence**

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northwest  
*Aspect (range):* South to northeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from basalt, andesite, or rhyolite  
*Slope range:* 30 to 50 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 4 inches; gravelly ashy fine sandy loam  
4 to 14 inches; very gravelly ashy fine sandy loam  
14 to 24 inches; gravelly ashy fine sandy loam  
24 to 63 inches; very gravelly ashy loam

**Dissimilar Minor Components**

**Fiscus soils**

*Percentage of map unit:* 5 percent

**Naxing soils**

*Percentage of map unit:* 5 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

**Snowplow soils**

*Percentage of map unit:* 5 percent

**Major Uses**

Timber production, recreation, and wildlife habitat

**120—Terence-Spexarth complex, 30 to 55 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,000 to 5,700 feet

*Mean annual precipitation:* 45 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

**Map Unit Composition**

*Terence and similar soils:* 60 percent

*Spexarth and similar soils:* 25 percent

*Dissimilar minor components:* 15 percent

**Characteristics of Terence**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from basalt, andesite, or rhyolite

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 4 inches; gravelly ashy fine sandy loam

4 to 14 inches; very gravelly ashy fine sandy loam

14 to 24 inches; gravelly ashy fine sandy loam

24 to 63 inches; very gravelly ashy loam

### **Characteristics of Spexarth**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium and residuum derived from sandstone and siltstone

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

#### **Typical profile**

0 to 5 inches; ashy loamy sand

5 to 15 inches; gravelly ashy fine sandy loam

15 to 23 inches; extremely paracobbly sandy loam

23 to 33 inches; weathered bedrock

### **Dissimilar Minor Components**

#### **Fiscus soils**

*Percentage of map unit:* 5 percent

#### **Naxing soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **121—Terence-Stilgar-Spexarth complex, 30 to 55 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,000 to 6,000 feet

*Mean annual precipitation:* 45 to 70 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 80 days

### **Map Unit Composition**

*Terence and similar soils:* 35 percent  
*Stilgar and similar soils:* 30 percent  
*Spexarth and similar soils:* 25 percent  
*Dissimilar minor components:* 10 percent

### **Characteristics of Terence**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* South  
*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from basalt, andesite, or rhyolite  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Moderate (about 6.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

#### **Typical profile**

0 to 4 inches; gravelly ashy fine sandy loam  
4 to 14 inches; very gravelly ashy fine sandy loam  
14 to 24 inches; gravelly ashy fine sandy loam  
24 to 63 inches; very gravelly ashy loam

### **Characteristics of Stilgar**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* Northwest to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or other pyroclastic rock  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None

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*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.1 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/deerfoot vanillaleaf (CFF254)

### **Typical profile**

0 to 10 inches; gravelly ashy sandy loam

10 to 15 inches; very gravelly ashy sandy loam

15 to 30 inches; very gravelly ashy sandy loam

30 to 60 inches; extremely gravelly ashy sandy loam

### ***Characteristics of Spexarth***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* East to west (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium and residuum derived from sandstone and siltstone

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.3 inches)

### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

### **Typical profile**

0 to 5 inches; ashy loamy sand

5 to 15 inches; gravelly ashy fine sandy loam

15 to 23 inches; extremely paracobbly sandy loam

23 to 33 inches; weathered bedrock

### ***Dissimilar Minor Component***

#### **Rock outcrop**

*Percentage of map unit:* 10 percent

### ***Major Uses***

Timber production, recreation, and wildlife habitat

## **122—Tumac gravelly ashy sandy loam, 30 to 55 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,000 to 4,250 feet  
*Mean annual precipitation:* 35 to 50 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Tumac and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Tumac**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or basalt  
*Slope range:* 30 to 55 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 8 inches; gravelly ashy sandy loam  
8 to 17 inches; very cobbly ashy sandy loam  
17 to 37 inches; very cobbly ashy sandy loam  
37 to 60 inches; extremely cobbly ashy fine sandy loam

### **Dissimilar Minor Components**

#### **Icksix soils**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Terence soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **123—Twolakes-Gilpar complex, 45 to 65 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Twolakes and similar soils:* 50 percent

*Gilpar and similar soils:* 35 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Twolakes**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 45 to 65 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.1 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/blue (big) huckleberry/queencup  
beadlily (CFS233)

#### **Typical profile**

0 to 1 inch; ashy sandy loam

1 to 6 inches; gravelly ashy sandy loam

6 to 16 inches; very gravelly ashy sandy loam

16 to 47 inches; extremely gravelly loam

47 to 64 inches; extremely gravelly loam

### **Characteristics of Gilpar**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Volcanic ash and colluvium derived from rhyolite or pyroclastic material

*Slope range:* 45 to 65 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 2.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/deerfoot vanillaleaf (CFF254)

**Typical profile**

0 to 5 inches; ashy sandy loam

5 to 16 inches; very cobbly ashy sandy loam

16 to 60 inches; extremely gravelly ashy sandy loam

***Dissimilar Minor Components***

**Rock outcrop**

*Percentage of map unit:* 8 percent

**Fiscus soils**

*Percentage of map unit:* 5 percent

**Aquic Vitricryands**

*Percentage of map unit:* 2 percent

***Major Uses***

Timber production, recreation, and wildlife habitat

***124—Twolakes-Walupt complex, 30 to 55 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Twolakes and similar soils:* 50 percent

*Walupt and similar soils:* 35 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Twolakes**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.1 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/blue (big) huckleberry/queencup  
beadlily (CFS233)

#### **Typical profile**

0 to 1 inch; ashy sandy loam

1 to 6 inches; gravelly ashy sandy loam

6 to 16 inches; very gravelly ashy sandy loam

16 to 47 inches; extremely gravelly loam

47 to 64 inches; extremely gravelly loam

### **Characteristics of Walupt**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or  
andesite

*Slope range:* 30 to 55 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately  
high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 6 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated): 7e*

*Forestland plant association: Pacific silver fir/blue (big) huckleberry/queencup  
beadlily (CFS233)*

**Typical profile**

0 to 5 inches; ashy loamy sand

5 to 19 inches; ashy sandy loam

19 to 34 inches; very cobbly loam

34 to 60 inches; very gravelly loam

***Dissimilar Minor Components***

**Fiscus soils**

*Percentage of map unit: 5 percent*

**Ravensroost soils**

*Percentage of map unit: 5 percent*

**Rock outcrop**

*Percentage of map unit: 5 percent*

***Major Uses***

Timber production, recreation, and wildlife habitat

***125—Typic Vitricryands, 90 to 120 percent slopes***

***Map Unit Setting***

*Major land resource area (MLRA): 3*

*Elevation: 3,900 to 7,200 feet*

*Mean annual precipitation: 60 to 120 inches*

*Mean annual air temperature: 37 to 43 degrees F*

*Frost-free period: 35 to 75 days*

***Map Unit Composition***

*Typic Vitricryands and similar soils: 70 percent*

*Dissimilar minor components: 30 percent*

***Characteristics of Typic Vitricryands***

**Setting**

*Landform: Mountain slopes*

*Downslope shape: Linear*

*Across-slope shape: Convex*

*Aspect (representative): East*

*Aspect (range): Northwest to south (clockwise)*

**Properties and qualities**

*Parent material: Volcanic ash mixed with andesite or pyroclastic rock*

*Slope range: 90 to 120 percent*

*Depth to restrictive feature: 20 to 80 inches to lithic bedrock*

*Drainage class: Well drained*

*Capacity of the most limiting soil layer to transmit water (Ksat): Moderately high*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Seasonal high water table (minimum depth): More than 72 inches*

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

***Dissimilar Minor Components***

**Lithic Vitricryands**

*Percentage of map unit:* 10 percent

**Rock outcrop**

*Percentage of map unit:* 10 percent

**Rubble land**

*Percentage of map unit:* 10 percent

***Major Uses***

Wildlife habitat and recreation

***126—Typic Vitricryands, 10 to 30 percent slopes\*\****

**Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Typic Vitricryands and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

**Characteristics of Typic Vitricryands**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; ashy loamy sand  
3 to 12 inches; gravelly ashy sandy loam  
12 to 33 inches; very stony ashy fine sandy loam  
33 to 60 inches; very gravelly loam

***Dissimilar Minor Components***

**Cryaquands**

*Percentage of map unit:* 5 percent

**Kaner soils**

*Percentage of map unit:* 5 percent

**Lithic Vitricryands**

*Percentage of map unit:* 5 percent

***Major Uses***

Wildlife habitat and recreation

***127—Typic Vitricryands, 5 to 15 percent slopes\*\****

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,900 to 7,200 feet  
*Mean annual precipitation:* 60 to 120 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Typic Vitricryands and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

***Characteristics of Typic Vitricryands***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Southeast  
*Aspect (range):* Northeast to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock  
*Slope range:* 5 to 15 percent  
*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock  
*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

#### ***Dissimilar Minor Components***

#### **Cryaquands**

*Percentage of map unit:* 5 percent

#### **Lithic Vitricryands**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### ***Major Uses***

Timber production, recreation, and wildlife habitat

### ***128—Typic Vitricryands, 45 to 90 percent slopes\*\****

#### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

#### **Map Unit Composition**

*Typic Vitricryands and similar soils:* 75 percent

*Dissimilar minor components:* 25 percent

#### ***Characteristics of Typic Vitricryands***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* Southwest to east (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock

*Slope range:* 45 to 90 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 5.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; ashy loamy sand  
3 to 12 inches; gravelly ashy sandy loam  
12 to 33 inches; very stony ashy fine sandy loam  
33 to 60 inches; very gravelly loam

***Dissimilar Minor Components***

**Rubble land**

*Percentage of map unit:* 10 percent

**Cryaquands**

*Percentage of map unit:* 5 percent

**Lithic Vitricryands**

*Percentage of map unit:* 5 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

***Major Uses***

Wildlife habitat and recreation

***129—Typic Vitricryands-Aquic Vitricryands complex, 0 to 15 percent slopes***

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,900 to 7,200 feet  
*Mean annual precipitation:* 60 to 120 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Typic Vitricryands and similar soils:* 65 percent  
*Aquic Vitricryands and similar soils:* 30 percent  
*Dissimilar minor components:* 5 percent

***Characteristics of Typic Vitricryands***

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock

*Slope range:* 5 to 15 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

***Characteristics of Aquic Vitricryands***

**Setting**

*Landform:* Flood plains and depressions

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Volcanic ash and alluvium

*Slope range:* 0 to 5 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Somewhat poorly drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* Occasional (see Water Features table)

*Frequency of ponding:* Occasional (see Water Features table)

*Seasonal high water table (minimum depth):* About 21 to 31 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 7.8 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6w

*Forestland plant association:* Subalpine fir/dwarf huckleberry (CES422)

**Typical profile**

0 to 6 inches; ashy loam

6 to 31 inches; ashy fine sandy loam

31 to 60 inches; gravelly ashy loam

***Dissimilar Minor Component***

**Cryaquands**

*Percentage of map unit:* 5 percent

***Major Uses***

Wildlife habitat and recreation

***130—Typic Vitricryands-Lithic Vitricryands complex, 20 to 90 percent slopes\*\****

**Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Typic Vitricryands and similar soils:* 65 percent

*Lithic Vitricryands and similar soils:* 25 percent

*Dissimilar minor components:* 10 percent

***Characteristics of Typic Vitricryands***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* North to south (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock

*Slope range:* 20 to 90 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

### ***Characteristics of Lithic Vitricryands***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* East

*Aspect (range):* North to south (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with residuum and colluvium derived from andesite or pyroclastic rock

*Slope range:* 20 to 90 percent

*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 1.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Mountain hemlock/pink mountainheath-blueleaved huckleberry (CMS354)

#### **Typical profile**

0 to 7 inches; cobbly ashy loamy sand

7 to 11 inches; gravelly ashy sandy loam

11 to 18 inches; very gravelly ashy sandy loam

18 to 28 inches; unweathered bedrock

### ***Dissimilar Minor Components***

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Darland soils**

*Percentage of map unit:* 3 percent

#### **Rubble land**

*Percentage of map unit:* 2 percent

### ***Major Uses***

Wildlife habitat and recreation

## ***131—Typic Vitricryands-Lithic Vitricryands-Rock outcrop complex, 10 to 30 percent slopes\*\****

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Typic Vitricryands and similar soils:* 45 percent

*Lithic Vitricryands and similar soils:* 20 percent

*Rock outcrop:* 20 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Typic Vitricryands**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* North to west (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

### **Characteristics of Lithic Vitricryands**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* North to west (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with residuum and colluvium derived from andesite or pyroclastic rock

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 1.3 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Mountain hemlock/pink mountainheath-blueleaved huckleberry (CMS354)

**Typical profile**

0 to 7 inches; cobbly ashy loamy sand

7 to 11 inches; gravelly ashy sandy loam

11 to 18 inches; very gravelly ashy sandy loam

18 to 28 inches; unweathered bedrock

***Characteristics of Rock Outcrop***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* North to west (clockwise)

**Properties and qualities**

*Description of areas:* Exposures of bare bedrock

**Interpretive groups**

*Land capability subclass:* 8

***Dissimilar Minor Components***

**Rubble land**

*Percentage of map unit:* 10 percent

**Cryaquands**

*Percentage of map unit:* 5 percent

***Major Uses***

Wildlife habitat and recreation

***132—Typic Vitricryands-Rock outcrop complex, 10 to 30 percent slopes\*\****

**Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Typic Vitricryands and similar soils:* 50 percent

*Rock outcrop:* 35 percent

*Dissimilar minor components:* 15 percent

### ***Characteristics of Typic Vitricryands***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock

*Slope range:* 10 to 30 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

### ***Characteristics of Rock Outcrop***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* North

*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Dissimilar Minor Components***

#### **Aquic Vitricryands**

*Percentage of map unit:* 5 percent

#### **Cryaquands**

*Percentage of map unit:* 5 percent

#### **Kaner soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Wildlife habitat and recreation

## **133—Typic Vitricryands-Rock outcrop-Lithic Vitricryands complex, 45 to 90 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Typic Vitricryands and similar soils:* 35 percent

*Rock outcrop:* 30 percent

*Lithic Vitricryands and similar soils:* 15 percent

*Dissimilar minor components:* 20 percent

### **Characteristics of Typic Vitricryands**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* Northwest to east (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock

*Slope range:* 45 to 90 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

#### **Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

### ***Characteristics of Rock Outcrop***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* Northwest to east (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Characteristics of Lithic Vitricryands***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* Northwest to east (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with residuum and colluvium derived from andesite or pyroclastic rock

*Slope range:* 45 to 90 percent

*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 1.3 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Mountain hemlock/pink mountainheath-blueleaved huckleberry (CMS354)

#### **Typical profile**

0 to 7 inches; cobbly ashy loamy sand

7 to 11 inches; gravelly ashy sandy loam

11 to 18 inches; very gravelly ashy sandy loam

18 to 28 inches; unweathered bedrock

### ***Dissimilar Minor Components***

#### **Rubble land**

*Percentage of map unit:* 10 percent

#### **Cryaquands**

*Percentage of map unit:* 5 percent

**Haplocryolls**

*Percentage of map unit:* 5 percent

**Major Uses**

Wildlife habitat and recreation

**134—Typic Vitricryands-Rubble land-Rock outcrop complex, 20 to 60 percent slopes\*\***

**Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Typic Vitricryands and similar soils:* 30 percent

*Rock outcrop:* 25 percent

*Rubble land:* 15 percent

*Dissimilar minor components:* 30 percent

**Characteristics of Typic Vitricryands**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with andesite or pyroclastic rock

*Slope range:* 20 to 60 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry (CFS556)

**Typical profile**

0 to 3 inches; ashy loamy sand

3 to 12 inches; gravelly ashy sandy loam

12 to 33 inches; very stony ashy fine sandy loam

33 to 60 inches; very gravelly loam

### ***Characteristics of Rubble Land***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

#### **Properties and qualities**

*Description of areas:* Colluvial areas of gravel, cobbles, stones, and boulders; voids between fragments contain little if any soil material; typically underlain by bedrock at a depth of more than 40 inches

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Characteristics of Rock Outcrop***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

#### **Properties and qualities**

*Description of areas:* Exposures of bare bedrock

#### **Interpretive groups**

*Land capability subclass:* 8

### ***Dissimilar Minor Components***

#### **Kaner soils**

*Percentage of map unit:* 10 percent

#### **Lithic Vitricryands**

*Percentage of map unit:* 10 percent

#### **Chutes, avalanche**

*Percentage of map unit:* 5 percent

#### **Cryaquands**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Wildlife habitat and recreation

## ***135—Walupt-Twolakes-Ravensroost complex, 5 to 30 percent slopes***

### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### **Map Unit Composition**

*Walupt and similar soils:* 35 percent  
*Twolakes and similar soils:* 30 percent  
*Ravensroost and similar soils:* 20 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Walupt**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 5 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 6 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 4e  
*Forestland plant association:* Pacific silver fir/blue (big) huckleberry/queencup  
beadlily (CFS233)

#### **Typical profile**

0 to 5 inches; ashy loamy sand  
5 to 19 inches; ashy sandy loam  
19 to 34 inches; very cobbly loam  
34 to 60 inches; very gravelly loam

### **Characteristics of Twolakes**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* Northeast  
*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite  
*Slope range:* 5 to 30 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.1 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Pacific silver fir/blue (big) huckleberry/queencup  
beadlily (CFS233)

**Typical profile**

0 to 1 inch; ashy sandy loam

1 to 6 inches; gravelly ashy sandy loam

6 to 16 inches; very gravelly ashy sandy loam

16 to 47 inches; extremely gravelly loam

47 to 64 inches; extremely gravelly loam

***Characteristics of Ravensroost***

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium and residuum derived from basalt,  
andesite, or saprolitic tuff

*Slope range:* 5 to 30 percent

*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Pacific silver fir/Cascade azalea-blue (big) huckleberry  
(CFS556)

**Typical profile**

0 to 8 inches; ashy sandy loam

8 to 18 inches; ashy fine sandy loam

18 to 26 inches; cobbly fine sandy loam

26 to 36 inches; weathered bedrock

***Dissimilar Minor Components***

**Aquic Vitricryands**

*Percentage of map unit:* 5 percent

**Fiscus soils**

*Percentage of map unit:* 5 percent

**Rock outcrop**

*Percentage of map unit:* 5 percent

**Major Uses**

Timber production, recreation, and wildlife habitat

**136—Weirman gravelly fine sandy loam, 0 to 2 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,000 to 2,500 feet

*Mean annual precipitation:* 10 to 14 inches

*Mean annual air temperature:* 48 to 50 degrees F

*Frost-free period:* 110 to 150 days

**Map Unit Composition**

*Weirman and similar soils:* 100 percent

**Characteristics of Weirman**

**Setting**

*Landform:* Flood plains

*Downslope shape:* Concave

*Across-slope shape:* Concave

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Mixed alluvium

*Slope range:* 0 to 2 percent

*Depth to restrictive feature:* 10 to 30 inches to strongly contrasting textural stratification

*Drainage class:* Somewhat excessively drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* High

*Frequency of flooding:* Rare (see Water Features table)

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Very low (about 2.4 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6s

*Land capability subclass (irrigated):* 4s

*Ecological site:* LOAMY BOTTOM 6-9 PZ (R007XY402WA)

**Typical profile**

0 to 8 inches; gravelly fine sandy loam

8 to 21 inches; loamy fine sand

21 to 61 inches; extremely gravelly sand

**Major Uses**

Wildlife habitat and crop production

## **137—Weirman sandy loam, 0 to 5 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,000 to 2,500 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 48 to 50 degrees F  
*Frost-free period:* 110 to 150 days

### **Map Unit Composition**

*Weirman and similar soils:* 100 percent

### **Characteristics of Weirman**

#### **Setting**

*Landform:* Flood plains  
*Downslope shape:* Concave  
*Across-slope shape:* Concave  
*Aspect (range):* All aspects

#### **Properties and qualities**

*Parent material:* Mixed alluvium  
*Slope range:* 0 to 5 percent  
*Depth to restrictive feature:* 10 to 30 inches to strongly contrasting textural stratification  
*Drainage class:* Somewhat excessively drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* Frequent (see Water Features table)  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* About 21 to 60 inches (see Water Features table)  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Very low (about 2.4 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6w  
*Ecological site:* LOAMY BOTTOM 6-9 PZ (R007XY402WA)

#### **Typical profile**

0 to 8 inches; sandy loam  
8 to 21 inches; loamy fine sand  
21 to 61 inches; extremely gravelly sand

### **Major Uses**

Wildlife habitat and crop production

## **138—Xeralfs, 5 to 45 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,000 to 4,300 feet  
*Mean annual precipitation:* 30 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Xeralfs and similar soils:* 85 percent

*Dissimilar minor components:* 15 percent

### **Characteristics of Xeralfs**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

#### **Properties and qualities**

*Parent material:* Colluvium derived from basalt, andesite, and bentonite with an influence of volcanic ash

*Slope range:* 5 to 45 percent

*Depth to restrictive feature:* 20 to 80 inches to paralithic bedrock

*Drainage class:* Moderately well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately low

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* About 24 to 60 inches (see Water Features table)

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Moderate (about 6.7 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Grand fir/Cascade Oregongrape/pinegrass (CWS226)

#### **Typical profile**

0 to 4 inches; ashy fine sandy loam

4 to 26 inches; loam

26 to 40 inches; clay

40 to 60 inches; silty clay loam

### **Dissimilar Minor Components**

#### **Aquic Vitricryands**

*Percentage of map unit:* 5 percent

#### **Ghormley soils**

*Percentage of map unit:* 5 percent

#### **Singh soils**

*Percentage of map unit:* 5 percent

### **Major Uses**

Wildlife habitat and recreation

## **139—Xeric Vitricryands, 10 to 30 percent slopes\*\***

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 3,700 to 6,500 feet  
*Mean annual precipitation:* 35 to 60 inches  
*Mean annual air temperature:* 41 to 43 degrees F  
*Frost-free period:* 40 to 80 days

### **Map Unit Composition**

*Xeric Vitricryands and similar soils:* 85 percent  
*Dissimilar minor components:* 15 percent

### **Characteristics of Xeric Vitricryands**

#### **Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Convex  
*Aspect (representative):* North  
*Aspect (range):* West to northeast (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite and pyroclastic rock  
*Slope range:* 10 to 30 percent  
*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 4.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregon grape (CHS142)

#### **Typical profile**

0 to 3 inches; ashy loamy sand  
3 to 17 inches; gravelly ashy loamy sand  
17 to 30 inches; very gravelly ashy sandy loam  
30 to 60 inches; extremely gravelly sandy loam

### **Dissimilar Minor Components**

#### **Aquic Vitricryands**

*Percentage of map unit:* 5 percent

#### **Lithic Vitricryands**

*Percentage of map unit:* 5 percent

**Rock outcrop**

*Percentage of map unit:* 3 percent

**Rubble land**

*Percentage of map unit:* 2 percent

**Major Uses**

Wildlife habitat and recreation

**140—Xeric Vitricryands, 20 to 90 percent slopes\*\***

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 3,700 to 6,500 feet

*Mean annual precipitation:* 35 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

**Map Unit Composition**

*Xeric Vitricryands and similar soils:* 75 percent

*Dissimilar minor components:* 25 percent

**Characteristics of Xeric Vitricryands**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Northeast

*Aspect (range):* West to southeast (clockwise)

**Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite and pyroclastic rock

*Slope range:* 20 to 90 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Western hemlock/Cascade Oregongrape (CHS142)

**Typical profile**

0 to 3 inches; ashy loamy sand

3 to 17 inches; gravelly ashy loamy sand

17 to 30 inches; very gravelly ashy sandy loam

30 to 60 inches; extremely gravelly sandy loam

### ***Dissimilar Minor Components***

#### **Lithic Vitricryands**

*Percentage of map unit:* 10 percent

#### **Cryaquands**

*Percentage of map unit:* 5 percent

#### **Rock outcrop**

*Percentage of map unit:* 5 percent

#### **Rubble land**

*Percentage of map unit:* 5 percent

### ***Major Uses***

Wildlife habitat and recreation

## ***141—Xeric Vitricryands-Rock outcrop complex, 20 to 90 percent slopes\*\****

### ***Map Unit Setting***

*Major land resource area (MLRA):* 6

*Elevation:* 3,700 to 6,500 feet

*Mean annual precipitation:* 35 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

### ***Map Unit Composition***

*Xeric Vitricryands and similar soils:* 50 percent

*Rock outcrop:* 40 percent

*Dissimilar minor components:* 10 percent

### ***Characteristics of Xeric Vitricryands***

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* South

*Aspect (range):* Northeast to west (clockwise)

#### **Properties and qualities**

*Parent material:* Volcanic ash mixed with colluvium derived from andesite and pyroclastic rock

*Slope range:* 20 to 90 percent

*Depth to restrictive feature:* 20 to 80 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 4.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated): 7e*

*Forestland plant association: Western hemlock/Cascade Oregongrape (CHS142)*

**Typical profile**

0 to 3 inches; ashy loamy sand

3 to 17 inches; gravelly ashy loamy sand

17 to 30 inches; very gravelly ashy sandy loam

30 to 60 inches; extremely gravelly sandy loam

***Characteristics of Rock Outcrop***

**Setting**

*Landform: Mountain slopes*

*Downslope shape: Linear*

*Across-slope shape: Convex*

*Aspect (representative): South*

*Aspect (range): Northeast to west (clockwise)*

**Properties and qualities**

*Description of areas: Exposures of bare bedrock*

**Interpretive groups**

*Land capability subclass: 8*

***Dissimilar Minor Components***

**Lithic Vitricryands**

*Percentage of map unit: 5 percent*

**Rubble land**

*Percentage of map unit: 5 percent*

***Major Uses***

Wildlife habitat and recreation

**142—Yakima silt loam, 0 to 2 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA): 6*

*Elevation: 2,000 to 2,500 feet*

*Mean annual precipitation: 10 to 14 inches*

*Mean annual air temperature: 48 to 50 degrees F*

*Frost-free period: 110 to 150 days*

***Map Unit Composition***

*Yakima and similar soils: 100 percent*

***Characteristics of Yakima***

**Setting**

*Landform: Flood plains*

*Downslope shape: Concave*

*Across-slope shape: Concave*

*Aspect (range): All aspects*

**Properties and qualities**

*Parent material: Alluvium*

*Slope range: 0 to 2 percent*

*Depth to restrictive feature:* 20 to 40 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* Occasional (see Water Features table)

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 5.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 3w

*Land capability subclass (irrigated):* 2w

*Ecological site:* LOAMY BOTTOM 6-9 PZ (R007XY402WA)

#### **Typical profile**

0 to 13 inches; silt loam

13 to 30 inches; sandy loam

30 to 60 inches; extremely gravelly coarse sand

#### **Major Uses**

Wildlife habitat and crop production

### **143—Water**

*Major land resource area (MLRA):* 6

*Map unit composition:* Water—100 percent

*Land capability classification—*8

### **144—Andic Dystrocryepts, 30 to 90 percent slopes**

#### **Map Unit Setting**

*Major land resource area (MLRA):* 3

*Elevation:* 4,000 to 6,500 feet

*Mean annual precipitation:* 50 to 100 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 40 to 80 days

#### **Map Unit Composition**

*Andic Dystrocryepts and similar soils:* 100 percent

#### **Characteristics of Andic Dystrocryepts**

##### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Convex

*Aspect (representative):* Southeast

*Aspect (range):* Northeast to southwest (clockwise)

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

*Parent material:* Residuum and colluvium derived from basalt, andesite, phyllite, and sandstone with volcanic ash in the upper part

*Slope range:* 30 to 90 percent

*Depth to restrictive feature:* 20 to 60 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* High  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* Low (about 3.2 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Western hemlock/Cascade Oregon grape  
(CHS142)

**Typical profile**

0 to 7 inches; very gravelly ashy sandy loam  
7 to 16 inches; very gravelly sandy loam  
16 to 44 inches; extremely gravelly sandy loam  
44 to 54 inches; unweathered bedrock

**Major Uses**

Timber production, wildlife habitat, and recreation

**145—Haywire ashy loamy sand, tuff substratum, 30 to 65 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 3  
*Elevation:* 3,500 to 6,000 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

**Map Unit Composition**

*Haywire and similar soils:* 100 percent

**Characteristics of Haywire**

**Setting**

*Landform:* Backslopes and ridges of mountains  
*Downslope shape:* Linear  
*Across-slope shape:* Linear  
*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Volcanic ash over colluvium and residuum derived from tuff  
*Slope range:* 30 to 65 percent  
*Depth to restrictive feature:* 20 to 40 inches to lithic bedrock  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* Low (about 3.3 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Pacific silver fir/rusty menziesia (rustyleaf) (CFS542)

**Typical profile**

0 to 8 inches; ashy loamy sand

8 to 14 inches; very cobbly medial loam

14 to 30 inches; extremely gravelly loam

30 to 40 inches; unweathered bedrock

**Major Uses**

Timber production, recreation, and wildlife habitat

**146—Carmack loam, 0 to 25 percent slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,200 to 3,500 feet

*Mean annual precipitation:* 20 to 35 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 80 to 110 days

**Map Unit Composition**

*Carmack and similar soils:* 100 percent

**Characteristics of Carmack**

**Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Linear

*Aspect (representative):* East

*Aspect (range):* All aspects

**Properties and qualities**

*Parent material:* Residuum derived from basaltic conglomerate and tuffaceous sandstone

*Slope range:* 0 to 25 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 11.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 4e

*Forestland plant association:* Douglas-fir/common snowberry/bluebunch wheatgrass (CDS637)

**Typical profile**

0 to 7 inches; loam  
7 to 15 inches; loam  
15 to 21 inches; loam  
21 to 43 inches; silty clay loam  
43 to 60 inches; loam

**Major Uses**

Timber production, recreation, and wildlife habitat

**147—Carmack cobbly loam, 25 to 50 percent south slopes**

**Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,200 to 3,500 feet  
*Mean annual precipitation:* 20 to 35 inches  
*Mean annual air temperature:* 41 to 45 degrees F  
*Frost-free period:* 80 to 110 days

**Map Unit Composition**

*Carmack and similar soils:* 100 percent

**Characteristics of Carmack**

**Setting**

*Landform:* Mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Linear  
*Aspect (representative):* East  
*Aspect (range):* North to south (clockwise)

**Properties and qualities**

*Parent material:* Residuum derived from basaltic conglomerate and tuffaceous sandstone  
*Slope range:* 25 to 50 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* High (about 11.9 inches)

**Interpretive groups**

*Land capability subclass (nonirrigated):* 6e  
*Forestland plant association:* Douglas-fir/common snowberry/bluebunch wheatgrass (CDS637)

**Typical profile**

0 to 7 inches; cobbly loam  
7 to 15 inches; loam

15 to 21 inches; loam  
21 to 43 inches; silty clay loam  
43 to 60 inches; loam

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **148—Carmack cobbly loam, 50 to 75 percent north slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6  
*Elevation:* 2,200 to 3,500 feet  
*Mean annual precipitation:* 20 to 35 inches  
*Mean annual air temperature:* 41 to 45 degrees F  
*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Carmack and similar soils:* 100 percent

### **Characteristics of Carmack**

#### **Setting**

*Landform:* North-facing mountain slopes  
*Downslope shape:* Linear  
*Across-slope shape:* Linear  
*Aspect (representative):* North  
*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Parent material:* Residuum derived from basaltic conglomerate and tuffaceous sandstone  
*Slope range:* 50 to 75 percent  
*Depth to restrictive feature:* None within a depth of 60 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Seasonal high water table (minimum depth):* More than 72 inches  
*Salinity (maximum):* Nonsaline  
*Sodicity (maximum):* Nonsodic  
*Available water capacity (entire profile):* High (about 11.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e  
*Forestland plant association:* Douglas-fir/common snowberry/pinegrass (CDS638)

#### **Typical profile**

0 to 7 inches; cobbly loam  
7 to 15 inches; loam  
15 to 21 inches; loam  
21 to 43 inches; silty clay loam  
43 to 60 inches; loam

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **149—Carmack cobbly loam, 25 to 50 percent north slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,200 to 3,500 feet

*Mean annual precipitation:* 20 to 35 inches

*Mean annual air temperature:* 41 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Map Unit Composition**

*Carmack and similar soils:* 100 percent

### **Characteristics of Carmack**

#### **Setting**

*Landform:* North-facing mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Linear

*Aspect (representative):* North

*Aspect (range):* West to east (clockwise)

#### **Properties and qualities**

*Parent material:* Residuum derived from basaltic conglomerate and tuffaceous sandstone

*Slope range:* 25 to 50 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 11.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 6e

*Forestland plant association:* Douglas-fir/common snowberry/pinegrass (CDS638)

#### **Typical profile**

0 to 7 inches; cobbly loam

7 to 15 inches; loam

15 to 21 inches; loam

21 to 43 inches; silty clay loam

43 to 60 inches; loam

### **Major Uses**

Timber production, recreation, and wildlife habitat

## **150—Carmack-Rock outcrop complex, 40 to 70 percent slopes**

### **Map Unit Setting**

*Major land resource area (MLRA):* 6

*Elevation:* 2,200 to 3,500 feet

*Mean annual precipitation:* 20 to 35 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 80 to 110 days

### **Map Unit Composition**

*Carmack and similar soils:* 60 percent

*Rock outcrop:* 40 percent

### **Characteristics of Carmack**

#### **Setting**

*Landform:* Mountain slopes

*Downslope shape:* Linear

*Across-slope shape:* Linear

*Aspect (representative):* Southeast

*Aspect (range):* Northeast to southwest (clockwise)

#### **Properties and qualities**

*Parent material:* Residuum derived from basaltic conglomerate and tuffaceous sandstone

*Slope range:* 40 to 70 percent

*Depth to restrictive feature:* None within a depth of 60 inches

*Drainage class:* Well drained

*Capacity of the most limiting soil layer to transmit water (Ksat):* Moderately high

*Frequency of flooding:* None

*Frequency of ponding:* None

*Seasonal high water table (minimum depth):* More than 72 inches

*Salinity (maximum):* Nonsaline

*Sodicity (maximum):* Nonsodic

*Available water capacity (entire profile):* High (about 11.9 inches)

#### **Interpretive groups**

*Land capability subclass (nonirrigated):* 7e

*Forestland plant association:* Douglas-fir/common snowberry/bluebunch wheatgrass (CDS637)

#### **Typical profile**

0 to 7 inches; loam

7 to 15 inches; loam

15 to 21 inches; loam

21 to 43 inches; silty clay loam

43 to 60 inches; loam

***Characteristics of Rock Outcrop***

**Setting**

*Aspect (representative):* Southeast

*Aspect (range):* Northeast to southwest (clockwise)

**Properties and qualities**

*Description of areas:* Exposures of bare bedrock

**Interpretive groups**

*Land capability subclass:* 8

***Major Uses***

Timber production, recreation, and wildlife habitat

# Use and Management of the Soils

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This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information gathered for this survey can be used to plan the use and management of soils for many uses. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of gravel, sand, reclamation material, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

## Soil Survey Information on the Internet

Soil survey reports have traditionally contained tables providing the properties of the soils and interpretations regarding the use of the soils. The tables for this survey are available online from the Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov/app/>. The information is provided online instead of in this publication so that the information can be more readily updated. The information on the Web Soil Survey is the official soil survey information.

The information listed below is currently available online for each soil map unit component. This list will expand with time as additional reports and interpretations are developed.

