Soil Resource Inventory

Gifford Pinchot National Forest

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INTRODUCTION
INTRODUCTION

History of the Soil Resource Inventory (SRI)

The Soil Survey Program in Region 6 began in the mid-1950's. It consisted of both reconnaissance and detailed soil surveys on several National Forests. Around 1960 a reconnaissance-type survey was started in the west side Oregon forests called the "Mantle Stability Survey." This survey was designed to map the stability and surface erosion potential of soils and bedrock to give land managers assistance in road location and design and timber sale layout. This survey took into account soil properties, landforms, and bedrock type as they related to mass wasting and erosion and the principles of photo interpretation and stereoscopic study of aerial photography. This program was completed in the west side forests of Oregon in 1966. It was also the forerunner of the Region-wide Soil Resource Inventory (SRI).

The Soil Resource Inventory program was established in Region 6 to soil survey all National Forest land by 1980. It followed the principles of mapping forest land established in the Mantle Stability Survey. The soil mapping unit component includes the soil, landform, bedrock, and vegetation. The SRI contained more management interpretations than other types of soils surveys.

The SRI on the Gifford Pinchot NF was the first started (1967) in Region 6 and was completed in 1971, with the report published in 1972. SRI mapping has been periodically updated between 1975 and 1990. Changes in mapping have been kept current in the Total Resource Inventory System (TRI). In the future, changes will be made in the Geographic Information System.

Changes to the 1972 Gifford Pinchot National Forest Soil Resource Inventory

The Soil Resource Inventory (SRI) update incorporates changes and adds some revised aspects to the original Soil Resource Inventory (1972) and interim "Blue Book." The most important change is with the soil maps. The original inventory included hard copy maps. The update recognizes the continued effort to upgrade mapping as more is learned about the resource. The Forest employs a Graphic Information System (GIS), a computer system which stores the mapping. Soil maps can now be provided with the most current information for specific location at a desired scale.

Another refinement changes the numbering system for soil mapping unit identification. Chapter III provides legend correlation to go from the old to the new and from the new to the old. The following is a summary of the new numbering system for the soil mapping units (SMU's).

| SMU's 1-10 | Miscellaneous units such as meadows and rock land with limited coniferous forest. |
| SMU's 11-24 | All deep soils >12' found throughout the Forest. |
| SMU's 25-37 | Deep pumice and ash-dominated soils found mostly north of North Fork Lewis River drainage. |
| SMU's 40-46 | Soils derived from andesite and basalt with pumice and ash soils, mostly north of North Fork Lewis River drainage. |
| SMU's 50-59 | Soils derived from volcanic tuffs and breccia with pumice and ash soils, mostly north of the North Fork Lewis River drainage. |
| SMU's 70-78 | Soils derived from volcanic sediments found in mineral block (a separate block of Forest Service land located northwest of Morton, Washington.) |
SMU's 81-88 Soils derived from volcanic sediments, tuffs, and breccia found south of the North Fork Lewis River and west of White Salmon drainage.

SMU's 91-95 Soils derived from andesite and basalt found south of the North Fork Lewis River drainage.

Soil mapping unit complexes use a 4-digit number instead of 3 digits. The two soil mapping units that make up the complex become more apparent. For instance:

Old complex 154 was made up of 50 percent soil mapping unit 15 and 50 percent soil mapping unit 94. The new complex is 1594, both competent part, soil mapping units 15 and 94, are used in identifying the complex.

Many of the soil mapping unit interpretations found in the original soil resource inventory and Blue Book are also found in the update. Some interpretations were dropped for the lack of use. Soil mapping unit descriptions are the same as in the original Soil Resource Inventory but are recorded in a new format. The Table of Soil Characteristics, Features, and Qualities, and Table of Bedrock Characteristics are included.
MAPPING UNIT LEGEND
MAPPING UNIT LEGEND

A mapping unit legend is a listing of all the mapping units (alpha/numeric characters) used in the Soil Resource Inventory. In this case the list is supplemental, in some cases with suffixes which are described on Pages III-1 to III-3.

For this report the legend is: There are two arrangements displayed to aid past users of this survey. The first arrangement shows the now applicable soil mapping unit number in numeric in the left column and on the adjacent right column is the legend from the blue book era of the SRI. The second arrangement is the reverse, the old legend in numeric order in the left column and the new in the right column.
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SOIL MAPPING UNIT SUFFICES
SOIL MAPPING UNIT SUFFICES

Soil Mapping Unit descriptions for the numeric portion of the mapping symbol are given under Mapping Unit Descriptions (Chapter 7). The Gifford Pinchot National Forest has used an alpha suffix on some Soil Mapping Units to denote the situations described in the right column. Note that within this description there are some terms referring to Management direction and suitability. These are codes used in "TRI." Suitability in this case is the field classified lands as to their suitability for timber production.

- **Suitability "N"** = Not forest land (not 10% occupied by forest trees or developed for non-Forest use.
- **Suitability "S"** = Suitable for timber production.
- **Suitability "T"** = Technology not available to ensure timber production without irreversible resource damage.

Management direction codes are described as follows:

- **"TM"** = "Marginal, resource limitations. Erodable soils, terrain and topographic barriers, and need for stream coarse protection from siltation make are unsuitable for logging with currently available logging systems."

- **"TMR"** = Marginal, regeneration uncertain. Use only if no regeneration cutting is to be permitted on an area until procedure has been developed which will ensure adequate regeneration.

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<td><em>B</em> is used in mapping to indicate that the mapping unit delineation is primarily greater than 30 percent slope.</td>
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<td>C</td>
<td>5C</td>
<td><em>C</em> is used to break out the part of Mapping Unit 5 that is at high elevation where productivity is very low and regeneration is extremely difficult. Suitability is &quot;N&quot;, not forest land (not 10% occupied by forest trees).</td>
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<td>E</td>
<td>6E, 7E, 8E, 9E, 19E</td>
<td><em>E</em> is used to indicate areas where rock outcrop and rock exposure are high, talus is often common, and/or generally the soil content in the surface layer is less than 20 percent by volume, and/or the depth to bedrock is generally less than 1 foot. Management direction is &quot;TMR.&quot; Suitability is &quot;T.&quot; There is no assurance that reforestation would be successful in a five-year time frame. An additional feature is that slope generally exceeds 60 percent, thus debris slide or avalanche risk is fairly high.</td>
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<td>&quot;F&quot; used with these mapping units is the same as for &quot;E&quot; above. The difference is that slope generally is less than 60 percent, thus a reduced risk of debris slides or avalanches. &quot;F&quot; used with these mapping units indicates there is a very short growing season and the soil is cold and/or there is a high water table leading to a park-like situation of meadows between clumps or stringers of established trees. Management direction is &quot;TMR.&quot; Suitability is &quot;T.&quot; &quot;F&quot; used with these mapping units indicates there is a high risk of high-risk-of failure caused by man’s activities which, because of proximity to streams, will produce unacceptable sedimentation to a stream and irreversible damage to the soil resource. Locally, there could be a high risk to life and property. Management direction is &quot;TML.&quot; Many of these areas have been field verified. Suitability is &quot;T,&quot; technology not available to ensure timber production without irreversible resource damage.</td>
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<td>K</td>
<td>6K, 7K, 8K, 4603K</td>
<td>&quot;K&quot; used with these mapping units recognizes a soil and/or climate situation which would be difficult to reforest, but which has been assessed by District Silviculturist to be a situation where use of a current practice and correct species of selection will allow for assurance of reforestation within 5 years. Suitability is &quot;S.&quot;</td>
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<td>&quot;N&quot; relates primarily to small, nonvegetated areas, road fill, or waste areas generally caused through man’s activities. These are candidates for revegetation efforts. &quot;N&quot; does not occur as a suffix to mapping unit numbers on the soil subsystem layer. It occurs only as an indicator in the master cell file. It is the same as a nonforest (NM) on the ecoclass subsystem. Suitability is &quot;N.&quot;</td>
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<td>&quot;R&quot; used with these mapping units indicates productive lands prior to the May 18, 1980, eruption of Mount St. Helens. These areas now have a new ash/pumice layer of greater than 8 inches in depth over the buried soil, and slopes for the mapping units are generally greater than 60 percent. Management direction is &quot;TMR.&quot; Safety was also a consideration in these areas. Suitability is &quot;R.&quot;</td>
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<td>92R</td>
<td>&quot;R&quot; with this mapping unit indicates a very difficult reforestation situation in the Yacolt area. Soil content in the surface layer is less than 20 percent by volume and depth to a tipped bedrock layer is less than 2 feet. The bedrock layers are tipped perpendicular to the slope. The units are located on ridgetops. The combination of limited soil, bedrock tip, and exposure to east winds makes reforestation very difficult. Management direction is &quot;TMR.&quot; Suitability is &quot;T.&quot;</td>
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<td>95R</td>
<td>&quot;R&quot; used with this mapping unit indicates a very difficult reforestation situation south of Mount St. Helens. The mapping units have soils of less than 2 feet in depth over lava. Cold air moves from the mountain through the lava which establishes a cold soil situation. Reforestation efforts in the past have met with little success. Management direction is &quot;TMR.&quot; Suitability is &quot;T.&quot;</td>
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<td>S</td>
<td>41T, 42T, 51T, 1841T, 41T18, 42T18, 51T18</td>
<td>&quot;S&quot; relates primarily to small natural slides which are nonvegetated within mass movement areas. &quot;S&quot; does not occur on the soil subsystem layer. It occurs only as an indicator in the master cell file and is mapped as a nonforest area on the ecoclass subsystem. Suitability is &quot;N.&quot;</td>
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<td>T</td>
<td>Q</td>
<td>&quot;Q&quot; indicates a rock quarry or road rock storage area. Suitability is &quot;N.&quot;</td>
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<td>W</td>
<td>&quot;W&quot; indicates an area of significant amount of water. Suitability is &quot;N.&quot;</td>
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LANDFORMS
LANDFORMS OF THE GIFFORD PINCHOT NATIONAL FOREST

There are many different soils on the Forest. These different soils result from variations in one or more of the soil-forming processes, five of which are recognized in soil formation. These are climate, vegetative cover, time, topography, and parent material. Of these, the two that are considered the most significant at the level of soil identification in this report are parent material and topography. Both form the basis for landform discussion.