### Soil Properties and Qualities

*Chemical properties:* Content of calcium carbonate, cation-exchange capacity, electrical conductivity (EC), and pH

*Soil erosion factors:* K-factor (whole soil and rock free), T-factor, wind erodibility group, and wind erodibility index

*Physical properties:* Available water capacity; bulk density; linear extensibility; content

## Soil Survey of Wenatchee National Forest, Naches Area, Washington

of organic matter, clay, sand, and silt; saturated hydraulic conductivity; surface texture; water content; liquid limit; and plasticity index

*Soil qualities and features:* Depth to restrictive layer, drainage class, frost action, and hydrologic soil group

*Water features:* Depth to water table and frequency of flooding and ponding

### Suitabilities and Limitations for Use

*Building site development:* Risk of corrosion of steel and concrete and suitability for shallow excavations, dwellings, and other uses

*Construction materials:* Potential as a source of gravel, sand, roadfill, topsoil, and other material

*Disaster recovery planning:* Suitability for disposal of animal carcasses in case of catastrophic mortality, suitability as a location for a composting facility, and other ratings

*Land classification:* Ecological site name and ID (number), farmland classification (prime, unique, and statewide importance), hydric rating by map unit, and irrigated and nonirrigated capability class and subclass

*Land management:* Forestry interpretations, including seedling mortality, suitability for hand planting, suitability for log landings, potential for damage by fire, harvest equipment operability, construction limitations for haul roads and landings, and other ratings

*Military operations:* Vehicle trafficability, suitability for evacuations, and other ratings

*Recreational development:* Suitability for camp areas, off-road motorcycle trails, paths and trails, picnic areas, and playgrounds

*Sanitary facilities:* Suitability for septic tank absorption fields, sanitary landfills, sewage lagoons, and daily cover for landfill

*Vegetative productivity:* Forest productivity, crop productivity index, range production, and yields of irrigated and nonirrigated crops by map unit or component

*Waste management:* Disposal of wastewater, treatment of wastewater, and land application of sewage sludge

### Soil Reports

*Building site development:* Dwellings and small commercial buildings; and roads and streets, shallow excavations, and lawns and landscaping

*Construction materials:* Source of reclamation material and roadfill

*Land classifications:* Land capability classification, prime and other important farmlands, and taxonomic classification of the soils

*Land management:* Damage by fire and seedling mortality on forestland; forestland planting and harvesting; forestland site preparation; haul roads, log landings, and soil rutting on forestland; and hazard of erosion and suitability for roads on forestland

*Recreational development:* Camp areas, picnic areas, and playgrounds; and paths, trails, and golf fairways

*Sanitary facilities:* Landfills and sewage disposal

*Soil chemical properties:* Cation-exchange capacity and soil reaction

*Soil erosion:* RUSLE2 related attributes

*Soil physical properties:* Engineering properties and physical soil properties

*Soil qualities and features:* Restrictive layer, potential for frost action, and risk of corrosion

*Vegetative productivity:* Forestland productivity and rangeland productivity

*Waste management:* Agricultural disposal of manure, food-processing waste, and

sewage sludge; agricultural disposal of wastewater by overland flow; agricultural disposal of wastewater by rapid infiltration and slow rate treatment; and large animal carcass disposal

*Water features:* Hydrologic group, water table, ponding, and flooding

*Water management:* Pond reservoir areas; embankments, dikes, and levees; aquifer-fed excavated ponds

## Water Features

**Table 5** gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations. Only the map units with a component that has a high water table or is subject to flooding or ponding are listed in the table.

*Water table* refers to a saturated zone in the soil. The table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

*Ponding* is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year). If frequency is rare, surface water depth and duration are not given in the table.

*Flooding* is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

*Duration* and *frequency* are estimated. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is less than 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year). If frequency is rare, duration is not given in the table.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; presence of redoximorphic features; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Table 5.--Water Features

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated. Only the map units with a component that has a high water table or is subject to flooding or ponding is listed.)

Map symbol and soil name	Month	Water table		Ponding			Flooding	
		Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
		<i>Ft</i>	<i>Ft</i>	<i>Ft</i>				
7: Aquic Haploxererts-----	January	1.7-3.7	>6.0	---	---	None	---	None
	February	1.7-3.7	>6.0	---	---	None	---	None
	March	1.7-3.7	>6.0	---	---	Rare	---	None
	April	1.7-3.7	>6.0	---	---	Rare	---	None
	May	1.7-3.7	>6.0	---	---	Rare	---	None
	June	3.7-5.0	>6.0	---	---	Rare	---	None
	November	3.7-5.0	>6.0	---	---	None	---	None
	December	1.7-3.7	>6.0	---	---	None	---	None
8: Aquic Vitricryands-----	January	1.7-2.6	>6.0	---	---	None	---	None
	February	1.7-2.6	>6.0	---	---	None	---	None
	March	1.7-2.6	>6.0	---	---	None	---	None
	April	1.7-2.6	>6.0	0.0-0.5	Brief	Occasional	Brief	Occasional
	May	1.7-2.6	>6.0	0.0-0.5	Brief	Occasional	Brief	Occasional
	June	1.7-2.6	>6.0	0.0-0.5	Brief	Occasional	Brief	Occasional
	July	2.6-4.2	>6.0	---	---	None	---	None
	August	2.6-4.2	>6.0	---	---	None	---	None
	September	2.6-4.2	>6.0	---	---	None	---	None
	October	2.6-4.2	>6.0	---	---	None	---	None
	November	1.7-2.6	>6.0	---	---	None	---	None
	December	1.7-2.6	>6.0	---	---	None	---	None
Cryaquands-----	January	0.2-0.5	>6.0	---	---	None	---	None
	February	0.2-0.5	>6.0	---	---	None	---	None
	March	0.0-0.2	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	April	0.0-0.2	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	May	0.0-0.2	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	June	0.0-0.2	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	July	0.2-0.5	>6.0	---	---	None	---	None
	August	0.5-1.6	>6.0	---	---	None	---	None
	September	0.5-1.6	>6.0	---	---	None	---	None
	October	0.5-1.6	>6.0	---	---	None	---	None
	November	0.2-0.5	>6.0	---	---	None	---	None
	December	0.2-0.5	>6.0	---	---	None	---	None

Table 5.--Water Features--Continued

Map symbol and soil name	Month	Water table		Ponding			Flooding	
		Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
		<i>Ft</i>	<i>Ft</i>	<i>Ft</i>				
12: Bearrun-----	Jan-Dec	---	---	---	---	None	---	None
Aquic Haploxererts-----	January	1.7-3.7	>6.0	---	---	None	---	None
	February	1.7-3.7	>6.0	---	---	None	---	None
	March	1.7-3.7	>6.0	---	---	Rare	---	None
	April	1.7-3.7	>6.0	---	---	Rare	---	None
	May	1.7-3.7	>6.0	---	---	Rare	---	None
	June	3.7-5.0	>6.0	---	---	Rare	---	None
	November	3.7-5.0	>6.0	---	---	None	---	None
	December	1.7-3.7	>6.0	---	---	None	---	None
22: Haplocryolls-----	March	3.0-5.0	>6.0	---	---	None	Brief	Occasional
	April	3.0-5.0	>6.0	---	---	None	Brief	Occasional
	May	3.0-5.0	>6.0	---	---	None	Brief	Occasional
	June	3.0-5.0	>6.0	---	---	None	Brief	Occasional
23: Cryosaprists-----	January	0.0-0.3	>6.0	---	---	None	---	None
	February	0.0-0.3	>6.0	---	---	None	---	None
	March	0.0-0.3	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	April	0.0-0.3	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	May	0.0-0.3	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	June	0.0-0.3	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	July	0.3-1.2	>6.0	---	---	None	---	None
	August	1.2-1.4	>6.0	---	---	None	---	None
	September	1.2-1.4	>6.0	---	---	None	---	None
	October	1.2-1.4	>6.0	---	---	None	---	None
	November	0.3-1.2	>6.0	---	---	None	---	None
	December	0.0-0.3	>6.0	---	---	None	---	None

Table 5.--Water Features--Continued

Map symbol and soil name	Month	Water table		Ponding			Flooding	
		Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
		<i>Ft</i>	<i>Ft</i>	<i>Ft</i>				
23: Cryaquands-----	January	0.2-0.5	>6.0	---	---	None	---	None
	February	0.2-0.5	>6.0	---	---	None	---	None
	March	0.0-0.2	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	April	0.0-0.2	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	May	0.0-0.2	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	June	0.0-0.2	>6.0	0.5-1.0	Brief	Occasional	Brief	Occasional
	July	0.2-0.5	>6.0	---	---	None	---	None
	August	0.5-1.6	>6.0	---	---	None	---	None
	September	0.5-1.6	>6.0	---	---	None	---	None
	October	0.5-1.6	>6.0	---	---	None	---	None
	November	0.2-0.5	>6.0	---	---	None	---	None
	December	0.2-0.5	>6.0	---	---	None	---	None
31: Ghormley-----	January	2.2-5.0	>6.0	---	---	None	---	None
	February	2.2-5.0	>6.0	---	---	None	---	None
	March	2.2-5.0	>6.0	---	---	None	---	None
	April	2.2-5.0	>6.0	---	---	None	---	None
	May	2.9-5.0	>6.0	---	---	None	---	None
	June	2.9-5.0	>6.0	---	---	None	---	None
	July	2.9-5.0	>6.0	---	---	None	---	None
	December	2.2-5.0	>6.0	---	---	None	---	None
Bearrun-----	Jan-Dec	---	---	---	---	None	---	None
32: Ghormley-----	January	2.2-5.0	>6.0	---	---	None	---	None
	February	2.2-5.0	>6.0	---	---	None	---	None
	March	2.2-5.0	>6.0	---	---	None	---	None
	April	2.2-5.0	>6.0	---	---	None	---	None
	May	2.9-5.0	>6.0	---	---	None	---	None
	June	2.9-5.0	>6.0	---	---	None	---	None
	July	2.9-5.0	>6.0	---	---	None	---	None
	December	2.2-5.0	>6.0	---	---	None	---	None
Bearrun-----	Jan-Dec	---	---	---	---	None	---	None

Table 5.--Water Features--Continued

Map symbol and soil name	Month	Water table		Ponding			Flooding	
		Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
		<i>Ft</i>	<i>Ft</i>	<i>Ft</i>				
32: Aquic Haploxererts-----	January	1.7-3.7	>6.0	---	---	None	---	None
	February	1.7-3.7	>6.0	---	---	None	---	None
	March	1.7-3.7	>6.0	---	---	Rare	---	None
	April	1.7-3.7	>6.0	---	---	Rare	---	None
	May	1.7-3.7	>6.0	---	---	Rare	---	None
	June	3.7-5.0	>6.0	---	---	Rare	---	None
	November	3.7-5.0	>6.0	---	---	None	---	None
	December	1.7-3.7	>6.0	---	---	None	---	None
71: Mippon-----	February	3.5-5.0	>6.0	---	---	None	Brief	Frequent
	March	3.5-5.0	>6.0	---	---	None	Brief	Frequent
	April	3.5-5.0	>6.0	---	---	None	Brief	Frequent
	May	3.5-5.0	>6.0	---	---	None	Brief	Frequent
	June	3.5-5.0	>6.0	---	---	None	Brief	Frequent
Xerofluvents-----	January	3.1-5.0	>6.0	---	---	None	---	None
	February	1.9-3.1	>6.0	---	---	None	Long	Frequent
	March	1.9-3.1	>6.0	---	---	None	Long	Frequent
	April	1.9-3.1	>6.0	---	---	None	Long	Frequent
	May	1.9-3.1	>6.0	---	---	None	Long	Frequent
	June	1.9-3.1	>6.0	---	---	None	Long	Frequent
	July	3.1-5.0	>6.0	---	---	None	---	None
	August	3.1-5.0	>6.0	---	---	None	---	None
	September	3.1-5.0	>6.0	---	---	None	---	None
	October	3.1-5.0	>6.0	---	---	None	---	None
	November	3.1-5.0	>6.0	---	---	None	---	None
	December	3.1-5.0	>6.0	---	---	None	---	None
75: Naxing-----	Jan-Dec	---	---	---	---	None	---	None
Darland-----	Jan-Dec	---	---	---	---	None	---	None

Table 5.--Water Features--Continued

Map symbol and soil name	Month	Water table		Ponding			Flooding	
		Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
		Ft	Ft	Ft				
75: Cryaquolls-----	January	0.0-0.3	>6.0	---	---	None	---	None
	February	0.0-0.3	>6.0	---	---	None	---	None
	March	0.0-0.3	>6.0	0.0-0.5	Long	Frequent	---	None
	April	0.0-0.3	>6.0	0.0-0.5	Long	Frequent	Long	Occasional
	May	0.0-0.3	>6.0	0.0-0.5	Long	Frequent	Long	Occasional
	June	0.0-0.3	>6.0	0.0-0.5	Long	Frequent	Long	Occasional
	July	0.0-0.3	>6.0	0.0-0.5	Long	Frequent	Long	Occasional
	August	1.4-2.3	>6.0	---	---	None	---	None
	September	1.4-2.3	>6.0	---	---	None	---	None
	October	1.4-2.3	>6.0	---	---	None	---	None
	November	0.0-0.3	>6.0	---	---	None	---	None
	December	0.0-0.3	>6.0	---	---	None	---	None
98: Saydab-----	January	0.9-1.2	1.7-3.3	---	---	None	---	None
	February	0.9-1.2	1.7-3.3	---	---	None	---	None
	March	0.9-1.2	1.7-3.3	---	---	None	---	None
	April	0.9-1.2	1.7-3.3	---	---	None	---	None
	May	0.9-1.2	1.7-3.3	---	---	None	---	None
	June	1.2-2.3	1.7-3.3	---	---	None	---	None
	July	1.2-2.3	1.7-3.3	---	---	None	---	None
	November	1.2-2.3	1.7-3.3	---	---	None	---	None
	December	0.9-1.2	1.7-3.3	---	---	None	---	None
129: Typic Vitricryands-----	Jan-Dec	---	---	---	---	None	---	None
Aquic Vitricryands-----	January	1.7-2.6	>6.0	---	---	None	---	None
	February	1.7-2.6	>6.0	---	---	None	---	None
	March	1.7-2.6	>6.0	---	---	None	---	None
	April	1.7-2.6	>6.0	0.0-0.5	Brief	Occasional	Brief	Occasional
	May	1.7-2.6	>6.0	0.0-0.5	Brief	Occasional	Brief	Occasional
	June	1.7-2.6	>6.0	0.0-0.5	Brief	Occasional	Brief	Occasional
	July	2.6-4.2	>6.0	---	---	None	---	None
	August	2.6-4.2	>6.0	---	---	None	---	None
	September	2.6-4.2	>6.0	---	---	None	---	None
	October	2.6-4.2	>6.0	---	---	None	---	None
	November	1.7-2.6	>6.0	---	---	None	---	None
	December	1.7-2.6	>6.0	---	---	None	---	None

Table 5.--Water Features--Continued

Map symbol and soil name	Month	Water table		Ponding			Flooding	
		Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
		<i>Ft</i>	<i>Ft</i>	<i>Ft</i>				
136: Weirman-----	January	---	---	---	---	None	---	Rare
	February	---	---	---	---	None	---	Rare
	March	---	---	---	---	None	---	Rare
	April	---	---	---	---	None	---	Rare
	December	---	---	---	---	None	---	Rare
137: Weirman-----	January	1.7-5.0	>6.0	---	---	None	Long	Frequent
	February	1.7-5.0	>6.0	---	---	None	Long	Frequent
	March	1.7-5.0	>6.0	---	---	None	Long	Frequent
	April	1.7-5.0	>6.0	---	---	None	Long	Frequent
	May	---	---	---	---	None	Long	Frequent
	November	1.7-5.0	>6.0	---	---	None	---	None
	December	1.7-5.0	>6.0	---	---	None	Long	Frequent
138: Xeralfs-----	January	2.0-5.0	>6.0	---	---	None	---	None
	February	2.0-5.0	>6.0	---	---	None	---	None
	March	2.0-5.0	>6.0	---	---	None	---	None
	April	2.0-5.0	>6.0	---	---	None	---	None
	May	2.0-5.0	>6.0	---	---	None	---	None
	June	2.0-5.0	>6.0	---	---	None	---	None
	December	2.0-5.0	>6.0	---	---	None	---	None
142: Yakima-----	January	---	---	---	---	None	Brief	Occasional
	February	---	---	---	---	None	Brief	Occasional
	March	---	---	---	---	None	Brief	Occasional

## Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

*Capability classes*, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, 2*e*. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

The capability classification of the soils in this survey area is given in the section “Detailed Soil Map Units” under the heading “Interpretive Groups.”

## Rangeland

Soils that have an overstory canopy cover of less than 25 percent are classified as rangeland. Rangeland plant communities are identified by the Natural Resources Conservation Service as ecological sites. The ecological sites are identified by a

name and number; for example, VERY SHALLOW 15+ PZ (R006XY301WA). The ecological site name and number is given in the section "Detailed Soil Map Units" under the heading "Interpretive Groups."

An ecological site is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The hydrology of the site is influenced by development of the soil and plant community. The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range similarity index and rangeland trend. Range similarity index is determined by comparing the present plant community with the potential natural plant community on a particular rangeland ecological site. The more closely the existing community resembles the potential community, the higher the range similarity index. Rangeland trend is defined as the direction of change in an existing plant community relative to the potential natural plant community. Further information about the range similarity index and rangeland trend is available in the "National Range and Pasture Handbook," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, an area with a range similarity index somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Many acres of woodland in the survey area are suitable for grazing by livestock. Most of this acreage is grazed by cattle or has been grazed by sheep and cattle. Generally, the production of wood fiber is the primary use of the woodland and grazing is a secondary use. The forest understory produces forage suitable for wildlife and livestock. Unlike rangeland which supports dominantly grass plants, woodland understory consists dominantly of shrubby plants, broadleaf succulent plants, and young trees.

Forestry activities have a greater impact on the production and composition of woodland understory than do grazing activities. During the early period of settlement, grass production was high, shrubs were sparse, and fast-moving ground fires were common. Heavily barked trees were relatively undamaged by the fires. As practices were implemented to control fires, brush replaced much of the grass and shade-tolerant trees gained a foothold. As the canopy closed, the amount of forage decreased dramatically. Commonly, the number of livestock was not adjusted to the decrease in production of forage and overgrazing resulted.

Silvicultural practices, such as harvesting of shelterwood and thinning for commercial production, increase forage production by opening up the canopy. Using managed burns to dispose of slash and controlling plant competition also increase production of timber and forage.

Areas of rangeland are intermingled with forested areas. The areas of rangeland

produce the majority of the forage in the survey area. These areas may be mapped as a single soil unit or as a complex with forested areas, depending on their size.

Most of the forested soils that are grazed by livestock and wildlife are on south-facing slopes of 0 to 65 percent. Elevation ranges from 1,000 to 5,000 feet. Slope, aspect, elevation, and the climatic and edaphic variations throughout the grazeable woodland affect the understory plant community. The time of year when the forage is suitable for grazing varies depending on whether the area is on south-facing or north-facing slopes and at the lower or higher elevations. Generally, forage plants at the lowest elevations have achieved adequate growth for livestock grazing about mid-May and those at the highest elevations are suitable for grazing about mid-July.

## **Forestland Vegetation, Management, and Productivity**

### **Forestland Vegetation**

#### **Climate and Stand History**

The survey area lies on the east slopes of the Central Cascades Mountains, and it spans a variety of climatic zones. The majority of the area is in the drier rainshadow of the Cascades; however, wetter and colder plant communities are along the crest of the mountains on the far western edge of the survey area. The mean annual precipitation ranges from about 15 to 18 inches at the lower elevations of the Tieton River drainageway and Mount Clemans area to more than 100 inches near the crest of the Cascades. Most precipitation falls as snow, with a small amount of rain in July, August, and September. The last major stand replacement fires occurred about 90 to 100 years ago. Lightning fires occur, but they generally are small in size because of the rain and fire suppression efforts. The exclusion of fire has increased the abundance of shade-tolerant tree species, such as grand fir, western hemlock, and Pacific silver fir. It has also resulted in an increase in fuel loadings and the associated fire risks.

#### **Plant Series, Associations, and Community Types**

Douglas-fir, grand fir, western hemlock, Pacific silver fir, mountain hemlock, and subalpine fir plant series are dominant on the forestland in the survey area. A plant series is named for the most shade-tolerant and environmentally demanding tree species capable of reproducing itself and maintaining itself as the dominant species in the stand over the long term. Within each plant series are several plant associations. Each detailed soil map unit component, excluding miscellaneous areas, have been assigned to a forestland plant association. The plant association for each map unit component is given in the section "Detailed Soil Map Units" under the heading "Interpretive Groups." The two sources of information used extensively to develop this section are the Field Guide for Forested Plant Associations of the Wenatchee National Forest (Lillybridge and others, 1995) and the Little Naches Pilot Watershed Assessment completed in 1994.

Six major climatic influences that differentiate the forestland plant series in the survey area are summer drought, decreasing temperature and increasing precipitation with elevation, maritime influence near the crest of the Cascades, depth and duration of snowpack, early frosts, and slope aspect. The influence of aspect is evident throughout most of the survey area, but it is most pronounced in areas of the drier, lower elevation Douglas-fir and grand fir plant series. While some general vegetation zoning by elevation is evident, much local variation, intermixing, and intergrading of the plant series occurs because of the interaction of climatic influences and micro-site variations. General correlations can be made between forest plant series and soil temperature and moisture regimes. The following table shows these correlations.

Soil Survey of Wenatchee National Forest, Naches Area, Washington

Soil temperature/ moisture regimes	Forest plant series
Mesic/xeric----- (hot/dry)	Douglas-fir
Frigid/xeric----- (warm/dry)	Grand fir
Cryic/xeric----- (cool/dry)	Western hemlock
Cryic/xeric----- (cold/dry)	Subalpine fir
Cryic/udic----- (cool/wet)	Pacific silver fir
Cryic/udic----- (cold/wet)	Mountain hemlock

Plant series are made up of plant associations capable of supporting a given climax tree species. Plant associations are groupings of overstory and understory species (plant communities) that exist under competition and are stable over long periods of time if not disturbed. Climax plant associations are those that would develop to the last stage of plant succession if not disturbed. Plant community types are plant communities for which the climax status is unknown or not reasonably inferred, but identification is useful for management purposes. Approximately 85 percent of the survey area supports forestland plant communities. The remaining 15 percent is classified as non-forestland types. The six plant series in the survey area are discussed in the following paragraphs.

**Douglas-fir series**

The Douglas-fir series occupies the driest forested sites in the survey area, and it commonly is associated with hotter, drier soils such as the McDanielake (south aspect) and Seeburg series. Douglas-fir is the climax tree species in areas that are too dry for more shade-tolerant species such as western hemlock, grand fir, and subalpine fir. Douglas-fir is a relatively long lived, fire-resistant pioneer species that commonly is dominant in tree stands that are mixed with grand fir, western hemlock, and Pacific silver fir. Plant associations in the Douglas-fir series typically have distributions that are not confined to a distinctive climatic belt. Generally, they occur in especially dry areas in which Douglas-fir normally is a serial species or in especially dry areas near the interface of forestland and grassland. The Douglas-fir plant associations correlated to detailed soil map unit components in this survey area are Douglas-fir/common snowberry/pinegrass and Douglas-fir/common snowberry/bluebunch wheatgrass.

Ponderosa pine occurs as a serial species in the Douglas-fir series. Grand fir and western larch may be in localized, small, moist micro-site areas. Lodgepole pine stands may occur, and they appear to have been maintained by repeated stand replacement crown fires.

Plant growth in the Douglas-fir series is primarily limited by lack of moisture during the growing season. Soil drought is severe in summer. Shade-tolerant trees, such as grand fir and western hemlock, are unable to successfully occupy areas that support the Douglas-fir series primarily because of moisture stress. Many herbs and shrubs, such as pinegrass, elk sedge, northwest sedge, common snowberry, and shinyleaf

spirea, are rhizomatous. This allows them to compete with other species that rely entirely on seeds for regeneration, growth, and distribution.

Major diseases and insects include dwarf mistletoe, Armillaria root rot, laminated root rot, mountain pine beetle, and western pine beetle. Spruce budworm habitat is increasing along with the risk of an outbreak.

The soils that support the Douglas-fir series have the lowest timber productivity in the survey area, except for those at the high elevations that support the mountain hemlock series. High seeding mortality is primarily caused by competition from grass along with low available moisture and high temperatures in summer. Areas of forage in the Douglas-fir series generally provide important habitat for wildlife because they commonly are some of the first sites to become re-vegetated in spring.

Suitable management techniques include use of shelterwood and seed tree regeneration. Ponderosa pine commonly will regenerate, but it may take more than 5 years to become established. Douglas-fir regeneration is periodical, but it will become established eventually in the absence of frequent underburning. Use of slash treatments that lop and scatter and use of light-concentration (jackpot) burns help to maintain the content of organic matter and nutrients for tree growth and regeneration.

### **Grand fir series**

Grand fir is an important forest species in the survey area. It is a major serial species in the western hemlock series and is in some of the warmer plant associations in the Pacific silver fir and subalpine fir series. Its absence from the Douglas-fir and mountain hemlock series suggests that it has an affinity to maritime climates and does not tolerate dry or cold conditions. It does, however, tolerate drier conditions than does western hemlock, which is similarly distributed on the landscape.

The grand fir series is characteristic of warm, moderately dry forest habitats. It grades into the Douglas-fir series in the warmer and drier areas. More moist areas support the western hemlock series, and cooler areas closer to the crest of the Cascades support the Pacific silver fir series. The grand fir series is widely distributed over much of the survey area below an elevation of 4,000 feet. The subalpine fir series generally is at the higher elevations and in cooler areas with similar moisture characteristics to areas that support the grand fir series. The grand fir series is in all topographic positions and in areas of all types of bedrock. The grand fir plant associations correlated to detailed soil map unit components in this survey area are grand fir/vanillaleaf, grand fir/Cascade Oregongrape/pinegrass, grand fir/common snowberry/pinegrass, grand fir/pinegrass, and grand fir/oceanspray/pinegrass.

Douglas-fir and ponderosa pine are dominant in the overstory canopy of most stands in the grand fir series. Grand fir commonly is co-dominant, especially in the more moist plant associations and community types, but it is less commonly dominant. Western larch and lodgepole pine are serial species in the cooler drainageways. Western white pine may be a significant component in some of the plant community types. Engelmann spruce is most frequently in the grand fir/vanillaleaf plant association, where it may be co-dominant with grand fir in areas of wet soils.

The understory vegetation in mature stands varies from a dense shrub layer to dense grass and sedge groundcover. Few understory species occur in all of the plant community types in this series, and none are confined to this series. Some of the most common species include baldhip rose, shinyleaf spirea, and pachistima. Important factors influencing the pattern of species include the availability of water, temperature, parent material, and past disturbances, including grazing, logging, and fire.

While potential timber production in areas of the grand fir series is fairly good as compared to that of other series (production is generally higher only in areas of the western hemlock and Pacific silver fir series), most tree stands are at a high risk for

attack by diseases and insects. Drought cycles and localized overstocking periodically stress many trees. Wider-scale tree stress is more evident in areas of this plant series than in areas of any other series. This stress can kill trees, or it can weaken trees so that they are less resistant to diseases and insects. Most of the mortality of trees in the grand fir series is caused by annosus root disease, laminated root disease, armillaria root disease, dwarf mistletoe, mountain pine beetle, western pine beetle, Douglas-fir beetle, and fir engraver. Use of increased stocking rates of grand fir and Douglas-fir appears to have increased the susceptibility of the trees to root rot. Annosus root disease, laminated root disease, and armillaria root disease are increasing to epidemic proportions in some areas. Dwarf mistletoe in Douglas-fir trees generally decreases as moisture increases and stands become less uniform. The incidence of Indian paint fungus and velvet top fungus is more frequent in areas of the grand fir species than in areas of the Douglas-fir series. This series provides habitat for spruce budworm, and the risk of an outbreak is increasing. Fir engraver (*Scolytus*) activity in grand fir has increased during the last few years. Tree diseases and drought cycles commonly weaken trees enough to allow for damage by bark beetle. If the damage is severe enough, the trees will eventually die.

Suitable management techniques are similar to those for areas of the Douglas-fir series, but they include more seed tree harvests, small sanitation harvests to remove trees susceptible to root rot, and some partial cutting to remove dead or high-risk trees. Slash treatments normally involve lop and scatter, concentrated burning, or underburning in spring. Tree regeneration generally is not as much of a problem as it is in areas of the Douglas-fir series. Damage to tree plantations by animals can be a problem, but it is usually localized.

The grand fir/pinegrass plant association provides some of the better forage in mature stands. The other plant associations in this series provide little palatable forage under mature tree canopies. Areas that have abundant shrub cover provide forage and cover for wildlife.

#### **Western hemlock series**

Western hemlock is one of the most shade-tolerant and environmentally restricted conifers in the survey area. The western hemlock series is most strongly expressed in areas that have a maritime climatic influence.

The associated soils commonly are deep and include volcanic ash or alluvium. Colder areas of the western hemlock series normally are bounded by the Pacific silver fir series, and warmer, slightly drier areas are bounded by the grand fir series. Western redcedar tolerates warm temperatures, and both wetter and drier conditions better than does western hemlock. Very old stands of western hemlock are uncommon because of widespread disturbances, such as wildlife and timber harvesting. The western hemlock plant associations correlated to the detailed soil map unit components in this survey area are western hemlock/deerfoot vanillaleaf and western hemlock/Cascade Oregon grape.

Because of its tolerance to shade, western hemlock is considered the climax dominant species wherever it occurs in warm areas. In cool areas that also support Pacific silver fir, western hemlock is considered to be a long-lived serial species. Pacific silver fir can tolerate cooler temperatures and deep snowpack better than can western hemlock.

The type, timing, and intensity of disturbances combined with the species composition prior to disturbances are important modifiers of secondary succession within the series. Although there is a complexity in the possible succession paths, some general patterns exist. Nearly any tree species in the survey area may be important during early serial stages in the warmer areas of the western hemlock series. Ponderosa pine generally is only in the warmest areas. Lodgepole pine is favored when the interval is less than 200 years. Western larch or western white pine

appear to be favored when there is a longer interval between intense crown fires. Western larch, western white pine, and Douglas-fir seem to be favored for the fires are less intense.

The western hemlock series is highly productive, as indicated by the high basal area. Abundant grand fir regeneration can be expected. Planted tree species generally grow well.

Varying amounts of dwarf mistletoe occur in western larch and lodgepole pine. Annosus, laminated, and armillaria root rots occur in the western hemlock series, but they generally are not as virulent as in the grand fir series. The western hemlock series generally is not considered to be suitable habitat for spruce budworm. White pine blister rust commonly is evident on western white pine. Browsing by big game can cause localized damage to plantations.

Suitable management techniques for timber production generally include clearcut, seed tree, and shelterwood harvest methods. Use of seed tree and other partial harvest regeneration methods has increased as the concern for biodiversity, wildlife habitat, and visual quality has increased. Slash treatment methods include broadcast burning and underburning.

### **Pacific silver fir series**

The Pacific silver fir series includes all forest tree stands potentially dominated at climax by Pacific silver fir. Pacific silver fir is also common in plant community types included in the mountain hemlock series, but it does not appear to be dominant in these types. Pacific silver fir is one of the most shade-tolerant conifer species in the survey area. It is only in areas that have a strong maritime climatic influence, usually within a few miles of the crest of the Cascades. Snowpack is deep. Temperatures are cold, but intense, long-lasting temperatures of below zero are rare. The soils that support the Pacific silver fir series rarely, if ever, are under drought conditions.

Areas of the Pacific silver fir series on cooler sites with a deeper snowpack are bounded by the mountain hemlock series, and those on warmer sites that have less snow are bounded by the western hemlock series. Very old stands (more than 400 years old) are uncommon on the east-facing slopes of the Cascade Mountains because of recurring disturbances, such as fire, wind, avalanches, and disease. The Pacific silver fir plant associations correlated to the detailed soil map unit components in this survey area are Pacific silver fir/deerfoot vanillaleaf, Pacific silver fir/rusty menziesia (rustyleaf), Pacific silver fir/blue (big) huckleberry/queencup beadlily, and Pacific silver fir/Cascade azalea-blue (big) huckleberry.

Because of its tolerance to shade, Pacific silver fir commonly is the most abundant species in the tree regeneration layer in stands of mixed species. Some Pacific silver fir trees less than 10 feet tall can be more than 50 years old. Pacific silver fir can persist in the understory for years and then respond to openings in the canopy as a result of windfall or mortality of taller trees.

Tree species commonly associated with Pacific silver fir include mountain hemlock, western hemlock, western redcedar, subalpine fir, Douglas-fir, western larch, western white pine, noble fir, lodgepole pine, Engelmann spruce, and Alaska cedar. Mountain hemlock is an important seral species in the cooler areas of the Pacific silver fir series, and western hemlock is important in the drier areas. In the warmer areas that have been deforested, Pacific silver fir generally appears to require the establishment of shade prior to entering the stand. As the forest canopy develops, the interior of the stand becomes cooler and Pacific silver fir becomes favored over the equally shade-tolerant western hemlock. In frost-prone areas, mountain hemlock appears to be dominant until the canopy reduces the risk of frost and then Pacific silver fir is able to reproduce more successfully than mountain hemlock.

Mature stands typically have at least two tree canopies, with the higher canopy consisting of Douglas-fir, noble fir, and western larch and the lower canopy consisting

of more shade-tolerant, slower growing trees such as Pacific silver fir, western hemlock, and grand fir.

The shrub and herb layers are floristically rich and varied in areas where the tree canopy is more open. Very dense canopies, deep layers of litter, low levels of light at the forest floor, and browsing by animals limit the abundance of shrubs and herbs.

Areas of the Pacific silver fir series generally are some of the most productive tree-growing areas in the survey area. Cool temperatures and heavy snowpack are the main limitations for tree growth and harvest operations. Dwarf mistletoe and forest insects generally are less of a problem in areas of this series than in areas of the western hemlock, grand fir, and Douglas-fir series. Stem diseases such as Pini rot, Indian Paint fungus, brown cubical rot, and velvet top fungus commonly are evident in stands that are more than 300 years old. Annosus root rot is present, but it does not appear to be as virulent as in areas of the western hemlock or grand fir series.

Suitable management techniques include clearcut or seed tree harvest methods. More use of partial-cut regeneration methods is expected because of the increasing concern for biodiversity, wildlife habitat, and visual quality. Harvest activities should maintain only small openings in the canopy to reduce the risk of frost. Regeneration of western hemlock generally is vigorous, and regeneration of other species commonly is not a problem if the risk of frost is controlled.

#### **Mountain hemlock series**

The mountain hemlock series generally occurs in areas of cold, maritime climates near the crest of the Cascades. It is a major upper timberline tree species, and its presence is indicative of cold climates with several feet of snow accumulation in winter. Deep snowpack persists well into June, resulting in a relatively short growing season.

Mountain hemlock is dominant in the overstory of many stands within the Pacific silver fir series. Mountain hemlock and Pacific silver fir broadly overlap in their ecological distribution. The mountain hemlock series is in the upper fringe of closed forests and extends into the subalpine parkland areas as isolated islands of trees. Factors thought to contribute to subalpine parkland development include the depth and duration of the snowpack. Pruning of tree limbs and branches by persistent winds is common in stands along ridgetops. The incidence of stand replacement fires is infrequent as compared to other plant series. At the lower elevations, the mountain hemlock series grades into the Pacific silver fir series. At its driest extent, the mountain hemlock series grades into the subalpine fir series. The mountain hemlock plant associations correlated to detailed soil map unit components in this survey area are mountain hemlock/rusty menziesia-blue (big) huckleberry, mountain hemlock/beargrass-low huckleberry, and mountain hemlock/pink mountainheath-blueleaved huckleberry.

Subalpine fir, whitebark pine, and occasionally lodgepole pine are the primary serial species in this series. Alaska cedar and Pacific silver fir are shade-tolerant species that can also be co-dominant with mountain hemlock, but they are not as well adapted to conditions on the eastern slope of the Cascade Mountains, which limits distribution within the survey area. Stands more than 200 years old commonly consist of a pure canopy of mountain hemlock trees that are very uniform in size and height and have the appearance of an even-aged stand.

Understory vegetation varies from dense herbaceous or shrub layers to a few scattered plants. Dense shrub layers, which include species such as Cascade azalea, are characteristic of the more moist habitats in the series, while beargrass or smooth woodrush are common in the drier areas.

Most areas of the mountain hemlock series are not well suited to intensive timber management. Major limitations include the deep, persistent snowpack and short growing season. Productivity estimates are difficult to obtain because of early growth suppression and frequent damage to the top of the trees. Stem diseases such as Pini

rot, Indian paint fungus, velvet top fungus, and brown cubical rot are evident due to the advanced age of most stands. Annosus root rot is present, but it does not appear to be as virulent as in the other series. Tipover of trees (windthrow) can be a problem along exposed ridges.

### **Subalpine fir series**

The subalpine fir series includes all forest stands that potentially are dominated at climax by subalpine fir or Engelmann spruce. Subalpine fir becomes the dominant climax species in areas that are too cold for more shade-tolerant species to reproduce.

The subalpine fir series extends from middle elevations to the timberline. It tolerates lower temperatures than do most other climax tree species. Presence of this series at lower elevations in association with other series such as Pacific silver fir, western hemlock, grand fir, and Douglas-fir generally is indicative of cold air drainage and frost pockets. The subalpine fir plant associations correlated to detailed soil map unit components are subalpine fir/dwarf huckleberry and subalpine fir/grouse blueberry (huckleberry).

Douglas-fir is an important serial species in the warmer, drier environments at the middle to lower elevations. Western larch is common at the lower elevations. Lodgepole pine is throughout, and it commonly is an important component of many stands (especially those burned in the last 100 years). Intense burns at intervals of less than 200 years strongly favor the development of dense stands of lodgepole pine. Engelmann spruce develops best in the more moist areas of the series. Dense stands of Engelmann spruce commonly are called "spruce bottoms" because of their sheltered, lower lying position.

Cold temperatures and early frosts are the main limitations for tree growth. Slope position and topography are important considerations for development of frost pockets. Grouse blueberry and common beargrass are indicative of cold sites. The occurrence of root diseases is similar to that in the western hemlock series. Dwarf mistletoe can reduce the rate of growth and increase mortality in stands of western larch and lodgepole pine. Mountain pine beetle can also cause increased mortality in pines. The subalpine fir series typically is at elevations above the western spruce budworm habitat found in the grand fir series. Harvesting techniques generally include seed tree harvests or other partial cut regeneration methods of small acreages. These harvests should be designed to reduce the risk of developing frost pockets by creating large openings in the forest canopy. Lodgepole pine regeneration commonly is vigorous, especially after burning. Lop and scatter or low-intensity concentration burns are the preferred methods of slash treatment. Engelmann spruce is suitable for planting in moist areas of the subalpine fir series.

## **Forestland Management**

### **Management Practices**

Suitable management practices include the following:

- Using cable logging systems on slopes of more than 30 to 40 percent to prevent excessive soil displacement and erosion.
- Restricting harvest operations when the soils are moist and easily compacted.
- Using designated skid trails to minimize soil disturbance.
- Ripping of roads, landings, and skid trails to help mitigate soil compaction.
- Commercial and precommercial thinning to control tree stocking levels and reduce drought stress.
- Planting disease-resistant tree species in areas susceptible to root rot.

- Sanitizing to control dwarf mistletoe.
- Salvaging dead trees.
- Planting genetically improved stock when seed is available.
- Using aerial fertilization in areas where past research and practice have demonstrated good growth responses.

### **Insects and Diseases**

Available moisture as influenced by drought cycles and stocking levels is the most important factor influencing general tree development and susceptibility to insects and diseases. Mountain pine beetle, western pine beetle, and Douglas-fir beetle are the principal bark beetles that have caused sporadic mortality of all pines and Douglas-fir. Fir engraver beetle causes mortality of grand fir. Western spruce budworm is the principal defoliating insect found in the survey area, especially in the drier areas. Budworm populations are somewhat cyclical, depending on weather and the mortality rate of larvae. Annosus root disease, laminated root disease, Armillaria root disease, and white pine blister rust are found in trees throughout the survey area. Douglas-fir, ponderosa pine, lodgepole pine, and western larch are susceptible to dwarf mistletoe.

### **Fuel Treatment Methods**

Slash treatment and site preparation for regeneration generally include either broadcast burning or concentration burning. Some lop per acre should be removed in areas of ponderosa pine and Douglas-fir. Machine piling generally is not used because of the associated ground disturbance and soil compaction.

### **Common Logging Equipment**

Logging equipment commonly used includes crawler tractors, rubber-tired skidders, loaders, skyline yarders, and helicopters. Use of log processors, log forwarders, and multi-span logging methods is not widespread.

### **Wood Utilization and Rotation Age**

Forest wood utilization has increased over the years and is expected to increase in the future as land available for intensive timber management declines. Some wood from the top of trees that is as small as 2 inches in diameter is now being used.

A general rotation age of 130 years was used in the Wenatchee National Forest Plan yield modeling for commercial forestland managed by the Forest Service. Current trends are for use of a longer rotation age or maintenance of stands that have two to four rotation ages, some of which are more than 130 years.

### **Forestland Productivity**

Site index values can be converted into estimated yields of trees at various ages using the applicable yield tables. The following summarizes the site indexes and yield tables used for this survey. The site index based on a 50-year and 100-year site curve is listed in this section. An asterisk before the site curve number indicates that the curve was used to develop estimated timber yields for various soil series. Site curve numbers that do not have an asterisk were used for general reference only. The site index information for the detailed soil map unit components is available online from the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/>).

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Site Index Based on a 50-year Site Curve

Tree species	Site index curve reference	Site index curve number
Grand fir	Cochran, 1979	*31
Douglas-fir	SCS, 1988	*765
Western larch	Schmidt and others, 1976	*265
Western white pine	Haig, 1932	*570

Site Index Based on a 100-year Site Curve

Tree species	Site index curve reference	Site index curve number
Engelmann spruce	Alexander, 1967	*412
Lodgepole pine	Alexander, 1966	*520
Mountain hemlock	Barnes, 1962	*990
Pacific silver fir	Hoyer and Herman, 1989	5
Ponderosa pine	Meyer, 1961	*600
Subalpine fir	Alexander, 1967	*412
Western hemlock	Barnes, 1962	*990

## Recreation

Three designated wilderness areas are in the survey area. These areas comprise approximately 225,000 acres, or about one-half of the survey area. The Goat Rocks Wilderness Area was originally designated as a wild area in 1931, and it became a Federal wilderness area in 1964. The William O. Douglas and Norse Peak Wilderness areas were designated as such in 1984. The Pacific Crest National Scenic Trail system, which crosses each of the wilderness areas, can be reached from the two major highways that bisect the survey area and from other connecting trails. The survey area has hundreds of miles of hiking trails as well as excellent trout fishing in rivers, streams, and lakes. Resorts on Rimrock Lake and Bumping Lake reservoirs offer marinas and boat ramps. The Forest Service maintains numerous campgrounds that provide picnic and camping facilities. Elk were introduced into the area in 1913. The herds have grown enough now to provide sport for hunters. Heavy snowfall in winter provides excellent opportunities for cross-country skiing, snowmobiling, and snowshoeing. The White Pass ski area offers downhill skiing.

# Classification of the Soils

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The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

**ORDER.** Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

**SUBORDER.** Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeroll (*Xer*, meaning dry, plus *oll*, from Mollisol).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxerolls (*Hapl*, meaning minimal horizonation, plus *xeroll*, the suborder of the Mollisols that has a xeric moisture regime).

**SUBGROUP.** Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Ultic* identifies the subgroup that typifies the great group. An example is Ultic Haploxerolls.

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy-skeletal, mixed, superactive, frigid Ultic Haploxerolls.

**SERIES.** The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

[Table 6](#) indicates the order, suborder, great group, subgroup, and family of the soil series in the survey area.

## Soil Survey of

Table 6.--Taxonomic Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Ainsley-----	Clayey-skeletal, isotic Andic Haplocryalfs
Alfic Vitrixerands-----	Alfic Vitrixerands
Andic Dystrocryepts-----	Andic Dystrocryepts
Andic Haplocryods-----	Andic Haplocryods
Aquic Haploxererts-----	Aquic Haploxererts
Aquic Vitricryands-----	Aquic Vitricryands
Bearrun-----	Fine, mixed, active, frigid Vitrandic Palexeralfs
Bertolotti-----	Loamy-skeletal, isotic, frigid Andic Dystroxerepts
Bocker-----	Loamy-skeletal, mixed, superactive, frigid Lithic Haploxerolls
Bograp-----	Fine-loamy, isotic, frigid Vitrandic Palexeralfs
Carmack-----	Fine-loamy, mixed, superactive, frigid Ultic Argixerolls
Cryaquands-----	Cryaquands
Cryaquolls-----	Cryaquolls
Cryosaprists-----	Cryosaprists
*Darland-----	Loamy-skeletal, isotic Vitrandic Argicryolls
Fifesridge-----	Fine-loamy, isotic Andic Haplocryalfs
Fiscus-----	Ashy-skeletal over loamy-skeletal, glassy over isotic Xeric Vitricryands
Ghormley-----	Fine, isotic, frigid Vitrandic Palexerolls
Gidwin-----	Loamy-skeletal, mixed, superactive, frigid Lithic Argixerolls
Gilpar-----	Ashy-skeletal, amorphic Andic Haplocryods
Haplocryolls-----	Haplocryolls
Haywire-----	Medial-skeletal over loamy-skeletal, amorphic over isotic Andic Humicryods
Icksix-----	Ashy-skeletal, mixed, frigid Typic Vitrixerands
Jumpe-----	Loamy-skeletal, isotic, frigid Vitrandic Haploxerepts
Kaner-----	Ashy-skeletal over loamy-skeletal, amorphic over isotic Humic Vitricryands
Keechelus-----	Clayey-skeletal, mixed, superactive, frigid Ultic Palexeralfs
Lithic Vitricryands-----	Lithic Vitricryands
Littlebald-----	Medial, mixed Humic Vitricryands
Loneridge-----	Clayey-skeletal, isotic, frigid Vitrandic Palexeralfs
McDanielake-----	Loamy-skeletal, isotic, frigid Andic Haploxeralfs
Millerpoint-----	Ashy, mixed Typic Vitricryands
Mippon-----	Sandy-skeletal, mixed, frigid Fluventic Haploxerolls
Naxing-----	Ashy-skeletal over loamy-skeletal, mixed over isotic Humic Xeric Vitricryands
Nile-----	Ashy over loamy, glassy over isotic Xeric Vitricryands
Nomlas-----	Ashy-skeletal over loamy-skeletal, glassy over isotic Typic Vitricryands
Osborn-----	Coarse-loamy, isotic, frigid Andic Dystroxerepts
Pachic Argixerolls-----	Pachic Argixerolls
Pileup-----	Loamy-skeletal, isotic Andic Haplocryalfs
Ravensroost-----	Ashy over loamy, amorphic over isotic Ultic Vitricryands
Retep-----	Ashy, glassy, frigid Humic Vitrixerands
Sapkin-----	Loamy-skeletal, mixed, superactive, frigid Ultic Argixerolls
Saydab-----	Ashy-skeletal, mixed Oxyaquic Vitricryands
Seeburg-----	Loamy-skeletal, isotic, frigid Vitrandic Haploxerepts
Singh-----	Ashy over loamy-skeletal, mixed over isotic, frigid Alfic Vitrixerands
Snilec-----	Loamy-skeletal, isotic, frigid Vitrandic Palexeralfs
Snowplow-----	Ashy, mixed Humic Xeric Vitricryands
Spexarth-----	Ashy over loamy, glassy over isotic Xeric Vitricryands
Stemilt-----	Loamy-skeletal, isotic, frigid Vitrandic Argixerolls
Stilgar-----	Ashy-skeletal, amorphic Humic Vitricryands
Sutkin-----	Loamy-skeletal, mixed, superactive, frigid Ultic Haploxerolls
Terence-----	Ashy-skeletal, glassy Xeric Vitricryands
Tumac-----	Ashy-skeletal, mixed, frigid Humic Vitrixerands
Twolakes-----	Ashy-skeletal over loamy-skeletal, amorphic over isotic Ultic Vitricryands
Typic Vitricryands-----	Typic Vitricryands
Walupt-----	Ashy over loamy-skeletal, amorphic over isotic Ultic Vitricryands
Weirman-----	Sandy-skeletal, mixed, mesic Torrifuventic Haploxerolls
Xeralfs-----	Xeralfs
Xeric Vitricryands-----	Xeric Vitricryands

## Soil Survey of

Table 6.--Taxonomic Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Xerofluvents-----	Xerofluvents
Yakima-----	Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Cumulic Haploxerolls

### Taxonomic Units and Their Morphology

In this section, each taxonomic unit recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each unit. A pedon, a small three-dimensional area of soil, that is typical of the unit in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff, 1993) and in the "Field Book for Describing and Sampling Soils" (Schoeneberger and others, 2002). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999) and in "Keys to Soil Taxonomy" (Soil Survey Staff, 2003). Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the taxonomic unit.

#### ***Ainsley Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium and residuum derived from andesite or basalt with a mantle of volcanic ash

*Slope range:* 5 to 55 percent

*Elevation:* 2,800 to 5,400 feet

*Mean annual precipitation:* 50 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

#### ***Typical Pedon Location***

Ainsley gravelly ashy sandy loam, 5 to 30 percent slopes, about 6 miles north of Cliffdell, Washington; about 1,800 feet south and 1,800 feet west of the northeast corner of sec. 22, T. 18 N., R. 14 E.

#### ***Typical Pedon***

Oi—1.5 inches to 0; slightly decomposed forest litter; abrupt smooth boundary.

A1—0 to 4 inches; light brownish gray (10YR 6/2) gravelly ashy sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; 15 percent gravel; slightly acid; clear smooth boundary.

A2—4 to 10 inches; pale brown (10YR 6/3) gravelly ashy sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; 15 percent gravel; slightly acid; gradual smooth boundary.

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- 2Bt1—10 to 17 inches; pale brown (10YR 6/3) very gravelly clay loam, dark yellowish brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine, fine, and medium roots; common very fine and fine irregular pores and few fine tubular pores; common distinct brown (10YR 4/3) clay films on faces of peds; 35 percent gravel; slightly acid; gradual smooth boundary.
- 2Bt2—17 to 26 inches; pale brown (10YR 6/3) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and few fine roots; common very fine and fine irregular pores and few very fine and fine tubular pores; common distinct brown (10YR 4/3) clay films on faces of peds and lining root channels; 25 percent gravel and 10 percent cobbles; slightly acid; clear smooth boundary.
- 2Bt3—26 to 38 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine and fine roots; common very fine and fine irregular pores and common fine tubular pores; common distinct dark brown (10YR 3/3) clay films on faces of peds; 45 percent gravel and 10 percent cobbles; slightly acid; clear smooth boundary.
- 2Bt4—38 to 56 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine irregular pores and common fine tubular pores; few faint brown (10YR 4/3) clay films on faces of peds; 25 percent gravel and 10 percent cobbles; slightly acid; clear smooth boundary.
- 2Bt5—56 to 60 inches; brown (10YR 5/3) very gravelly clay loam, yellowish brown (10YR 4/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine and fine tubular pores; few faint brown (10YR 4/3) clay films on faces of peds; 25 percent gravel and 10 percent cobbles; slightly acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—7 to 14 inches

#### **A horizon**

Value—3 or 4 moist

Chroma—2 or 3 dry or moist

Content of clay—4 to 8 percent

#### **2Bt horizon**

Value—5 or 6 dry

Chroma—3 or 4 dry or moist

Content of clay—27 to 40 percent

Reaction—neutral or slightly acid

### ***Alfic Vitrixerands***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 20 to 60 percent

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Elevation:* 3,400 to 5,000 feet

*Mean annual precipitation:* 40 to 60 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Alfic Vitrixerands, 20 to 60 percent slopes, 100 feet north and 1,900 feet east of the southwest corner of sec. 20, T. 18 N., R. 13 E.

***Reference Pedon***

Oi—2 inches to 0; slightly decomposed forest litter; abrupt smooth boundary.

A1—0 to 3 inches; grayish brown (10YR 5/2) ashy loamy sand, very dark grayish brown (10YR 3/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine irregular pores; 40 percent pumice less than 2 millimeters in size; 5 percent gravel; slightly acid; clear smooth boundary.

A2—3 to 9 inches; brown (10YR 5/3) ashy loamy sand, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine and fine irregular pores; 5 percent gravel; slightly acid; gradual smooth boundary.

BA—9 to 18 inches; pale brown (10YR 6/3) ashy sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to moderate fine and medium granular; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine and fine irregular pores; 5 percent gravel; slightly acid; gradual wavy boundary.

2Bt1—18 to 21 inches; brown (10YR 5/3) gravelly loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine irregular pores and few very fine and fine tubular pores; 15 percent gravel; neutral; gradual wavy boundary.

2Bt2—21 to 29 inches; brown (10YR 5/3) very gravelly loam, dark brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few very fine and fine irregular pores and few very fine and fine tubular pores; 25 percent gravel and 10 percent cobbles; neutral; gradual smooth boundary.

2Bt3—29 to 39 inches; yellowish brown (10YR 5/4) extremely cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly sticky; common very fine and fine and few medium and coarse roots; few very fine and fine irregular pores and few fine tubular pores; 30 percent gravel, 30 percent cobbles, and 5 percent stones; slightly acid; gradual smooth boundary.

2Bt4—39 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine and fine irregular and tubular pores; 35 percent gravel, 40 percent cobbles, and 10 percent stones; neutral.

***Range in Characteristics***

**Profile**

Thickness of the volcanic ash—14 to 31 inches

**BA horizon**

Texture—ashy sandy loam or ashy loamy sand

**2Bt horizon**

Hue—7.5YR or 10YR

Chroma—3 or 4 moist

Texture—gravelly loam in upper part and very cobbly loam, extremely cobbly loam, or very gravelly loam in lower part

Clay content—15 to 25 percent

Reaction—slightly acid or neutral

***Andic Dystrocryepts***

*Depth class:* Moderately deep and deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Residuum and colluvium derived from basalt, andesite, phyllite, and sandstone with volcanic ash in upper part

*Slope range:* 30 to 90 percent

*Elevation:* 4,000 to 6,500 feet

*Mean annual precipitation:* 50 to 100 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 40 to 80 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Andic Dystrocryepts in the Snoqualmie Pass Area, Washington, Parts of King and Pierce Counties, soil survey area.

***Reference Pedon***

Oi—0.5 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 7 inches; very dark grayish brown (10YR 3/2) very gravelly ashy sandy loam, grayish brown (10YR 5/2) dry; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; weakly smeary; many very fine and fine roots; many very fine irregular pores; 50 percent gravel; strongly acid; clear smooth boundary.

2Bw1—7 to 16 inches; dark yellowish brown (10YR 3/4) very gravelly sandy loam, yellowish brown (10YR 5/4) dry; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; weakly smeary; many very fine and fine roots; many fine irregular pores; 50 percent gravel; strongly acid; diffuse smooth boundary.

2Bw2—16 to 44 inches; dark brown (7.5YR 3/4) extremely gravelly sandy loam, light yellowish brown (10YR 6/4) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine irregular pores; 60 percent gravel; strongly acid; abrupt smooth boundary.

2R—44 inches; andesite.

***Range in Characteristics***

**Profile**

Thickness of volcanic ash—7 to 14 inches

Depth to bedrock—20 to 60 inches

**Particle-size control section**

Content of rock fragments—25 to 75 percent

**A horizon**

Hue—7.5YR or 10YR

Value—2 to 4 moist, 4 to 6 dry

Chroma—2 to 4 moist or dry

**2Bw1 horizon**

Texture—very cobbly sandy loam or very gravelly sandy loam

**2Bw2 horizon**

Hue—7.5YR or 10YR

Value—3 or 4 moist, 5 or 6 dry

Chroma—3 or 4 moist or dry

Texture—extremely stony sandy loam, extremely cobbly loam, or extremely gravelly sandy loam

***Andic Haplocryods***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from andesite or rhyolite

*Slope range:* 10 to 60 percent

*Elevation:* 3,600 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Andic Haplocryods, 20 to 60 percent slopes, 1,600 feet south and 600 feet west of the northeast corner of sec. 36, T. 15 N., R. 11 E.

***Reference Pedon***

Oi—2 inches to 0; slightly decomposed forest litter; abrupt smooth boundary.

E—0 to 3 inches; very dark grayish brown (10YR 3/2) ashy loamy sand, light brownish gray (10YR 6/2) dry; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine irregular pores; 25 percent coarse and very coarse ash; moderately acid; abrupt smooth boundary.

Bhs—3 to 7 inches; dark brown (7.5YR 4/4) ashy sandy loam, yellowish brown (10YR 5/8) dry; weak fine subangular blocky structure parting to weak moderate granular; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 10 percent gravel; moderately acid; gradual smooth boundary.

Bw1—7 to 14 inches; dark yellowish brown (10YR 3/4) gravelly ashy sandy loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine irregular pores; weakly smeary; 15 percent gravel; moderately acid; gradual smooth boundary.

Bw2—14 to 21 inches; dark brown (7.5YR 4/4) very gravelly ashy sandy loam,

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yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 25 percent gravel and 10 percent cobbles; moderately acid; gradual smooth boundary.

Bw3—21 to 37 inches; dark brown (7.5YR 4/4) very gravelly ashy sandy loam, yellowish brown (10YR 5/6) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine irregular pores and few fine tubular pores; weakly smeary; 35 percent gravel and 10 percent cobbles; moderately acid; gradual smooth boundary.

Bw4—37 to 52 inches; dark brown (10YR 3/3) extremely gravelly ashy sandy loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few medium irregular pores; weakly smeary; 50 percent gravel and 25 percent cobbles; slightly acid; clear smooth boundary.

2BC—52 to 63 inches; dark grayish brown (2.5Y 4/2) extremely gravelly loam, light yellowish brown (2.5Y 6/3) dry; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine irregular pores and few fine tubular pores; 50 percent gravel and 25 percent cobbles; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of the volcanic ash—20 to 60 inches

#### **Bhs horizon**

Value—3 or 4 moist

Chroma—2 or 4 moist

Texture—ashy sandy loam or gravelly ashy sandy loam

Content of clay—4 to 8 percent

#### **Bw horizon**

Hue—7.5YR or 10YR

Value—3 or 4 moist

Chroma—3 to 6 moist

Texture—gravelly ashy sandy loam, very gravelly ashy sandy loam, or extremely gravelly ashy sandy loam

Content of clay—4 to 8 percent

Reaction—moderately acid or slightly acid

#### **2BC horizon**

Value—4 or 5 moist

Chroma—2 or 3 moist

Texture—extremely gravelly loam or extremely cobbly loam

Content of clay—5 to 10 percent

Reaction—slightly acid or neutral

### ***Aquic Haploxererts***

*Depth class:* Very deep

*Drainage class:* Somewhat poorly drained

*Position on landscape:* Depressions

*Parent material:* Slackwater sediment mixed with bentonite

*Slope range:* 0 to 3 percent

*Elevation:* 2,150 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

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*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Aquic Haploxererts, 0 to 3 percent slopes, 1,700 feet north and 1,300 east of the southwest corner of sec. 5, T. 13 N., R. 14 E.

***Reference Pedon***

A—0 to 2 inches; gray (10YR 5/1) ashy sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine and fine irregular pores; 25 percent coarse and very coarse ash; neutral; abrupt irregular boundary.

2Btss—2 to 21 inches; about 75 percent very dark gray (2.5Y 3/1) and 25 percent light olive brown (2.5Y 5/3) clay, about 75 percent very dark gray (2.5Y 3/1) and 25 percent olive brown (2.5Y 4/3) peds, very dark grayish brown (2.5Y 3/2) moist; strong medium and coarse angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common very fine and fine roots; few very fine and fine tubular pores; common distinct very dark gray (10YR 3/1) clay films on faces of peds; common cracks 0.5 to 5.0 centimeters wide throughout; common intersecting slickensides at 30 to 50 degrees from horizontal; neutral; gradual smooth boundary.

2Bt1—21 to 33 inches; light yellowish brown (2.5Y 6/3) clay loam, brown (10YR 4/3) moist; strong coarse subangular blocky structure parting to strong fine subangular blocky; very hard, firm, slightly sticky and moderately plastic; few fine roots; few very fine, fine, and medium tubular pores; common prominent yellowish red (5YR 5/8) redoximorphic concentrations; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common cracks 0.5 to 5.0 centimeters wide throughout horizon; neutral; clear wavy boundary.

2Bt2—33 to 44 inches; brown (10YR 5/3) sandy clay loam, dark brown (7.5YR 4/2) moist; moderate medium and coarse prismatic structure parting to moderate coarse subangular blocky; hard, firm, moderately sticky and moderately plastic; common very fine and fine irregular pores; common prominent yellowish red (5YR 5/8) and common distinct strong brown (7.5YR 5/6) redoximorphic concentrations; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

3Bt3—44 to 60 inches; about 60 percent reddish brown (5YR 5/3) and 40 percent light yellowish brown (2.5Y 6/3) clay, about 60 percent reddish brown (5YR 4/3) and 40 percent pale olive (5Y 6/3) peds, dark brown (10YR 4/3) moist; massive; very hard, very firm, moderately sticky and very plastic; few fine tubular pores; common prominent yellowish red (5YR 5/8) and common distinct strong brown (7.5YR 5/6) redoximorphic concentrations; few faint reddish brown (5YR 4/3) clay films on faces of peds; neutral.

***Range in Characteristics***

**Profile**

Depth to abrupt textural change (2Btss horizon)—2 to 7 inches

Depth to redoximorphic features—20 to 30 inches

High water table—present in winter and spring and early in summer

Ponding—present in spring

**A horizon**

Value—2 or 3 moist

Chroma—1 or 2 moist

Content of clay—4 to 8 percent

**2Bt horizon**

Hue—5Y, 2.5Y, or 10YR

Value—3 to 6 dry, 3 or 4 moist

Chroma—1 or 3 dry, 2 or 3 moist

Texture—clay, clay loam, sandy clay loam, or very gravelly clay

Content of clay—35 to 65 percent in upper part and 27 to 60 percent in lower part

Reaction—slightly acid or neutral

**3Bt horizon**

Value—4 to 6 dry or moist

Chroma—3 or 4 dry or moist

Texture—clay, clay loam, or very gravelly clay

Content of clay—35 to 60 percent

***Aquic Vitricryands***

*Depth class:* Very deep

*Drainage class:* Somewhat poorly drained

*Position on landscape:* Depressions and flood plains

*Parent material:* Volcanic ash and alluvium

*Slope range:* 0 to 5 percent

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 50 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Aquic Vitricryands in an area of Typic Vitricryands-Aquic Vitricryands complex, 0 to 15 percent slopes, about 1,600 feet south and 600 feet east of the northwest corner of sec. 9, T. 14 N., R. 14 E.

***Reference Pedon***

Oe—4 inches to 0; moderately decomposed forest litter; abrupt smooth boundary.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) ashy loam, light brownish gray (10YR 6/2) dry; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; weakly smeary; 5 percent coarse and very coarse ash; slightly acid; clear smooth boundary.

Bw1—6 to 21 inches; ashy fine sandy loam that is dark grayish brown (10YR 4/2) in matrix, 25 percent grayish brown (10YR 5/2) and 25 percent very dark grayish brown (10YR 3/2) on peds, and very pale brown (10YR 7/2) dry; weak medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; common very fine and fine irregular pores and few fine tubular pores; moderately smeary; neutral; clear smooth boundary.

Bw2—21 to 31 inches; light yellowish brown (2.5Y 6/2) ashy fine sandy loam, light gray (2.5Y 7/2) dry; moderate medium and coarse subangular blocky structure;

slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine irregular pores; moderately smeary; common prominent yellowish brown (10YR 5/6) redoximorphic concentrations on faces of peds; neutral; gradual smooth boundary.

BCg—31 to 50 inches; olive (5Y 5/4) gravelly ashy loam, pale yellow (2.5Y 7/4) dry; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine irregular pores; common prominent strong brown (7.5YR 5/6) redoximorphic concentrations and few prominent greenish gray (5G 5/1) redoximorphic depletions on faces of peds; 25 percent gravel; neutral; gradual smooth boundary.

Cg—50 to 64 inches; light olive brown (2.5Y 5/4) very gravelly ashy loam, yellowish brown (10YR 5/6) dry; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; few very fine and fine irregular pores; many prominent dark bluish gray (5B 4/1) and dark greenish gray (5BG 4/1) redoximorphic depletions and common distinct yellowish red (5YR 5/8) redoximorphic concentrations throughout matrix; 40 percent gravel; neutral.

### ***Range in Characteristics***

#### **Profile**

High water table—present throughout year

Flooding—present in spring

Ponding—present in spring

Thickness of volcanic ash—more than 60 inches

Depth to redoximorphic features—20 to 30 inches

#### **A horizon**

Value—3 or 4 moist

Chroma—2 or 3 moist

Content of clay—5 to 10 percent

#### **Bw horizon**

Hue—10YR or 2.5Y

Value—3 to 6 moist

Chroma—2 or 3 moist

Texture—ashy loam or ashy fine sandy loam

Content of clay—5 to 18 percent

#### **Cg horizon**

Hue—5Y or 2.5Y

Chroma—4 or 5 dry

Texture—gravelly ashy loam or very gravelly ashy loam

Content of clay—10 to 18 percent

### ***Bearrun Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt and bentonite with a mantle of volcanic ash (fig. 1)

*Slope range:* 3 to 55 percent

*Elevation:* 2,150 to 5,400 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### ***Typical Pedon Location***

Bearrun ashy sandy loam, 15 to 30 percent slopes, about 2,600 feet east and 100 feet north of the southwest corner of sec. 16, T. 15 N., R. 14 E.

### ***Typical Pedon***

Oi—1 inch to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash; abrupt smooth boundary.

A—0 to 7 inches; brown (10YR 5/3) ashy sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine irregular pores; moderately acid; clear smooth boundary.

2Bw1—7 to 13 inches; pale brown (10YR 6/3) ashy loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, common fine and



**Figure 1.—Typical pedon of a Bearrun soil. The mantle of volcanic ash is 0 to 55 centimeters (22 inches) thick over the clayey 3Bt horizon. Numerals on tape indicate centimeters.**

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- medium, and few coarse roots; common very fine and fine irregular pores and few fine tubular pores; moderately acid; clear smooth boundary.
- 2Bw2—13 to 22 inches; pale brown (10YR 6/3) ashy loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; common fine irregular and tubular pores; 5 percent gravel; moderately acid; abrupt wavy boundary.
- 3Bt1—22 to 32 inches; pale brown (10YR 6/3) clay, grayish brown (2.5Y 5/2) moist; strong medium prismatic structure parting to strong medium subangular blocky; very hard, very firm, very sticky and very plastic; few very fine and fine roots; few fine and medium tubular pores; common prominent very dark grayish brown (10YR 3/2) clay films lining pores and on faces of peds; 5 percent gravel and 5 percent cobbles; moderately acid; gradual smooth boundary.
- 3Bt2—32 to 44 inches; light gray (10YR 7/2) clay, grayish brown (2.5YR 5/2) moist; strong medium and coarse prismatic structure parting to strong medium subangular blocky; very hard, very firm, very sticky and very plastic; few very fine and fine roots; few fine and medium tubular pores; common prominent olive brown (2.5Y 4/4) clay films lining pores and on faces of peds; 5 percent gravel and 5 percent cobbles; moderately acid; gradual smooth boundary.
- 3Bt3—44 to 54 inches; light yellowish brown (10YR 6/4) gravelly clay loam, brown (10YR 5/3) moist; moderate medium and coarse subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few fine and medium roots; common fine irregular pores and few fine tubular pores; common distinct brown (10YR 4/3) clay films lining pores and on faces of peds; 15 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.
- 3Bt4—54 to 60 inches; light yellowish brown (10YR 6/4) very gravelly clay loam, light olive brown (2.5Y 5/4) moist; moderate coarse prismatic structure parting to moderate coarse and medium subangular blocky; hard, friable, moderately sticky and moderately plastic; common very fine and fine irregular pores; common distinct yellowish brown (10YR 3/4) clay films lining pores and on faces of peds; 35 percent gravel and 15 percent cobbles; moderately acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of mixed volcanic ash material—7 to 14 inches

Depth to abrupt textural change (3Bt horizon)—8 to 23 inches

#### **2Bw horizon**

Texture—ashy loam or gravelly ashy clay loam

Content of clay—10 to 30 percent

Reaction—moderately acid or slightly acid

#### **3Bt horizon**

Hue—10YR in upper part and 10YR or 2.5Y in lower part

Value—4 to 7 dry, 4 or 5 moist

Chroma—2 to 4 dry or moist

Texture—clay, silty clay, clay loam, gravelly clay loam, very gravelly clay loam, or gravelly clay

Content of clay—38 to 70 percent in upper part and 30 to 55 percent in lower part

Reaction—moderately acid or slightly acid

### ***Bertolotti Series***

*Depth class:* Very deep

*Drainage class:* Well drained

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from rhyolite with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Elevation:* 3,000 to 4,800 feet

*Mean annual precipitation:* 40 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Typical Pedon Location**

Bertolotti gravelly ashy loamy sand, 30 to 55 percent slopes, 2,400 feet west and 200 feet north of the southeast corner of sec. 13, T. 18 N., R. 13 E.

**Typical Pedon**

Oi—1 inch to 0; slightly decomposed forest litter mixed with Mount St. Helens ash.

A1—0 to 5 inches; light brownish gray (10YR 6/2) gravelly ashy loamy sand, dark brown (10YR 3/3) moist; single grain; loose, nonsticky and nonplastic; many very fine and common fine roots; many very fine irregular pores; 20 percent gravel; moderately acid; clear smooth boundary.

A2—5 to 11 inches; pale brown (10YR 6/3) very gravelly ashy sandy loam, grayish brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; many very fine and fine irregular pores; 35 percent gravel and 5 percent cobbles; slightly acid; clear smooth boundary.

2Bw1—11 to 17 inches; very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine irregular pores; 40 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

2Bw2—17 to 28 inches; very pale brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 45 percent gravel and 10 percent cobbles; moderately acid; clear smooth boundary.

2BC—28 to 51 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine and fine irregular pores; 70 percent gravel and 10 percent cobbles; slightly acid; clear smooth boundary.

2C—51 to 60 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine and fine irregular pores; 70 percent gravel and 10 percent cobbles; moderately acid.

**Range in Characteristics**

**Profile**

Thickness of the volcanic ash—7 to 14 inches

**Particle-size control section**

Content of rock fragments—35 to 60 percent rock fragments

**A horizon**

Value—3 to 5 moist

Chroma—2 or 3 moist or dry

Texture—gravelly ashy loamy sand, very gravelly ashy sandy loam, or very gravelly ashy loam

Content of clay—3 to 12 percent

Reaction—moderately acid or slightly acid

**2Bw horizon**

Hue—10YR or 7.5YR

Value—4 or 5 moist

Chroma—3 or 4 dry or moist

Texture—very gravelly loam, very gravelly sandy loam, or extremely cobbly sandy loam

Content of clay—6 to 12 percent

Reaction—moderately acid or slightly acid

**2BC and 2C horizons**

Value—7 or 8 dry, 5 or 6 moist

Chroma—3 or 4 dry or moist

Texture—extremely cobbly loam, very cobbly loam, or extremely gravelly sandy loam

Content of clay—6 to 12 percent

Reaction—moderately acid or slightly acid

***Bocker Series***

*Depth class:* Very shallow

*Drainage class:* Well drained

*Position on landscape:* Grass- and shrub-covered mountain slopes

*Parent material:* Residuum derived from basalt and mixed with loess and a small amount of volcanic ash

*Slope range:* 0 to 25 percent

*Elevation:* 2,100 to 6,000 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Typical Pedon Location***

Bocker extremely gravelly sandy loam in an area of Bocker-Gidwin complex, 0 to 25 percent slopes, 800 feet north and 2,400 feet east of the southwest corner of sec. 23, T. 17 N., R. 15 E.

***Typical Pedon***

A—0 to 1 inch; dark yellowish brown (10YR 4/4) extremely gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; common very fine and fine irregular pores; 40 percent gravel, 20 percent cobbles, 25 percent surface gravel, and 20 percent surface cobbles; slightly acid; clear smooth boundary.

Bw1—1 to 3 inches; dark brown (7.5YR 4/4) extremely gravelly loam, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine irregular pores; 45 percent gravel and 20 percent cobbles; slightly acid; clear smooth boundary.

Bw2—3 to 8 inches; dark yellowish brown (10YR 4/4) extremely gravelly loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and medium roots;

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common very fine and fine irregular pores; 45 percent gravel and 20 percent cobbles; slightly acid; abrupt smooth boundary.  
R—8 inches; basalt.

***Range in Characteristics***

**Profile**

Depth to bedrock and thickness of mollic epipedon—6 to 10 inches

**Particle-size control section**

Content of rock fragments—40 to 70 percent

**A horizon**

Hue—7.5YR or 10YR

Value—4 or 5 dry

Chroma—3 or 4 dry, 2 or 3 moist

Content of clay—7 to 15 percent

**Bw horizon**

Hue—7.5YR or 10YR

Value—4 or 5 dry

Chroma—3 or 4 dry, 2 or 3 moist

Texture—extremely gravelly loam, very gravelly loam, or extremely cobbly loam

Content of clay—18 to 22 percent

***Bograp Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash

*Slope range:* 3 to 55 percent

*Elevation:* 2,150 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Typical Pedon Location***

Bograp ashy fine sandy loam, 10 to 35 percent slopes, about 7 miles west of Nile, Washington; 1,400 feet north and 2,300 feet west of the southeast corner of sec. 10, T. 15 N., R. 14 E.

***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter.

C—0 to 1 inch; grayish brown (10YR 5/2) ashy loamy sand (volcanic ash), very dark brown (10YR 2/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine irregular pores; strongly acid; abrupt smooth boundary.

A1—1 to 5 inches; light brownish gray (10YR 6/2) ashy fine sandy loam, very dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; common very fine irregular pores; moderately acid; clear smooth boundary.

A2—5 to 9 inches; pale brown (10YR 6/3) ashy fine sandy loam, very dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and

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few coarse roots; common very fine irregular pores; moderately acid; clear smooth boundary.