A very strong influence on soil formation on much of the Forest has been volcanic ejecta of pumice and ash. These materials are present in the soil profile to some degree on more than three-fourths of the Forest. This ejecta is from a number of sources. Ash, probably from Mt. Rainier, has been deposited on the north Forest soils to a depth of 2 to 12 inches. Throughout much of the Forest, vast quantities of pumice and ash, originating from Mount St. Helens, is the dominant soil feature. The 1980 eruption and those which have followed have added new pumice and ash. Within 6 miles of the volcano as much as 12 inches or more was added in a north and northeaster direction. The depth of the new ash becomes less with distance and direction from the volcano. As much as 4 inches of new ash was delivered to the Packwood area. Ash from Mt. Adams, Mt. Mazoma, and other volcanos can be found on the Forest.

Many soils have been formed from residual (soil formed in place) or colluvial (soil profile form through gravitational movement of rock and soil components) bedrock materials. The properties of soil depth and textures are related to the kind of bedrock, and influenced by the topography.

The bedrock of the Forest is primarily of volcanic origin. Although many variabilities of the bedrock occur, it can be placed into two classes. One class consists of hard rocks formed from volcanic lavas. These include basalts, andesites, and andesitic breccias. The second class ranges from hard to soft and consists of rock formed from volcanic ejecta that become consolidated. This class is highly variable and includes volcanic breccias and volcanic sediment which sometimes are referred to as pyroclastic flows. Two addition kinds of bedrock are found on the Forest. One is a marine sediment rock which is generally moder-ately hard found in the mineral block. The second is a dacit intrusive rock found in numerous scatter locations around the Forest.

Landforms on the Forest can be divided and subdivided in many ways. The approach as presented below was taken during Forest Planning. The primary goal was to minimize the number of landform yet be able to characterize the Forest on a basis of difficulty to manage with some reflection on the cost to develop a transportation system. Seven landforms where used to reach this goal. Further subdivision may be use for different problems or completely new groups can be formed for a stated purpose. No approach can be right or useable situations.

Gentle Sloping Pumice and Ash Landforms/Soils

These landforms with the thick to very thick pumice and ash soils layers are found south of Highway 12 on the Randle Ranger District and on the Mount St. Helens National Volcanic Monument. Approximately 97,100 acres are included in this group. Generally, ash and pumice layers are more than 36 inches thick over colluvial and residual soil. The landform are varied. Included are flat valley bottoms where ash and pumice has accumulated. There are flat benches and ridgetops. The thickness of ash and pumice is variable. There are a few areas of uneven slopes where the ash and pumice layers tend to be thick over variable layers of residual heavy (clayey) soils. These local areas could just as well be included in the Unstable Landform Group.

Steep Sloping Pumice and Ash Landforms/Soils

These landforms with the thick to very thick pumice and ash soils layers are found south of Highway 12 on the Randle Ranger District and on the Mount St. Helens National Volcanic Monument. Approximately 42,000 acres are included in this group. Generally, ash and pumice layers are more than 36 inches thick over colluvial and residual soil. The landform are varied. The pumice and ash layers tend to be deeper on the lower slopes as a result of accumulation. Slopes may be steep and smooth or steep and dissected, thus for these
Reasons could be grouped with the two steep landform descriptions listed below.

Gentle Sloping Landforms with Shallow to Very Deep Soils

These forested lands are found scattered throughout the Forest. Approximately 321,500 acres are included in this group. Slope ranges from 0 to 30 percent. The cost of harvest/transportation systems is lowest in these areas. Not included are 56,000 acres of Landform 1a and 42,000 acres of Landform 5 lands which also have slopes of less than 30 percent.

Steep Smooth Landforms with Shallow to Moderately Deep Soils

This is the major land class on the Forest. Approximately 494,800 acres are included in this group. Slopes range from 30 to 100 percent; the average is approximately 45 percent. Slopes generally have a drainage density of five or less drainage miles per square mile. Soils range from very deep glacial till on the toe slopes of glacial valleys to very thin residual soils near ridgetops.

Steep Dissected Landforms with Shallow to Moderately Deep Soils

Six percent or approximately 102,100 acres of the Forest is in this Land Class, with slopes ranging from 30 to 100 percent; the average is approximately 50 percent. These slopes generally have drainage density of greater than five stream miles per square mile. Soils are generally shallow, residual, or colluvial. The majority of debris slides and avalanche tracks on suitable forest lands occur in these areas.

Uneven and/or Steep Unstable Landforms with Shallow to Deep Soils

These areas are significant because of the potential for delivering sediment and special provisions for timber harvest and road construction they often require. Slopes are uneven, with variable steep and gentle slopes having, on the average, four stream miles per square. Approximately 97,800 acres are included in this group.

Nonforest Lands Ranging from Steep Rocky Areas to Meadows

These lands include a variety of features. Snow and ice on high elevation peaks, alpine areas, lakes, rock outcrop and talus slopes, shrublands and meadows of all types make up this land. There are a few other small acre situations which are included. Currently, the Mount St. Helens landslide is also included. Others are approximately 223,600 acres included in this group.
GUIDE TO USE OF KEY
GUIDE TO USE OF KEY

The key presented here is basically dichotomous -- the user has two mutually exclusive choices; i.e., MUs are miscellaneous units or regular units. The user should move forward choosing between the two descriptions of each numerical set until the selected choice is right. Once you have zeroed in on the proper mapping unit, refer to the description and guideline sections for further information.

If you are unfamiliar with this type of keying system, follow this example: You know the mapping unit is hummocky, unstable, about eight feet deep on a 53% slope with about six inches of aeolian (ash and/or pumice) materials at the surface and has a pyroclastic bedrock.

Starting at key numbers 1, the MU is a regular homogeneous unit so your choice is the second number 1.

Next, key numbers 19: the depth is about eight feet so you choose the second number 19 (MUs are shallow to deep over bedrock).

Next, key numbers 40: the bedrock is pyroclastic so you choose the second number 40.

- Six inches is greater than one inch of ash and pumice so you choose the first number 58.
- Six inches is less than a foot so you choose the first number 59.
- 53 percent is steep so you choose the first number 60.
- Eight feet deep is a moderately deep soil so you can choose the second 61.
- You have to get more information. Consulting your air photos, you note a landflow so you choose the second number 66, and your MAPPING UNIT IS 59. You now refer to the guidelines and descriptions for further information.
MAPPING UNIT KEY

1. MUs are a miscellaneous unit (a nonhomogeneous soil, soil/rock, or rock situation) (MUs - W, Q, 1, 2, 3, 4, 5A, 5B, 5C, 6, 7, 8, 9, 10, 40, 50, and 70)

2. **MUW** Water
3. **MUQ** Quarry
4. **MU 1** Alluvium, fresh sands and gravels
5. **MU 2** Lava flows
6. **MU 3** Marshland and wet meadows
7. **MU 4** Rock outcrop, talus, and snow and ice
8. **MU 5A** Cinder Cone, gentle slopes, timbered
9. **MU 5B** Cinder Cone, steep slopes, timbered
10. **MU 5C** Cinder Cone, gentle to steep, nontimbered
11. **MU 6** High elevation, nontimbered, limited ash and pumice
12. **MU 7** Rugged, including rock outcrop, talus, shub land with scattered timber
13. **MU 8** Avalanche tracks, rock outcrop, with same timber
14. **MU 9** Steep, eroding alluvium
15. **MU 10** Recent Mount St. Helens land flow material
16. **MU 40** Rock outcrop, andesite, basalt, hard andesite breccia
17. **MU 50** Rock outcrop, pyroclastic, and breccia
18. **MU 70** Rock outcrop, marine sediment rocks

20. MUs are a very deep (greater than 12 feet) to bedrock

21. **MU 11** Gentle sloping outwash plains on flanks of Mount St. Helens and Mt. Adams.
22. **MU 12** Lacustrine deposits (lake laid material) in Canyon Creek and Upper Lewis River areas

23. MUs have less than 1 inch ash and pumice on surface over deep alluvium, till or colluvium.

24. **MU 14** Alluvium.
25. **MU 21** Gentle slopes (<30% slope).
26. **MU 22** Steep slopes (>30% slope).

28. MUs are stable landforms.

29. MUs subsoil texture are medium ranging to coarse.

29. **MU 13** Supports Site Class II Douglas-fir.
30. **MU 15** Occurs on gentle slopes.
31. **MU 16** Occurs on steep slopes.
32. **MU 17** Occurs on gentle slopes.