BA—9 to 14 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; common very fine irregular pores and few fine tubular pores; moderately acid; gradual smooth boundary.

Bt1—14 to 23 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; common very fine tubular pores; common distinct brown (10YR 4/3) clay films lining pores and on faces of peds; neutral; clear smooth boundary.

Bt2—23 to 36 inches; pale brown (10YR 6/3) loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to medium and coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; common very fine tubular pores; many distinct brown (10YR 4/3) clay films lining pores and on faces of peds; moderately acid; gradual smooth boundary.

Bt3—36 to 47 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few very fine tubular pores; many distinct brown (10YR 4/3) clay films lining pores and on faces of peds; slightly acid; clear smooth boundary.

Bt4—47 to 60 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine and fine and few medium and coarse roots; few very fine tubular pores; 10 percent gravel; many distinct brown (10YR 4/3) clay films lining pores and on faces of peds; slightly acid.

### ***Range in Characteristics***

The C horizon may be absent in some pedons.

#### **Profile**

Thickness of the mixed volcanic ash material—7 to 14 inches

#### **A horizon**

Value—5 or 6 dry, 3 or 4 moist

Chroma—2 or 3 dry or moist

Content of clay—4 to 8 percent

Reaction—moderately acid or slightly acid

#### **BA horizon**

Content of clay—7 to 12 percent

#### **Bt horizon**

Value—5 or 6 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—loam or silty clay loam

Content of clay—18 to 30 percent

Content of rock fragments—0 to 10 percent

Reaction—moderately acid to neutral

### ***Carmack Series***

*Depth class:* Very deep

*Drainage class:* Well drained

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*Position on landscape:* Mountain slopes

*Parent material:* Residuum derived from basaltic conglomerate and tuffaceous sandstone

*Slope range:* 0 to 75 percent

*Elevation:* 2,200 to 3,500 feet

*Mean annual precipitation:* 20 to 35 inches

*Mean annual air temperature:* 41 to 45 degrees F

*Frost-free period:* 70 to 110 days

**Typical Pedon Location**

Carmack loam in the Yakima County Area, Washington, soil survey area..

**Typical Pedon**

Oe—2 inches to 0; moderately decomposed forest litter.

C—0 to 1 inch; grayish brown (10YR 5/2) and light gray (10YR 7/2) ashy loamy sand (volcanic ash), very dark grayish brown (10YR 3/2) and light brownish gray (10YR 6/2) moist; single grain; loose; few very fine and fine roots; slightly acid; abrupt smooth boundary.

A1—1 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine irregular pores; 5 percent gravel; slightly acid; clear wavy boundary.

A2—7 to 15 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine roots; few very fine irregular pores; slightly acid; abrupt smooth boundary.

Bw—15 to 21 inches; brown (10YR 5/3) loam, dark yellowish brown (10YR 3/4) moist; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine irregular pores; moderately acid; clear wavy boundary.

Bt—21 to 43 inches; pale brown (10YR 6/3) silty clay loam, dark yellowish brown (10YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine and fine and common medium roots; common very fine irregular pores; common thin clay films on faces of peds; moderately acid; clear wavy boundary.

BC—43 to 60 inches; pale brown (10YR 6/3) loam, dark yellowish brown (10YR 3/4) moist; moderate very fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few fine and common medium roots; few very fine irregular pores; moderately acid.

**Range in Characteristics**

The C horizon may be absent in some pedons.

**Profile**

Thickness of the mollic epipedon—10 to 15 inches

**A1 horizon**

Hue—7.5YR or 10YR

Chroma—2 or 3 dry or moist

Texture—loam or cobbly loam

Content of clay—10 to 20 percent

Content of rock fragments—0 to 25 percent

**A2 horizon**

Hue—7.5YR or 10YR

Chroma—2 or 3 dry or moist

Texture—loam or silt loam  
Content of clay—10 to 20 percent  
Content of rock fragments—0 to 10 percent

**Bw horizon**

Hue—7.5YR or 10YR  
Value—5 to 7 dry, 3 to 5 moist  
Chroma—2 or 3 dry, 2 to 4 moist  
Texture—loam, silt loam, or gravelly loam  
Content of clay—10 to 20 percent  
Content of rock fragments—0 to 25 percent

**Bt horizon**

Value—6 or 7 dry, 3 or 4 moist  
Chroma—2 or 3 dry, 2 to 4 moist  
Texture—silty clay loam, clay loam, or loam  
Content of clay—18 to 35 percent  
Content of rock fragments—0 to 10 percent

**BC horizon**

Texture—loam or silt loam  
Content of clay—10 to 25 percent  
Content of rock fragments—0 to 10 percent

***Cryaquands***

*Depth class:* Very deep  
*Drainage class:* Very poorly drained  
*Position on landscape:* Depressions and flood plains  
*Parent material:* Volcanic ash  
*Slope range:* 0 to 5 percent  
*Elevation:* 4,500 to 6,200 feet  
*Mean annual precipitation:* 50 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Cryaquands in an area of Aquic Vitricryands-Cryaquands complex, 1 to 3 percent slopes, about 5 miles southwest of Clear Lake, Washington; about 1,200 feet south and 2,600 feet west of the northeast corner of sec. 6., T. 12 N., R. 12 E.

***Reference Pedon***

Oi—1 inch to 0; slightly decomposed sedges and grasses; abrupt smooth boundary.  
C—0 to 2.5 inches; dark grayish brown (10YR 4/2) ashy sand (volcanic ash), grayish brown (2.5Y 5/2) dry; single grain; loose, nonsticky and nonplastic; common very fine roots; many very fine and fine irregular pores; moderately acid; abrupt smooth boundary.  
A—2.5 to 6 inches; dark brown (7.5YR 3/2) ashy loam, brown (10YR 4/3) dry; weak medium granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and common fine roots; common fine irregular pores; many distinct brown (7.5YR 4/4) redoximorphic concentrations and few prominent very dark gray (5Y 3/1) depletions; moderately smeary; 35 percent coarse and very coarse ash; moderately acid; clear smooth boundary.

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- Bw1—6 to 19 inches; very dark grayish brown (10YR 3/2) ashy silt loam, grayish brown (10YR 5/2) dry; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many very fine and common fine roots; many very fine and few fine irregular pores; many distinct brown (7.5YR 4/4) redoximorphic concentrations on faces of peds and lining root channels; 35 percent coarse and very coarse ash; very smeary; moderately acid; abrupt smooth boundary.
- Bw2—19 to 27 inches; very dark grayish brown (10YR 3/2) ashy fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and common fine roots; common very fine and fine irregular pores; common distinct brown (7.5YR 4/4) redoximorphic concentrations lining root channels; moderately smeary; 15 percent coarse and very coarse ash; moderately acid; abrupt smooth boundary.
- 2Cg1—27 to 34 inches; greenish gray (5GB 5/1) ashy sandy loam, light gray (2.5Y 7/2) dry; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine irregular pores; 30 percent coarse and very coarse ash; moderately acid; abrupt smooth boundary.
- 2Cg2—34 to 45 inches; greenish gray (5GY 5/1) ashy coarse sandy loam, light gray (5Y 7/1) dry; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine irregular pores; 50 percent coarse and very coarse ash; moderately acid; abrupt wavy boundary.
- 2Cg3—45 to 53 inches; dark greenish gray (5GY 4/1) gravelly ashy loamy sand, light gray (2.5Y 7/1) dry; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine irregular pores; 50 percent coarse and very coarse ash; 15 percent gravel; slightly acid; abrupt smooth boundary.
- 2Cg4—53 to 60 inches; very dark gray (5Y 3/1) ashy very fine sandy loam, light brownish gray (2.5Y 6/2) dry; massive; soft, very friable, nonsticky and nonplastic; common very fine irregular pores; 20 percent coarse and very coarse ash; slightly acid.

### ***Range in Characteristics***

The C horizon may be absent in some pedons.

#### **Profile**

High water table—present year round

Flooding—present in spring

Ponding—present in spring

Thickness of volcanic ash—more than 60 inches

#### **Bw horizon**

Value—3 or 4 moist, 5 or 6 dry

Texture—ashy silt loam or ashy fine sandy loam

Content of clay—6 to 10 percent

Content of rock fragments—0 to 5 percent

#### **2Cg horizon**

Hue—5GY, 5GB, or 2.5Y

Value—3 to 5 moist

Chroma—1 or 3 moist

Texture—ashy sandy loam, ashy very fine sandy loam, or gravelly ashy loamy sand

Content of clay—4 to 8 percent

Content of rock fragments—0 to 30 percent

Reaction—moderately acid or slightly acid

## ***Cryaquolls***

*Depth class:* Very deep

*Drainage class:* Very poorly drained

*Position on landscape:* Depressions of mountain slopes

*Parent material:* Lacustrine sediment mixed with minor amounts of volcanic ash

*Slope range:* 0 to 3 percent

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 40 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

### ***Reference Pedon Location***

Cryaquolls in an area of Naxing-Darland-Cryaquolls complex, 0 to 50 percent slopes, about 11 miles southwest of Nile, Washington; about 1,600 feet south and 500 feet west of the northeast corner of sec. 31, T. 15 N., R. 14 E.

### ***Reference Pedon***

Oi—2 inches to 0; slightly decomposed sedges and grasses; abrupt smooth boundary.

C—0 to 0.5 inch; 1980 Mount St. Helens ash; abrupt smooth boundary.

A—0.5 to 4 inches; very dark grayish brown (2.5Y 3/2) ashy loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; hard, friable, slightly sticky and moderately plastic; many very fine and fine roots; common very fine and fine irregular pores; common distinct strong brown (7.5YR 5/6) redoximorphic concentrations on faces of peds; slightly acid; clear smooth boundary.

Bw—4 to 17 inches; very dark grayish brown (2.5Y 3/2) ashy loam, dark olive brown (2.5Y 3/3) dry; moderate medium subangular blocky structure parting to moderate fine and medium granular; hard, friable, slightly sticky and moderately plastic; common very fine and fine and few medium roots; few very fine and fine irregular pores and few very fine tubular pores; common prominent strong brown (7.5YR 5/6) redoximorphic concentrations on faces of peds; 25 percent coarse and very coarse ash; slightly acid; clear smooth boundary.

2Bg1—17 to 28 inches; dark gray (5Y 4/1) clay loam, light olive brown (2.5Y 5/3) dry; moderate medium subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; common fine irregular pores; common prominent strong brown (7.5YR 5/8) redoximorphic concentrations on faces of peds; slightly acid; gradual smooth boundary.

2Bg2—28 to 35 inches; dark gray (5Y 4/1) clay loam, light olive gray (5Y 6/2) dry; moderate coarse subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; few very fine roots; common very fine and fine irregular pores; common prominent strong brown (7.5YR 5/8) redoximorphic concentrations; slightly acid; gradual smooth boundary.

2BCg—35 to 60 inches; dark gray (5Y 4/1) clay loam, light olive gray (5Y 6/2) dry; massive; hard, friable, moderately sticky and moderately plastic; few very fine irregular pores; few prominent strong brown (7.5YR 5/8) redoximorphic concentrations; slightly acid.

### ***Range in Characteristics***

The C horizon may be absent in some pedons.

**Profile**

Thickness of mollic epipedon—15 to 25 inches  
Thickness of mixed volcanic ash material—0 to 17 inches  
High water table—present throughout year  
Flooding—present in spring  
Ponding—present in spring

**Bw horizon**

Hue—2.5Y or 5Y  
Chroma—1 or 2 moist, 2 or 3 dry  
Texture—ashy loam or ashy silt loam  
Content of clay—18 to 25 percent  
Content of rock fragments—0 to 10 percent

**2Bg and 2BCg horizons**

Hue—2.5Y or 5Y  
Value—5 or 6 dry  
Chroma—2 or 3 dry  
Content of clay—27 to 35 percent  
Content of rock fragments—0 to 10 percent

***Cryosaprists***

*Depth class:* Very deep  
*Drainage class:* Very poorly drained  
*Position on landscape:* Flood plains and depressions  
*Parent material:* Organic deposits derived from grasses and sedges  
*Slope range:* 0 to 3 percent  
*Elevation:* 4,700 to 6,100 feet  
*Mean annual precipitation:* 60 to 90 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Cryosaprists in an area of Cryosaprists-Cryaquands complex, 0 to 5 percent slopes, 1,000 feet south and 800 feet east of the northwest corner of sec. 10, T. 16 N., R. 11 E.

***Reference Pedon***

Oe1—0 to 3 inches; black (10YR 2/1) mucky peat; about 80 percent fibers, 60 percent rubbed; about 80 percent fibrous roots; moderately acid; clear smooth boundary.  
Oe2—3 to 14 inches; black (10YR 2/1) mucky peat; about 70 percent fibers, 40 percent rubbed; about 50 percent fibrous roots; moderately acid; gradual smooth boundary.  
Oa1—14 to 17 inches; black (10YR 2/1) muck; about 40 percent fibers, 15 percent rubbed; about 20 percent fibrous roots; 5 percent pumice less than 2 millimeters in size; moderately acid; abrupt smooth boundary.  
Oa2—17 to 20 inches; very dark grayish brown (10YR 3/2) muck; about 40 percent fibers, 10 percent rubbed; about 20 percent fibrous roots; 60 percent pumice less than 2 millimeters in size; moderately acid; abrupt smooth boundary.  
Oa3—20 to 27 inches; very dark brown (10YR 2/2) muck; about 20 percent fibers,

5 percent rubbed; about 10 percent fibrous roots; 15 percent pumice less than 2 millimeters in size; moderately acid; gradual smooth boundary.  
Oa4—27 to 60 inches; very dark brown (10YR 2/2) muck; about 15 percent fibers, 5 percent rubbed; 10 percent pumice less than 2 millimeters in size; moderately acid.

### ***Range in Characteristics***

Some pedons have thin lenses of volcanic ash in surface tier.

#### **Profile**

High water table—present throughout year

Flooding—present in spring

Ponding—present in spring

#### **Oe horizon**

Hue—7.5YR or 10YR

Value—1 to 3 moist

Chroma—1 or 2 moist

#### **Oa horizon**

Value—2 or 3 dry or moist

Chroma—1 or 2 dry or moist

Content of fibers—20 to 50 percent, 5 to 25 percent rubbed

## ***Darland Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium mixed with loess and volcanic ash

*Slope range:* 3 to 70 percent

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 25 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

### ***Typical Pedon Location***

Darland very gravelly ashy fine sandy loam in an area of Darland-Naxing complex, 15 to 55 percent slopes, about 3 miles northeast of Cliffdell, Washington; about 2,400 feet south and 1,250 feet west of the northeast corner of sec. 18, T. 17 N., R. 15 E.

### ***Typical Pedon***

Oi—0.5 inch to 0; slightly decomposed grasses and forbs.

A—0 to 3 inches; dark brown (10YR 4/3) very gravelly ashy fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine and fine irregular pores; 35 percent gravel; moderately acid; abrupt smooth boundary.

AB—3 to 8 inches; dark brown (10YR 4/3) very gravelly ashy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine and few medium and coarse roots; common very fine tubular pores; 35 percent gravel; moderately acid; clear wavy boundary.

Bt1—8 to 16 inches; dark brown (10YR 4/3) very gravelly loam, very dark grayish

brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common very fine tubular pores; 30 percent gravel and 5 percent cobbles; few faint clay films on faces of peds; moderately acid; clear wavy boundary.

Bt2—16 to 27 inches; dark brown (10YR 4/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common fine and medium tubular pores; 30 percent gravel and 15 percent cobbles; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; moderately acid; gradual wavy boundary.

Bt3—27 to 43 inches; yellowish brown (10YR 5/3) very cobbly loam, dark brown (10YR 3/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine, fine, and medium tubular pores; 15 percent gravel and 35 percent cobbles; common distinct brown (10YR 3/4) clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt4—43 to 60 inches; brown (10YR 5/3) very cobbly loam, dark brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine, fine, and medium tubular pores; 15 percent gravel and 35 percent cobbles; common distinct brown (10YR 4/3) clay films on faces of peds; moderately acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of mollic epipedon—20 to 40 inches

Thickness of the mixed volcanic ash material—7 to 10 inches

#### **Particle-size control section**

Content of clay—15 to 25 percent

Content of rock fragments—35 to 75 percent

#### **A horizon**

Value—4 or 5 dry, 2 or 3 moist

Chroma—3 or 4 dry, 2 or 3 moist

Content of clay—10 to 18 percent

Reaction—moderately acid or slightly acid

#### **AB horizon**

Value—4 or 5 dry, 2 or 3 moist

Chroma—3 or 4 dry, 2 or 3 moist

Texture—very gravelly ashy loam or very gravelly ashy fine sandy loam

Content of clay—10 to 18 percent

#### **Upper part of Bt horizon**

Value—4 or 5 dry, 2 to 4 moist

Chroma—3 or 4 dry or moist

Texture—very gravelly loam, very cobbly loam, or extremely cobbly loam

Content of clay—15 to 25 percent clay

Reaction—moderately acid or slightly acid

#### **Lower part of Bt horizon**

Value—4 or 5 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—extremely cobbly sandy loam or very cobbly loam

Content of clay—10 to 18 percent  
Reaction—moderately acid or slightly acid

The Darland soils in this survey area are a taxadjunct to the series because they have an argillic horizon. This difference has a minimal affect on use and management.

### ***Fifesridge Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 10 to 55 percent

*Elevation:* 3,000 to 5,400 feet

*Mean annual precipitation:* 40 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

#### ***Typical Pedon Location***

Fifesridge ashy sandy loam in an area of Fifesridge-Pileup-Fiscus complex, 10 to 30 percent slopes, about 3.5 miles northwest of Cliffdell, Washington; about 2,300 feet south and 1,800 feet west of the northeast corner of sec. 5, T. 17 N., R. 14 E.

#### ***Typical Pedon***

- Oi—1 inch to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash; abrupt smooth boundary.
- A—0 to 7 inches; brown (7.5YR 5/4) ashy sandy loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine and fine irregular pores; 30 percent coarse and very coarse ash; NaF pH 10.1; slightly acid; abrupt smooth boundary.
- 2Bw—7 to 13 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine irregular pores; 5 percent gravel; NaF pH 9.6; slightly acid; gradual smooth boundary.
- 2Bt1—13 to 20 inches; strong brown (7.5YR 4/6) loam, dark brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common very fine and fine irregular pores and few tubular pores; 10 percent gravel; NaF pH 9.2; slightly acid; gradual smooth boundary.
- 2Bt2—20 to 30 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, and coarse roots; common fine irregular pores and few fine tubular pores; few faint brown (7.5YR 4/4) clay films on faces of peds; 10 percent gravel; slightly acid; clear smooth boundary.
- 2Bt3—30 to 40 inches; brown (7.5YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common very fine and fine irregular pores and few fine tubular pores; few

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distinct brown (7.5YR 4/4) clay films on faces of peds; 5 percent gravel; slightly acid; clear smooth boundary.

2Bt4—40 to 51 inches; light yellowish brown (10YR 6/4) gravelly sandy clay loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine irregular and tubular pores; common distinct brown (7.5YR 4/4) clay films on faces of peds; 15 percent gravel and 5 percent cobbles; neutral; gradual smooth boundary.

3Bt5—51 to 60 inches; light yellowish brown (10YR 6/4) gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine and fine irregular pores and few fine tubular pores; common distinct brown (7.5YR 4/4) clay films on faces of peds; 15 percent gravel and 5 percent cobbles; slightly acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of the volcanic ash—7 to 14 inches

#### **A horizon**

Hue—7.5YR or 10YR

Value—5 to 7 dry

Chroma—2 to 4 dry, 3 or 4 moist

Content of clay—4 to 8 percent

#### **2Bw horizon**

Hue—7.5YR or 10YR

Value—5 to 7 dry

Chroma—3 or 4 dry or moist

Texture—loam or gravelly loam

Content of clay—18 to 27 percent

#### **2Bt horizon**

Hue—2.5Y, 7.5YR, or 10YR

Value—5 to 7 dry, 4 or 5 moist

Chroma—3 or 4 dry or moist

Texture—loam, gravelly loam, or gravelly sandy clay loam

Content of clay—18 to 27 percent

#### **3Bt horizon**

Hue—2.5Y or 10YR

Value—5 or 6 dry, 4 or 5 moist

Texture—gravelly loam or gravelly clay loam

Content of clay—18 to 35 percent

Reaction—slightly acid or neutral

### ***Fiscus Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 10 to 70 percent

*Elevation:* 2,500 to 6,200 feet

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*Mean annual precipitation:* 25 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

***Typical Pedon Location***

Fiscus ashy sandy loam, 25 to 55 percent slopes, about 550 feet south and 150 feet east of the northwest corner of sec. 35, T. 14 N., R. 13 E.

***Typical Pedon***

- Oi—1 inch to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash.
- A—0 to 4 inches; brown (10YR 5/3) ashy sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to weak fine and medium granular; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine irregular pores; 30 percent coarse and very coarse ash; 5 percent gravel; slightly acid; clear smooth boundary.
- Bw1—4 to 14 inches; pale brown (10YR 6/3) gravelly ashy sandy loam, dark brown (10YR 3/3) moist; soft, very friable, nonsticky and nonplastic; moderate fine and medium subangular blocky structure parting to moderate fine granular; many very fine and fine, common medium, and few coarse roots; many very fine irregular pores; 25 percent coarse and very coarse ash; 15 percent gravel and 5 percent cobbles; slightly acid; gradual smooth boundary.
- Bw2—14 to 20 inches; light yellowish brown (10YR 6/4) very gravelly ashy sandy loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; 15 percent coarse and very coarse ash; 25 percent gravel and 10 percent cobbles; neutral; gradual smooth boundary.
- Bw3—20 to 28 inches; light yellowish brown (10YR 6/4) very gravelly ashy sandy loam, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; common very fine and few fine tubular pores; 45 percent gravel and 5 percent cobbles; NaF pH 10.1; neutral; gradual smooth boundary.
- 2Bt1—28 to 40 inches; light yellowish brown (10YR 6/4) very gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common fine tubular pores; few distinct clay films on faces of peds; 40 percent gravel and 15 percent cobbles; NaF pH 9.2; neutral; gradual wavy boundary.
- 2Bt2—40 to 53 inches; brownish yellow (10YR 6/6) extremely gravelly fine sandy loam, dark yellowish brown (10YR 4/6) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine tubular pores; common distinct clay films on faces of peds; 40 percent gravel, 20 percent cobbles, and 1 percent stones; slightly acid; gradual smooth boundary.
- 2Bt3—53 to 67 inches; brownish yellow (10YR 6/6) very gravelly fine sandy loam, dark yellowish brown (10YR 4/6) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few fine tubular pores; common distinct clay films on faces of peds; 30 percent gravel and 10 percent cobbles; neutral.

***Range in Characteristics***

**Profile**

Thickness of volcanic ash—14 to 30 inches

**A horizon**

Hue—7.5YR or 10YR  
Value—4 to 6 dry, 3 or 4 moist  
Chroma—3 or 4 dry or moist  
Content of clay—4 to 8 percent

**Bw horizon**

Hue—10YR or 7.5YR  
Value—4 to 6 dry, 3 to 5 moist  
Chroma—3 or 4 dry or moist  
Texture—gravelly ashy sandy loam in upper part and very gravelly ashy sandy loam or extremely gravelly ashy sandy loam in lower part  
Content of clay—4 to 8 percent  
Reaction—slightly acid or neutral

**2Bt horizon**

Hue—10YR or 7.5YR  
Value—4 or 5 moist  
Chroma—4 or 6 dry or moist  
Texture—very gravelly sandy clay loam, extremely gravelly fine sandy loam, or very gravelly fine sandy loam  
Content of clay—18 to 30 percent  
Reaction—slightly acid or neutral

***Ghormley Series***

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt and bentonite with a minor amount of volcanic ash

*Slope range:* 3 to 55 percent

*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Typical Pedon Location***

Ghormley ashy sandy loam in an area of Ghormley-Bearrun complex, 30 to 55 percent slopes, about 2,300 feet south and 1,200 feet east of the northeast corner of sec. 27, T. 14 N., R. 14 E.

***Typical Pedon***

Oi—1 inch to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash; abrupt smooth boundary.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) ashy sandy loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium roots; many very fine and fine irregular pores; 35 percent coarse and very coarse ash; slightly acid; gradual smooth boundary.

A2—2 to 7 inches; dark grayish brown (10YR 4/2) ashy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine, common medium, and few coarse roots; common very fine and fine irregular pores; 15 percent coarse and very coarse ash; slightly acid; abrupt irregular boundary.

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- AB—7 to 12 inches; grayish brown (10YR 5/2) ashy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; common very fine and fine irregular pores and few very fine and fine tubular pores; 5 percent gravel; slightly acid; abrupt irregular boundary.
- 2BE—12 to 20 inches; grayish brown (10YR 5/2) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to weak fine subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and fine irregular pores and few very fine and fine tubular pores; 10 percent gravel and 5 percent cobbles; slightly acid; clear wavy boundary.
- 2Bt1—20 to 26 inches; light olive brown (2.5Y 5/3) gravelly clay, olive brown (2.5Y 4/3) moist; very hard, very firm, very sticky and very plastic; strong coarse subangular blocky structure; few fine roots; few very fine and fine irregular pores and few very fine, fine, and medium tubular pores; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; 10 percent gravel and 5 percent cobbles; slightly acid; gradual wavy boundary.
- 2Bt2—26 to 35 inches; light olive brown (2.5Y 5/3) gravelly clay, light olive brown (2.5Y 5/3) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; few very fine and fine irregular and tubular pores; common distinct dark brown (10YR 4/3) clay films on faces of peds; few distinct brownish yellow (10YR 6/8) redoximorphic concentrations; 15 percent gravel and 10 percent cobbles; neutral; gradual wavy boundary.
- 2Bt3—35 to 62 inches; pale brown (10YR 6/3) cobbly clay, olive brown (2.5Y 4/3) moist; moderate coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few fine roots matted on faces of peds; few very fine and fine irregular pores; many distinct dark brown (10YR 4/3) clay films on faces of peds; common distinct olive yellow (5Y 6/6) redoximorphic concentrations; 10 percent gravel, 15 percent cobbles, and 5 percent stones; neutral.

### ***Range in Characteristics***

#### **Profile**

- Thickness of mollic epipedon—10 to 16 inches  
Thickness of mixed volcanic ash material—7 to 14 inches  
High water table—present in winter, spring, and summer  
Depth to abrupt textural change—16 to 25 inches

#### **A and AB horizons**

- Value—3 to 5 dry, 2 or 3 moist  
Chroma—1 to 3 dry or moist  
Texture—ashy sandy loam, ashy loam, cobbly ashy loam, or gravelly ashy loam  
Content of clay—7 to 20 percent  
Reaction—slightly acid or neutral

#### **2BE horizon**

- Texture—loam, gravelly loam, or cobbly loam  
Content of clay—18 to 25 percent

#### **2Bt horizon**

- Hue—5Y to 10YR  
Value—3 to 6 dry, 4 or 5 moist  
Chroma—2 to 4 dry, 1 to 4 moist  
Texture—clay, gravelly clay, or cobbly clay  
Content of clay—40 to 60 percent  
Reaction—slightly acid or neutral

## ***Gidwin Series***

*Depth class:* Shallow

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Residuum and colluvium derived from basalt mixed with loess and a small amount of volcanic ash

*Slope range:* 0 to 25 percent

*Elevation:* 3,100 to 4,200 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### ***Typical Pedon Location***

Gidwin gravelly loam in an area of Bocker-Gidwin complex, 0 to 25 percent slopes, 2,000 feet north and 2,600 feet east of the southwest corner of sec. 23, T. 15 N., R. 14 E.

### ***Typical Pedon***

- C—0 to 0.5 inch; light gray (10YR 7/2) loamy fine sand (volcanic ash), dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; slightly acid; abrupt smooth boundary.
- A—0.5 to 5 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine irregular pores; few faint clay films on faces of peds; 10 percent gravel and 5 percent cobbles; slightly acid; clear smooth boundary.
- AB—5 to 12 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine irregular pores and few fine tubular pores; 15 percent gravel and 5 percent cobbles; slightly acid; clear smooth boundary.
- Bt—12 to 15 inches; brown (10YR 5/3) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine irregular pores and few fine tubular pores; common distinct brown (10YR 4/3) clay films on faces of peds; 30 percent gravel and 10 percent cobbles; slightly acid; abrupt irregular boundary.
- R—15 inches; basalt.

### ***Range in Characteristics***

The C horizon may be absent in some pedons.

#### **Profile**

Thickness of mollic epipedon—10 to 20 inches

Depth to bedrock—10 to 20 inches

#### **A and AB horizons**

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 or 3 dry or moist

Texture—gravelly loam or very cobbly loam

Content of clay—15 to 25 percent

**Bt horizon**

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 to 4 dry or moist

Texture—very gravelly clay loam, very gravelly loam, or extremely cobbly loam

Content of clay—18 to 30 percent

***Gilpar Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash and colluvium derived from rhyolite or pyroclastic rock

*Slope range:* 5 to 65 percent

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

***Typical Pedon Location***

Gilpar ashy sandy loam in an area of Twolakes-Gilpar complex, 45 to 65 percent slopes, about 1,800 feet east and 1,600 feet south of the northwest corner of sec. 9, T. 15 N., R. 12 E.

***Typical Pedon***

Oi—1 inch to 0; slightly decomposed forest litter.

C—0 to 1 inch; light gray (10YR 7/1) ashy sand (volcanic ash), white (10YR 8/1) dry; single grain; loose, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 5 percent gravel; moderately acid; abrupt smooth boundary.

E—1 to 5 inches; dark grayish brown (10YR 4/2) ashy sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 5 percent gravel; moderately acid; clear smooth boundary.

Bs—5 to 16 inches; strong brown (7.5YR 5/6) very cobbly ashy sandy loam, reddish yellow (7.5YR 7/6) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 15 percent gravel and 20 percent cobbles; moderately acid; clear smooth boundary.

Bw1—16 to 35 inches; dark yellowish brown (10YR 4/4) extremely cobbly ashy sandy loam, brownish yellow (10YR 6/6) dry; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 30 percent gravel and 40 percent cobbles; moderately acid; gradual smooth boundary.

Bw2—35 to 49 inches; dark yellowish brown (10YR 4/4) extremely cobbly ashy sandy loam, yellowish brown (10YR 5/4) dry; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; few very fine and fine irregular pores; 40 percent gravel and 30 percent cobbles; slightly acid; gradual smooth boundary.

BC—49 to 60 inches; yellowish brown (10YR 5/4) extremely gravelly ashy sandy loam, very pale brown (10YR 7/4) dry; massive; soft, very friable, nonsticky and nonplastic; 50 percent gravel and 20 percent cobbles; slightly acid.

### ***Range in Characteristics***

The C horizon may be absent in some pedons.

#### **Profile**

Thickness of volcanic ash—more than 60 inches

#### **E horizon**

Value—4 or 5 moist, 5 or 7 dry

Chroma—1 or 2 moist or dry

Content of clay—1 to 4 percent

#### **Bs horizon**

Hue—5YR or 7.5YR

Value—3 to 5 moist, 5 to 7 dry

Chroma—4 to 6 moist or dry

Texture—very gravelly ashy sandy loam, very cobbly ashy sandy loam, or extremely cobbly ashy sandy loam

Content of clay—4 to 8 percent

Reaction—strongly acid or moderately acid

#### **Bw horizon**

Hue—10YR

Value—3 to 5 moist, 5 or 6 dry

Chroma—3 to 6 moist or dry

Texture—extremely gravelly ashy sandy loam, extremely cobbly ashy sandy loam, or very gravelly ashy loam

Content of clay—5 to 10 percent

Reaction—moderately acid or slightly acid

#### **BC horizon**

Hue—10YR or 2.5Y

Value—4 or 5 moist, 5 to 7 dry

Chroma—3 or 4 moist or dry

Texture—extremely gravelly ashy sandy loam, very gravelly ashy loam, or extremely cobbly ashy sandy loam

Content of clay—5 to 10 percent

### ***Haplocryolls***

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Position on landscape:* Flood plains

*Parent material:* Recent alluvium mixed with volcanic ash

*Slope range:* 0 to 3 percent

*Elevation:* 3,000 to 5,200 feet

*Mean annual precipitation:* 35 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 80 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

#### ***Reference Pedon Location***

Haplocryolls, 0 to 3 percent slopes, 1,500 feet north and 2,200 feet west of the southeast corner of sec. 9, T. 18 N., R. 13 E.

### ***Reference Pedon***

- A1—0 to 3 inches; dark brown (10YR 3/3) ashy sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine irregular pores; 5 percent gravel; neutral; clear smooth boundary.
- A2—3 to 10 inches; dark brown (10YR 3/3) ashy loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure parting to weak fine and medium granular; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 25 percent coarse and very coarse ash; 10 percent gravel; neutral; gradual irregular boundary.
- Bw1—10 to 24 inches; grayish brown (10YR 5/2) gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine irregular pores; 35 percent coarse and very coarse ash; 20 percent gravel; slightly acid; abrupt irregular boundary.
- Bw2—24 to 35 inches; brown (10YR 5/3) extremely gravelly sandy loam, brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; many very fine and fine irregular pores; 10 percent coarse and very coarse ash; 55 percent gravel and 15 percent cobbles; neutral; abrupt smooth boundary.
- Bw3—35 to 44 inches; brown (10YR 4/3) gravelly sandy loam, dark brown (10YR 3/3) moist; weak coarse and medium subangular blocky structure parting to weak fine and medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine irregular pores and few very fine and fine tubular pores; few distinct brownish yellow (10YR 6/8) redoximorphic concentrations; 15 percent coarse and very coarse ash; 15 percent gravel; neutral; gradual smooth boundary.
- Bw4—44 to 55 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine and fine irregular pores and few fine tubular pores; common distinct brownish yellow (10YR 6/8) redoximorphic concentrations; 10 percent gravel; neutral; abrupt smooth boundary.
- Bw5—55 to 65 inches; brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine irregular pores and few fine tubular pores; many distinct brownish yellow (10YR 6/8) redoximorphic concentrations; 45 percent gravel and 10 percent cobbles; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of mixed volcanic ash material—1 to 27 inches

High water table—present in spring

Flooding—present in spring

#### **A horizon**

Hue—7.5YR or 10YR

Value—3 or 4 moist

Chroma—2 or 3 moist

Texture—ashy sandy loam, ashy loam, or ashy loamy sand

Content of clay—2 to 12 percent

Reaction—slightly acid or neutral

**Bw horizon**

Hue—7.5YR or 10YR

Value—3 or 4 moist, 4 or 5 dry

Chroma—2 or 3 moist or dry

Texture—gravelly sandy loam, very gravelly loam, gravelly loamy sand, loam, fine sandy loam, or extremely gravelly sandy loam

Content of clay—2 to 17 percent

Content of rock fragments—10 to 75 percent

Reaction—slightly acid or neutral

**Haywire Series**

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Position on landscape:* Ridgetops and mountain slopes

*Parent material:* Volcanic ash over residuum and colluvium derived from extrusive igneous rock or tuff

*Slope range:* 5 to 65 percent

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

**Typical Pedon Location**

Haywire ashy sandy loam in the Snoqualmie Pass Area, Parts of King and Pierce Counties, Washington, soil survey area.

**Typical Pedon**

Oi—1 to 0.5 inch; slightly decomposed forest litter consisting of needles and twigs; abrupt smooth boundary.

Oa—0.5 inch to 0; highly decomposed forest litter; common fine, medium, and coarse roots; abrupt smooth boundary.

E—0 to 1 inch; very dark gray (10YR 3/1) ashy sandy loam, gray (10YR 5/1) dry; single grain; loose; weakly smeary; many very fine, fine, and medium roots; very strongly acid; abrupt smooth boundary.

Bhs—1 to 4 inches; dusky red (2.5YR 3/2) medial loam, dark reddish brown (5YR 3/4) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; moderately smeary; many very fine, fine, and medium roots and common coarse roots; 10 percent gravel; very strongly acid; clear irregular boundary.

Bs1—4 to 9 inches; dark reddish brown (2.5YR 3/4) medial loam, dark brown (7.5YR 3/4) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; moderately smeary; many very fine, fine, and medium and common coarse roots; 10 percent gravel; very strongly acid; clear irregular boundary.

Bs2—9 to 17 inches; dark reddish brown (5YR 3/4) gravelly medial loam, dark brown (7.5YR 4/4) dry; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; moderately smeary; common very fine and many fine and medium roots; 25 percent gravel and 5 percent cobbles; strongly acid; clear irregular boundary.

Bs3—17 to 25 inches; dark brown (7.5YR 3/4) very cobbly medial loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; moderately smeary; common fine and

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medium roots; 25 percent gravel, 20 percent cobbles, and 5 percent stones; strongly acid; clear smooth boundary.

2BC1—25 to 28 inches; dark yellowish brown (10YR 4/4) extremely cobbly loam, light yellowish brown (10YR 6/4) dry; massive; soft, friable, slightly sticky and slightly plastic; 35 percent gravel, 20 percent cobbles, and 10 percent stones; strongly acid; clear smooth boundary.

2BC2—28 to 36 inches; dark yellowish brown (10YR 4/4) extremely cobbly loam, light yellowish brown (10YR 6/4) dry; massive; soft, friable, slightly sticky and slightly plastic; 50 percent gravel, 20 percent cobbles, and 10 percent stones; moderately acid; abrupt smooth boundary.

2R—36 inches; fractured andesite.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—15 to 25 inches

Depth to bedrock—20 to 40 inches

#### **Particle-size control section**

Content of rock fragments—averages 35 to 45 percent in upper part and 50 to 75 percent in lower part

#### **E horizon**

Texture—ashy sandy loam or ashy loamy sand

#### **Bhs horizon and upper part of Bs horizon**

Hue—2.5YR, 5YR, 7.5YR, or 10YR

Value—3 or 4 moist, 3 to 5 dry

Chroma—2 to 4 moist or dry

Texture—medial sandy loam, medial loam, gravelly medial sandy loam, or gravelly medial loam

Content of clay—5 to 15 percent

Reaction—very strongly acid or strongly acid

#### **Lower part of Bs horizon**

Hue—2.5YR, 5YR, 7.5YR, or 10YR

Value—3 or 4 moist, 3 to 6 dry

Chroma—3 to 6 moist or dry

Texture—very gravelly medial loam, extremely gravelly medial loam, or very cobbly medial loam

Content of clay—5 to 15 percent

Reaction—very strongly acid or strongly acid

#### **2BC horizon**

Hue—7.5YR or 10YR

Value—4 or 5 moist, 6 or 7 dry

Chroma—4 to 6 moist or dry

Texture—very gravelly loam, very gravelly silt loam, extremely gravelly loam, or extremely cobbly loam

Content of clay—5 to 15 percent

Reaction—strongly acid or moderately acid

### ***Icksix Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash and colluvium derived from basalt and andesite

*Slope range:* 5 to 80 percent

*Elevation:* 2,500 to 4,500 feet

*Mean annual precipitation:* 30 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Typical Pedon Location**

lcksix gravelly ashy sandy loam, 30 to 55 percent slopes, about 7 miles west of Tieton Dam, in Yakima County, Washington; about 900 feet south and 700 feet west of the northeast corner of sec. 36, T. 14 N., R. 12 E.

### **Typical Pedon**

Oi—2 inches to 0; slightly decomposed forest litter; abrupt smooth boundary

C—0 to 2 inches; gray (10YR 6/1) ashy fine sand (volcanic ash), very dark gray (10YR 3/1) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; slightly acid; abrupt smooth boundary.

A—2 to 7 inches; pale brown (10YR 6/3) gravelly ashy sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 25 percent gravel and 5 percent cobbles; NaF pH 11.5; moderately acid; gradual smooth boundary.

AB—7 to 11 inches; light yellowish brown (10YR 6/4) very gravelly ashy sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium and few coarse roots; many very fine and fine irregular pores; 40 percent gravel and 15 percent cobbles; NaF pH 11.5; slightly acid; gradual smooth boundary.

Bw1—11 to 22 inches; light yellowish brown (10YR 6/4) very gravelly ashy sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; many very fine and fine irregular pores; 35 percent gravel, 15 percent cobbles, and 1 percent stones; NaF pH 11.5; slightly acid; gradual smooth boundary.

Bw2—22 to 34 inches; light yellowish brown (10YR 6/4) very cobbly ashy sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; common very fine and fine and few medium roots; many very fine and fine irregular pores; 30 percent gravel, 20 percent cobbles, and 2 percent stones; NaF pH 11.5; slightly acid; gradual smooth boundary.

Bw3—34 to 44 inches; light yellowish brown (10YR 6/4) extremely cobbly ashy fine sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; few very fine and fine roots; many very fine and fine irregular pores; 35 percent gravel, 20 percent cobbles, and 10 percent stones; NaF pH 11.5; slightly acid; gradual smooth boundary.

Bw4—44 to 60 inches; light yellowish brown (10YR 6/4) very cobbly ashy fine sandy loam, brown (10YR 4/3) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine irregular pores; 30 percent gravel, 20 percent cobbles, and 5 percent stones; NaF pH 11.0; slightly acid.

### ***Range in Characteristics***

The C horizon is absent in some pedons.

#### **Profile**

Thickness of volcanic ash—more than 60 inches

#### **AB and Bw horizons**

Value—5 or 6 dry, 3 to 5 moist

Chroma—3 or 4 dry or moist

Texture—very gravelly ashy sandy loam, very cobbly ashy sandy loam, very gravelly ashy fine sandy loam, very cobbly ashy fine sandy loam, extremely cobbly ashy fine sandy loam, or extremely gravelly ashy fine sandy loam

Content of clay—4 to 8 percent

Reaction—slightly acid or neutral

### ***Jumpe Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Residuum and colluvium derived from basalt with a minor amount of loess and volcanic ash

*Slope range:* 5 to 65 percent

*Elevation:* 2,800 to 5,800 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### ***Typical Pedon Location***

Jumpe stony ashy loam, 45 to 65 percent north slopes, about 100 feet west and 200 feet north of the southeast corner of sec. 36, T. 14 N., R. 14 E.

### ***Typical Pedon***

Oe—2 inches to 0; moderately decomposed forest litter.

A—0 to 3 inches; brown (10YR 4/3) stony ashy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; few very fine and fine roots; 10 percent gravel, 10 percent cobbles, and 5 percent stones; slightly acid; clear wavy boundary.

Bw1—3 to 19 inches; brown (7.5YR 4/4) extremely cobbly ashy loam, dark yellowish brown (10YR 3/4) moist; moderate very fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine and common fine and medium roots; 15 percent gravel, 40 percent cobbles, and 10 percent stones; moderately acid; clear wavy boundary.

2Bw2—19 to 41 inches; dark yellowish brown (10YR 4/4) extremely cobbly loam, dark yellowish brown (10YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; few very fine and fine and common medium roots; 15 percent gravel, 35 percent cobbles, and 20 percent stones; moderately acid; clear wavy boundary.

2Bw3—41 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly loam, dark yellowish brown (10YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common

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medium roots; 30 percent gravel, 20 percent cobbles, and 10 percent stones; moderately acid.

***Range in Characteristics***

**Profile**

Thickness of mixed volcanic ash material—7 to 19 inches

**A horizon**

Hue—7.5YR or 10YR

Value—4 to 6 dry, 3 or 4 moist

Chroma—2 or 3 dry or moist

Content of clay—8 to 15 percent

**Bw horizon**

Hue—7.5YR or 10YR

Value—4 to 6 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—very cobbly ashy loam, very cobbly ashy silt loam, or extremely cobbly ashy loam

Content of clay—15 to 27 percent

Reaction—strongly acid to slightly acid

**2Bw horizon**

Hue—7.5YR or 10YR

Value—4 to 6 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—very cobbly loam, very cobbly silt loam, or extremely cobbly loam

Content of clay—8 to 15 percent

Reaction—strongly acid to slightly acid

***Kaner Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from granite or rhyolite

*Slope range:* 5 to 75 percent

*Elevation:* 4,400 to 6,500 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

***Typical Pedon Location***

Kaner-Rubble land complex, 40 to 75 percent slopes, about 6 miles southwest of Bumping Lake Dam; about 50 feet south and 75 feet east of the center of sec. 11, T. 15 N., R. 11 E.

***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter mixed with 1980 Mount St. Helens ash; abrupt smooth boundary.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) gravelly ashy sandy loam, dark grayish brown (10YR 4/2) dry; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 10 percent

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- gravel and 5 percent cobbles; 30 percent coarse and very coarse ash; moderately acid; clear smooth boundary.
- A2—6 to 11 inches; dark brown (10YR 3/3) gravelly ashy sandy loam, brown (10YR 4/3) dry; weak fine subangular blocky structure parting to weak fine and medium granular; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 15 percent gravel and 10 percent cobbles; 20 percent coarse and very coarse ash; moderately acid; gradual smooth boundary.
- AB—11 to 26 inches; dark brown (10YR 3/3) extremely gravelly ashy loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 45 percent gravel, 15 percent cobbles, and 5 percent stones; moderately acid; clear smooth boundary.
- Bw—26 to 37 inches; dark yellowish brown (10YR 4/4) extremely gravelly ashy loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 45 percent gravel, 15 percent cobbles, and 5 percent stones; slightly acid; clear smooth boundary.
- 2C—37 to 60 inches; yellowish brown (2.5Y 5/4) extremely gravelly loam, light yellowish brown (2.5Y 6/4) dry; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine irregular pores; 45 percent gravel, 10 percent cobbles, and 10 percent stones; slightly acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of umbric epipedon—20 to 28 inches

Thickness of volcanic ash—25 to 40 inches

#### **A horizon**

Value—2 or 3 moist, 3 or 4 dry

Content of clay—4 to 8 percent

#### **AB and Bw horizons**

Hue—10YR or 7.5YR

Value—3 to 5 moist, 4 to 6 dry

Chroma—2 to 4 moist, 3 or 4 dry

Texture—extremely gravelly ashy sandy loam, very gravelly ashy loam, or extremely gravelly ashy loam

Content of clay—8 to 12 percent

Reaction—moderately acid or slightly acid

#### **2C horizon**

Value—3 to 5 moist, 4 to 6 dry

Chroma—2 to 4 moist, 4 or 6 dry

Texture—extremely gravelly loam or very gravelly loam

Content of clay—6 to 10 percent

Reaction—moderately acid or slightly acid

### ***Keechelus Series***

*Depth class:* Very deep

*Drainage class:* Well drained

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*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt or andesite mixed with clay deposits with an influence of volcanic ash

*Slope range:* 5 to 55 percent

*Elevation:* 2,500 to 5,400 feet

*Mean annual precipitation:* 35 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Typical Pedon Location**

Keechelus cobbly ashy sandy loam in an area of Keechelus-Bearrun complex, 30 to 55 percent slopes, 1,800 feet north and 1,200 feet east of the southwest corner of sec. 6, T. 17 N., R. 15 E.

**Typical Pedon**

- Oi—1 inch to 0; slightly decomposed forest litter mixed with 1980 Mount St. Helens ash.
- A—0 to 5 inches; light brownish gray (10YR 6/2) cobbly ashy sandy loam, very dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common very fine and fine irregular pores; 5 percent gravel and 15 percent cobbles; neutral; gradual smooth boundary.
- AB—5 to 9 inches; pinkish gray (7.5YR 6/2) cobbly loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine irregular pores; 5 percent gravel and 15 percent cobbles; slightly acid; abrupt smooth boundary.
- Bt1—9 to 16 inches; light brown (7.5YR 6/4) very cobbly clay, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; hard, very firm, very sticky and very plastic; few very fine and fine roots; few fine irregular pores and few very fine tubular pores; few faint light olive brown (2.5Y 5/3) clay films on faces of peds and lining pores; 15 percent gravel and 40 percent cobbles; slightly acid; gradual irregular boundary.
- Bt2—16 to 31 inches; yellowish brown (10YR 5/6) very cobbly clay, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; hard, firm, moderately sticky and moderately plastic; few fine roots; few fine irregular pores and few very fine tubular pores; common faint light olive brown (2.5Y 5/3) clay films on faces of peds and lining pores; common distinct strong brown (7.5YR 5/8) and few distinct olive gray (5Y 4/2) lithochromic colors; 10 percent gravel and 40 percent cobbles; slightly acid; gradual irregular boundary.
- Bt3—31 to 38 inches; light yellowish brown (10YR 6/4) very cobbly clay, yellowish brown (10YR 5/4) moist; moderate coarse prismatic structure; hard, very firm, moderately sticky and moderately plastic; few fine and coarse roots; few fine and medium irregular pores and few very fine tubular pores; common distinct grayish brown (10YR 5/3) clay films on faces of peds and lining pores; grayish brown (2.5Y 5/2) lithochromic colors; 10 percent gravel and 35 percent cobbles; slightly acid; gradual irregular boundary.
- BCt—38 to 48 inches; light olive brown (2.5Y 5/4) gravelly clay, light olive brown (2.5Y 5/4) moist; moderate medium and coarse prismatic structure; hard, very firm, very sticky and very plastic; few fine roots; few fine irregular pores; common distinct grayish brown (10YR 5/3) clay films on faces of peds and lining pores; many prominent olive gray (5Y 5/2) and olive (5Y 5/4) lithochromic colors; 15 percent gravel and 5 percent cobbles; slightly acid; abrupt smooth boundary.

BC—48 to 60 inches; reddish brown (2.5YR 5/4) gravelly clay, reddish brown (5YR 5/4) moist; massive; hard, firm, very sticky and very plastic; few fine roots; few fine irregular pores; 20 percent gravel; slightly acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of mixed volcanic ash material—0 to 6 inches

#### **A horizon**

Hue—10YR or 7.5YR

Value—5 or 6 dry, 3 or 4 moist

Chroma—2 or 3 dry or moist

Content of clay—4 to 8 percent

Reaction—slightly acid or neutral

#### **AB horizon**

Hue—10YR or 7.5YR

Value—5 or 6 dry, 3 or 4 moist

Chroma—2 or 3 dry, 3 or 4 moist

Content of clay—15 to 20 percent

#### **Bt horizon**

Hue—7.5YR or 10YR

Value—5 or 6 dry, 3 to 5 moist

Chroma—4 to 6 dry or moist

Texture—very gravelly clay loam, very gravelly clay, or very cobbly clay

Content of clay—35 to 55 percent

#### **BCt and BC horizons**

Hue—2.5Y to 2.5YR

Value—5 or 6 dry, 3 to 5 moist

Chroma—4 to 6 dry or moist

Texture—gravelly clay, very cobbly clay, or very gravelly clay

Content of clay—45 to 55 percent

### ***Lithic Vitricryands***

*Depth class:* Shallow

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash mixed with residuum and colluvium derived from andesite or pyroclastic rock

*Slope range:* 10 to 90 percent

*Elevation:* 3,700 to 7,200 feet

*Mean annual precipitation:* 35 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 80 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

### ***Reference Pedon Location***

Lithic Vitricryands in an area of Typic Vitricryands-Rock outcrop-Lithic Vitricryands, 45 to 90 percent slopes; 500 feet east and 300 feet north of the southwest corner of sec. 20, T. 17 N., R. 11 E.

### **Reference Pedon**

- Oi—2 inches to 0; slightly decomposed leaves, twigs, and other forest litter mixed with a small amount of 1980 Mount St. Helens ash.
- A—0 to 7 inches; very dark grayish brown (10YR 3/2) cobbly ashy loamy sand, brown (10YR 5/3) dry; single grain; loose, very friable, nonsticky and nonplastic; weakly smeary; common very fine and fine and few medium roots; many very fine and fine irregular pores; 50 percent coarse and very coarse ash; 5 percent gravel and 10 percent cobbles; strongly acid; clear smooth boundary.
- AB—7 to 11 inches; very dark grayish brown (10YR 3/2) gravelly ashy sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; common very fine and fine and few medium roots; many very fine and fine irregular pores; 40 percent coarse and very coarse ash; 10 percent gravel and 5 percent cobbles; strongly acid; clear smooth boundary.
- Bw—11 to 18 inches; very dark grayish brown (10YR 3/2) very gravelly ashy sandy loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; few very fine, fine, and medium roots; many very fine and fine irregular pores; 25 percent coarse and very coarse ash; 30 percent gravel and 15 percent cobbles; moderately acid; clear smooth boundary.
- 2R—18 inches; bedrock.

### **Range in Characteristics**

#### **Profile**

Depth to bedrock and thickness of volcanic ash—10 to 20 inches

#### **A horizon**

Hue—10YR or 7.5YR

Value—2 or 3 moist, 4 or 5 dry

Chroma—2 to 4 moist or dry

Content of clay—0 to 4 percent

Reaction—strongly acid to slightly acid

#### **AB and Bw horizons**

Hue—10YR or 7.5YR

Value—3 to 6 moist, 5 to 7 dry

Chroma—2 to 4 moist or dry

Texture—ashy sandy loam, gravelly ashy sandy loam, very gravelly ashy sandy loam, or extremely cobbly ashy sandy loam

Content of clay—4 to 12 percent

Reaction—moderately acid or slightly acid

### **Littlebald Series**

*Depth class:* Deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over weathered tuff

*Slope range:* 0 to 40 percent

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### ***Typical Pedon Location***

Littlebald medial sandy loam, 0 to 15 percent slopes, about 0.5 mile north of Clover Springs; about 300 feet north and 1,000 feet east of the southwest corner of sec. 15, T. 16 N., R. 13 E.

### ***Typical Pedon***

- Oi—1 inch to 0; slightly decomposed forest litter; abrupt smooth boundary.
- A1—0 to 3 inches; very dark brown (10YR 2/2) medial sandy loam, dark brown (10YR 3/3) dry; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 15 percent coarse and very coarse ash; 5 percent gravel; NaF pH 11.5; moderately acid; clear smooth boundary.
- A2—3 to 10 inches; very dark brown (10YR 2/2) medial sandy loam, dark brown (10YR 3/3) dry; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; weakly smeary; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 30 percent coarse and very coarse ash; 5 percent gravel; NaF pH 12.0; moderately acid; gradual smooth boundary.
- Bw1—10 to 19 inches; very dark brown (10YR 2/2) medial sandy loam, brown (10YR 4/3) dry; moderate fine subangular blocky structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; weakly smeary; common very fine and fine and few medium roots; many very fine and fine irregular pores; 25 percent coarse and very coarse ash; 5 percent gravel; NaF pH 11.5; slightly acid; gradual smooth boundary.
- Bw2—19 to 33 inches; very dark brown (10YR 2/2) medial sandy loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; weakly smeary; common very fine and fine roots; many very fine and fine irregular pores; 25 percent coarse and very coarse ash; 5 percent gravel; NaF pH 11.5; slightly acid; clear smooth boundary.
- Bw3—33 to 46 inches; dark yellowish brown (10YR 3/4) cobbly medial loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure parting to weak fine subangular blocky; soft, very friable, nonsticky and nonplastic; weakly smeary; few very fine and fine roots; many very fine and fine irregular pores; 10 percent gravel and 10 percent cobbles; NaF pH 10.5; slightly acid; gradual wavy boundary.
- 2Cr1—46 to 53 inches; weathered tuff; crushes to yellowish brown (10YR 5/4) loam, very pale brown (10YR 7/3) dry; gradual wavy boundary.
- 2Cr2—53 to 60 inches; weathered tuff; crushes to light yellowish brown (10YR 6/4) loam, very pale brown (10YR 7/3) dry.

### ***Range in Characteristics***

#### **Profile**

Thickness of umbric epipedon—13 to 36 inches

Depth to bedrock and thickness of volcanic ash—40 to 60 inches

#### **A horizon**

Value—2 or 3 moist, 3 to 5 dry

Chroma—2 or 3 moist or dry

Content of clay—4 to 8 percent

#### **Bw1 and Bw2 horizons**

Value—2 or 3 moist, 4 or 5 dry

Chroma—2 or 3 moist or dry

Texture—medial loam or medial sandy loam  
Content of clay—6 to 10 percent

**Bw3 horizon**

Value—3 or 4 moist, 5 or 6 dry  
Chroma—3 or 4 moist or dry  
Texture—medial sandy loam, gravelly medial sandy loam, or cobbly medial loam  
Content of clay—6 to 10 percent

***Loneridge Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium and residuum derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 15 to 65 percent

*Elevation:* 3,100 to 5,500 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Typical Pedon Location***

Loneridge gravelly ashy sandy loam in an area of Loneridge-Stemilt complex, 15 to 45 percent slopes, 2,400 feet east and 2,450 feet south of the northwest corner of sec. 35, T. 17 N., R. 15 E.

***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash.

A1—0 to 5 inches; grayish brown (10YR 5/3) gravelly ashy sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 15 percent gravel and 5 percent cobbles; neutral; gradual smooth boundary.

A2—5 to 10 inches; pale brown (10YR 6/3) cobbly ashy sandy loam, dark brown (10YR 3/4) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine and fine irregular pores; 15 percent gravel and 15 percent cobbles; neutral; clear smooth boundary.

BE—10 to 19 inches; pale brown (10YR 6/3) very cobbly ashy loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common very fine and fine irregular pores; 25 percent gravel and 25 percent cobbles; neutral; abrupt smooth boundary.

2Bt1—19 to 27 inches; grayish brown (10YR 5/3) very cobbly clay, brown (10YR 4/3) moist; strong coarse prismatic structure; very hard, firm, moderately sticky and moderately plastic; few very fine and fine roots; few fine tubular pores and few very fine irregular pores; common distinct clay films on faces of peds and lining pores; 20 percent gravel and 20 percent cobbles; neutral; clear smooth boundary.

2Bt2—27 to 42 inches; grayish brown (10YR 5/3) very cobbly clay loam, brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few very fine and fine roots; few fine tubular pores and few very fine and fine irregular pores; common distinct clay

films on faces of peds and lining pores; 25 percent gravel and 30 percent cobbles; neutral; clear smooth boundary.

2Bt3—42 to 60 inches; yellowish brown (10YR 5/4) very cobbly clay loam, brown (10YR 4/4) moist; strong medium and coarse subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few very fine roots; few fine tubular pores and few very fine irregular pores; common distinct clay films on faces of peds and lining pores; 25 percent gravel and 30 percent cobbles; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of mixed volcanic ash material—7 to 20 inches

Depth to abrupt textural change (2Bt horizon)—12 to 24 inches

#### **A horizon**

Value—5 or 6 dry, 2 to 4 moist

Chroma—3 or 4 dry or moist

Texture—gravelly ashy sandy loam or cobbly ashy sandy loam

Content of clay—4 to 8 percent

Reaction—slightly acid or neutral

#### **BE horizon**

Value—5 or 6 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—very cobbly ashy loam or very gravelly ashy loam

Content of clay—18 to 27 percent

#### **2Bt horizon**

Hue—7.5YR or 10YR

Value—5 or 6 dry

Chroma—3 to 5 dry or moist

Texture—very cobbly clay loam, extremely cobbly clay loam, very gravelly clay loam, or very cobbly clay

Content of clay—35 to 55 percent

### ***McDanielake Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 0 to 70 percent

*Elevation:* 2,150 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### ***Typical Pedon Location***

McDanielake ashy sandy loam, 15 to 30 percent slopes, about 500 feet north and 2,500 feet west of the southeast corner of sec. 35, T. 17 N., R. 15 E.

### ***Typical Pedon***

Oi—1 inch to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash.

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- A1—0 to 4 inches; light brown (7.5YR 6/4) ashy sandy loam, dark brown (7.5YR 3/4) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 20 percent coarse and very coarse ash; 10 percent gravel; neutral; gradual smooth boundary.
- A2—4 to 11 inches; brown (7.5YR 5/4) gravelly ashy sandy loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine irregular pores; 20 percent gravel and 10 percent cobbles; neutral; clear smooth boundary.
- 2Bt1—11 to 22 inches; strong brown (7.5YR 5/6) extremely cobbly loam, dark brown (7.5YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and common fine and medium roots; common very fine and fine irregular pores; few faint clay films on faces of peds; 30 percent gravel and 30 percent cobbles; slightly acid; abrupt smooth boundary.
- 2Bt2—22 to 41 inches; light yellowish brown (10YR 6/4) extremely cobbly loam, dark yellowish brown (10YR 4/4) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine and fine irregular pores; few distinct clay films on faces of peds; 30 percent gravel and 40 percent cobbles; slightly acid; clear smooth boundary.
- 2BC—41 to 61 inches; light yellowish brown (10YR 6/4) extremely cobbly loam, dark yellowish brown (10YR 4/4) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; many very fine and fine irregular pores; 35 percent gravel and 45 percent cobbles; slightly acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—7 to 14 inches

Depth to strongly contrasting textural stratification (2Bt horizon)—10 to 20 inches

#### **A horizon**

Hue—5YR to 10YR

Value—5 or 6 dry

Texture—ashy sandy loam or gravelly ashy sandy loam

Content of clay—4 to 8 percent

Reaction—slightly acid or neutral

#### **2Bt horizon**

Hue—5YR to 10YR

Value—5 or 6 dry, 3 or 4 moist

Chroma—3 or 4 moist

Texture—very gravelly loam, very gravelly clay loam, or extremely cobbly loam

Content of clay—18 to 35 percent

#### **2BC horizon**

Value—5 or 6 dry, 4 or 5 moist

Chroma—4 or 5 dry or moist

Texture—very gravelly loam or extremely cobbly loam

Content of clay—18 to 27 percent

### ***Millerpoint Series***

*Depth class:* Very deep

*Drainage class:* Well drained

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*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from andesite

*Slope range:* 5 to 40 percent

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

**Typical Pedon Location**

Millerpoint ashy sandy loam, 5 to 35 percent slopes, about 1,500 feet east and 1,800 feet south of the northwest corner of sec. 3, T. 12 N., R. 12 E.

**Typical Pedon**

Oi—1 inch to 0; slightly decomposed forest litter; abrupt smooth boundary.

C—0 to 2 inches; gray (10YR 5/1) ashy loamy sand (volcanic ash), light gray (10YR 7/1) dry; single grain; loose, very friable, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine and fine and few medium and coarse irregular pores; 50 percent coarse and very coarse ash; NaF pH 9.2; slightly acid; abrupt smooth boundary.

A1—2 to 4 inches; brown (10YR 4/3) ashy sandy loam, pale brown (10YR 6/3) dry; weak fine and medium granular structure; loose, very friable, nonsticky and nonplastic; weakly smeary; many very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 20 percent coarse and very coarse ash; NaF pH 11.2; slightly acid; clear smooth boundary.

A2—4 to 13 inches; brown (10YR 4/3) ashy sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; many very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 10 percent coarse and very coarse ash; 5 percent gravel; NaF pH 11.2; slightly acid; gradual smooth boundary.

Bw1—13 to 23 inches; dark yellowish brown (10YR 3/6) gravelly ashy fine sandy loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; common fine and few medium and coarse roots; many very fine and fine irregular pores; 10 percent gravel and 5 percent cobbles; NaF pH 10.6; slightly acid; gradual smooth boundary.

Bw2—23 to 41 inches; yellowish brown (10YR 5/6) gravelly ashy fine sandy loam, very pale brown (10YR 7/4) dry; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; few very fine and fine roots; many very fine and fine irregular pores; 10 percent gravel and 5 percent cobbles; NaF pH 10.6; moderately acid; gradual smooth boundary.

2Bw3—41 to 60 inches; yellowish brown (10YR 5/6) fine sandy loam, very pale brown (10YR 7/4) dry; moderate coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; few very fine and fine irregular pores; 5 percent gravel; NaF pH 9.6; moderately acid.

**Range in Characteristics**

The C horizon is absent in some pedons.

**Profile**

Thickness of volcanic ash—40 to 60 inches

**A horizon**

Hue—7.5YR or 10YR

Value—3 or 4 moist, 5 or 6 dry

Chroma—3 to 6 moist or dry  
Content of clay—4 to 8 percent

**Bw horizon**

Value—3 to 5 moist, 5 to 7 dry  
Chroma—3 or 4 moist or dry  
Texture—ashy sandy loam, ashy fine sandy loam, or gravelly ashy fine sandy loam  
Content of clay—4 to 8 percent  
Reaction—moderately acid or slightly acid

**2Bw horizon**

Value—3 to 5 moist, 5 to 7 dry  
Chroma—3 or 4 moist or dry  
Texture—fine sandy loam or gravelly fine sandy loam  
Content of clay—4 to 8 percent  
Reaction—moderately acid or slightly acid

***Mippon Series***

*Depth class:* Very deep  
*Drainage class:* Moderately well drained  
*Position on landscape:* Flood plains  
*Parent material:* Recent alluvium  
*Slope range:* 0 to 5 percent  
*Elevation:* 2,150 to 2,900 feet  
*Mean annual precipitation:* 20 to 30 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

***Typical Pedon Location***

Mippon very cobbly ashy sandy loam in an area of Mippon-Xerofluvents complex, 0 to 5 percent slopes, 1,200 feet north and 2,300 feet west of the southeast corner of sec. 12, T. 17 N., R. 13 E.

***Typical Pedon***

Oi—0.5 inch to 0; slightly decomposed forest litter; abrupt smooth boundary.  
A1—0 to 4 inches; grayish brown (10YR 5/2) very cobbly ashy sandy loam, very dark brown (10YR 3/3) moist; weak fine granular structure; soft, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; 20 percent coarse and very coarse ash; 25 percent gravel and 20 percent cobbles; slightly acid; clear smooth boundary.  
2A2—4 to 13 inches; grayish brown (10YR 5/3) very cobbly loamy sand, very dark brown (10YR 3/3) moist; weak fine granular structure; loose, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 30 percent gravel and 20 percent cobbles; slightly acid; gradual smooth boundary.  
2AC—13 to 23 inches; dark yellowish brown (10YR 4/6) extremely cobbly loamy sand, dark brown (10YR 3/4) moist; weak fine granular structure; loose, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 40 percent gravel and 30 percent cobbles; slightly acid; gradual smooth boundary.  
2C1—23 to 42 inches; multicolored extremely cobbly coarse sand; single grain; loose, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many fine irregular pores; 40 percent gravel and 30 percent cobbles; neutral; gradual smooth boundary.

2C2—42 to 60 inches; multicolored extremely cobbly coarse sand; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; many very fine irregular pores; 40 percent gravel, 30 percent cobbles, and 5 percent stones; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of mollic epipedon—10 to 17 inches

Thickness of volcanic ash—0 to 7 inches

High water table—present late in winter, in spring, and early in summer

Flooding—present late in winter, in spring, and early in summer

#### **A1 horizon**

Value—3 to 5 dry, 2 or 3 moist

Chroma—2 or 3 dry, 1 to 3 moist

Content of clay—5 to 10 percent

Reaction—slightly acid or neutral

#### **2A2 and 2AC horizons**

Value—4 to 6 dry

Chroma—4 to 6 dry, 2 to 4 moist

Texture—very cobbly loamy sand, extremely cobbly loamy sand, or extremely gravelly sandy loam

Content of clay—2 to 5 percent

Reaction—slightly acid or neutral

#### **2C horizon**

Value—4 or 5 dry and 3 or 4 moist, or multicolored

Texture—extremely gravelly coarse sand or extremely cobbly coarse sand

Content of clay—0 to 2 percent

Reaction—slightly acid or neutral

### ***Naxing Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash

*Slope range:* 3 to 65 percent

*Elevation:* 4,600 to 6,300 feet

*Mean annual precipitation:* 25 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

### ***Typical Pedon Location***

Naxing very gravelly ashy sandy loam, 45 to 65 percent slopes, about 3 miles northeast of Cliffdell, Washington; about 20 feet west and 2,250 feet south of the northeast corner of sec. 18, T. 17 N., R. 15 E.

### ***Typical Pedon***

Oi—2 inches to 0; slightly decomposed needles and twigs mixed with a small amount of 1980 Mount St. Helens ash.

A1—0 to 5 inches; brown (10YR 4/3) very gravelly ashy sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; common very fine

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- and fine roots; many very fine and fine irregular pores; 45 percent gravel; NaF pH 10.6; slightly acid; clear smooth boundary.
- A2—5 to 13 inches; brown (10YR 4/3) very gravelly ashy sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine irregular pores; 45 percent gravel; NaF pH 10.6; slightly acid; clear smooth boundary.
- AB—13 to 24 inches; yellowish brown (10YR 5/4) very gravelly ashy sandy loam, dark brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium and few coarse roots; 45 percent gravel and 5 percent cobbles; NaF pH 11.0; neutral; gradual smooth boundary.
- Bw1—24 to 34 inches; yellowish brown (10YR 5/4) very gravelly ashy sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 35 percent gravel, 15 percent cobbles, and 5 percent stones; NaF pH 10.6; neutral; clear smooth boundary.
- 2Bw2—34 to 50 inches; light brown (7.5YR 6/3) very gravelly sandy loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; common very fine and fine irregular pores; 35 percent gravel and 15 percent cobbles; NaF pH 10.1; neutral; gradual wavy boundary.
- 2Bw3—50 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly sandy loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine to coarse roots; common very fine and fine irregular pores; 35 percent gravel and 20 percent cobbles; NaF pH 10.1; neutral.

### *Range in Characteristics*

#### **Profile**

Thickness of umbric epipedon—18 to 35 inches

Thickness of volcanic ash—28 to 36 inches

Reaction—slightly acid or neutral

#### **A horizon**

Hue—7.5YR or 10YR

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 or 3 dry or moist

Content of clay—4 to 8 percent

#### **Bw horizon**

Hue—7.5YR or 10YR

Value—5 or 6 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—very gravelly ashy sandy loam, extremely cobbly ashy sandy loam, or very cobbly ashy sandy loam

Content of clay—4 to 8 percent

#### **2Bw horizon**

Hue—7.5YR or 10YR

Value—5 or 6 dry, 3 or 4 moist

Chroma—3 or 4 moist, 4 or 5 dry or moist

Texture—very cobbly sandy loam, very gravelly sandy loam, or extremely cobbly sandy loam

Content of clay—4 to 8 percent

## ***Nile Series***

*Depth class:* Very deep

*Drainage class:* Somewhat excessively drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from conglomerate and tuffaceous sandstone

*Slope range:* 10 to 70 percent

*Elevation:* 3,000 to 5,200 feet

*Mean annual precipitation:* 40 to 50 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

### ***Typical Pedon Location***

Nile ashy sandy loam in an area of Nile-Snilec complex, 10 to 30 percent slopes, about 8 miles northwest of Nile, Washington; about 900 feet south and 400 feet east of the northwest corner of sec. 5, T. 16 N., R. 14 E.

### ***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash; abrupt smooth boundary.

A—0 to 2 inches; pale brown (10YR 6/3) ashy sandy loam, very dark brown (10YR 3/3) moist; single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; 20 percent coarse and very coarse ash; 10 percent gravel; moderately acid; gradual smooth boundary.

Bw1—2 to 8 inches; pale brown (10YR 6/3) ashy sandy loam, brown (10YR 4/3) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium and few coarse roots; many very fine and fine irregular pores; 10 percent gravel; moderately acid; abrupt smooth boundary.

Bw2—8 to 16 inches; light gray (10YR 7/2) gravelly ashy sandy loam, grayish brown (10YR 5/3) moist; weak fine and medium subangular blocky structure parting to weak fine and medium granular; soft, very friable, nonsticky and nonplastic; few very fine and common fine and medium roots; many very fine and fine irregular pores; 20 percent gravel and 5 percent cobbles; NaF pH 9.6; strongly acid; gradual smooth boundary.

2Bw3—16 to 33 inches; light gray (10YR 7/2) gravelly sandy loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; many very fine and fine irregular pores; 15 percent gravel and 5 percent cobbles; 25 percent paragravel and 20 percent paracobbles; slightly acid; gradual smooth boundary.

3Bw4—33 to 45 inches; light gray (10YR 7/2) very gravelly sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, very friable, nonsticky and nonplastic; weak very fine, fine, and medium roots; many very fine and fine irregular pores; 30 percent gravel and

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15 percent cobbles; 15 percent paragravel and 15 percent paracobbles; slightly acid; gradual wavy boundary.

3Bw5—45 to 60 inches; light gray (10YR 7/2) cobbly sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure parting to moderate medium and coarse granular; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine irregular pores; 10 percent gravel and 10 percent cobbles; 10 percent paragravel and 20 percent paracobbles; neutral; gradual wavy boundary.