KEY 
V - 2
31. **MU 18** Occurs on steep slopes.

27. MUs subsoil texture is moderately fine
32. **MU 13** Supports Site Class II Douglas-fir.
32. MUs support Site Class IV and V Douglas-fir.
33. **MU 23** A concave appearance with slopes of less than 10 percent where cold air may be trapped.
33. **MU 24** Varied slope or is in positions where air may drain. Slope range from 0 to 50 percent.

26. **MU 19** Till on steep slope which is moderately stable to unstable.

20. MUs have ash and/or pumice of greater than 4 feet.
34. MUs occur on steep slopes.
35. MUs pumice and ash continues to more than 10 feet.
36. **MU 26** Primarily pumice to 10 feet.
36. **MU 37** Ash with interlayers of pumice to 10 feet.

34. MUs occur on gentle slopes.
37. **MU 12** Subsoil below 4 feet is alluvium.
37. MUs pumice and ash continues to more than 6 feet.
38. **MU 25** is primarily pumice to 10 feet.
38. MUs are primarily ash with interlayers of pumice to 10 feet.
39. **MU 36** occurs generally below 2000 feet elevation and supports Site Class III Douglas-fir.
39. **MU 34** occurs generally above 2000 feet elevation and supports Site Class IV and V Douglas-fir.

19. MUs are shallow to deep (1-12 feet) over bedrock units.
40. MUs have bedrock of basalt, andesite, hard andesitic breccia or quartz diorite.
41. MUs occur on steep slopes.
42. MUs have shallow to moderately deep soils.
43. MUs very thin to thin surface soil is ash and pumice.
44. **MU 46** Supports subalpine (noncommercial) stands.
44. MUs support western hemlock working group
46. **MU 41** Smooth slopes.
46. **MU 42** Dissected slopes.
44. MUs support true fir timber stands (silver fir and grand fir).
47. **MU 41T** Smooth slopes.
47. **MU 42T** Dissected slopes

43. MUs surface soil may have ash and cinders incorporated but not dominating.
48. **MU 91** Occurs at lower elevations and supports Site Class III and IV Douglas-fir.
48. **MU 92** Occurs at higher elevations and supports Site Class V Douglas-fir along with true fir.

42. MUs have deep soils.
49. **MU 44** Less than 1 foot of ash.
49. MUs have greater than 1 foot of ash.
50. **MU 31** has smooth to slightly dissected sideslopes.
50. **MU 35** has dissected slopes.
41. MUs occur on gentle slopes.
  51. **MU 43** Deep soil with less than 1 foot of ash.
  51. MUs have shallow to moderately deep soils.
  52. MUs have a surface layer of ash or pumice.
  53. MUs support very low site to noncommercial (subalpine) stands of timber.
  54. **MU 45** Supports very low site high elevation timber.
  54. **MU 46** Supports noncommercial (subalpine) stands of timber.
  53. MUs support commercial stands of timber.
  55. **MU 58** Very thin ash with pumice surface layer.
  55. **MU 29** Thin ash and pumice surface layer.
  52. MUs have a nonash to locally thin ash and cinder surface soil.
  56. **MU 93** Supports ponderosa pine along with some Douglas-fir.
  56. MUs support a mixed species stand.
  57. **MU 94** Occurs at lower elevations supporting Site Class III and Douglas-fir.
  57. **MU 95** Occurs at higher elevations supporting Site Class V Douglas-fir along with true fir.

40. MUs occur over pyroclastic or breccia rocks.
  58. MUs have greater than 1 inch of aeolian material (ash and/or pumice) on the surface.
  59. MUs have very thin (less than 1 foot) ash and pumice surface layers.
  60. MUs occur on steep slopes.
  61. MUs have shallow soils.
  62. MUs have stable slopes.
  63. MUs support western hemlock working group
     64. **MU 51** Smooth to slightly dissected, even slopes.
     64. **MU 52** Dissected even slopes.
  63. **MUs** support silver fir working group
     65. **MU 51T** Smooth to slightly dissected, even slopes.
     65. **MU 52T** Dissected even slopes.
  62. **MU 56** Unstable, steep dissected slopes.

61. MUs have moderately deep to very deep soils.
  66. MUs have uneven slopes which are unstable.
     67. **MU 53** Well-drained soil.
     67. **MU 56** Moderately well drained soil.

66. **MU 59** Uneven, hummocky slopes which are unstable to very unstable and are associated with landflows.

60. MUs occur on gentle slopes.
  68. **MU 58** Shallow soils.
  68. MUs of moderately deep to deep soils.
  69. **MU 57** Uneven slopes which are unstable but not associated with a major landflow.
  69. **MU 59** Uneven, hummocky slopes which are unstable to very unstable and are associated with landflows.

KEY
59. MUs have thin to thick (1-10 feet) ash and pumice surface layers.
60. MUs occur on steep slopes.
   71. MU 31 Stable slopes.
   71. MUs have unstable slopes.
       72. MU 57 Uneven slopes which are not associated with landflows.
       72. MU 54b Uneven slopes which are associated with landflows.
60. MUs occur on gentle slopes.
61. MUs are stable to moderately stable.
   74. MUs support Site Class I and II Douglas-fir.
       75. MU 27 Well-drained soils on gentle, smooth to slightly uneven sideslopes.
       75. MU 28 Moderately well-drained soils in valley bottom areas.
   74. MUs support Site Class IV and V Douglas-fir.
       76. MU 23 Concave landform which has imperfectly drained soils.
       76. MUs have well-drained soils.
           77. MU 24 Uneven appearance with residual soils occurring at less than 36 inches.
           77. MU 29 Even appearance with aeolian soil deeper than 36 inches.
61. MUs are unstable.
   78. MU 57 Uneven slopes not associated with a landflow.
   78. MU 54 Uneven slopes which are associated with landflows.
58. MUs have no aeolian materials or less than 1 inch of ash on the surface. (South Portion of Forest or Mineral Block)
69. MUs have bedrock of pyroclastic or breccia volcanic material.
80. MUs occur on steep slopes.
   81. MU 87 Unstable.
   81. MUs are stable to moderately stable.
       82. MUs have coarse to moderately coarse textured surface soils and are generally shallow.
       83. MU 81 Nondissected to slightly dissected slopes.
       83. MU 82 Dissected slopes.
   82. MUs have medium textured surface soils and are generally moderately deep to very deep.
       84. MU 83 Occurs at lower elevations and supports Site Class III and IV Douglas-fir.
       84. MU 84 Occurs at higher elevations and supports Site Class V Douglas-fir.
80. MUs occur on gentle slopes.
   85. MU 89 is unstable.
   85. MUs are stable.
       86. MU 85 Generally less than 4’ deep to bedrock.
       86. MU 88 Generally greater than 4’ deep to bedrock.
79. MUs have bedrock of marine sediments
87. MUs occur on steep slopes.

V - 5
88. *MU 77* is unstable.
88. MUs are stable to moderately stable.
89. MUs have coarse to moderately coarse textured surface soils and are generally shallow.
90. *MU 71* Occurs on nondissected to slightly dissected slopes.
90. *MU 72* Occurs on dissected slopes.
89. MUs have medium textured surface soils and are generally moderately deep to very deep.
91. *MU 73* Occurs at lower elevations and supports Site Class III and IV Douglas-fir.
91. *MU 74* Occurs at upper elevations and supports Site Class V Douglas-fir.
87. MU 75 Occur on gentle slopes.
SOIL CHARACTERISTICS
SOIL CHARACTERISTICS

These terms are used in the Mapping Unit Description. They describe morphological properties of the soil.

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

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

Shallow - less than 3 feet. (less than 91.44 cm)
Moderately deep - 3 to 6 feet. (91.44-182.88 cm)
Deep - 6 to 12 feet. (182.88-365.76 cm)
Very deep - greater than 12 feet. (greater than 365.76 cm)

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

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

Soil Layer - Each soil layer is a homogeneous layer of soil material. Soil layers are described when soil characteristics change significantly and have definite effects on management. Layers are usually at least 12 inches thick, unless material is very contrasting. Each layer may result from stratification or soil formation processes.

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

Soil Layer Thickness Classes - Thickness is in feet.

Very thin - less than 1 foot.
Thin - 1 to 3 feet.
Moderately thick - 3 to 6 feet.
Thick - 6 to 10 feet.
Very thick - greater than 10 feet.

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

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

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

Coarse-textured soils - Sands, loamy sands.
Moderately coarse-textured soils - Sandy loam, fine sandy loam.
Medium-textured soils - Very fine sandy loam, loam, silt loam, silt.
Moderately fine-textured soils - Clay loam, sandy clay loam, silty clay loam.
Fine-textured soils - Sandy clay, silty clay, clay.

*Standard USDA Handbook 18 Definitions.
Rock Fragment Quantity, Size, and Shape* -
Percent by volume occupied by consolidated
fragments larger than sand size (larger 2 mm.).

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

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

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

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

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

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

Weak - Indistinct peds, barely observable in
place.

Moderate - Distinct peds, moderately durable
and evident.

Strong - Distinct peds in place, durable.

Size - Refers to size of aggregates according to
five size classes.

Very fine - less than 5 mm.

Fine - 5 mm. to 10 mm.

Medium - 10 mm. to 20 mm.

Coarse - 20 mm. to 50 mm.

Very coarse - greater than 50 mm.

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

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

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

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

Spheroidal - Soil particles arranged around
a point and bounded by curved or very
irregular surfaces (Granular, Crumb).

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

Massive - The soil material is coherent.

Single-grain - The soil material is incoherent.

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

Degree of Compaction

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

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

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

Permeability - Water or air movement in and
through the soil material. The

*Standard USDA Handbook 18 Definitions.
classes are based on soil texture, rock fragment content, porosity and bulk density.

**Class**

**Very slow** - Very little if any water transmission. Generally fine-textured soils - clay. Less than .05 inches/hr.

**Slow** - Little water transmission. Generally moderately fine-textured soils - clay loams and silt loams. 0.05 inches/hr. to 1 inch/hr.

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

**Rapid** - Water transmission too great for optimum growth. Generally moderately - coarse-textured soils - sandy loams, gravelly loams. 5 inches/hr. to 10 inches/hr.


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

**Dry**

**Loose** - Noncoherent.

**Soft** - Easily crushes to powder or single grain.

**Slightly hard** - Easily broken between thumb and forefinger.

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

**Very hard** - Can be broken in hands without difficulty.

**Extremely hard** - Cannot be broken in hands.

**Moist**

**Loose** - Noncoherent.

**Very friable** - Crushes under gentle pressure.

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

**Firm** - Crushes under moderate pressure between thumb and forefinger.

**Very firm** - Crushes under strong pressure, barely crushable between thumb and forefinger.

**Extremely firm** - Crushes under very strong pressure, cannot be crushed between thumb and forefinger.

**Wet**

**Stickiness** - is measured by pressing wet soil between fingers.

**Nonsticky** - Practically no adherence when pressure is released.

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

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

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

**Plasticity** - is measured by rolling wet soil and observing wire.

**Nonplastic** - No wire is formable.

**Slightly plastic** - Wire forms, but soil mass easily deformed.

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

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*Standard USDA Handbook 18 Definitions.*
Very plastic - Wire forms; much pressure required to deform soil mass.

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

<table>
<thead>
<tr>
<th></th>
<th>pH</th>
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</thead>
<tbody>
<tr>
<td>Extremely acid</td>
<td>Below 4.5</td>
</tr>
<tr>
<td>Strongly acid</td>
<td>4.6 - 5.5</td>
</tr>
<tr>
<td>Slightly acid</td>
<td>5.6 - 6.4</td>
</tr>
<tr>
<td>Neutral</td>
<td>6.5 - 7.3</td>
</tr>
<tr>
<td>Slightly alkaline</td>
<td>7.4 - 8.4</td>
</tr>
<tr>
<td>Strongly alkaline</td>
<td>8.5 - 9.0</td>
</tr>
<tr>
<td>Very strongly alkaline</td>
<td>Above 9.0</td>
</tr>
</tbody>
</table>
MAPPING UNIT DESCRIPTION
SOIL DESCRIPTION

Mapping Unit 1 consists of Soil 1 and inclusions of other soils. The most common inclusions are Soils 12, 13, 14, 15, and 17.

Mapping Unit 1 consists of fresh sands and gravels occurring along streams. It contains little or no vegetation and is frequently flooded.

GEOLOGY

TOPOGRAPHY AND CLIMATE

Slope: 0-5 percent
Elevation: 1200-2500 feet

Soil Temperature Regime:

MANAGEMENT

VEGETATION

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter:
Surface Layers:

Subsoil Layer:

Range of Depth to Bedrock:
Drainage Class:
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
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</table>

VII-1
SOIL DESCRIPTION

Mapping Unit 2 consists of basalt and andesitic lava flows.

GEOLOGY

TOPOGRAPHY AND CLIMATE

Slope: 0-30 percent
Elevation: 1500-4500 feet

Soil Temperature Regime:

MANAGEMENT

VEGETATION

Mapping Unit 2 is frequently barren of vegetation, but occasionally contain scattered vegetation consisting of lodgepole pine, larch, and brush.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

<table>
<thead>
<tr>
<th>Liter</th>
<th>Surface Layers:</th>
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</thead>
<tbody>
<tr>
<td>Subsoil Layer:</td>
<td></td>
</tr>
</tbody>
</table>

Range of Depth to Bedrock:
Drainage Class:
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

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<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

SMU 2 VII-2
### SOIL DESCRIPTION
Shallow to deep, sandy loam to silt loam.

### MAPPING UNIT 3
Mapping Unit 3 are meadows and marshlands.

### GEOLOGY

### TOPOGRAPHY AND CLIMATE
- **Slope:** 0-5 percent
- **Elevation:** 1200-6000 feet

### MANAGEMENT

### VEGETATION
Primarily sedges, rushes, grasses, tag alder, and willow.

### RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Details</th>
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<tbody>
<tr>
<td>Litter</td>
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<td>Surface Layers</td>
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</tr>
<tr>
<td>Subsoil Layer</td>
<td></td>
</tr>
<tr>
<td>Range of Depth to Bedrock</td>
<td>Imperfectly to poorly drained</td>
</tr>
<tr>
<td>Drainage Class</td>
<td></td>
</tr>
<tr>
<td>Surface Soil Permeability Class</td>
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</tr>
<tr>
<td>Subsoil Permeability Class</td>
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</table>

### U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

### Associated Mapping Unit Complexes:

<table>
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<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
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</table>

VII-3 SMU 3
SOIL DESCRIPTION

Mapping Unit 4 includes the upper slopes of Mount St. Helens, Mt. Adams, and portions of the Cascade Crest above timberline. This unit is primarily rock outcrop, talus, and perpetual snow and ice.

GEOLOGY

TOPOGRAPHY AND CLIMATE

Slope: 30 to greater than 100 percent
Elevation: 5000+ feet

Soil Temperature Regime:

MANAGEMENT

VEGETATION

Void of vegetation except lichens, sedges and a few hardy shrubs near timberline.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter:
Surface Layers:

Subsoil Layer:

Range of Depth to Bedrock:
Drainage Class:
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

Number Components
None

SMU 4

VII-4
SOIL DESCRIPTION
Consist of shallow, sandy loam soils overlying volcanic cinders.

MAPPING UNIT 5A
Mapping Unit 5A consists of cinder cones.

GEOLOGY

TOPOGRAPHY AND CLIMATE
Slope: 0-30 percent
Elevation: 2500-5000 feet
Soil Temperature Regime:

MANAGEMENT
It supports Site Class V Douglas-fir, silver fir, and some ponderosa pine.

VEGETATION

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter:
Surface Layers:
Subsoil Layer:
Range of Depth to Bedrock:
Drainage Class: Excessively drained
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

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<tr>
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<tbody>
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VII-5  SMU 5A
### SOIL DESCRIPTION
Consist of shallow, sandy loam soils overlying volcanic cinders.

### MAPPING UNIT SB
Mapping Unit SB consists of cinder cones.

### GEOLOGY

### TOPOGRAPHY AND CLIMATE
- **Slope:** 30-70 percent
- **Elevation:** 2500-5000 feet

### MANAGEMENT

### VEGETATION
It supports Site Class V Douglas-fir, silver fir, and some ponderosa pine.

### RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

<table>
<thead>
<tr>
<th>Litter:</th>
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<tr>
<th>Range of Depth to Bedrock:</th>
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<tr>
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<table>
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<th>Drainage Class:</th>
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This Mapping Unit is similar to Soil

**Associated Mapping Unit Complexes:**

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<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION
Consist of shallow, sandy loam soils overlying volcanic cinders.

MAPPING UNIT 5C
Mapping Unit 5C consists of cinder cones.

GEOLOGY

TOPOGRAPHY AND CLIMATE
Slope: 0-70 percent
Elevation: 4500+ feet
Soil Temperature Regime:

MANAGEMENT

VEGETATION
It supports subalpine vegetation.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter:
Surface Layers:

Subsoil Layer:
Range of Depth to Bedrock:
Drainage Class: Excessively drained
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:
Number Components
None

VII-7 SMU 5C
SOIL DESCRIPTION
Soils occur intermittently and are very shallow gravelly loams or sandy loams with same areas consisting of shallow to deep ash and pumice.

GEOLOGY
Primarily hard andesites and breccias.

TOPOGRAPHY AND CLIMATE
Slope: 0-90+ percent
Elevation: 5000+ feet
Soil Temperature Regime:

MANAGEMENT

VEGETATION
Supports meadow and subalpine vegetation.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter:
Surface Layer:
Subsoil Layer:
Range of Depth to Bedrock:
Drainage Class:
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

Number Components
None

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

Number Components
None
SOIL DESCRIPTION
Soils occur intermittently and are generally very shallow to shallow gravelly medium-textured soils with some areas consisting of shallow to deep ash and pumice.

GEOLOGY
Primarily hard andesite and breccias.

TOPOGRAPHY AND CLIMATE
Slope: 30+ percent
Elevation: 2000-5000 feet

MANAGEMENT

VEGETATION
Islands, stringers, and scattered low site and non-commercial timber.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Liter:
Surface Layers:

Subsoil Layer:

Range of Depth to Bedrock:
Drainage Class:
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION
Soils occur intermittently and are generally very shallow to shallow gravelly medium-textured soils with some areas consisting of shallow to deep ash and pumice.