4BC—60 to 72 inches; light gray (10YR 7/2) very cobbly sandy loam, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many fine pores; 15 percent gravel and 40 percent cobbles; 10 percent paragravel and 20 percent paracobbles; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—14 to 35 inches

#### **A and Bw horizons**

Value—5 or 6 dry, 3 to 5 moist

Chroma—2 or 3 dry or moist

Texture—ashy sandy loam or gravelly ashy sandy loam

Content of clay—4 to 8 percent

Reaction—moderately acid or slightly acid

#### **2Bw horizon**

Value—6 or 7 dry, 4 to 6 moist

Chroma—2 or 3 dry, 2 to 4 moist

Content of clay—7 to 16 percent

Reaction—strongly acid to slightly acid

#### **3Bw and 4BC horizons**

Value—6 or 7 dry, 4 to 6 moist

Chroma—2 to 4 dry or moist

Texture—very gravelly sandy loam, cobbly sandy loam, or very cobbly sandy loam

Content of clay—4 to 8 percent

Reaction—slightly acid or neutral

### ***Nomlas Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or basalt

*Slope range:* 10 to 90 percent

*Elevation:* 3,800 to 7,000 feet

*Mean annual precipitation:* 60 to 100 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### ***Typical Pedon Location***

Nomlas gravelly ashy sandy loam, 10 to 30 percent slopes, about 8 miles northwest of Cliffdell, Washington; 2,400 feet north and 2,500 feet west of the southeast corner of sec. 4, T. 17 N., R. 13 E.

### ***Typical Pedon***

- Oi—2 inches to 0; slightly decomposed leaves, twigs, and other forest litter mixed with a small amount of 1980 Mount St. Helens ash.
- A—0 to 3 inches; dark brown (10YR 3/3) gravelly ashy sandy loam, brown (10YR 5/3) dry; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine irregular pores; 25 percent gravel and 5 percent cobbles; NaF pH 10.3; moderately acid; clear smooth boundary.
- Bw1—3 to 12 inches; dark brown (10YR 3/3) very gravelly ashy sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine irregular pores; 35 percent gravel and 5 percent cobbles; NaF pH 10.4; moderately acid; clear smooth boundary.
- Bw2—12 to 25 inches; dark yellowish brown (10YR 4/4) very gravelly ashy fine sandy loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, common fine and medium, and few coarse roots; many very fine and fine irregular pores; 40 percent gravel and 10 percent cobbles; NaF pH 10.3; moderately acid; clear smooth boundary.
- 2Bw3—25 to 34 inches; dark brown (10YR 4/3) extremely gravelly sandy loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine irregular pores; 60 percent gravel and 20 percent cobbles; NaF pH 9.9; moderately acid; clear wavy boundary.
- 2Bw4—34 to 40 inches; dark brown (10YR 4/3) extremely gravelly fine sandy loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine irregular pores; 60 percent gravel and 20 percent cobbles; NaF pH 9.9; moderately acid; gradual wavy boundary.
- 2Bw5—40 to 56 inches; dark brown (10YR 4/3) extremely gravelly fine sandy loam, pale brown (10YR 6/3) dry; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine and fine irregular pores; 50 percent gravel and 25 percent cobbles; NaF pH 9.6; moderately acid; gradual wavy boundary.
- 2BC—56 to 60 inches; dark brown (10YR 4/3) extremely gravelly fine sandy loam, pale brown (10YR 6/3) dry; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine irregular pores; 45 percent gravel and 20 percent cobbles; NaF pH 9.6; slightly acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—20 to 30 inches

#### **A horizon**

Value—3 or 4 moist, 4 or 5 dry

Chroma—2 or 3 moist or dry

Content of clay—4 to 8 percent

#### **Bw horizon**

Value—3 or 4 moist, 5 or 6 dry

Chroma—3 or 4 moist or dry

Texture—very gravelly ashy fine sandy loam or very gravelly ashy sandy loam

Content of clay—4 to 8 percent

Reaction—moderately acid to neutral

**2Bw and 2BC horizons**

Value—3 or 4 moist, 5 or 6 dry

Chroma—3 or 4 moist or dry

Texture—extremely gravelly sandy loam, extremely gravelly fine sandy loam, or very gravelly sandy loam

Content of clay—5 to 10 percent

***Osborn Series***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium and residuum derived from sandstone with a mantle of volcanic ash

*Slope range:* 30 to 55 percent

*Elevation:* 2,900 to 4,600 feet

*Mean annual precipitation:* 35 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Typical Pedon Location***

Osborn ashy sandy loam, 30 to 55 percent slopes, 900 feet south and 300 feet east of the northeast corner of sec. 29, T. 18 N., R. 14 E.

***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter.

A1—0 to 3 inches; grayish brown (10YR 5/2) ashy sandy loam, dark brown (10YR 3/3) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine and fine irregular pores; 10 percent gravel; slightly acid; clear smooth boundary.

A2—3 to 9 inches; pale brown (10YR 6/3) gravelly ashy sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 15 percent gravel; slightly acid; clear smooth boundary.

2Bw1—9 to 17 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine irregular pores; 10 percent gravel; slightly acid; gradual smooth boundary.

2Bw2—17 to 27 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine irregular pores; 10 percent paragravel and 10 percent paracobbles; neutral; abrupt irregular boundary.

2Cr—27 to 37 inches; weathered sandstone; crushes to very pale brown (10YR 7/3) loam, yellowish brown (10YR 5/4) moist.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—7 to 14 inches

Depth to bedrock—24 to 40 inches

#### **A horizon**

Value—5 to 7 dry, 3 or 4 moist

Chroma—2 or 3 dry or moist

Texture—ashy sandy loam or gravelly ashy sandy loam

Content of clay—4 to 8 percent

Reaction—moderately acid or slightly acid

#### **2Bw horizon**

Value—6 or 7 dry, 4 or 5 moist

Chroma—3 or 4 moist

Texture—sandy loam, loam, or gravelly sandy loam

Content of clay—5 to 10 percent

Reaction—slightly acid or neutral

### ***Pachic Argixerolls***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt or andesite mixed with a minor amount of loess and volcanic ash

*Slope range:* 5 to 12 percent

*Elevation:* 3,200 to 4,800 feet

*Mean annual precipitation:* 25 to 45 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### ***Reference Pedon Location***

Pachic Argixerolls, 5 to 12 percent slopes, 1,100 feet south and 500 feet east of northwest corner of sec. 21. T. 14 N., R. 14 E.

### ***Reference Pedon***

A1—0 to 4 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and common medium and coarse roots; common very fine and fine irregular pores; 5 percent gravel; neutral; clear smooth boundary.

A2—4 to 12 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; common very fine and fine irregular pores and few fine tubular pores; common faint coatings on faces of peds; 10 percent gravel; neutral; gradual smooth boundary.

ABt—12 to 20 inches; grayish brown (10YR 5/2) gravelly loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few

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medium roots; common very fine and fine irregular pores and few fine tubular pores; 20 percent gravel and 5 percent cobbles; common faint clay films on faces of peds; slightly acid; clear smooth boundary.

- Bt1—20 to 33 inches; light brownish gray (10YR 6/2) very gravelly clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; common fine irregular pores and few fine tubular pores; many distinct dark brown (10YR 3/3) clay films on faces of peds; 25 percent gravel and 10 percent cobbles; neutral; gradual smooth boundary.
- Bt2—33 to 46 inches; light yellowish brown (10YR 6/4) gravelly clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, moderately sticky and moderately plastic; few very fine roots; common fine tubular pores; many distinct dark brown (10YR 3/3) clay films on faces of peds; 15 percent gravel and 10 percent cobbles; neutral; gradual smooth boundary.
- Bt3—46 to 60 inches; light yellowish brown (10YR 6/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, moderately sticky and moderately plastic; few very fine roots; few fine irregular pores and few very fine and fine tubular pores; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; 15 percent gravel and 10 percent cobbles; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of mollic epipedon—20 to 30 inches

Thickness of volcanic ash—0 to 3 inches

#### **Particle-size control section**

Content of clay—18 to 34 percent

Content of rock fragments—5 to 45 percent

#### **A horizon**

Value—3 to 5 dry, 2 or 3 moist

Chroma—1 or 2 dry or moist

Texture—silt loam or loam

Content of clay—18 to 25 percent

Reaction—slightly acid or neutral

#### **ABt and Bt horizons**

Value—5 or 6 dry, 3 or 4 moist

Chroma—2 to 4 dry or moist

Texture—gravelly loam, clay loam, gravelly clay loam, very gravelly clay loam, or loam

Content of clay—18 to 35 percent

### ***Pileup Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash

*Slope range:* 10 to 55 percent

*Elevation:* 3,000 to 5,400 feet

*Mean annual precipitation:* 40 to 60 inches

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*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

**Typical Pedon Location**

Pileup ashy sandy loam in an area of Fifesridge-Pileup-Fiscus complex, 10 to 30 percent slopes, about 2,200 feet south and 1,700 feet east of the northwest corner of sec. 5, T. 17 N., R. 14 E.

**Typical Pedon**

- Oi—2 inches to 0; slightly decomposed forest litter with a small amount of 1980 Mount St. Helens ash; abrupt smooth boundary.
- A1—0 to 3 inches; brown (10YR 5/3) ashy sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine irregular pores; 5 percent gravel; NaF pH 10.1; slightly acid; abrupt smooth boundary.
- A2—3 to 12 inches; brown (7.5YR 5/4) gravelly ashy sandy loam, dark brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine and medium roots; many very fine and fine irregular pores; 10 percent gravel and 5 percent cobbles; NaF pH 9.6; slightly acid; clear smooth boundary.
- 2Bt1—12 to 21 inches; brown (7.5YR 5/4) very cobbly loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine and few coarse roots; common fine irregular pores; few faint clay films bridging sand grains; 20 percent gravel and 20 percent cobbles; neutral; gradual smooth boundary.
- 2Bt2—21 to 29 inches; yellowish brown (10YR 5/4) very cobbly loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure parting to weak fine subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; common very fine and fine irregular pores and few very fine and fine tubular pores; few distinct dark brown (7.5YR 4/4) clay films lining pores and on faces of peds; 20 percent gravel and 20 percent cobbles; slightly acid; gradual smooth boundary.
- 2Bt3—29 to 40 inches; yellowish brown (10YR 5/4) very cobbly loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and fine irregular pores and few very fine tubular pores; few distinct dark brown (7.5YR 4/4) clay films lining pores and on faces of peds; 20 percent gravel and 20 percent cobbles; neutral; gradual smooth boundary.
- 2Bt4—40 to 60 inches; yellowish brown (10YR 5/4) very cobbly loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine irregular pores and few fine tubular pores; few distinct dark brown (10YR 3/3) clay films on faces of peds; 20 percent gravel and 20 percent cobbles; neutral.

**Range in Characteristics**

**Profile**

Thickness of volcanic ash—7 to 14 inches

**A horizon**

Hue—7.5YR or 10YR

Value—5 or 6 dry, 3 to 5 moist

Chroma—3 or 4 dry or moist

Texture—ashy sandy loam or gravelly ashy sandy loam

Content of clay—4 to 8 percent

**2Bt horizon**

Hue—7.5YR or 10YR

Value—5 or 6 dry, 4 or 5 moist

Chroma—2 to 4 dry or moist

Texture—very cobbly loam or very gravelly loam

Content of clay—18 to 27 percent

Reaction—slightly acid or neutral

***Ravensroost Series***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes and cirque lake basins

*Parent material:* Volcanic ash over colluvium and residuum derived from basalt, andesite, or saprolitic tuff

*Slope range:* 5 to 30 percent

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

***Typical Pedon Location***

Ravensroost ashy sandy loam in an area of Walupt-Twolakes-Ravensroost complex, 5 to 30 percent slopes, about 8 miles northwest of Cliffdell, Washington; about 1,100 feet south and 1,600 feet west of the northeast corner of sec. 12, T. 18 N., R. 12 E.

***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash.

C—0 to 2 inches; gray (10YR 5/1) ashy loamy sand (volcanic ash), light gray (10YR 7/1) dry; single grain; soft, very friable, nonsticky and nonplastic; common medium and few coarse roots; many very fine and fine irregular pores; NaF pH 10.1; moderately acid; abrupt smooth boundary.

A—2 to 8 inches; very dark brown (10YR 3/3) ashy sandy loam, grayish brown (10YR 5/3) dry; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; NaF pH 10.1; slightly acid; gradual smooth boundary.

BA—8 to 18 inches; brown (10YR 4/3) ashy fine sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; many very fine and fine irregular pores; 5 percent gravel; NaF pH 10.6; slightly acid; gradual wavy boundary.

2Bt—18 to 26 inches; olive brown (2.5Y 4/4) cobbly fine sandy loam, light yellowish brown (2.5Y 6/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common fine and very fine tubular pores; common distinct olive brown (2.5Y 4/3) clay films lining pores and on faces of peds; 10 percent gravel and 10 percent cobbles; NaF pH 9.6; slightly acid; clear smooth boundary.

2Cr—26 to 36 inches; andesite.

### ***Range in Characteristics***

The C horizon is absent in some pedons.

#### **Profile**

Thickness of volcanic ash—14 to 25 inches

Depth to bedrock—20 to 40 inches

Reaction—moderately acid or slightly acid

#### **A and BA horizons**

Value—3 or 4 moist, 5 or 6 dry

Texture—ashy sandy loam or ashy fine sandy loam

Content of clay—4 to 8 percent

#### **2Bt horizon**

Hue—10YR or 2.5Y

Value—4 or 5 moist, 6 or 7 dry

Chroma—3 to 6 moist or dry

Texture—gravelly loam, loam, or cobbly fine sandy loam

Content of clay—18 to 27 percent

### ***Retep Series***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Position on landscape:* Ridges and mountain slopes

*Parent material:* Volcanic ash over colluvium and residuum derived from andesite

*Slope range:* 25 to 55 percent

*Elevation:* 2,500 to 4,400 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### ***Typical Pedon Location***

Retep ashy sandy loam in an area of Retep-McDanielake complex, 25 to 55 percent slopes, about 1,500 feet north and 2,000 feet east of southwest corner of sec. 11, T. 16 N., R. 14 E.

### ***Typical Pedon***

Oi—1 inch to 0; slightly decomposed leaves, twigs, and other forest litter mixed with a small amount of 1980 Mount St. Helens ash.

A—0 to 4 inches; grayish brown (10YR 5/2) ashy sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine irregular pores; 20 percent coarse and very coarse ash; 10 percent gravel and 2 percent cobbles; NaF pH 9.2; slightly acid; gradual smooth boundary.

AB—4 to 10 inches; brown (10YR 5/3) ashy sandy loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic, many very fine and fine and few medium roots; many very fine irregular pores; 20 percent coarse and very coarse ash; 5 percent gravel; NaF pH 9.2; slightly acid; clear smooth boundary.

2Bw1—10 to 16 inches; brown (10YR 5/3) gravelly ashy loam, brown (10YR 4/3)

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moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; soft, friable, slightly sticky and slightly plastic; many very fine, common fine, and few medium roots; few fine tubular pores and common very fine and fine irregular pores; 10 percent gravel and 5 percent cobbles; slightly acid; gradual smooth boundary.

2Bw2—16 to 30 inches; light yellowish brown (10YR 6/4) gravelly ashy loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure parting to moderate medium subangular blocky; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; few fine tubular pores and common very fine and fine irregular pores; 15 percent gravel and 2 percent cobbles; slightly acid; gradual wavy boundary.

2Cr—30 to 40 inches; andesite.

### ***Range in Characteristics***

#### **Profile**

Thickness of mollic epipedon—8 to 12 inches

Depth to bedrock and thickness of volcanic ash—20 to 40 inches

#### **A and AB horizons**

Hue—7.5YR or 10YR

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 or 3 dry or moist

Content of clay—4 to 8 percent

#### **2Bw horizon**

Hue—5YR, 7.5YR, or 10YR

Value—5 or 6 dry, 4 moist

Chroma—3 or 4 dry, 3 to 6 moist

Texture—ashy loam, ashy sandy loam, or gravelly ashy loam

Content of clay—18 to 27 percent

### ***Sapkin Series***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Loess mixed with residuum and colluvium derived from basalt

*Slope range:* 10 to 75 percent

*Elevation:* 2,800 to 5,600 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 130 days

### ***Typical Pedon Location***

Sapkin very stony loam, 10 to 45 percent slopes, about 6 miles northeast of Naches; about 100 feet east and 900 feet south of the northwest corner of sec. 14, T. 15 N., R. 16 E.

### ***Typical Pedon***

A1—0 to 7 inches; dark grayish brown (10YR 4/2) very stony loam, very dark brown (10YR 2/2) moist; moderate medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and few coarse roots; 10 percent gravel, 25 percent cobbles, and 15 percent stones; slightly acid; clear wavy boundary.

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- A2—7 to 15 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and coarse roots; 5 percent gravel and 5 percent cobbles; slightly acid; clear wavy boundary.
- AB—15 to 27 inches; brown (7.5YR 5/4) very cobbly loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine roots; few fine tubular pores; 20 percent gravel and 15 percent cobbles; slightly acid; clear wavy boundary.
- Bt1—27 to 31 inches; brown (7.5YR 5/4) very cobbly loam, dark brown (7.5YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, firm, slightly sticky and plastic; few fine roots; common fine tubular pores; few thin clay films on faces of peds; 15 percent gravel and 20 percent cobbles; slightly acid; clear wavy boundary.
- Bt2—31 to 35 inches; brown (7.5YR 5/4) extremely cobbly clay loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; hard, firm, sticky and plastic; very few fine roots; few fine tubular pores; few thin clay films on faces of peds; 20 percent gravel and 70 percent cobbles; slightly acid; abrupt wavy boundary.
- R—35 inches; basalt.

### ***Range in Characteristics***

#### **Profile**

Thickness of mollic epipedon—10 to 18 inches

Depth to bedrock—20 to 40 inches

#### **A1 horizon**

Hue—10YR or 7.5YR

Value—4 or 5 dry

Chroma—2 or 3 moist

Content of clay—10 to 20 percent

Reaction—slightly acid or neutral

#### **A2 and AB horizons**

Hue—10YR or 7.5YR

Value—4 or 5 dry, 2 to 4 moist

Chroma—2 to 4 dry or moist

Texture—loam, very cobbly loam, or cobbly loam

#### **Bt horizon**

Hue—10YR or 7.5YR

Value—4 or 5 dry, 2 or 3 moist

Chroma—3 or 4 moist or dry

Texture—very cobbly loam, extremely cobbly loam, or extremely cobbly clay loam

Content of clay—18 to 30 percent

### ***Saydab Series***

*Depth class:* Moderately deep

*Drainage class:* Moderately well drained

*Position on landscape:* Mountaintops

*Parent material:* Colluvium and residuum derived from basalt mixed with volcanic ash and loess

*Slope range:* 0 to 5 percent

*Elevation:* 5,500 to 7,000 feet

*Mean annual precipitation:* 20 to 50 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 40 to 80 days

### **Typical Pedon Location**

Saydab cobbly ashy loam in the Yakima County Area, Washington, soil survey area.

### **Typical Pedon**

Oe—1 inch to 0; moderately decomposed forest litter.

A1—0 to 5 inches; dark brown (10YR 4/3) cobbly ashy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; weakly smeary; common coarse roots; common very fine irregular pores; 5 percent gravel and 10 percent cobbles; moderately acid; abrupt wavy boundary.

A2—5 to 11 inches; dark brown (10YR 4/3) ashy loam, very dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; common medium and very fine and few coarse roots; common very fine interstitial pores; 5 percent gravel; moderately acid; clear smooth boundary.

Bw1—11 to 15 inches; yellowish brown (10YR 5/4) very cobbly ashy loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; few very fine and medium roots; many very fine irregular pores; 10 percent gravel and 35 percent cobbles; few fine redoximorphic concentrations that are light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/6) moist; strongly acid; clear wavy boundary.

Bw2—15 to 27 inches; yellowish brown (10YR 5/4) very cobbly ashy loam, dark yellowish brown (10YR 3/4) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and medium roots; many very fine irregular pores; 10 percent gravel and 40 percent cobbles; common fine distinct redoximorphic concentrations that are brownish yellow (10YR 6/6) and brown (7.5YR 4/4) moist; moderately acid; abrupt smooth boundary.

R—27 inches; basalt.

### **Range in Characteristics**

#### **Profile**

Thickness of umbric epipedon—10 to 20 inches

Depth to bedrock and thickness of volcanic ash—20 to 40 inches

High water table—present in winter, spring, and summer

#### **A horizon**

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 or 3 dry and moist

Texture—ashy loam or cobbly ashy loam

Content of clay—7 to 15 percent

Reaction—moderately acid or slightly acid

#### **Bw horizon**

Value—5 to 7 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—very gravelly ashy loam, gravelly ashy loam, or very cobbly ashy loam

Content of clay—7 to 15 percent

Reaction—strongly acid to slightly acid

## **Seeburg Series**

*Depth class:* Very deep

*Drainage class:* Somewhat excessively drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash

*Slope range:* 15 to 70 percent

*Elevation:* 2,200 to 4,600 feet

*Mean annual precipitation:* 25 to 45 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### **Typical Pedon Location**

Seeburg ashy loamy sand in an area of Snilec-Seeburg complex, 15 to 30 percent slopes, about 3 miles northwest of Nile, Washington; about 200 feet south and 2,400 feet west of the northeast corner of sec. 19, T. 16 N., R. 15 E.

### **Typical Pedon**

Oi—1 inch to 0; slightly decomposed leaves, twigs, and other forest litter mixed with a small amount of 1980 Mount St. Helens ash.

A1—0 to 4 inches; light gray (10YR 6/1) ashy loamy sand, very dark grayish brown (10YR 3/2) moist; single grain; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine and fine irregular pores; 15 percent coarse and very coarse ash; 10 percent gravel; NaF pH 9.4; slightly acid; gradual smooth boundary.

A2—4 to 9 inches; light brownish gray (10YR 6/2) ashy loamy sand, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure parting to weak fine and medium granular; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 5 percent pumice less than 2 millimeters in size; 10 percent gravel; NaF pH 8.9; slightly acid; gradual smooth boundary.

2Bw1—9 to 22 inches; light brownish gray (10YR 6/2) gravelly sandy loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine and fine irregular pores; 5 percent pumice less than 2 millimeters in size; 15 percent gravel and 5 percent cobbles; NaF pH 8.6; slightly acid; gradual smooth boundary.

2Bw2—22 to 43 inches; light brownish gray (10YR 6/2) extremely cobbly sandy loam, grayish brown (2.5Y 5/2) moist; weak fine granular structure parting to single grain; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; common very fine and fine irregular pores; 40 percent gravel and 30 percent cobbles; neutral; abrupt wavy boundary.

2BC—43 to 60 inches; light brownish gray (10YR 6/2) extremely cobbly loamy sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and few fine roots; many very fine and fine irregular pores; 40 percent gravel and 30 percent cobbles; neutral.

### **Range in Characteristics**

#### **Profile**

Thickness of mixed volcanic ash material—7 to 14 inches

Depth to strongly contrasting textural stratification (2Bw2 horizon)—14 to 22 inches

**A horizon**

Value—5 or 6 dry, 3 or 4 moist  
Chroma—1 or 2 dry, 2 or 3 moist  
Content of clay—0 to 4 percent

**2Bw1 horizon**

Hue—2.5Y or 10YR  
Value—4 to 7 moist  
Chroma—2 or 3 dry, 2 to 4 moist  
Content of clay—5 to 10 percent  
Reaction—slightly acid or neutral

**2Bw2 and 2BC horizons**

Hue—2.5Y or 10YR  
Value—5 to 7 dry, 4 or 5 moist  
Chroma—2 or 3 dry, 2 to 4 moist  
Texture—extremely cobbly loamy sand, extremely cobbly sandy loam, very gravelly sandy loam, or very gravelly loamy sand  
Content of clay—2 to 10 percent  
Reaction—slightly acid or neutral

***Singh Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from basalt or andesite

*Slope range:* 5 to 55 percent

*Elevation:* 2,150 to 4,800 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

***Typical Pedon Location***

Singh ashy sandy loam in an area of McDanielake-Singh complex, 15 to 30 percent slopes, about 150 feet south and 1,900 feet west of the northeast corner of sec. 36, T. 15 N., R. 14 E.

***Typical Pedon***

Oi—1 inch to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash; abrupt smooth boundary.

A—0 to 3 inches; pale brown (10YR 6/3) ashy sandy loam, dark brown (10YR 3/3) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 5 percent gravel; NaF pH 10.1; slightly acid; gradual smooth boundary.

Bw1—3 to 12 inches; pale brown (10YR 6/3) ashy fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 10 percent gravel; NaF pH 10.1; slightly acid; gradual smooth boundary.

Bw2—12 to 22 inches; pale brown (10YR 6/3) gravelly ashy fine sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots;

common very fine and fine irregular pores; 25 percent gravel and 5 percent cobbles; NaF pH 9.6; neutral; clear smooth boundary.

2Bt1—22 to 35 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common distinct brown (10YR 4/3) clay films lining pores and on faces of peds; 25 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; gradual smooth boundary.

2Bt2—35 to 46 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common fine irregular pores and few fine tubular pores; common distinct brown (10YR 4/3) clay films lining pores and on faces of peds; 25 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; gradual smooth boundary.

2BC—46 to 60 inches; light brownish gray (10YR 6/2) extremely cobbly loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine irregular pores; 35 percent gravel, 20 percent cobbles, and 10 percent stones; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—14 to 25 inches

#### **A horizon**

Value—5 or 6 dry, 3 or 4 moist

Chroma—2 to 4 dry or moist

Content of clay—4 to 8 percent

#### **Bw horizon**

Hue—7.5YR or 10YR

Value—6 or 7 dry, 4 or 5 moist

Chroma—3 to 6 dry or moist

Texture—ashy fine sandy loam or gravelly ashy fine sandy loam

Content of clay—4 to 8 percent

Reaction—slightly acid or neutral

#### **2Bt horizon**

Value—6 or 7 dry, 4 or 5 moist

Chroma—3 to 6 dry or moist

Texture—very gravelly loam, very gravelly clay loam, or very cobbly loam

Content of clay—22 to 33 percent

Reaction—slightly acid or neutral

#### **2BC horizon**

Texture—very gravelly loam, extremely gravelly loam, or extremely cobbly loam

Content of clay—10 to 18 percent

Reaction—slightly acid or neutral

## ***Snilec Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from conglomerate and tuffaceous sandstone with a mantle of volcanic ash

Soil Survey of Wenatchee National Forest, Naches Area, Washington

*Slope range:* 10 to 70 percent

*Elevation:* 2,200 to 5,200 feet

*Mean annual precipitation:* 25 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

**Typical Pedon Location**

Snilec ashy sandy loam, 30 to 55 percent slopes, 1,500 feet north and 2,150 feet east of the southwest corner of sec. 31, T. 16 N., R. 15 E.

**Typical Pedon**

- Oi—1 inch to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash.
- A—0 to 4 inches; light brownish gray (10YR 6/2) ashy sandy loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; common very fine and fine irregular pores; 5 percent gravel; NaF pH 9.6; neutral; gradual smooth boundary.
- AB—4 to 9 inches; light gray (10YR 7/2) gravelly ashy sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium and few coarse roots; many very fine and fine irregular pores; 10 percent gravel and 5 percent cobbles; NaF pH 9.6; neutral; gradual smooth boundary.
- 2Bt1—9 to 17 inches; light brownish gray (10YR 6/2) very cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; soft, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few fine and very fine tubular pores; common faint brown (10YR 4/3) clay films lining pores and on faces of peds; 20 percent gravel and 15 percent cobbles; neutral; gradual smooth boundary.
- 2Bt2—17 to 36 inches; light brownish gray (10YR 6/2) very gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; common fine and very fine tubular pores; common faint brown (10YR 4/3) clay films lining pores and on faces of peds; 30 percent gravel and 10 percent cobbles; neutral; gradual smooth boundary.
- 2Bt3—36 to 52 inches; grayish brown (10YR 5/3) very cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and very fine tubular pores; common faint brown (10YR 4/3) clay films lining pores and on faces of peds; 35 percent gravel and 20 percent cobbles; neutral; gradual smooth boundary.
- 2Bt4—52 to 60 inches; pale brown (10YR 6/3) extremely cobbly loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and very fine tubular pores; common faint brown (10YR 4/3) clay films lining pores and on faces of peds; 35 percent gravel, 30 percent cobbles, and 5 percent stones; neutral.

**Range in Characteristics**

**Profile**

Thickness of mixed volcanic ash material—7 to 14 inches

**A and AB horizons**

Value—5 or 6 dry, 3 or 4 moist

Chroma—2 to 4 dry or moist

Content of clay—4 to 8 percent

**2Bt horizon**

Value—5 to 7 dry, 4 or 5 moist

Chroma—2 to 4 dry, 3 or 4 moist

Texture—very cobbly loam, extremely cobbly loam, very gravelly loam, very gravelly fine sandy loam, or extremely gravelly loam

Content of clay—18 to 27 percent clay

***Snowplow Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash mixed with colluvium derived from basalt or andesite

*Slope range:* 5 to 45 percent

*Elevation:* 4,300 to 6,300 feet

*Mean annual precipitation:* 40 to 55 inches

*Mean annual air temperature:* 39 to 43 degrees F

*Frost-free period:* 30 to 60 days

***Typical Pedon Location***

Snowplow ashy fine sandy loam in an area of Naxing-Snowplow complex, 5 to 25 percent slopes, about 2,200 feet south and 350 feet west of the northeast corner of sec. 2, T. 14 N., R. 14 E.

***Typical Pedon***

Oi—2 inches to 0; slightly decomposed needles and twigs mixed with a small amount of 1980 Mount St. Helens ash.

A1—0 to 4 inches; brown (10YR 5/3) ashy fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine irregular pores; 10 percent gravel; NaF pH 9.9; moderately acid; clear smooth boundary.

A2—4 to 10 inches; brown (10YR 5/3) ashy fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine and medium roots; many very fine and fine irregular pores; 10 percent gravel; NaF pH 9.9; strongly acid; gradual smooth boundary.

AB—10 to 16 inches; brown (10YR 5/3) ashy fine sandy loam, very dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 10 percent gravel; NaF pH 10.1; strongly acid; gradual smooth boundary.

Bw1—16 to 22 inches; light yellowish brown (10YR 6/4) ashy fine sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 10 percent gravel; NaF pH 10.3; strongly acid; clear smooth boundary.

2Bw2—22 to 34 inches; brown (7.5YR 5/4) very gravelly ashy fine sandy loam, brown

- (7.5YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; many very fine and fine irregular pores; 30 percent gravel and 5 percent cobbles; NaF pH 10.3; strongly acid; gradual smooth boundary.
- 2Bw3—34 to 44 inches; light brown (7.5YR 6/4) very gravelly ashy fine sandy loam, brown (7.5YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine, medium, and coarse roots; many very fine and fine irregular pores; 45 percent gravel and 5 percent cobbles; NaF pH 10.5; moderately acid; gradual smooth boundary.
- 3BC—44 to 60 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine, medium, and coarse roots; few very fine and fine irregular pores and common fine tubular pores; 30 percent gravel and 10 percent cobbles; NaF pH 9.0; moderately acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of umbric epipedon—10 to 20 inches

Thickness of volcanic ash—40 to 60 inches

Depth to 2Bw horizon—20 to 30 inches

#### **A horizon**

Content of clay—4 to 8 percent

#### **Bw horizon**

Hue—7.5YR or 10YR

Value—5 or 6 dry, 4 or 5 moist

Chroma—2 to 4 dry or moist

Texture—ashy fine sandy loam or ashy sandy loam

Content of clay—4 to 8 percent

Reaction—strongly acid or moderately acid

#### **2Bw horizon**

Hue—7.5YR or 10YR

Value—5 or 6 dry, 4 or 5 moist

Chroma—2 to 4 dry or moist

Texture—very gravelly ashy fine sandy loam, very gravelly ashy sandy loam, or very cobbly ashy sandy loam

Content of clay—4 to 8 percent

Reaction—strongly acid or moderately acid

#### **3BC horizon**

Texture—very gravelly loam or gravelly sandy loam

Content of clay—10 to 15 percent

Reaction—moderately acid or slightly acid

## ***Spexarth Series***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash mixed with colluvium and residuum derived from sandstone and siltstone ([fig. 2](#))

*Slope range:* 30 to 55 percent

*Elevation:* 3,000 to 6,000 feet

*Mean annual precipitation:* 45 to 70 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

### ***Typical Pedon Location***

Spexarth ashy loamy sand in an area of Terence-Spexarth complex, 30 to 55 percent slopes, about 800 feet south and 1,000 feet east of the northwest corner of sec. 27, T. 18 N., R. 14 E.

### ***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter.

A—0 to 5 inches; grayish brown (10YR 5/2) ashy loamy sand, dark brown (10YR 3/3) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 25 percent coarse and very coarse ash; 10 percent gravel and 2 percent cobbles; moderately acid; clear smooth boundary.

Bw1—5 to 11 inches; pale brown (10YR 6/3) gravelly ashy fine sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and slightly plastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 20 percent coarse and very coarse ash; 10 percent gravel and 5 percent cobbles; NaF pH 10.1; moderately acid; clear wavy boundary.

Bw2—11 to 15 inches; pale brown (10YR 6/3) gravelly ashy fine sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and



**Figure 2.—Typical pedon of a Spexarth soil. The mantle of volcanic ash is 0 to 38 centimeters (15 inches) thick, and the extremely paracobbly 2Bw horizon is 38 to 58 centimeters (15 to 23 inches) thick over bedrock. Numerals on tape indicate centimeters.**

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coarse roots; many very fine and fine irregular pores; 40 percent coarse and very coarse ash; 15 percent gravel and 5 percent cobbles; moderately acid; clear wavy boundary.

2Bw3—15 to 23 inches; light yellowish brown (10YR 6/4) extremely paracobbly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; common very fine and fine and few medium and coarse roots; common very fine and fine and few medium and coarse irregular pores; 5 percent gravel; 30 percent paragravel and 35 percent paracobbles; slightly acid; abrupt irregular boundary.

2Cr—23 to 33 inches; sandstone.

### ***Range in Characteristics***

#### **Profile**

Depth to bedrock—20 to 40 inches

Thickness of volcanic ash and depth to 2Bw3 horizon—14 to 30 inches

#### **A horizon**

Value—5 to 7 dry, 3 to 5 moist

Chroma—1 or 2 dry, 2 to 4 moist

Content of clay—0 to 4 percent

Reaction—moderately acid or slightly acid

#### **Bw horizon**

Value—6 or 7 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—gravelly ashy fine sandy loam, gravelly ashy sandy loam, or ashy loam

Content of clay—4 to 8 percent

Reaction—strongly acid or moderately acid

#### **2Bw3 horizon**

Value—6 or 7 dry, 4 or 5 moist

Chroma—3 or 4 dry or moist

Texture—extremely paracobbly sandy loam or very paragravelly loam

Content of clay—6 to 10 percent

Reaction—strongly acid to slightly acid

### ***Stemilt Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt or andesite with a mantle of volcanic ash and loess

*Slope range:* 0 to 75 percent

*Elevation:* 2,100 to 5,500 feet

*Mean annual precipitation:* 20 to 40 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### ***Typical Pedon Location***

Stemilt ashy sandy loam in an area of Stemilt-Rock outcrop complex, 25 to 75 percent slopes, 300 feet north and 800 feet east of the southwest corner of sec. 1, T. 15 N., R. 13 E.