GEOLOGY
Primarily hard andesite and breccias.

TOPOGRAPHY AND CLIMATE
Slope: 30+ percent
Elevation: 2000-5000 feet

MANAGEMENT
It supports Site Classes IV and V timber.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter:
Surface Layers:
Subsoil Layer:

Range of Depth to Bedrock:
Drainage Class:
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION
Soil is very stony and cobbly sands, fine sands, and silty sand.

GEOLGY

TOPOGRAPHY AND CLIMATE
Slope: 60+ percent
Elevation: 3000-5000 feet

MANAGEMENT

VEGETATION
Void of vegetation.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter:
Surface Layers:

Subsoil Layer:

Range of Depth to Bedrock:
Drainage Class:
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil:

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
### Soil Description
Soil 10 is a very deep soil derived from avalanche debris flow from the May 18, 1980, eruption of Mount St. Helens. Surface soils are very gravelly sandy loam. Subsoils are extremely gravelly loamy sand. Typically, Soil 10 occurs on highly irregular dissected valley fill.

### Mapping Unit 10
Mapping Unit 10 consists of Soil 10.

### Geology

### Topography and Climate
- **Slope**: 0 to 55 percent
- **Elevation**: 1200 to 4500 feet
- **Soil Temperature Regime**: Frigid

### Management
Surface erosion potential is severe.

### Vegetation
The soil is not forested at this time.

### Range of Soil Profile Characteristics of Soil
- **Litter**: None
- **Surface Layers**: Very gravelly sandy loam, light gray
- **Subsoil Layer**: Extremely gravelly loamy sand, light gray
- **Range of Depth to Bedrock**: Greater than 12 feet
- **Drainage Class**: Excessively
- **Surface Soil Permeability Class**: Very rapid
- **Subsoil Permeability Class**: Very rapid

### U.S.D.A. Soil Classification
Vitrandic udorthents, sandy skeletal, mixed, frigid

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

SMU 10    VII-12
SOIL DESCRIPTION

Soil 11 is a very deep nonplastic soil derived from ash and outwash. Surface soils are generally thin fine sandy loams. Subsoils are generally very thick, very cobbly sands. Typically, Soil 11 occurs on broad outwash plains.

GEOLOGY

Bedrock is andesite or breccia and occurs 12 feet or more beneath the surface.

TOPOGRAPHY AND CLIMATE

Slope: Less than 20 percent
Elevation: 2500 to 5000 feet
Soil Temperature Regime: Frigid

MANAGEMENT

Surface erosion potential is slight. Compaction potential and displacement hazard are low to moderate. Nutrient cycling is slow. Regeneration potential is low.

VEGETATION

It supports Site Class IV and V Douglas-fir along with hemlock and true fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

<table>
<thead>
<tr>
<th>Litter:</th>
<th>0-1 inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Layers:</td>
<td>Thin sandy loam, dark yellowish brown</td>
</tr>
<tr>
<td>Subsoil Layer:</td>
<td>very cobbly sands, dark gray</td>
</tr>
<tr>
<td>Range of Depth to Bedrock:</td>
<td>Greater than 12 feet</td>
</tr>
<tr>
<td>Drainage Class:</td>
<td>Excessively drained</td>
</tr>
<tr>
<td>Surface Soil Permeability Class:</td>
<td>Rapid</td>
</tr>
<tr>
<td>Subsoil Permeability Class:</td>
<td>Very Rapid</td>
</tr>
</tbody>
</table>

U.S.D.A. Soil Classification: Vitrandic udorthents, sandy skeletal, mixed, frigid

This Mapping Unit is similar to Soil:
MU 9 - Remarks: MU 9 is the steep eroding drainage areas that cut through MU 11

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

VII-13

SMU 11
SOIL DESCRIPTION

Soil 12 is a very deep nonplastic soil derived from Aeolian materials over river alluvium. Surface soils are moderately thick ash sandy loams, silt loams, and pumice. Subsoils are fresh sands and gravels.

Typically, Soil 12 occurs on smooth gentle slopes and valley bottoms.

GEOLOGY

Bedrock consists of andesites or breccias and occurs 12 feet or more beneath the soil surface.

MANAGEMENT

Use is riparian, wildlife, and timber. Erosion potential is slight. Some erosion of stream banks may occur. Compaction potential is low to moderate. Displacement potential is high. Nutrient cycling and regeneration potential are moderate.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 2000 to 3800 feet
Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class III and IV Douglas-fir along with hemlock, Pacific silver fir and western redcedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Ashy sandy loams and pumice, very dark brown
Subsoil Layer: Fresh sands and gravel, dark grayish brown
Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well drained
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Rapid

U.S.D.A. Soil Classification: Typic udiflvents, pumiceous over sandy skeletal

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

SMU 12  VII-14
SOIL DESCRIPTION

Soil 13 is very deep nonplastic to slightly plastic soil derived from till and alluvial deposits. Surface soils are generally thin, ashy, fine sandy loams, or gravelly clay loams. Subsoils are very thick gravelly loams or gravelly clay loams.

Soil 13 occurs primarily in the lower valley of the Cispus River.

GEOMETRY

Bedrock is andesite or breccia and generally occurs 12 feet or more beneath the soil surface.

GEOLOGY TOPOGRAPHY AND CLIMATE

Bedrock is andesite or breccia and generally occurs 12 feet or more beneath the soil surface.

Elevation: 1200 to 2500 feet

Soil Temperature Regime: Frigid

TOPOGRAPHY AND CLIMATE

Elevation: 1200 to 2500 feet

Soil Temperature Regime: Frigid

MANAGEMENT

High site timber land. Erosion potential is slight. Nutrient cycling and regeneration potential are high.

MANAGEMENT VEGETATION

It supports Site Class II Douglas-fir.

VEGETATION

It supports Site Class II Douglas-fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Lesser: 1 to 2 inches

Surface Layers: Thin ashy fine sandy loams and sands, brownish gray

Subsoil Layer: Very thick gravelly loams, dark brown

Range of Depth to Bedrock: Greater than 12 feet

Drainage Class: Well drained

Surface Soil Permeability Class: Rapid

Subsoil Permeability Class: Moderate to rapid

U.S.D.A. Soil Classification: Typic udifirands, pumicous, mixed, frigid

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

Number Components

None
**SOIL DESCRIPTION**

Soil 14 is a very deep nonplastic soil derived from alluvium. Surface soils are thin silt loams or very fine sandy loams. Subsoils are very thick, very fine sandy loams or loamy sands.

Typically, Soil 14 occurs on gently sloping valley bottoms.

**GEOLOGY**

Bedrock is andesite or breccia and occurs 12 feet or more beneath the soil surface.

**TOPOGRAPHY AND CLIMATE**

Slope: 0 to 20 percent
Elevation: 900 to 2500 feet

Soil Temperature Regime: Mesic

**MANAGEMENT**

Erosion potential is slight. Compaction and displacement potentials are moderate. Nutrient cycling and regeneration potential are high.

**VEGETATION**

It supports Site Class III and IV Douglas-fir along with cottonwood and willow.

**RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Layers</td>
<td>Very fine sandy loams and silt loams, dark grayish brown</td>
</tr>
<tr>
<td>Subsoil Layer</td>
<td>Very thick, very fine sandy loams, and loamy sands, dark brown</td>
</tr>
</tbody>
</table>

Range of Depth to Bedrock: Greater than 12 feet

Drainage Class: Moderately well to well drained
Surface Soil Permeability Class: Moderate to rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic hapludands, medial mixed, mesic

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 15 is a very deep nonplastic soil derived from colluvium and till. Surface soils are very thin coarse sands. Subsoils are very thick gravelly loams or gravelly sandy loams.

Typically, Soil 15 occurs on smooth, slightly dissected valley bottoms and toeslopes.

MAPPING UNIT 15

Mapping Unit 15 consists of Soil 15 and inclusions of other soils. The most common inclusions are Soils 13, 16, 17, and 58.

Mapping Unit 15 is similar to Mapping Unit 16 with the exception of landform and inclusions, and Mapping Unit 17 with the exception of Site Class.

GEOLOGY

Bedrock is andesite or breccia and occurs 12 feet or more beneath the soil surface.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 1300 to 3800 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is slight. Compaction potential is low to moderate. Displacement potential is moderate. Nutrient cycling is high and regeneration potential is moderate.

VEGETATION

It supports Site Class III and IV Douglas-fir along with hemlock, western redcedar, and alder.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands, light brownish gray

Subsoil Layer: Gravelly loams and gravelly sandy loams, dark brown

Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic udivitrands, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil:
MU 16 - Remarks: MU 16 is steep version of MU 15.
MU 17 - Remarks: MU 17 has similar landform but occurs at higher elevations and supports lower site timber.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1594</td>
<td>50% Unit 15 and 50% Unit 94</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 16 is a very deep nonplastic to slightly plastic soil derived from colluvium and till. Surface soils are very thin coarse sands. Subsoils are very thick and range from gravelly sandy loam to gravelly clay loam. Typically, Soil 16 occurs on smooth, slightly dissected sideslopes.

GEOLoGY

Bedrock is andesite or breccia and occurs 12 feet or more beneath the soil surface.

MANAGEMENT

Erosion potential is moderate. Nutrient cycling is high and regeneration potential is moderate.