### ***Typical Pedon***

- Oi—1 inch to 0; partially decomposed forest litter mixed with a small amount of 1980 Mount St. Helens volcanic ash; abrupt smooth boundary.
- A—0 to 3 inches; dark grayish brown (10YR 4/2) ashy sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine and fine irregular pores; 10 percent gravel; slightly acid; clear smooth boundary.
- AB—3 to 11 inches; yellowish brown (10YR 5/4) gravelly ashy sandy loam, dark brown (7.5YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine and medium roots; many very fine and fine irregular pores; 15 percent gravel and 5 percent cobbles; slightly acid; gradual smooth boundary.
- Bw—11 to 15 inches; yellowish brown (10YR 5/4) gravelly ashy loam, brown (7.5YR 4/3) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and common fine, medium, and coarse roots; common very fine and fine and few medium irregular pores; 15 percent gravel and 10 percent cobbles; slightly acid; clear smooth boundary.
- 2Bt1—15 to 22 inches; light yellowish brown (10YR 6/4) very gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common fine irregular pores and few fine tubular pores; few faint dark brown (10YR 4/3) clay films on faces of peds; 25 percent gravel and 15 percent cobbles; neutral; clear smooth boundary.
- 2Bt2—22 to 31 inches; yellowish brown (10YR 5/4) extremely cobbly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine irregular pores and few fine tubular pores; common distinct dark brown (10YR 4/3) clay films on faces of peds; 35 percent gravel and 30 percent cobbles; neutral; gradual smooth boundary.
- 2Bt3—31 to 39 inches; brown (7.5YR 5/3) extremely cobbly clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; common very fine irregular pores and few fine tubular pores; common distinct dark brown (7.5YR 4/3) clay films on faces of peds; common prominent silt coatings on peds; 40 percent gravel and 30 percent cobbles; neutral; gradual smooth boundary.
- 2Bt4—39 to 60 inches; pale brown (10YR 6/3) extremely cobbly clay loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine irregular and tubular pores; common distinct dark brown (10YR 4/3) clay films on faces of peds; common prominent silt coatings on peds; few prominent iron stains and few distinct manganese stains; 45 percent gravel and 30 percent cobbles; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of mollic epipedon—10 to 16 inches

Thickness of mixed volcanic ash material—7 to 14 inches

#### **A and AB horizons**

Hue—10YR or 7.5YR

Value—3 moist, 4 or 5 dry

Chroma—2 or 3 moist, 2 to 4 dry  
Content of clay—4 to 8 percent

**AB and Bw horizons**

Hue—10YR or 7.5YR  
Value—4 or 5 dry or moist  
Chroma—3 or 4 dry or moist  
Texture—gravelly ashy loam or gravelly ashy sandy loam  
Content of clay—10 to 15 percent

**2Bt horizon**

Hue—7.5YR or 10YR  
Value—4 to 6 dry, 3 or 4 moist  
Chroma—3 or 4 dry, 2 to 4 moist  
Texture—very cobbly clay loam, very gravelly loam, extremely cobbly clay loam, or extremely gravelly clay loam  
Content of clay—15 to 35 percent  
Reaction—slightly acid or neutral

***Stilgar Series***

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Position on landscape:* Mountain slopes  
*Parent material:* Volcanic ash mixed with colluvium derived from andesite or pyroclastic rock  
*Slope range:* 30 to 55 percent  
*Elevation:* 3,000 to 6,000 feet  
*Mean annual precipitation:* 45 to 80 inches  
*Mean annual air temperature:* 37 to 43 degrees F  
*Frost-free period:* 35 to 75 days

***Typical Pedon Location***

Stilgar gravelly ashy sandy loam in an area of Terence-Stilgar-Spexarth complex, 30 to 55 percent slopes, about 12 miles northwest of Cliffdell, Washington; about 850 feet south and 400 feet west of the northeast corner of sec. 29, T. 19 N., R. 13 E.

***Typical Pedon***

- Oi—2 inches to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash; abrupt smooth boundary.
- A1—0 to 2 inches; very dark grayish brown (10YR 3/2) gravelly ashy sandy loam, dark grayish brown (10YR 4/2) dry; single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; 40 percent coarse and very coarse ash; 25 percent gravel and 5 percent cobbles; 25 percent coarse fragments on surface; moderately acid; clear smooth boundary.
- A2—2 to 10 inches; very dark grayish brown (10YR 3/2) gravelly ashy sandy loam, brown (10YR 4/3) dry; single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 35 percent coarse and very coarse ash; 15 percent gravel; moderately acid; clear smooth boundary.
- Bw1—10 to 15 inches; dark brown (10YR 3/3) gravelly ashy sandy loam, brown (10YR 5/3) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and

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common fine irregular pores; 20 percent coarse and very coarse ash; 20 percent gravel; moderately acid; gradual smooth boundary.

Bw2—15 to 20 inches; dark brown (10YR 3/3) very gravelly ashy sandy loam, brown (10YR 5/3) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and few medium roots; common very fine and fine irregular pores; 20 percent coarse and very coarse ash; 35 percent gravel and 15 percent cobbles; moderately acid; gradual smooth boundary.

Bw3—20 to 30 inches; dark brown (10YR 3/3) extremely gravelly ashy sandy loam, yellowish brown (10YR 5/3) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; common very fine and fine irregular pores; 25 percent coarse and very coarse ash; 45 percent gravel and 15 percent cobbles; moderately acid; gradual smooth boundary.

Bw4—30 to 48 inches; yellowish brown (10YR 5/4) extremely gravelly ashy sandy loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine and fine irregular pores; 10 percent coarse and very coarse ash; 55 percent gravel and 25 percent cobbles; moderately acid; gradual smooth boundary.

Bw5—48 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly ashy sandy loam, very pale brown (10YR 7/4) dry; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine and fine irregular pores; 20 percent coarse and very coarse ash; 35 percent gravel and 25 percent cobbles; moderately acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of umbric epipedon—10 to 20 inches

Thickness of volcanic ash—more than 60 inches

#### **A horizon**

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 or 3 dry or moist

Content of clay—4 to 8 percent

Reaction—moderately acid to neutral

#### **Bw horizon**

Hue—2.5Y, 7.5YR, or 10YR

Value—3 to 6 moist, 5 to 7 dry

Chroma—3 or 4 moist or dry

Texture—gravelly ashy sandy loam, very gravelly ashy sandy loam, extremely gravelly ashy sandy loam, or extremely cobbly ashy sandy loam

Content of clay—6 to 10 percent

Reaction—strongly acid or moderately acid

### ***Sutkin Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes and ridges

*Parent material:* Volcanic ash mixed with colluvium derived from andesite or pyroclastic material

*Slope range:* 25 to 65 percent

*Elevation:* 2,000 to 4,800 feet

*Mean annual precipitation:* 20 to 30 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 110 days

### **Typical Pedon Location**

Sutkin stony loam in the Yakima County Area, Washington, soil survey area.

### **Typical Pedon**

Oi—1 inch to 0; slightly decomposed forest litter.

A—0 to 10 inches; dark brown (10YR 3/3) stony loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and common coarse roots; 5 percent surface stones, 5 percent cobbles, and 5 percent gravel; slightly acid; clear wavy boundary.

Bw1—10 to 20 inches; dark yellowish brown (10YR 4/4) very cobbly loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common coarse and many fine roots; 30 percent gravel and 20 percent cobbles; neutral; clear irregular boundary.

Bw2—20 to 38 inches; dark yellowish brown (10YR 4/4) extremely cobbly loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common coarse and many fine roots; 35 percent gravel and 35 percent cobbles; neutral; clear wavy boundary.

C—38 to 60 inches; dark yellowish brown (10YR 4/4) extremely cobbly loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, friable, slightly sticky and moderately plastic; common fine and coarse roots; 30 percent gravel and 40 percent cobbles; neutral.

### **Range in Characteristics**

#### **Profile**

Thickness of mollic epipedon—10 to 18 inches

#### **A horizon**

Value—3 to 5 dry, 2 or 3 moist

Chroma—3 or 4 dry, 1 to 3 moist

Content of clay—15 to 25 percent

#### **Bw horizon**

Hue—10YR or 7.5YR

Value—4 to 6 dry, 3 to 5 moist

Chroma—2 to 4 moist

Texture—very gravelly loam, very cobbly loam, or extremely cobbly loam

Content of clay—18 to 27 percent

#### **C horizon**

Hue—10YR or 7.5YR

Value—3 or 4 moist

Chroma—3 or 4 moist

Texture—very cobbly loam, extremely cobbly loam, or very cobbly clay loam

Content of clay—20 to 30 percent

### **Terence Series**

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

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*Parent material:* Volcanic ash mixed with colluvium derived from basalt, andesite, or rhyolite (fig. 3)

*Slope range:* 0 to 55 percent

*Elevation:* 3,000 to 6,000 feet

*Mean annual precipitation:* 45 to 70 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

***Typical Pedon Location***

Terence gravelly ashy fine sandy loam, 30 to 50 percent slopes, about 3 miles northeast of Cliffdell, Washington; 1,850 feet north and 1,700 feet west of the southeast corner of sec. 12. T. 17 N., R. 14 E.

***Typical Pedon***

Oi—2 inches to 0; slightly decomposed leaves, twigs, and other forest litter mixed with a small amount of 1980 Mount St. Helens ash.

A—0 to 4 inches; pale brown (10YR 6/3) gravelly ashy fine sandy loam, dark brown



**Figure 3.—**Typical pedon of a Terrence soil. Volcanic ash mixed with cobble-sized rock fragments is 0 to 150 centimeters (60 inches) thick. Numerals on tape indicate centimeters.

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- (10YR 3/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 15 percent gravel, 5 percent cobbles, and 2 percent stones; moderately acid; clear smooth boundary.
- Bw1—4 to 14 inches; light yellowish brown (10YR 6/4) very gravelly ashy fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 25 percent gravel, 10 percent cobbles, and 3 percent stones; moderately acid; gradual smooth boundary.
- Bw2—14 to 24 inches; light yellowish brown (10YR 6/4) gravelly ashy fine sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 20 percent gravel, 5 percent cobbles, and 2 percent stones; slightly acid; gradual wavy boundary.
- Bw3—24 to 35 inches; yellowish brown (10YR 5/4) very gravelly ashy loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 25 percent gravel, 10 percent cobbles, and 5 percent stones; slightly acid; gradual wavy boundary.
- Bw4—35 to 44 inches; yellowish brown (10YR 5/4) very cobbly ashy loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; common very fine and fine irregular pores; 20 percent gravel, 15 percent cobbles, and 5 percent stones; slightly acid; gradual wavy boundary.
- Bw5—44 to 55 inches; brown (10YR 5/3) very cobbly ashy loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; common very fine and fine irregular pores and few fine tubular pores; 25 percent gravel, 20 percent cobbles, and 5 percent stones; slightly acid; gradual wavy boundary.
- Bw6—55 to 63 inches; yellowish brown (10YR 5/4) extremely gravelly ashy loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; few fine tubular pores; 45 percent gravel, 15 percent cobbles, and 5 percent stones; slightly acid.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—more than 40 inches

#### **A horizon**

Value—4 to 6 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Content of clay—4 to 8 percent

#### **Bw horizon**

Value—4 to 6 dry, 3 or 4 moist

Chroma—3 to 6 dry or moist

Texture—very gravelly ashy fine sandy loam, very gravelly ashy loam, very cobbly ashy loam, extremely gravelly ashy loam, or gravelly ashy fine sandy loam

Content of clay—4 to 10 percent  
Reaction—moderately acid or slightly acid

## ***Tumac Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash mixed with colluvium derived from basalt and andesite

*Slope range:* 30 to 55 percent

*Elevation:* 3,000 to 4,250 feet

*Mean annual precipitation:* 35 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

### ***Typical Pedon Location***

Tumac gravelly ashy sandy loam, 30 to 55 percent slopes, about 5 miles southwest of Tieton Dam, Yakima County, Washington; about 1,600 feet west and 2,600 feet north of the southeast corner of sec. 15, T. 13 N., R. 13 E.

### ***Typical Pedon***

Oi—1 inch to 0; slightly decomposed forest litter; abrupt smooth boundary.

C—0 to 2 inches; gray (10YR 6/1) ashy fine sand (volcanic ash), very dark gray (10YR 3/1) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; slightly acid; abrupt smooth boundary.

A—2 to 8 inches; grayish brown (10YR 5/2) gravelly ashy sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 25 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

AB—8 to 17 inches; grayish brown (10YR 5/2) very cobbly ashy sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine irregular pores; 25 percent gravel and 20 percent cobbles; neutral; clear smooth boundary.

Bw1—17 to 31 inches; light yellowish brown (10YR 6/4) very cobbly ashy sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium and coarse roots; many very fine and fine irregular pores; 25 percent gravel and 30 percent cobbles; neutral; clear smooth boundary.

Bw2—31 to 37 inches; light yellowish brown (10YR 6/4) very cobbly ashy sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; many very fine and fine irregular pores; 25 percent gravel and 30 percent cobbles; neutral; gradual smooth boundary.

Bw3—37 to 45 inches; light yellowish brown (10YR 6/4) extremely cobbly ashy fine sandy loam, brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine irregular pores; 25 percent gravel, 30 percent cobbles, and 5 percent stones; neutral; gradual smooth boundary.

Bw4—45 to 60 inches; light yellowish brown (10YR 6/4) extremely cobbly ashy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine irregular pores; 25 percent gravel, 30 percent cobbles, and 5 percent stones; neutral.

### ***Range in Characteristics***

The C horizon is absent in some pedons.

#### **Profile**

Thickness of umbric epipedon—10 to 15 inches

Thickness of volcanic ash—more than 60 inches

#### **A and AB horizons**

Value—3 to 5 dry, 2 or 3 moist

Chroma—2 or 3 dry or moist

Texture of A horizon—gravelly ashy sandy loam

Texture of AB horizon—gravelly ashy sandy loam, very gravelly ashy sandy loam, or very cobbly ashy sandy loam

Content of clay—4 to 10 percent

Reaction—slightly acid or neutral

#### **Bw horizon**

Value—5 or 6 dry, 3 or 4 moist

Chroma—3 or 4 dry or moist

Texture—very gravelly ashy sandy loam, very cobbly ashy sandy loam, extremely cobbly ashy loam, extremely cobbly ashy fine sandy loam, extremely cobbly ashy sandy loam, extremely cobbly ashy loam, or extremely gravelly ashy sandy loam

Content of clay—6 to 10 percent

Reaction—slightly acid or neutral

### ***Twolakes Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from andesite or basalt

*Slope range:* 5 to 65 percent

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### ***Typical Pedon Location***

Twolakes ashy sandy loam in an area of Twolakes-Walupt complex, 30 to 55 percent slopes, about 200 feet north and 2,500 feet west of the southeast corner of sec. 2, T. 18 N., R. 12 E.

### ***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash.

E—0 to 1 inch; brown (10YR 5/3) ashy sandy loam, light gray (10YR 7/1) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine and fine irregular pores; 85 percent coarse and very coarse ash; NaF pH 10.1; moderately acid; clear smooth boundary.

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- AB—1 to 6 inches; brown (10YR 4/3) gravelly ashy sandy loam, gray (10YR 6/1) dry; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 45 percent coarse and very coarse ash; 20 percent gravel and 5 percent cobbles; NaF pH 11.5; slightly acid; clear smooth boundary.
- Bw—6 to 16 inches; brown (10YR 4/3) very gravelly ashy sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 35 percent coarse and very coarse ash; 35 percent gravel and 10 percent cobbles; NaF pH 11.0; slightly acid; clear smooth boundary.
- 2Bt1—16 to 30 inches; dark yellowish brown (10YR 4/4) extremely gravelly loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; many very fine and fine irregular pores and few fine tubular pores; common distinct brown (10YR 4/3) clay films lining pores and on faces of peds; 45 percent gravel and 20 percent cobbles; NaF pH 10.1; slightly acid; clear smooth boundary.
- 2Bt2—30 to 47 inches; dark yellowish brown (10YR 4/4) extremely gravelly loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and fine irregular pores and few medium and coarse tubular pores; common distinct brown (10YR 4/3) clay films lining pores and on faces of peds; 50 percent gravel and 25 percent cobbles; NaF pH 9.4; slightly acid; gradual wavy boundary.
- 2Bt3—47 to 64 inches; brown (10YR 4/3) extremely gravelly loam, light yellowish brown (10YR 6/4) dry; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few medium and coarse tubular pores; few faint clay films lining pores and on faces of peds; 45 percent gravel and 20 percent cobbles; slightly acid.

### *Range in Characteristics*

#### **Profile**

Thickness of volcanic ash—14 to 25 inches

#### **E horizon**

Chroma—1 or 2 moist

#### **AB horizon**

Hue—7.5YR or 10YR

Value—3 or 4 moist, 5 or 6 dry

Chroma—1 to 6 moist

Content of clay—4 to 8 percent

#### **Bw horizon**

Hue—7.5YR or 10YR

Value—4 or 5 moist

Chroma—2 to 4 moist or dry

Texture—very gravelly ashy sandy loam or very cobbly ashy sandy loam

Content of clay—4 to 8 percent

#### **2Bt horizon**

Hue—7.5YR or 10YR

Value—4 to 6 dry or moist

Chroma—2 to 4 moist or dry

Texture—very gravelly loam, extremely gravelly loam, or extremely cobbly loam

Content of clay—18 to 27 percent

### ***Typic Vitricryands***

*Depth class:* Moderately deep to very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash mixed with colluvium derived from andesite, volcanic rock, or pyroclastic rock

*Slope range:* 5 to 120 percent

*Elevation:* 3,900 to 7,200 feet

*Mean annual precipitation:* 60 to 120 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

#### ***Reference Pedon Location***

Typic Vitricryands, 45 to 90 percent slopes; 2,500 feet south and 2,300 feet west of the northeast corner of sec. 11, T. 14 N., R. 13 E.

#### ***Reference Pedon***

Oi—2 inches to 0; slightly decomposed forest litter.

A—0 to 3 inches; dark brown (10YR 3/3) ashy loamy sand, brown (10YR 5/3) dry; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine irregular pores; 5 percent gravel; moderately acid; clear smooth boundary.

AB—3 to 12 inches; dark brown (10YR 3/3) gravelly ashy sandy loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine irregular pores; 10 percent gravel, 5 percent cobbles, and 2 percent stones; moderately acid; clear smooth boundary.

Bw1—12 to 21 inches; dark yellowish brown (10YR 4/4) very stony ashy fine sandy loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic, weakly smeary; common very fine and fine and few medium and coarse roots; common very fine and fine irregular pores; 20 percent gravel, 10 percent cobbles, and 15 percent stones; moderately acid; clear wavy boundary.

Bw2—21 to 33 inches; brown (10YR 4/3) very gravelly ashy loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine irregular pores; 30 percent gravel, 5 percent cobbles, and 2 percent stones; slightly acid; gradual wavy boundary.

2BC1—33 to 41 inches; olive brown (2.5Y 4/4) and pale brown (10YR 6/3) very gravelly loam, very pale brown (10YR 7/3) dry; weak coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine irregular pores; 40 percent gravel and 15 percent cobbles; neutral; gradual wavy boundary.

2BC2—41 to 60 inches; olive brown (2.5Y 4/4) very gravelly loam, very pale brown (10YR 7/3) dry; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and few fine irregular pores; 35 percent gravel and 15 percent cobbles; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of volcanic ash—14 to 50 inches

Depth to bedrock—20 to 80 inches

#### **A horizon**

Hue—10YR or 7.5YR

Value—2 or 3 moist, 4 or 5 dry

Chroma—2 to 4 dry or moist

Content of clay—0 to 4 percent

#### **AB and Bw horizons**

Hue—10YR, 7.5YR, or 2.5Y

Value—3 to 6 moist, 5 to 7 dry

Chroma—2 to 6 moist or dry

Texture—very gravelly ashy loam, very gravelly ashy fine sandy loam, very stony ashy fine sandy loam, or extremely cobbly ashy loam

Content of clay—4 to 10 percent

Reaction—moderately acid or slightly acid

#### **2BC horizon**

Hue—10YR, 7.5YR, 2.5Y, or 5YR

Value—4 to 6 moist, 5 to 8 dry

Chroma—3 to 8 moist or dry

Texture—very gravelly loam, very stony loam, extremely cobbly loam, or extremely gravelly loam

Content of clay—6 to 10 percent

Reaction—slightly acid or neutral

### ***Walupt Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from andesite or basalt

*Slope range:* 5 to 55 percent

*Elevation:* 3,500 to 6,000 feet

*Mean annual precipitation:* 60 to 90 inches

*Mean annual air temperature:* 37 to 43 degrees F

*Frost-free period:* 35 to 75 days

### ***Typical Pedon Location***

Walupt ashy loamy sand in an area of Walupt-Twolakes-Ravensroost complex, 5 to 30 percent slopes, about 1,500 feet south and 1,400 feet west of the northeast corner of sec. 1, T. 18 N., R. 12 E.

### ***Typical Pedon***

Oi—2 inches to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash.

E—0 to 1 inch; gray (10YR 5/1) ashy sand, light gray (10YR 7/1) dry; single grain;

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- soft, very friable, nonsticky and nonplastic; common very fine and fine roots; NaF pH 11.5; slightly acid; abrupt smooth boundary.
- A—1 to 5 inches; brown (10YR 4/3) ashy loamy sand, brown (10YR 5/3) dry; weak fine subangular blocky structure parting to weak fine and medium granular; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 5 percent gravel; NaF pH 11.5; slightly acid; clear smooth boundary.
- Bw1—5 to 14 inches; brown (10YR 4/3) ashy sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine, medium, and coarse roots; many very fine and fine irregular pores; 10 percent gravel; NaF pH 11.5; slightly acid; clear smooth boundary.
- Bw2—14 to 19 inches; brown (7.5YR 4/4) gravelly ashy fine sandy loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; 15 percent gravel; NaF pH 11.5; slightly acid; clear irregular boundary.
- 2Bt1—19 to 34 inches; dark yellowish brown (10YR 4/4) very cobbly loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and fine irregular pores and few fine tubular pores; few distinct brown (10YR 4/3) clay films lining pores and on faces of peds; 25 percent gravel and 20 percent cobbles; NaF pH 11.0; slightly acid; clear irregular boundary.
- 2Bt2—34 to 50 inches; dark yellowish brown (10YR 4/4) very gravelly loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and fine irregular pores and few fine tubular pores; common distinct brown (10YR 4/3) clay films lining pores and on faces of peds; 30 percent gravel and 15 percent cobbles; NaF pH 9.6; neutral; gradual wavy boundary.
- 2Bt3—50 to 60 inches; dark yellowish brown (10YR 4/4) very cobbly loam, yellowish brown (10YR 5/4) dry; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and fine irregular pores and few fine tubular pores; few distinct brown (10YR 4/3) clay films lining pores and on faces of peds; 30 percent gravel and 20 percent cobbles; NaF pH 9.4; slightly acid.

### ***Range in Characteristics***

The E horizon is absent in some pedons

#### **Profile**

Thickness of volcanic ash—14 to 30 inches

#### **Bw horizon**

Hue—10YR or 7.5YR

Value—3 or 4 moist, 5 or 6 dry

Chroma—3 or 4 moist or dry

Texture—ashy sandy loam, ashy fine sandy loam, or gravelly ashy fine sandy loam

Content of clay—4 to 8 percent

#### **2Bt horizon**

Value—4 or 5 moist

Chroma—3 or 4 moist or dry

Texture—very gravelly loam, extremely gravelly loam, or very cobbly loam  
Content of clay—18 to 27 percent  
Reaction—slightly acid or neutral

### **Weirman Series**

*Depth class:* Very deep  
*Drainage class:* Somewhat excessively drained  
*Position on landscape:* Flood plains  
*Parent material:* Mixed alluvium  
*Slope range:* 0 to 5 percent  
*Elevation:* 2,000 to 2,500 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 48 to 50 degrees F  
*Frost-free period:* 110 to 150 days

#### **Typical Pedon Location**

Weirman sandy loam in the Yakims County Area, Washington, soil survey area.

#### **Typical Pedon**

Ap—0 to 8 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; common fine roots; slightly alkaline; abrupt smooth boundary.  
AC—8 to 15 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; single grain; loose; few very fine roots; slightly alkaline; abrupt smooth boundary.  
C1—15 to 21 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; few medium faint dark yellowish brown (10YR 4/4) mottles; massive; soft, very friable, nonsticky and slightly plastic; few very fine roots; slightly alkaline; gradual wavy boundary.  
2C2—21 to 60 inches; grayish brown (10YR 5/2) extremely gravelly sand, very dark grayish brown (10YR 3/2) moist; single grain; loose; 75 percent gravel and 5 percent cobbles; few very fine roots; slightly alkaline.

#### **Range in Characteristics**

##### **Profile**

Thickness of mollic epipedon—10 to 17 inches  
High water table—present in winter and spring in some areas  
Flooding—present in winter and spring  
Depth to strongly contrasting textural stratification (2C horizon)—10 to 30 inches

#### **Typical Pedon**

##### **Ap horizon**

Value—4 or 5 dry, 2 or 3 moist  
Chroma—2 or 3 dry or moist  
Texture—sandy loam or gravelly fine sandy loam  
Content of clay—5 to 8 percent

##### **AC and C horizons**

Value—4 or 5 dry, 3 or 4 moist  
Chroma—2 or 3 dry or moist  
Texture—loamy fine sand, sand, or loamy sand  
Content of clay—2 to 5 percent

**2C horizon**

Value—4 or 5 dry, 3 or 4 moist

Chroma—2 or 3 dry or moist

Texture—extremely gravelly sand, very gravelly sand, or very gravelly loamy sand

Content of clay—0 to 2 percent

***Xeralfs***

*Depth class:* Moderately deep to very deep

*Drainage class:* Moderately well drained

*Position on landscape:* Mountain slopes

*Parent material:* Colluvium derived from basalt, andesite, or bentonite with an influence of volcanic ash

*Slope range:* 5 to 45 percent

*Elevation:* 3,000 to 4,300 feet

*Mean annual precipitation:* 30 to 50 inches

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 70 to 100 days

These soils are extremely variable because of past mass movement and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Xeralfs, 5 to 45 percent slopes, about 80 feet north and 2,600 feet east of the southwest corner of sec. 16, T. 15 N., R. 14 E.

***Reference Pedon***

Oi—2 inches to 0; slightly decomposed forest litter mixed with a small amount of 1980 Mount St. Helens ash; abrupt smooth boundary.

C—0 to 0.25 inch; grayish brown (10YR 5/2) ashy loamy sand (volcanic ash), very dark brown (10YR 2/2) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 20 percent coarse and very coarse ash; slightly acid; abrupt smooth boundary.

A—0.25 to 4 inches; grayish brown (10YR 5/2) ashy fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine, common medium, and few coarse roots; common fine pores; 20 percent coarse and very coarse ash; slightly acid; clear smooth boundary.

2AB—4 to 9 inches; brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to weak fine granular; hard, very friable, slightly sticky and slightly plastic; many very fine and fine, common medium, and few coarse roots; common fine irregular pores; 5 percent coarse and very coarse ash; slightly acid; clear smooth boundary.

2Bt1—9 to 17 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly sticky; common fine and medium roots; few fine irregular pores and common very fine and fine tubular pores; many distinct brown (10YR 4/3) clay films on faces of peds; 15 percent coarse and very coarse ash; moderately acid; clear smooth boundary.

2Bt2—17 to 26 inches; brown (10YR 5/3) gravelly clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few fine and medium roots; few fine tubular pores; common distinct yellowish brown (10YR 4/4) clay films on faces of peds; many prominent strong brown (7.5YR 5/6) redoximorphic concentrations on faces of peds;

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15 percent coarse and very coarse ash; 25 percent gravel and 5 percent cobbles; moderately acid; abrupt smooth boundary.

3Bt3—26 to 40 inches; grayish brown (10YR 4/2) clay, olive brown (2.5Y 4/4) moist; strong medium prismatic structure parting to strong medium subangular blocky; very hard, very firm, very sticky and very plastic; few fine and medium roots; few fine tubular pores; common distinct pressure faces; pale yellow (2.5Y 7/4) material from underlying horizon as a result of churning; moderately acid; abrupt smooth boundary.

4C—40 to 60 inches; pale yellow (2.5Y 7/4) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, moderately sticky and moderately plastic; few very fine irregular pores; moderately acid.

***Range in Characteristics***

**Profile**

Thickness of volcanic ash—0 to 10 inches

Depth to bedrock—20 to 80 inches

High water table—present in winter and spring and early in summer

**A horizon**

Hue—5YR, 10YR, or 2.5Y

Value—5 to 7 dry, 3 to 5 moist

Chroma—2 or 3 dry or moist

Content of clay—4 to 8 percent

Reaction—slightly acid or neutral

**2AB and 2Bt horizons**

Hue—10YR or 2.5Y

Value—4 to 6 dry, 4 or 5 moist

Chroma—2 to 6 dry, 2 to 4 moist

Texture—gravelly clay loam or loam

Content of clay—18 to 30 percent

Reaction—moderately acid or slightly acid

**3Bt horizon**

Hue—10YR or 2.5Y

Value—4 to 6 dry, 4 or 5 moist

Chroma—2 to 6 dry, 2 to 4 moist

Texture—gravelly clay, clay, or very gravelly clay loam

Content of clay—35 to 50 percent

**4C horizon**

Hue—7.5YR, 10YR, 2.5Y, or 5Y

Value—3 to 7 dry, 3 to 6 moist

Chroma—2 to 6 dry and 2 to 4 moist

Texture—very cobbly clay, very gravelly clay loam, extremely gravelly silty clay loam, or silty clay loam

Content of clay—27 to 60 percent

Reaction—moderately acid or slightly acid

***Xeric Vitricryands***

*Depth class:* Moderately deep to very deep

*Drainage class:* Well drained

*Position on landscape:* Mountain slopes

*Parent material:* Volcanic ash over colluvium derived from andesite or pyroclastic rock

*Slope range:* 10 to 90 percent

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*Elevation:* 3,700 to 6,500 feet

*Mean annual precipitation:* 35 to 60 inches

*Mean annual air temperature:* 41 to 43 degrees F

*Frost-free period:* 40 to 80 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Xeric Vitricryands, 20 to 90 percent slopes; 500 feet north and 1,600 feet east of the southwest corner of sec. 24, T. 17 N., R. 11 E.

***Reference Pedon***

Oi—2 inches to 0; slightly decomposed forest litter.

A—0 to 3 inches; brown (10YR 4/3) ashy loamy sand, dark brown (10YR 3/3) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 10 percent gravel; slightly acid; gradual smooth boundary.

BA—3 to 10 inches; brown (10YR 4/3) gravelly ashy loamy sand, very dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine irregular pores; 15 percent gravel and 5 percent cobbles; slightly acid; gradual smooth boundary.

Bw1—10 to 17 inches; brown (10YR 4/3) very gravelly ashy fine sandy loam, very dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium and few coarse roots; many very fine and fine irregular pores; 25 percent gravel, 10 percent cobbles, and 2 percent stones; slightly acid; gradual smooth boundary.

Bw2—17 to 30 inches; brown (10YR 5/3) very gravelly ashy sandy loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium and few coarse roots; many very fine and fine irregular pores; 35 percent gravel, 15 percent cobbles, and 5 percent stones; slightly acid; gradual smooth boundary.

2Bw3—30 to 47 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; many very fine and fine irregular pores; 60 percent gravel, 15 percent cobbles, and 10 percent stones; neutral; gradual smooth boundary.

2Bw4—47 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine irregular pores; 50 percent gravel, 15 percent cobbles, and 10 percent stones; neutral.

***Range in Characteristics***

**Profile**

Thickness of volcanic ash—14 to 30 inches

Depth to bedrock—20 to 80 inches

**A horizon**

Hue—10YR or 7.5YR

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 to 4 dry or moist  
Content of clay—0 to 4 percent

**BA and Bw horizons**

Hue—10YR or 7.5YR  
Value—4 to 7 dry, 3 to 6 moist  
Chroma—2 to 6 moist or dry  
Texture—extremely gravelly ashy sandy loam, gravelly ashy loamy sand, very gravelly ashy fine sandy loam, very gravelly ashy sandy loam, very gravelly ashy loam, or very cobbly ashy sandy loam  
Content of clay—4 to 10 percent

**2Bw horizon**

Hue—10YR, 2.5Y, or 7.5YR  
Value—5 to 7 dry, 4 to 6 moist  
Chroma—3 to 6 moist or dry  
Texture—extremely gravelly sandy loam, extremely cobbly sandy loam, very gravelly sandy loam, or very cobbly sandy loam  
Content of clay—5 to 27 percent

***Xerofluvents***

*Depth class:* Very deep  
*Drainage class:* Moderately well drained  
*Position on landscape:* Flood plains  
*Parent material:* Recent alluvium  
*Slope range:* 0 to 5 percent  
*Elevation:* 2,150 to 2,900 feet  
*Mean annual precipitation:* 20 to 30 inches  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 70 to 100 days

These soils are highly variable and are not represented by any one pedon. Following is a commonly observed profile.

***Reference Pedon Location***

Xerofluvents in an area of Mippon-Xerofluvents complex, 0 to 5 percent slopes, 1,300 feet north and 1,900 feet west of the southeast corner of sec. 1, T. 16 N., R. 14 E.

***Reference Pedon***

O<sub>i</sub>—1 inch to 0; slightly decomposed forest litter; abrupt smooth boundary.  
A—0 to 1 inch; brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and common fine irregular pores; 15 percent gravel; slightly acid; clear smooth boundary.  
2AC—1 to 5 inches; dark grayish brown (10YR 4/2) very gravelly sand, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; loose, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; few very fine and many fine irregular pores; 35 percent gravel and 15 percent cobbles; slightly acid; gradual smooth boundary.  
2C1—5 to 23 inches; multicolored extremely cobbly coarse sand; single grain; loose, nonsticky and nonplastic; common very fine and few fine roots; many fine pores; 40 percent gravel and 45 percent cobbles; neutral; gradual smooth boundary.

2C2—23 to 38 inches; multicolored extremely cobbly coarse sand; single grain; loose, nonsticky and nonplastic; common very fine and few fine roots; many fine irregular pores; 45 percent gravel, 35 percent cobbles, and 2 percent stones; neutral; gradual smooth boundary.

2C3—38 to 60 inches; multicolored extremely cobbly coarse sand; single grain; loose, nonsticky and nonplastic; few very fine roots; many fine irregular pores; 45 percent gravel, 35 percent cobbles, and 10 percent stones; neutral.

### ***Range in Characteristics***

#### **Profile**

High water table—present throughout year

Flooding—present late in winter, in spring, and early in summer

#### **A horizon**

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 or 3 dry or moist

Content of clay—8 to 12 percent

Reaction—slightly acid or neutral

#### **2AC and C horizons**

Texture—extremely cobbly coarse sand, extremely gravelly coarse sand, very stony coarse sand, or very gravelly sand

Content of clay—0 to 2 percent

## ***Yakima Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Position on landscape:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Elevation:* 2,000 to 2,500 feet

*Mean annual precipitation:* 10 to 14 inches

*Mean annual air temperature:* 48 to 50 degrees F

*Frost-free period:* 110 to 150 days

### ***Typical Pedon Location***

Yakima silt loam in the Yakima County Area, Washington, soil survey area.

### ***Typical Pedon***

Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; hard, friable, slightly sticky and slightly plastic; many fine roots; common fine pores; slightly alkaline; abrupt smooth boundary.

A1—6 to 13 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine pores; slightly alkaline; abrupt smooth boundary.

A2—13 to 17 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; common fine pores; 10 percent basalt gravel; slightly alkaline; gradual wavy boundary.

A3—17 to 27 inches; brown (10YR 5/3) gravelly very fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very

friable, nonsticky and slightly plastic; few very fine roots; common fine pores;  
20 percent basalt gravel; neutral; gradual wavy boundary.

AC—27 to 30 inches; brown (10YR 5/3) gravelly very fine sandy loam, dark brown  
(10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic;  
few very fine roots; common fine pores; 30 percent basalt gravel; neutral; abrupt  
wavy boundary.

2C—30 to 60 inches; dark grayish brown (10YR 4/2) extremely gravelly coarse sand,  
very dark grayish brown (10YR 3/2) moist; single grain; loose; 60 percent gravel  
and 5 percent cobbles; few very fine roots; neutral.

### ***Range in Characteristics***

#### **Profile**

Thickness of mollic epipedon and depth to strongly contrasting textural stratification—  
20 to 40 inches

Flooding—present late in winter

#### **Ap and A1 horizons**

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 to 3 dry or moist

Content of clay—5 to 10 percent

#### **A2, A3, and AC horizons**

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 or 3 dry or moist

Texture—sandy loam, gravelly silt loam, gravelly loam, or gravelly very fine sandy  
loam

Content of clay—5 to 10 percent

#### **2C horizon**

Value—4 or 5 dry, 2 or 3 moist

Chroma—2 or 3 dry or moist

Texture—very gravelly sand, very gravelly loamy sand, or extremely gravelly coarse  
sand

Content of clay—0 to 2 percent



# Formation of the Soils

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By Christopher S. Miller, Natural Resources Conservation Service.

Soil is the unconsolidated material on the surface of the earth that provides a medium for plant growth. This medium is subject to and shaped by parent material, climate, relief, living organisms, and time. In combination, these soil-forming factors form a unique soil on the landscape (Jenny, 1941). The formation of soil begins when a large, sometimes catastrophic, event blankets the landscape with new unweathered material. The forces of soil formation act upon this material, creating soils that have varied and unique properties. The properties of soils are closely related to the parent material. Soils tend to exhibit properties from the parent material, especially texture, mineralogy, and color. As a soil matures, some features of the initial material are lost. The soils in the survey area formed primarily in colluvium and residuum derived from basalt, andesite, granite, sandstone, bentonite, tuffaceous material, glacial deposits, and alluvium with a mantle of volcanic ash that varies in thickness.

The soil-forming factors are interrelated. The type of soil that forms is dependent on the interaction of the five soil-forming factors. Soil formation is geological, biological, chemical, and physical. Wind, water, and other physical elements act on bedrock or rock fragments to break them down. Plants and animals also act on this material and affect its development. Some material is easily weathered, and other material is resistant to alteration. In the more easily weathered material, clay-sized particles commonly move down through the profile, forming an argillic horizon, or layer of clay accumulation.