TOPOGRAPHY AND CLIMATE

Mapping Unit 16 consists of Soil 16 and inclusions of other soils. The most common inclusions are Soils 15, 17, 18, 19, 51, and 41.

Mapping Unit 16 is similar to Mapping Unit 15 with the exception of landform and inclusions, and Mapping Unit 18 with the exception of Site Class.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands, light brownish gray
Subsoil Layer: Gravelly clay loams and gravelly sandy loams, dark yellowish brown

U.S.D.A. Soil Classification: Typic udifertands, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil:
MU 15 - Remarks: MU 15 is gentle version of MU 16.
MU 18 - Remarks: MU 18 has similar landform but occurs at higher elevations and supports lower site timber.
MU 19 - Remarks: MU 19 is a more dissected sideslope with less natural stability.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1641</td>
<td>60% Unit 16 and 40% Unit 41</td>
<td>4216</td>
<td>60% Unit 42 and 40% Unit 16</td>
</tr>
<tr>
<td>1642</td>
<td>60% Unit 16 and 40% Unit 42</td>
<td>5116</td>
<td>60% Unit 51 and 40% Unit 16</td>
</tr>
<tr>
<td>1651</td>
<td>60% Unit 16 and 40% Unit 51</td>
<td>5216</td>
<td>60% Unit 52 and 40% Unit 16</td>
</tr>
<tr>
<td>4116</td>
<td>60% Unit 41 and 40% Unit 16</td>
<td>9116</td>
<td>60% Unit 91 and 40% Unit 16</td>
</tr>
</tbody>
</table>
**SOIL DESCRIPTION**

Soil 17 is a very deep nonplastic soil derived from colluvium and till. Surface soils are very thin coarse sands. Subsoils are very thick gravelly loams or gravelly sandy loams.

Typically, Soil 17 occurs on smooth, slightly dissected valley bottoms and toeslopes.

**GEOLOGY**

Bedrock is andesite or breccia and occurs 12 feet or more beneath the soil surface.

**MANAGEMENT**

Erosion potential is slight. Compaction potential is low to moderate. Displacement potential is moderate. Nutrient cycling is moderate and regeneration potential is low to moderate.

**MAPPING UNIT 17**

Mapping Unit 17 consists of Soil 17 and inclusions of other soils. The most common inclusions are Soils 15, 16, and 18. Mapping Unit 17 is similar to Mapping Unit 18 with the exception of landform and inclusions, and Mapping Unit 15 with the exception of Site Class.

**TOPOGRAPHY AND CLIMATE**

Slope: 0 to 30 percent
Elevation: 3000 to 5500 feet

Soil Temperature Regime: Cryic

**VEGETATION**

It supports Site Class V Douglas-fir along with hemlock and true fir.

**RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL**

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands, gray
Subsoil Layer: Gravelly clay loams and gravelly sandy loams, brown

Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic vitricryands, pumiceous, mixed

This Mapping Unit is similar to Soil:
MU 18 - Remarks: MU 18 is steep version of MU 17.
MU 15 - Remarks: MU 15 has similar landform but occurs at lower elevations and supports higher site timber.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1795</td>
<td>50% Unit 17 and 50% Unit 95</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 18 is a very deep nonplastic soil derived from colluvium and till. Surface soils are very thin sandy loams or sands. Subsoils are very thick gravelly loams or gravelly sandy loams.

Typically, Soil 18 occurs on smooth to slightly dissected sideslopes.

GEOLGY

Bedrock is andesite or breccia and occurs 12 feet or more beneath the soil surface.

TOPOGRAPHY AND CLIMATE

Slope: 30 percent
Elevation: 3000 to 5500 feet
Soil Temperature Regime: Cryic

MANAGEMENT

Erosion potential is slight. Nutrient cycling is moderate and regeneration potential is low to moderate.

VEGETATION

It supports Site Class V Douglas-fir along with hemlock and true fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands, gray
Subsoil Layer: Gravelly clay loams and gravelly sandy loams, brown

Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Rapid to moderate

U.S.D.A. Soil Classification: Typic vitricryands, pumiceous, mixed

This Mapping Unit is similar to Soil:
MU 17 - Remarks: MU 17 is gentle version of MU 18.
MU 16 - Remarks: MU 16 has similar landform but occurs at lower elevations and supports higher site timber.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1841T</td>
<td>60% Unit 18 and 40% Unit 41T</td>
</tr>
<tr>
<td>1892</td>
<td>50% Unit 18 and 50% Unit 92</td>
</tr>
<tr>
<td>41T18</td>
<td>60% Unit 41T and 40% Unit 18</td>
</tr>
<tr>
<td>42T18</td>
<td>60% Unit 42T and 40% Unit 18</td>
</tr>
<tr>
<td>51T18</td>
<td>60% Unit 51T and 40% Unit 18</td>
</tr>
</tbody>
</table>

SMU 18
SOIL DESCRIPTION

Soil 19 is a very deep slightly plastic to plastic soil derived from colluvium and till. Surface soils are very thin coarse sands. Subsoils are very thick gravelly loams or gravelly clay loams.

Typically, Soil 19 occurs on uneven sideslopes and in unstable drainages.

GEOLOGY

Bedrock is breccia and occurs 12 feet or more beneath the soil surface.

MANAGEMENT

Erosion potential is moderate. Mass wasting potential is moderate to high. Nutrient cycling and regeneration potential are low to moderate.

VEGETATION

It supports Site Class II, III, and IV Douglas-fir along with cedar, hemlock and true fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands, light brownish gray

Subsoil Layer: Very thick gravelly loams and gravelly clay loams, dark yellowish brown

Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well to moderately well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Typic udipetrands, pumiceous over medial skeletal

This Mapping Unit is similar to Soil:
MU 16 - Remarks: MU 16 is a less dissected sideslope with greater natural stability

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

MAPPING UNIT 19

Mapping Unit 19 consists of Soil 19 and inclusions of other soils. The most common inclusions are Soils 16, 51, 53, and 57.

TOPOGRAPHY AND CLIMATE

Slope: 20 to 80 percent
Elevation: 1200 to 3000 feet

Soil Temperature Regime: Frigid
SOIL DESCRIPTION

Soil 21 is a very deep nonplastic to slightly plastic soil derived from colluvium and till. Surface soils are generally thin gravelly sandy loams. Subsoils are thick gravelly loams or gravelly sandy loams.

Typically, Soil 21 occurs on gentle, smooth, slightly dissected toeslopes and valley bottoms.

GEOLOGY

Bedrock consists of andesite or breccias and occurs 12 feet or more beneath the soil surface.

MANAGEMENT

Erosion potential is slight. Displacement potential is moderate. Compaction potential is high. Nutrient cycling and regeneration potential are moderate.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 2000 to 4000 feet
Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class III to V (predominantly IV) Douglas-fir along with hemlock and cedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loams, dark brown

Subsoil Layer: Thick gravelly loams and gravelly sandy loams, dark brown

Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic Haplumbrepts medial over loamy mixed, frigid

This Mapping Unit is similar to Soil:
MU 22 - Remarks: MU 22 is the steep version of MU 21.
MU 15 - Remarks: MU 15 has a surface layer of ash.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>9421</td>
<td>60% Unit 94 and 40% Unit 21</td>
</tr>
</tbody>
</table>

SMU 21

MAPPING UNIT 21

Mapping Unit 21 consists of Soil 21 and inclusions of other soils. The most common inclusion is Soil 22.

Mapping Unit 21 is similar to Mapping Unit 22 with the exception of landform and inclusions, and to Mapping Unit 15 with the exception that Mapping Unit 21 does not contain surface ash.
SOIL DESCRIPTION

Soil 22 is a very deep nonplastic to slightly plastic soil derived from colluvium and till. Surface soils are generally thin gravelly sandy loams. Subsoils are thick gravelly loams or gravelly sandy loams.

Typically, Soil 22 occurs on steep, smooth, slightly to somewhat dissected sideslopes on slopes.

GEOLOGY

Bedrock consists of hard andesite or breccias and occurs 12 feet or more beneath the soil surface.

MANAGEMENT

Erosion potential is slight. Nutrient cycling and regeneration potential are moderate.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 70 percent
Elevation: 2000 to 4000 feet
Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class III to V (predominantly IV) Douglas-fir along with hemlock and cedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loams, dark brown
Subsoil Layer: Thick gravelly loams and gravelly sandy loams, dark brown

Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic Haplustrepts medial over loamy, mixed, frigid

This Mapping Unit is similar to Soil:
MU 21 - Remarks: MU 21 is gentle version of MU 22.
MU 16 - Remarks: MU 16 has a surface layer of ash.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>8122</td>
<td>60% Unit 81 and 40% Unit 22</td>
</tr>
<tr>
<td>8222</td>
<td>60% Unit 82 and 40% Unit 22</td>
</tr>
<tr>
<td>8322</td>
<td>60% Unit 83 and 40% Unit 22</td>
</tr>
<tr>
<td>9122</td>
<td>60% Unit 91 and 40% Unit 22</td>
</tr>
<tr>
<td>9222</td>
<td>60% Unit 92 and 40% Unit 22</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 23 is a deep to very deep, slightly plastic to plastic soil derived from volcanic ash, pumice, till and residuum. Surface soils are sandy loam or loamy sand. Subsoils are sandy clay loam or clay loam. Typically, Soil 23 occurs on gentle, undulating slopes, concave shape with wet spots common.

GEOLOGY

Bedrock is breccias and generally occurs 9 feet or more beneath the soil surface.

MANAGEMENT

Erosion potential is slight. Displacement potential is moderate. Compaction potential is high. Nutrient cycling is moderate. Regeneration potential is low to moderate.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Sandy loams and loamy sands, dark brown
Subsoil Layer: Sandy clay loam and clay loam, dark yellowish brown

Range of Depth to Bedrock: Greater than 9 feet
Drainage Class: Imperfectly
Surface Soil Permeability Class: Moderate to rapid
Subsoil Permeability Class: Slow

U.S.D.A. Soil Classification: Aquic vitricryands, ashy over medial skeletal

This Mapping Unit is similar to Soil MU 24 - Remarks: MU 24 is well drained and is common to steeper slopes or convex shape.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>2324</td>
<td>60% Unit 23 and 40% Unit 24</td>
</tr>
<tr>
<td>2423</td>
<td>60% Unit 24 and 40% Unit 23</td>
</tr>
<tr>
<td>5923</td>
<td>60% Unit 59 and 40% Unit 23</td>
</tr>
</tbody>
</table>

SMU 23

MAPPING UNIT 23

Mapping Unit 23 consists of Soil 23 and inclusions of other soils. The most common inclusions are Soils 3, 17, 18, and 24.

Mapping Unit 23 is similar to Mapping Unit 24 with the exception of drainage and topography.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 20 percent
Elevation: 2000 to 4500 feet

Soil Temperature Regime: Cryic

VEGETATION

It supports Site Class IV Douglas-fir with hemlock, true fir, Engelmann spruce and cedar.

VII-24
SOIL DESCRIPTION

Soil 24 is a deep to very deep, slightly plastic to plastic soil derived from volcanic ash and pumice residuum and till. Surface soils are sandy loam or loamy sand. Subsoils are sandy clay loam or clay loam.

Typically, Soil 24 occurs on gentle (variable shape) uneven benches to moderately steep smooth to somewhat dissected sideslopes.

GEOLOGY

Bedrock is breccias and generally occurs 9 feet or more beneath the soil surface.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 50 percent
Elevation: 2500 to 5000 feet
Soil Temperature Regime: Cryic

MANAGEMENT

Erosion potential is slight. Displacement potential is moderate. Compaction potential is high. Nutrient cycling is moderate. Regeneration potential is low to moderate.

VEGETATION

It supports Site Class IV and V Douglas-fir along with hemlock and silver fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Sandy loams and loamy sands, dark yellowish brown
Subsoil Layer: Sandy clay loam and clay loam, yellowish brown

Range of Depth to Bedrock: Greater than 9 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to rapid

U.S.D.A. Soil Classification: Typic vitricryands, ashy over medial skeletal

This Mapping Unit is similar to Soil MU 23 - Remarks: MU 23 has gentle slopes and drainage is imperfect.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>2324</td>
<td>60% Unit 23 and 40% Unit 24</td>
</tr>
<tr>
<td>2423</td>
<td>60% Unit 24 and 40% Unit 23</td>
</tr>
<tr>
<td>2431</td>
<td>50% Unit 24 and 50% Unit 23</td>
</tr>
<tr>
<td>2493</td>
<td>50% Unit 24 and 50% Unit 93</td>
</tr>
</tbody>
</table>

VII-25

SMU 24
SOIL DESCRIPTION

Soil 25 is a very deep, nonplastic soil derived from volcanic pumice and ash. Surface soils are very thin fine sandy loams or loamy sands. Subsoils are very thick and consist primarily of pumice. Occasional interbeds ranging from fine sandy loam to loamy sand are present. Typically, Soil 25 occurs on smooth slopes.

GEOLOGY

Bedrock is andesite or breccia and occurs 12 feet or more beneath the soil surface.

MANAGEMENT

Erosion potential is slight but when water is allowed to concentrate, erosion can be high. Displacement potential is high. Compaction potential is moderate to low. Nutrient cycling is moderate. Regeneration potential is low to moderate.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 3 inches
Surface Layers: Very thin fine sandy loam and loamy sand, gray
Subsoil Layer: Thick layers of pumice and ash, light yellowish brown
Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Excessive to well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic udivitrands, cindery over medial

This Mapping Unit is similar to Soil: MU 26 - Remarks: MU 26 is a steep version of MU 25.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

MAPPING UNIT 25

Mapping Unit 25 consists of Soil 25 and inclusions of other soils. The most common inclusion is Soil 26. Mapping Unit 25 is similar to Mapping Unit 26 with the exception of landform and inclusions.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 2400 to 4500 feet
Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class III, IV, and V Douglas-fir along with hemlock and true fir.
SOIL DESCRIPTION

Soil 26 is a very deep, nonplastic soil derived from volcanic pumice and ash. Surface soils are very thin fine sandy loams or loamy sands. Subsoils are very thick and consist primarily of pumice. Occasional interbeds ranging from fine sandy loam to loamy sand are present. Typically, Soil 26 occurs on steep, smooth, and somewhat dissected sideslopes.

GEOLOGY

Bedrock is andesite or breccia and occurs 12 feet or more beneath the soil surface.

MANAGEMENT

Erosion potential is slight to moderate but when water is allowed to concentrate, erosion can be high. Nutrient cycling is moderate. Regeneration potential is low to moderate.

TOPOGRAPHY AND CLIMATE

Bedrock is andesite or breccia and occurs 12 feet or more beneath the soil surface. Slope: 30+ percent Elevation: 2100 to 5200 feet Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class III, IV, and V Douglas-fir, along with hemlock and true fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 3 inches Surface Layers: Very thin fine sandy loam and loamy sand, gray Subsoil Layer: Thick layers of pumice and ash, dark yellowish brown Range of Depth to Bedrock: Greater than 12 feet Drainage Class: Excessive to well Surface Soil Permeability Class: Rapid Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic udifirtrands, cindery over medial

This Mapping Unit is similar to Soil: MU 25 - Remarks: MU 25 is a gentle version of MU 26.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>2640</td>
<td>70% Unit 26 and 30% Unit 40</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 27 is a deep, nonplastic (surface) to plastic (subsoil) soil derived from aeolian and residual materials. Surface soils are ash and pumice. Subsoils are loams and clay loams.

Typically, Soil 27 occurs on gently sloping, smooth to slightly uneven sideslopes.

GEOLOGY

Bedrock consists of moderately hard andesitic breccias and conglomerates.

MANAGEMENT

This soil is one of highest timber sites. Erosion potential is slight but when water is allowed to concentrate, erosion can be high. Displacement potential is high. Compaction potential is moderate to low. Nutrient cycling and regeneration potential are high.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 1200 to 2000 feet
Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class II Douglas-fir along with western redcedar, hemlock, and bigleaf maple.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 4 inches
Surface Layers: Thin ash and pumice, light brownish gray

Subsoil Layer: Stratified ash and pumice, light yellowish brown

Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Typic ud vitrands, cindery over medial

This Mapping Unit is similar to Soil: MU 28

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Mapping Unit 27 consists of Soil 27 and inclusions of other soils. The most common inclusion is Soil 28.

Mapping Unit 27 is similar to Mapping Unit 28 with the exceptions of landform and inclusions.
SOIL DESCRIPTION

Soil 28 is a deep, nonplastic (surface) to plastic (subsoil) soil derived from aeolian and residual materials. Surface soils are ash and pumice. Subsoils are loams and clay loams. Typically, Soil 28 occurs in valley bottoms on slopes.

GEOLOGY

Bedrock consists of moderately hard andesitic breccias and conglomerates.

MANAGEMENT

This soil is one of highest timber sites. Erosion potential is slight but when water is allowed to concentrate, erosion can be high. Displacement potential is high. Compaction potential is moderate to low. Nutrient cycling and regeneration potential are high.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 4 inches
Surface Layer: Thin ash and pumice, light brownish gray
Subsoil Layer: Stratified ash and pumice, light yellowish brown
Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Moderately well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Typic udivitrands, cindery over medial

This Mapping Unit is similar to Soil MU 27

Associated Mapping Unit Complexes:

Number Components
None

MAPPING UNIT 28

Mapping Unit 28 consists of Soil 28 and inclusions of other soils. The most common inclusions are Soils 3 and 27. Mapping Unit 28 is similar to Mapping Unit 27 with the exceptions of landform and inclusions.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 1200 to 1500 feet
Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class I and II Douglas-fir, along with western redcedar and bigleaf maple.
SOIL DESCRIPTION

Soil 29 is moderately deep nonplastic to slightly plastic soil derived primarily from seolian ash with lesser amounts of pumice. Surface soils are thin, ashy fine sandy loams. Subsoils are moderately thick, somewhat stratified, fine sandy loams, loams, silty loams and pumice.

Typically, Soil 29 occurs on gentle smooth ridgetops and flats.

GEOLGY

Bedrock consists of hard andesites and andesitic breccias.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 3000 to 5000 feet

Soil Temperature Regime: Cryic

MANAGEMENT

Erosion potential is moderate. Displacement potential is high. Compaction potential is low to moderate. Nutrient cycling and regeneration potential are moderate.