The typical profile of a forested soil that developed under a temperate climate has four distinct major horizons. These are the O, A, B, and C horizons.

The O horizon, a layer that is dominantly organic matter and has more than 20 percent organic carbon, is subdivided into three additional layers. These are the Oi, Oe, and Oa horizons. The Oi horizon is slightly decomposed organic matter, and its origin is recognizable. The Oe horizon is made up of intermediately weathered organic matter that contains humus. The origin of some material is still recognizable. The Oa horizon is the most highly decomposed layer. The origin of the material is not recognizable.

The A horizon is the surface layer of the mineral soil. It is a mixture of humus and mineral soil material in which earthworms and other organisms commonly are active. In forested areas, the lower part of this horizon commonly is leached of nutrients by the downward movement of water and as a result is lighter in color.

The B horizon is the zone of accumulation. This zone is characterized by the deposition of iron and aluminum oxides and minute particles of clay and organic matter. As a result of these depositions, the B horizon commonly is browner or redder in color and finer in texture than the A horizon.

The C horizon generally is made up of the same material as the A and B horizons, but it is less weathered. The C horizon does not exhibit a high degree of weathering.

Generally, the A, B, and C horizons refer to layers that have been leached, enriched, and unchanged, respectively. The presence or absence of these horizons and other subhorizons vary greatly.

## Parent Material

Parent material is the fundamental building block upon which weathering factors influence soil development. Parent material can be organic matter or unconsolidated mineral material. The soils in the survey area formed in a wide variety of parent material. Most of the parent material emanated from the volcanic Cascade Mountains, including andesite, basalt, bentonite, diorite, gneiss, granite, rhyolite, and volcanic ash. Areas of glacial till, siltstone, and sandstone also are in the survey area. The soils on the eastern fringe of the area typically are mixed with small amounts of loess, originating in the Pasco Basin area during the Pleistocene.

Areas of basalt and andesite are extensive and are primarily in the eastern half of the survey area. Columbia River flood basalt covers large areas in eastern Washington and extends west into the survey area and into the Cascade Mountains. Several local sources of basalt and andesite are also in the Cascade Mountains. Some of these are the Fifes Peak Volcano, Tieton Volcano, and Goat Rocks Volcano. The uplifting of the Cascade Range disrupted the horizontal bedding of the many basalt flows. The soils that formed in basalt range from 10 to 60 inches or more in depth. These soils commonly have an argillic horizon. The Bograp, Bocker, McDanielake, and Fiscus series are examples of soils that formed in colluvium and residuum derived from basalt.

Areas of granite are in the William O. Douglas Wilderness Area, the Bumping drainageway, and the upper reaches of the Little Naches River drainageway. Kaner soils formed in material derived from granite. These soils average more than 35 percent coarse fragments, and they generally are on treeless south aspects of active colluvial landscapes. Because of the relative resistance of granite to weathering, the soils generally do not have an argillic horizon.

The Ellensburg Formation consists dominantly of volcanoclastic sandstone and interstratified breccia. The source of this formation is sedimentary material from the mudflows emanating from the uplifting of the Cascade Mountains. The mudflows and other water- or wind-deposited material are sandwiched between basalt from different flood events. Soils that formed in this material are the Nile, Snilec, and Seeburg series. These soils are dominantly limited to the Nile and Rattlesnake drainageways. Because of the inherent weatherability of this kind of material, the Snilec soils have an argillic horizon. The Seeburg soils do not have an argillic horizon because of the loose nature of these deposits and the intense colluvial activity that occurs in areas of these soils.

Sandstone and siltstone sedimentary deposits are in the South Fork of the Tieton River area, on the north side of the Naches River drainageway, and in the Milk Creek drainageway. Examples of soils that formed in this material include the Osborn and Spexarth series. Some tuffaceous sandstone is also included in the Ellensburg Formation.

Extensive areas of rhyolite are throughout most of the western part of the survey area. Most of the rhyolite is within the wilderness areas. In the more intensely mapped areas, the Bertolotti and Gilpar series are examples of soils that formed in material derived from rhyolite.

Landslide debris, bentonite, and tuff result in soils with extremely variable properties. This conglomerate of material and the subsurface hydrology are the major factors influencing the landslides and slope stability of the area. Characteristic landslide topography is easily recognized by deranged drainage patterns, hummocky relief, surface tension cracks, tilting trees, and sag ponds. Some of these soils are moving so rapidly that their progress can be measured by yards per year. Soil genesis on these unstable landscapes is complicated. Away from the fastest moving part of the landslide, soils can be recognized at the great group level and are

classified as Xeralfs. On slightly more stable landscapes, soils at the series level can be recognized. Examples are the Ghormley and Bearrun series.

Volcanic ash of various thicknesses and textures has been deposited throughout the survey area. The primary sources of the ash are Mount Mazama (Crater Lake) and Mount St. Helens. Small amounts of ash originating from local vents on both sides of the crest of the Cascades and Mount Rainer are also present.

In most soils, the upper layers of volcanic ash generally do not contain colluvium and are ashy sandy loam or ashy fine sandy loam in texture. The lower layers of ash, or B horizon, typically contain ash mixed with colluvium and are ashy fine sandy loam in texture. Soils that have fragments of cinder and pumice are not extensive in the survey area. The depth of the ash depends on many physical factors, including aspect, slope position, and proximity to the source. Examples of soils that have a mantle of ash 7 to 14 inches thick are the McDanielake, Bograp, and Snilec series. Examples of soils that have a mantle of ash 14 to 25 inches thick are the Twolakes and Singh series. Examples of soils that have a mantle of ash more than 60 inches thick are the Terence and Icksix series.

Glacial deposits occur across the alpine areas and the adjacent valleys. The American, Tieton, and Bumping drainageways are examples of glacial valleys. Glacial deposits consist of material scraped and collected from the local bedrock, and they exhibit mixed mineralogy, texture, and other soil properties. The Tumac Plateau, with its many pothole lakes and scoured rock outcroppings, is a typical late Pleistocene landscape.

## **Climate**

The climate in the survey area is greatly influenced by the crest of the Cascade Mountains, which is the western boundary of the survey area. The Cascade Mountains create a dramatic and discernable rainshadow. This shadow is illustrated by the areas that receive less than 20 inches of precipitation and those that receive more than 120 inches. Rainfall increases progressively from east to west. Precipitation and temperature are major factors in facilitating the physical, chemical, and biological processes of soil formation. The mean annual air temperature is 37 to 50 degrees F. The frost-free period is 30 to 195 days. Generally, precipitation increases and temperature decreases as elevation increases.

The soils in the survey area formed in four major climatic zones. Soils are classified according to their moisture and temperature regime. The survey area is comprised of three soil temperature regimes (mesic, frigid, and cryic) and two soil moisture regimes (xeric and udic). These regimes overlap, creating the four major climatic zones, which are mesic/xeric, frigid/xeric, cryic/xeric, and cryic/udic.

Most of the survey area is in the xeric moisture regime. In the southern Washington Cascade Mountains, the soils generally receive less than 70 inches of precipitation annually. Most of this precipitation falls as snow in winter. These soils are in a mesic, frigid, or cryic temperature regime. The classification of the soils into a temperature regime is supported by field data collected over a period of 6 years while the soil survey was in progress and by data collected during the Private Forest Land Grading soil survey of the late 1970's.

The mesic/xeric zone occurs as very small areas adjacent to Yakima County. This zone is on flood plains and is represented by the Weirman and Yakima series. The soils in this zone have developed a thick, dark-colored mollic epipedon. They are enriched with organic matter from the decomposition of the grass vegetation. The mean annual precipitation is 10 to 14 inches, and the mean annual air temperature is 48 to 50 degrees F. The frost-free period is 110 to 150 days. Elevation is 2,000 to 2,500 feet.

The frigid/xeric zone is the broadest zone in the survey area; it encompasses most of the eastern half of the area. The soils typically formed in colluvium and residuum derived from andesite or basalt with a mantle of volcanic ash 7 to 25 inches thick. The soils in this zone are represented by the Bograp, McDanielake, and Singh series. The soils have a light-colored ochric epipedon over an argillic horizon. The overstory vegetation is characterized by ponderosa pine, Douglas-fir, and grand fir. The understory vegetation commonly includes pinegrass, elk sedge, and Cascade Oregongrape. The mean annual precipitation is 25 to 50 inches, and the mean annual air temperature is 43 to 45 degrees F. The frost-free period is 70 to 100 days. Elevation is 2,150 to 4,800 feet.

The cryic/xeric zone is on cold mountain slopes. The soils generally have a mantle of volcanic ash over andesite, basalt, and pyroclastic breccia. The soils in this zone are represented by the Darland, Fiscus, Fifesridge, Nile, and Naxing series. The Darland, Fiscus, and Fifesridge soils have an argillic horizon below the mantle of ash. The Naxing and Nile soils have a cambic horizon below the mantle of ash. The break between the frigid/xeric zone and the cryic/xeric zone is based on a change in vegetation from a dominance of grand fir to a dominance of Engelmann spruce or subalpine fir. The mean annual precipitation is 25 to 60 inches, and the mean annual air temperature is 39 to 43 degrees F. The frost-free period is 30 to 80 days. Elevation is 2,500 to 6,300 feet.

The cryic/udic zone occurs near the crest of the Cascade Mountains, where the climate is influenced by the marine air west of the mountains. The soils generally formed in volcanic ash over colluvium and residuum derived from pyroclastic material, tuffaceous material, and breccia. The soils are represented by the Twolakes, Walupt, and Ravensroost series. These soils have an argillic horizon with a base saturation of less than 35 percent below the mantle of ash. The higher amount of precipitation received in this climatic zone along with the acidic foliage from the hemlock and fir trees, leaches iron and aluminum from the surface layer. A leached zone, or E horizon, eventually develops under the O horizon. This development of an E horizon and the precipitation and deposition of iron and aluminum in the B horizon creates an environment for the development of a spodic horizon. The soils in this zone are represented by the Gilpar series. This climate zone is typified by Pacific silver fir and mountain hemlock plant associations. The mean annual precipitation is 60 to 120 inches, and the mean annual air temperature is 37 to 43 degrees F. The frost-free period is 35 to 75 days. Elevation is 3,500 to 7,000 feet.

## Relief

Site location with respect to landscape position plays a large role in the makeup of the physical properties of soils. Mountainous regions have several very distinct landscape positions. Topography affects soil genesis in several ways. Some examples are the intensity of erosion based on slope runoff, movement of material in suspension based on infiltration and runoff, and water content of the soil based on the position on the slope.

On slopes of more than 45 percent, the downward movement of soil by gravity and water continues at a rate significant enough to hamper the development of soil properties commonly expressed in soils that are less sloping. An example of properties that are affected is the development of an argillic horizon or a spodic horizon. While both of these horizons occur in soils on slopes of as much as 60 percent, they are much more evident in soils on slopes of 45 percent or less. Both of these diagnostic horizons require time and stability to form.

The survey area has several large east-west ridges that extend eastward from the rangeland to the crest of the Cascade Mountains. These large ridges are primarily

basalt, and they exhibit a mountain landform catena of ridgetops, shoulder slopes, backslopes, footslopes, and toeslopes.

Divide Ridge, just south of Rimrock Lake, outlines the survey area from Jumpoff Lookout west to the Goat Rocks. This entire ridgetop is mapped as Darland and Naxing soils with inclusions of Rock outcrop.

Soils on south-facing shoulder slopes have a xeric moisture regime and a cryic temperature regime and are primarily treeless. The large windswept ridges and shoulder slopes receive the brunt of the weather and are typified by wind-pruned subalpine fir and whitebark pine. The soils are mapped primarily as the Darland series. Some deeper pockets of ash in protected areas are mapped as the Naxing series. Productivity in these areas is low, and the canopy generally is very open.

Soils on north-facing shoulder slopes have a xeric or udic moisture regime. North-facing slopes adjacent to the ridgetops typically are xeric. The canopy is closed, and the soils tend to be very deep with a thick mantle of ash. An example is the Naxing series. There are a few areas of Darland soils and Rock outcrop as well as several wet spots. On the shoulder slopes and grading into the upper backslopes is a distinct udic/cryic climatic zone. This zone is entirely forested, and the tree canopy is closed. It is primarily mapped as the Twolakes and Nomlas series. The soils support a canopy of mountain hemlock and Pacific silver fir.

Soils on backslopes grade into the xeric/cryic climatic zone. This zone is also entirely forested, except for the areas of Rock outcrop and Rubble land. The backslopes are dissected by drainageways. Fiscus soils have developed on the less active colluvial backslopes, and Terence soils have developed on the more active colluvial backslopes.

The lower part of the backslopes along with the footslopes and toeslopes are in the xeric/frigid climatic zone. These slopes are widely dissected. The McDanielake, Bearrun, Bograp, Ghormley, and Singh soils have developed on these slopes.

Landslides along the base of Divide Ridge, from the backslopes to the toeslopes, create an undulating landscape with several large sag ponds that hint at the magnitude and expanse of the landslides. Pickle Prairie and the surrounding depressions are examples of the wet areas on the landscape. These wet areas are characterized by organic soils and are mapped as Cryosaprists.

Sag ponds occur below the cryic zone. Closer to the footslopes and toeslopes, they are filled with fine-textured sediment and are mapped as Aquic Haploxererts. The soils in these nearly level depressional areas exhibit wide cracks at the soil surface when dry. Horsepasture Meadow and the surrounding depressions are examples.

Cold air movement downslope through drainageways and related soil/vegetation relationships are evident throughout most of the survey area. Because of this, that cryic soils, such as Haplocryolls, commonly are at lower elevations, even below areas of warmer frigid soils.

## Organisms

Plants and animals affect the formation of soils in many ways. They contribute organic matter to the solum, and they mix the material and thus contribute to the friability and tilth of soils. Rodents, insects, and earthworms all increase the friability of soils.

In alpine meadows, the work of rodents in just a single season can be quite astonishing. It is common to have several rodent burrows per square yard. The grasses in these meadows add organic material to the soils.

Most of the soils in the survey area formed under a forest environment, which produces soils that have a light-colored surface layer (ochric epipedon). This is a

result of the leaching of nutrients by the downward movement of water and inorganic and organic acids. In contrast, soils that formed under a grass/prairie environment have a dark-colored surface layer (mollic epipedon), which can extend to a depth of more than 20 inches. This is due to the dense, fibrous root mass near the surface that results in a very high content of organic matter.

Other flora-affected influences include windthrow. In certain areas, such as on ridgetops and areas of shallow soils or soils that have a high water table, windthrow and tipover occur on a frequent enough basis to regularly mix the soil. This has a significant impact on soil genesis.

## **Time**

Time is needed for the factors of soil formation to change the parent material. The degree to which the parent material is altered is due in part to the amount of time the process has been in place and the weatherability or alterability of the parent material. Very young soils that occur on flood plains and terraces exhibit minimal horizon development. Soils developing on steep slopes also have minimal horizon development because of the constant movement of colluvial material downslope. In contrast, some soils in more stable and less sloping landscape positions have developed a strongly expressed argillic horizon.

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# Glossary

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Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook" (available in local offices of the Natural Resources Conservation Service or on the Internet).

**ABC soil.** A soil having an A, a B, and a C horizon.

**Ablation till.** Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

**AC soil.** A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Albic horizon.** An eluvial horizon that is at least 1 centimeter thick or more. The color of the soil material is largely determined by the color of primary sand and silt particles rather than by the color of their coatings (Soil Survey Staff, 1999).

**Alluvial fan.** A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

**Alluvium.** Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

**Alpha,alpha-dipyridyl.** A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

**Andesite.** A fine-grained volcanic rock consisting mainly of plagioclase feldspar with small amounts of pyroxene, hornblende, or biotite. It is dark colored, mainly shades of gray or green.

**Andic soil properties.** A collection of physical and chemical properties that define the criteria for the Andisol order (Soil Survey Staff, 1999).

**Aquic conditions.** Current soil wetness characterized by saturation, reduction, and redoximorphic features.

**Argillic horizon.** A subsoil horizon characterized by an accumulation of illuvial clay.

**Arkose.** Sandstone containing unaltered feldspar; usually formed in mountainous regions from weathered granite.

**Ash (volcanic).** Unconsolidated, pyroclastic material less than 2 millimeters in all dimensions; commonly called volcanic ash.

**Ashy (family particle-size class).** A substitute class term used for the family particle-size in mineral soils (Soil Survey Staff, 1999).

**Ashy (textural modifier; for example, ashy sandy loam).** A term used to describe material in which the fine-earth fraction has 30 percent or more particles that are 0.02 to 2.0 millimeters in diameter. Of this, 5 percent or more is volcanic glass and the ammonium oxalate extractable aluminum plus ½ the ammonium oxalate extractable iron times 60 added to the percentage of volcanic glass are equal to or more than 30.

**Aspect.** The direction toward which a slope faces. Also called slope aspect.

**Association, soil.** A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low .....	0 to 3
Low .....	3 to 6
Moderate .....	6 to 9
High .....	9 to 12
Very high .....	more than 12

**Avalanche chute.** The central channel-like corridor, scar, or depression along which an avalanche has moved. It may take the form of an open path in a forest, with bent and broken trees, or an eroded surface marked by pits, scratches, and grooves.

**Backslope.** The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

**Backswamp.** A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

**Badland.** A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

**Basal area.** The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

**Basalt.** A fine-grained, dark-colored extrusive igneous rock composed primarily of calcic plagioclase and pyroxene, with or without olivine.

**Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

**Base slope (geomorphology).** A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

**Bedding plane.** A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a

change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

- Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.
- Bedrock-controlled topography.** A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.
- Bench terrace.** A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.
- Blowout.** A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.
- Bottom land.** An informal term loosely applied to various portions of a flood plain.
- Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.
- Breast height.** An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.
- Breccia.** Coarse grained, clastic rock made up of angular broken rock fragments that are held together by mineral cement or are in a fine-grained matrix.
- Brush management.** Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.
- Bulk density.** The mass of soil per unit bulk volume. Moist bulk density refers to the oven-dry weight of a given volume of soil with moisture content at or near field moisture capacity.
- Butte.** An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.
- Cable yarding.** A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.
- Calcic horizon.** A subsurface horizon that has an accumulation of calcium carbonate or of calcium and magnesium carbonate (Soil Survey Staff, 1999).
- Calcium carbonate equivalent.** The quantity of carbonates (CO<sub>3</sub>) in the soil, expressed as CaCO<sub>3</sub> and as a percentage by weight of the fraction less than 2 millimeters in size.
- Cambic horizon.** A mineral soil horizon that is loamy very fine sand or finer textured and has soil structure rather than rock structure. The cambic horizon contains some weatherable minerals, and it is characterized by alterations or removals as indicated by redoximorphic features or by stronger chroma or redder hue than that of the underlying horizons or removal of carbonates. (Soil Survey Staff, 1999).
- Canopy.** The leafy crown of trees or shrubs. (See Crown.)
- Canyon.** A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

- Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.
- Catena.** A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.
- Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.
- Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.
- Cement rock.** Shaly limestone used in the manufacture of cement.
- Channery soil material.** Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.
- Chemical treatment.** Control of unwanted vegetation through the use of chemicals.
- Cinder.** A glassy vesicular pyroclastic volcanic fragment that is 2 millimeters or more in all dimensions and is strongly cemented or has a stronger degree of cementation.
- Cirque.** A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).
- Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.
- Clay depletions.** See Redoximorphic features.
- Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.
- Claypan.** A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.
- Climax plant community.** The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.
- Climax tree.** The most competitive tree capable of growing on a particular site. In this survey area, the most competitive coniferous tree commonly is the species that is the most shade-tolerant and can reproduce in closed stands.
- Coarse textured soil.** Sand or loamy sand.
- Coarse-loamy.** A loamy particle-size class that is 15 percent or more fine sand or coarser, including fragments as much as 3 inches in diameter, and is less than 18 percent clay in the fine-earth fraction.
- Coarse-silty.** A loamy particle-size class that is less than 15 percent fine sand or coarser, including fragments as much as 3 inches in diameter, and is less than 18 percent clay in the fine-earth fraction.
- Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.
- Cobbly soil material.** Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

- COLE (coefficient of linear extensibility).** See Linear extensibility.
- Colluvium.** Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.
- Compaction.** The increase in soil bulk density as a result of applied loads or pressure. Compaction reduces porosity, water infiltration, and root penetration.
- Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.
- Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.
- Concretions.** See Redoximorphic features.
- Conglomerate.** A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.
- Consistence, soil.** Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."
- Continental glaciation.** Refers to the glaciers that covered much of North America during the Ice Age, as opposed to contemporary glaciers associated with mountains.
- Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
- Corrosion (geomorphology).** A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.
- Corrosion (soil survey interpretations).** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.
- Crown.** The upper part of a tree or shrub, including the living branches and their foliage.
- Cryic.** A soil temperature regime in which the mean annual soil temperature at a depth of 20 inches ranges from 33 to 46 degrees F. The mean summer soil temperature is less than 47 degrees for soils that have an O horizon, and it is less than 59 degrees for soils that do not have an O horizon.
- Culmination of the mean annual increment (CMAI).** The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.
- Decreasers.** The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.
- Deferred grazing.** Postponing grazing or resting grazing land for a prescribed period.
- Densic material.** Very firm, massive material that has a bulk density of more than 1.8 grams per cubic centimeter. Such material affects the ease of digging and can affect filling and compacting.
- Depth, soil.** Generally, the thickness of the soil over bedrock. Very deep soils are

more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

- Dike.** An intrusion of rock that cuts across the bedding or foliation of the pre-existing rock.
- Diorite.** A coarse-grained igneous rock consisting mainly of plagioclase but with smaller amounts of hornblende, biotite, and pyroxene. Quartz is absent or sparse. See Quartz diorite.
- Dip slope.** A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.
- Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.
- Drainage class (natural).** Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained*. These classes are defined in the “Soil Survey Manual.”
- Drainage, surface.** Runoff, or surface flow of water, from an area.
- Drainageway.** A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.
- Drift.** A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.
- Duff.** A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.
- Dune.** A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.
- Duripan.** A subsurface soil horizon that is cemented by illuvial silica, commonly opal or microcrystalline forms of silica, to the degree that less than 50 percent of the volume of air-dry fragments will slake in water or hydrochloric acid.
- Ecological site.** An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.
- Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.
- Endosaturation.** A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.
- Eolian deposit.** Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.
- Ephemeral stream.** A stream, or reach of a stream, that flows only in direct response

to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

**Episaturation.** A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion* (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

*Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

**Erosion surface.** A land surface shaped by the action of erosion, especially by running water.

**Erratic.** Refers to a rock fragment transported by glacial ice or floating ice that is different from the bedrock in the area in which it is deposited.

**Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

**Esker.** A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

**Extrusive rock.** Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

**Fan remnant.** A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

**Fault.** A fracture or fracture zone of the earth with displacement along one side in respect to the other.

**Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fill slope.** A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

**Fine textured soil.** Sandy clay, silty clay, or clay.

**Fine-loamy.** A loamy particle-size class that is 15 percent or more fine sand or coarser, including fragments as much as 3 inches in diameter, and is 18 to 34 percent clay in the fine-earth fraction.

**Fine-silty.** A loamy particle-size class that is less than 15 percent fine sand or

coarser, including fragments as much as 3 inches in diameter, and is 18 to 34 percent clay in the fine-earth fraction.

- Firebreak.** An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.
- Flaggy soil material.** Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.
- Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.
- Flood plain.** The nearly level plain that borders a stream and is subject to flooding unless protected artificially.
- Flood-plain landforms.** A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.
- Flood-plain step.** An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.
- Fluvial.** Of or pertaining to rivers or streams; produced by stream or river action.
- Foothills.** A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).
- Footslope.** The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).
- Forb.** Any herbaceous plant not a grass or a sedge.
- Forest cover.** All trees and other woody plants (underbrush) covering the ground in a forest.
- Forest type.** A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.
- Forestland.** Land on which the historic vegetation was dominated by a 25 percent overstory canopy cover of trees, as determined by crown perimeter-vertical projection. A tree is defined as a woody-stemmed plant that can grow to 4 meters (about 13 feet) in height at maturity.
- Frigid.** A soil temperature regime in which the mean annual soil temperature at a depth of 20 inches ranges from 33 to 46 degrees F. The mean summer soil temperature is more than 47 degrees for soils that have an O horizon. The difference between the mean winter soil temperature and the mean summer soil temperature is more than 9 degrees F.
- Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
- Glaciofluvial deposits.** Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.
- Glaciolacustrine deposits.** Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.
- Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

- Graben.** An elongated, relatively depressed unit or block of the earth's crust that is bounded by faults on its long sides.
- Granite.** A coarse-grained igneous rock consisting mainly of quartz and feldspar, with more orthoclase than plagioclase. See Granodiorite.
- Granitic.** Term generally applied to granite or granitelike rock. It is used when referring to granite, granodiorite, quartz monzonite, quartz diorite, diorite, and granitic gneiss.
- Granitic gneiss.** A crystalline, banded metamorphic rock of granitic composition.
- Granodiorite.** A coarse-grained igneous rock consisting mainly of quartz and feldspar, with more plagioclase than orthoclase. See Granite.
- Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.
- Gravelly soil material.** Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.
- Graywacke.** An indurated sedimentary rock that consists mainly of sand-sized grains but contains fragments of feldspar, quartz, and ferromagnesian minerals.
- Ground water.** Water filling all the unblocked pores of the material below the water table.
- Gully.** A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.
- Habitat type.** The collective area occupied by a single plant association. It is defined and described on the basis of the vegetation and its associated environment.
- Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.
- Head slope** (geomorphology). A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.
- Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.
- Hill.** A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.
- Hillslope.** A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.
- Histic epipedon.** A thin, organic soil horizon that is saturated with water at some time during the year unless it is artificially drained. This horizon is at or near the surface of a mineral soil. It contains more than 12 percent organic carbon (Soil Survey Staff, 1999).
- Historic climax plant community.** The plant community that was best adapted to the unique combination of factors associated with the ecological site. It was in a natural dynamic equilibrium with the historic biotic, abiotic, and climatic factors on its ecological site in North America at the time of European immigration and settlement.
- Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An

explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue.

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

*Cr horizon.*—Soft, consolidated bedrock beneath the soil.

*R layer.*—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff potential.

The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

**Igneous rock.** Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Increasers.** Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

**Indurated.** Refers to having a hard, brittle consistency as a result of particles being held together by cementing substances such as silica, calcium carbonate, and iron. An indurated layer can be broken by a sharp blow of a hammer.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Interfluve.** A landform composed of the relatively undissected upland or ridge

between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

- Interfluve** (geomorphology). A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.
- Intermittent stream.** A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.
- Intrusive rock.** Igneous rock derived from molten matter (magmas) that invaded pre-existing rock and cooled below the surface of the earth.
- Invaders.** On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.
- Iron depletions.** See Redoximorphic features.
- Knoll.** A small, low, rounded hill rising above adjacent landforms.
- Ksat.** See Saturated hydraulic conductivity.
- Lacustrine deposit.** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.
- Lake plain.** A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.
- Lake terrace.** A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.
- Landslide.** A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.
- Leaching.** The removal of soluble material from soil or other material by percolating water.
- Linear extensibility.** Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at  $1/3$ - or  $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.
- Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.
- Lithic contact.** A boundary between soil and coherent underlying material, typically bedrock. The bedrock has a cementation class of strongly cemented or stronger and is typically referred to as an R horizon.
- Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.
- Loamy-skeletal.** A particle-size class in which rock fragments 2 millimeters in diameter or larger make up 35 percent or more by volume. The fine-earth fraction is loamy.
- Loess.** Material transported and deposited by wind and consisting dominantly of silt-sized particles.

- Low strength.** The soil is not strong enough to support loads.
- Major Land Resource Area (MLRA).** A broad geographic land area characterized by a particular pattern of soils, geology, climate, water resources, and land use. An area is typically continuous, but small separate areas can occur.
- Mass movement.** A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.
- Masses.** See Redoximorphic features.
- Meander belt.** The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.
- Meander scar.** A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.
- Meander scroll.** One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.
- Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.
- Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.
- Mesic.** A soil temperature regime in which the mean annual temperature at a depth of 20 inches ranges from 47 to 58 degrees F. The difference between the mean winter soil temperature and the mean summer soil temperature is more than 9 degrees F.
- Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth's crust. Nearly all such rocks are crystalline.
- Mine spoil.** An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.
- Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.
- Miscellaneous area.** A kind of map unit that has little or no natural soil and supports little or no vegetation.
- Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.
- Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.
- Moisture control section.** The layer within a soil profile used to determine the soil moisture regime. The upper boundary is the depth to which a dry soil is moistened by 1 inch of water in 24 hours. The lower boundary is the depth to which a dry soil is moistened by 3 inches of water in 48 hours.
- Mollic epipedon.** A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.
- Moraine.** In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.
- Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

- Mottling, soil.** Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).
- Mountain.** A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.
- Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)
- Mudstone.** A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.
- Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.
- Neutral soil.** A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)
- Nodules.** See Redoximorphic features.
- Nose slope** (geomorphology). A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).
- Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.
- Ochric epipedon.** A surface horizon of mineral soil that is too light in color, too high in chroma, too low in organic carbon, or too thin to be a mollic, umbric, or histic epipedon (Soil Survey Staff, 1999).
- Organic matter.** Plant and animal residue in the soil in various stages of decomposition.
- Outwash.** Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.
- Outwash plain.** An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.
- Outwash terrace.** A valley train deposit extending along a valley downstream from an outwash plain or terminal moraine; a flat-topped bank of outwash with an abrupt outer face.
- Overstory.** The trees in a forest stand that form the upper crown cover. See Understory.
- Paleoterrace.** An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.
- Pan.** A compact, dense layer in a soil that impedes the movement of water and the

growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

**Paralithic contact.** A boundary between soil and coherent underlying material that can be dug with difficulty with a spade. It is referred to as weathered bedrock, has a cementation class of moderately cemented or weaker, and is typically referred to as a Cr horizon.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The movement of water through the soil.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

**Phyllite.** A fine-textured, foliated metamorphic rock that is intermediate in metamorphic grade between slate and schist. Mica crystals impart a silky sheen to the cleavage surfaces.

**Plant association.** A kind of climax plant community consisting of stands with essentially the same dominant species in corresponding layers.

**Plant community.** An assemblage of plants living together, reflecting no particular ecological status; a vegetative complex unique in its combination of plants.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plateau (geomorphology).** A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

**Pleistocene.** The epoch of geologic time from approximately 10,000 to 2 million years ago. The earlier of the two epochs comprising the Quaternary period. Also called the Glacial epoch.

**Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

**Poorly graded.** Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Pore linings.** See Redoximorphic features.

**Potential native plant community.** See Climax plant community.

**Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

**Prescribed burning.** Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

- Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.
- Proper grazing use.** Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.
- Pumice.** A light-colored, vesicular, glassy pararock fragment. The fragments are more than 2 millimeters in diameter and commonly have the composition of rhyolite. Pumice commonly has a specific gravity of <1.0 and is thereby sufficiently buoyant to float on water.
- Pyroclastic.** Pertaining to fragmental material produced by commonly explosive, aerial ejection of clastic particles from a volcanic vent.
- Quartz diorite.** A coarse-grained igneous rock consisting mainly of plagioclase with smaller amounts of quartz, hornblende, and biotite. (See Granodiorite.)
- Quartzite.** A nonfoliated metamorphic rock consisting mainly of quartz sand cemented with quartz.
- Quaternary.** The period of the Cenozoic era of geologic time, extending from the end of the Tertiary (about 2 million years ago) to the present and comprising two epochs, the Pleistocene (Ice Age) and the Holocene (Recent).
- Rangeland.** Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.
- Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid .....	less than 3.5
Extremely acid .....	3.5 to 4.4
Very strongly acid .....	4.5 to 5.0
Strongly acid .....	5.1 to 5.5
Moderately acid .....	5.6 to 6.0
Slightly acid .....	6.1 to 6.5
Neutral .....	6.6 to 7.3
Slightly alkaline .....	7.4 to 7.8
Moderately alkaline .....	7.9 to 8.4
Strongly alkaline .....	8.5 to 9.0
Very strongly alkaline .....	9.1 and higher

- Redoximorphic concentrations.** See Redoximorphic features.
- Redoximorphic depletions.** See Redoximorphic features.
- Redoximorphic features.** Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
  - A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
  - B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
  - C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
  - A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
  - B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletons).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

**Reduced matrix.** See Redoximorphic features.

**Regolith.** All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

**Relief.** The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

**Residuum (residual soil material).** Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

**Restrictive feature.** A nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly reduce the movement of water and/or air through the soil or that otherwise provide an unfavorable root environment.

**Rill.** A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

**Riparian.** Refers to areas adjacent to water or wetlands; vegetation is dependent on water or use and management directly impacts the water or wetlands.

**Riser.** The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Rubble land.** Areas that consist of cobbles, stones, and boulders, commonly at the base of mountains.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface

runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-sized particles.

**Sandy.** A particle-size class in which the texture of the fine-earth fraction is sand or loamy sand but not loamy very fine sand or very fine sand; it is less than 35 percent rock fragments by volume.

**Sandy-skeletal.** A particle-size class that is 35 percent or more by volume rock fragments 2 millimeters in diameter or larger. The fine-earth fraction is sandy.

**Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

**Saturated hydraulic conductivity (Ksat).** The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are *very high*, 100 or more micrometers per second (14.17 or more inches per hour); *high*, 10 to 100 micrometers per second (1.417 to 14.17 inches per hour); *moderately high*, 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour); *moderately low*, 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour); *low*, 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour); and *very low*, less than 0.01 micrometer per second (less than 0.001417 inch per hour). To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

**Saturation.** Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

**Schist.** A medium- to coarse-grained foliated metamorphic rock in which the platy minerals are clearly visible. Micaceous minerals commonly are present.

**Sedimentary rock.** A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

**Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

**Series, soil.** A group of soils that have profiles that are almost alike. All the soils of a given series have horizons that are similar in composition, thickness, and arrangement.

**Shale.** Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

**Shoulder.** The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

**Side slope (geomorphology).** A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

**Silica.** A combination of silicon and oxygen. The mineral form is called quartz.

- Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.
- Siltstone.** An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.
- Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.
- Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.
- Slate.** A fine-grained metamorphic rock that exhibits strong cleavage or layering.
- Slickensides** (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.
- Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.
- Slump.** A mass movement process characterized by a landslide involving shearing and rotary movement of a generally independent mass of rock or earth along a curved slip surface. The mass (slump) has its axis parallel to the slope from which it descends. A slump surface commonly exhibits a reversed slope facing uphill.
- Soft bedrock.** Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.
- Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.
- Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand .....	2.0 to 1.0
Coarse sand .....	1.0 to 0.5
Medium sand .....	0.5 to 0.25
Fine sand .....	0.25 to 0.10
Very fine sand .....	0.10 to 0.05
Silt .....	0.05 to 0.002
Clay .....	less than 0.002

- Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.
- Spodic horizon.** An illuvial horizon that is 85 percent or more spodic material. This layer is dominated by active amorphous material that is illuvial and is composed of organic matter and aluminum, with or without iron (Soil Survey Staff, 1999).
- Stone line.** In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic

surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

- Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.
- Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.
- Strath terrace.** A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).
- Stream terrace.** One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.
- Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).
- Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.
- Substratum.** The part of the soil below the solum.
- Subsurface layer.** Any surface soil horizon (A, E, AB, or EB) below the surface layer.
- Summit.** The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.
- Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”
- Surface soil.** The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.
- Talus.** Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.
- Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.
- Terminal moraine.** An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.
- Terrace (conservation).** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.
- Terrace (geomorphology).** A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

- Tertiary.** The period of geologic time from approximately 2 to 63 million years ago (radiometric dates). The earlier of the two geologic periods comprising the Cenozoic era.
- Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”
- Till.** Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.
- Till plain.** An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.
- Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.
- Toeslope.** The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.
- Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.
- Tread.** The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.
- Tuff.** A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.
- Udic.** A soil moisture regime common to a climate that has moisture throughout the year. The soil moisture control section is dry for less than 45 consecutive days during the 4 months following the summer solstice (Soil Survey Staff, 1999).
- Umbric epipedon.** A thick, dark-colored, humus-rich surface horizon that has low base saturation and pedogenic soil structure. It may include the upper part of the subsoil (Soil Survey Staff, 1999).
- Understory.** Plants in a forest community that grow to a height of 4.5 feet or less.
- Upland.** An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.
- Valley fill.** The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.
- Variation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.
- Varve.** A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.
- Water bars.** Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.
- Weathering.** All physical disintegration, chemical decomposition, and biologically

induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**Windthrow.** The uprooting and tipping over of trees by the wind.

**Xeric.** A soil moisture regime common to a climate having moist winters and dry summers. The soils are dry in the moisture control section for more than 45 consecutive days during the 4 months following the summer solstice and are moist for more than 45 consecutive days during the 4 months following the winter solstice (Soil Survey Staff, 1999).

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