VEGETATION

It supports Site Class IV and V Douglas-fir, along with Pacific silver fir and hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 3 inches
Surface Layers: Thin, ashy fine sandy loam, very dark gray
Subsoil Layer: Stratified ash and pumice, dark yellowish brown

Range of Depth to Bedrock: 3 to 6 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Vitric haploborands, cindery over medial

This Mapping Unit is similar to Soil:
MU 31 - Remarks: MU 31 is the steeper version of MU 29.
MU 58 - Remarks: MU 58 has a very thin layer of ash and pumice.
MU 34 - Remarks: MU 34 has a thick surface layer of pumice and ash, and is a deeper soil.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>2957</td>
<td>60% Unit 29 and 40% Unit 57 - a questionable complex</td>
</tr>
<tr>
<td>3429</td>
<td>60% Unit 34 and 40% Unit 29</td>
</tr>
</tbody>
</table>

SU 29

VII-30
**SOIL DESCRIPTION**

Soil 31 is a moderately deep nonplastic to plastic soil derived primarily from seolian ash with lesser amounts of pumice. Surface soils are thin ashy fine sandy loams. Subsoils are moderately thick to thick, somewhat stratified, fine sandy loams, loams, silt loams and pumice.

Typically, Soil 31 occurs on steep, smooth to slightly dissected side slopes.

**GEOLOGY**

Bedrock consists of hard andesites and andesitic breccias.

**TOPOGRAPHY AND CLIMATE**

Slope: 30 to 80+ percent
Elevation: 1800 to 5000 feet
Soil Temperature Regime: Cryic

**MANAGEMENT**

Erosion potential is moderate. Nutrient cycling is moderate and regeneration potential is low to moderate.

**VEGETATION**

It supports Site Class IV and V Douglas-fir, along with Pacific silver fir, noble fir, and hemlock.

**RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL**

- **Litter:** 2 to 3 inches
- **Surface Layer:** Thin, ashy fine sandy loam, very dark grayish brown
- **Subsoil Layer:** Stratified ash and pumice, yellowish brown
- **Range of Depth to Bedrock:** 3 to 6 feet
- **Drainage Class:** Well
- **Surface Soil Permeability Class:** Rapid
- **Subsoil Permeability Class:** Moderate

U.S.D.A. Soil Classification: Vitric haploeryands, cindery over medial

This Mapping Unit is similar to Soil:
- MU 29 - Remarks: MU 29 is the gentle version of MU 31.
- MU 57 - Remarks: MU 57 is the more unstable version of MU 31.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1231</td>
<td>50% Unit 12 and 50% Unit 31</td>
</tr>
<tr>
<td>3157</td>
<td>60% Unit 31 and 40% Unit 57</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 34 is deep to very deep nonplastic derived from aeolian materials. Surface soils are thin and are dominated by pumice and coarse ash. Subsoils are thick and are dominated by ashy silt loams and ashy loams.

Typically, Soil 34 occurs on gentle undulating ridgetops and sideslopes.

GEOLOGY

Bedrock consists of hard andesites and andesitic breccias and occurs 6 feet or more beneath the soil surface.

MANAGEMENT

Erosion potential is moderate. Displacement potential is high. Compaction potential is moderate. Nutrient cycling is low to moderate while regeneration potential is low.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litter</td>
<td>2 to 3 inches</td>
</tr>
<tr>
<td>Surface Layers</td>
<td>Thin, ashy fine sandy loam, light brownish gray</td>
</tr>
<tr>
<td>Subsoil Layer</td>
<td>Stratified ash and pumice, dark brown</td>
</tr>
<tr>
<td>Range of Depth to Bedrock</td>
<td>3 to 6 feet</td>
</tr>
<tr>
<td>Drainage Class</td>
<td>Well</td>
</tr>
<tr>
<td>Surface Soil Permeability Class</td>
<td>Rapid</td>
</tr>
<tr>
<td>Subsoil Permeability Class</td>
<td>Moderate</td>
</tr>
<tr>
<td>U.S.D.A. Soil Classification</td>
<td>Vitric haploxerands, cindery over medial</td>
</tr>
</tbody>
</table>

This Mapping Unit is similar to Soil:
- MU 29 - Remarks: MU 29 is a moderately deep soil.
- MU 36 - Remarks: MU 36 supports Site Class III DF and may be only moderately deep.
- MU 25 - Remarks: MU 25 has a very thick layer of pumice with interlayers of ash.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>3429</td>
<td>60% Unit 34 and 40% Unit 29</td>
</tr>
</tbody>
</table>

MAPPPING UNIT 34

Mapping Unit 34 consists of Soil 34 and inclusions of other soils. The most common inclusions are Soils 36 and 25.

Mapping Unit 34 is similar to Mapping Unit 36 with the exceptions of inclusions and Site Class.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 2000 to 5000 feet

Soil Temperature Regime: Cryic

VEGETATION

It supports Site Class IV and V Douglas-fir, along with Pacific silver fir, hemlock and cedar.
SOIL DESCRIPTION

Soil 35 is shallow to deep nonplastic soil derived from volcanic ash and pumice. This soil consists of somewhat stratified layers of ashy fine sandy loam, sandy loam and pumice.

Typically, Soil 35 occurs on steep very dissected sideslopes.

GEOLOGY

Bedrock consists of hard andesites and breccias.

TOPOGRAPHY AND CLIMATE

Slope: 55 to 90 percent
Elevation: 1100 to 4600 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is very severe. Mass wasting potential is moderate. Nutrient cycling is moderate. Regeneration potential is moderate to low.

VEGETATION

It supports Site Class IV and V Douglas-fir, along with hemlock, true fir, and cedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 3 inches
Surface Layers: Very thin fine sandy loam and loamy sand, very dark grayish brown

Subsoil Layer: Thick layers of pumice and ash, yellowish brown

Range of Depth to Bedrock: Greater than 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Rapid to moderate

U.S.D.A. Soil Classification: Typic udiflirtands, cindery over medial

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>3556</td>
<td>60% Unit 35 and 40% Unit 56</td>
</tr>
</tbody>
</table>
**SOIL DESCRIPTION**

Soil 36 is a moderately deep to very deep nonplastic derived from aeolian materials. Surface soils are thin and are dominated by pumice and ash. Subsoils are thick and are dominated by ashy silt loams.

Typically, Soil 36 occurs on gentle undulating topography.

**GEOLOGY**

Bedrock consists of hard andesites and andesitic breccias.

**TOPOGRAPHY AND CLIMATE**

Slope: 0 to 30 percent
Elevation: 1200 to 2000 feet
Soil Temperature Regime: Frigid

**MANAGEMENT**

Erosion potential is moderate. Displacement potential is high. Compaction potential is moderate. Nutrient cycling and regeneration potential are moderate.

**VEGETATION**

It supports Site Class III Douglas-fir along with hemlock and cedar.

**RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL**

- Litter: 2 to 4 inches
- Surface Layers: Thin ash and pumice, dark grayish brown
- Subsoil Layer: Stratified ash and pumice, dark brown
- Range of Depth to Bedrock: Greater than 12 feet
- Drainage Class: Well
- Surface Soil Permeability Class: Rapid
- Subsoil Permeability Class: Moderate to slow
- U.S.D.A. Soil Classification: Typic udifirands, cindery over medial

This Mapping Unit is similar to Soil:
- MU 37 - Remarks: MU 37 is the steep version of MU 36 and may have Site Class IV DF.
- MU 34 - Remarks: MU 34 occurs at higher elevation and supports Site Class IV & V DF. MU 34 is most always very deep.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 37 is moderately deep to very deep nonplastic soil derived from aeolian materials. Surface soils are thin and are dominated by pumice and ash. Subsoils are thick and are dominated by ashy silt loams.

Typically, Soil 37 occurs on steep somewhat uneven sideslopes.

GEOLOGY

Bedrock consists of hard andesites and andesitic breccias.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 60+ percent
Elevation: 1200 to 2500 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is severe. Nutrient cycling and regeneration potential are moderate.

VEGETATION

It supports Site Class III and IV Douglas-fir, along with cedar and hemlock.

U.S.D.A. Soil Classification: Typic udiphands, cindery over medial

This Mapping Unit is similar to Soil:
MU 36 - Remarks: MU 36 is the gentle version of MU 37.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litter: 2 to 4 inches</td>
</tr>
<tr>
<td>Surface Layers: Thin ash and pumice, yellowish brown</td>
</tr>
<tr>
<td>Subsoil Layer: Stratified ash and pumice, dark yellowish brown</td>
</tr>
<tr>
<td>Range of Depth to Bedrock: Greater than 12 feet</td>
</tr>
<tr>
<td>Drainage Class: Well</td>
</tr>
<tr>
<td>Surface Soil Permeability Class: Rapid</td>
</tr>
<tr>
<td>Subsoil Permeability Class: Slow</td>
</tr>
<tr>
<td>U.S.D.A. Soil Classification: Typic udiphands, cindery over medial</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vll-35</th>
<th>SMU 37</th>
</tr>
</thead>
</table>
SOIL DESCRIPTION

Mapping Unit 40 consists of andesite or basalt rock outcrop and inclusions of soils. The most common inclusions are Soils 6, 7, and 41.

GEOLGY

The andesite and basalt rock is hard and competent.

TOPOGRAPHY AND CLIMATE

Slope:

Elevation:

MANAGEMENT

VEGETATION

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter:

Surface Layers:

Subsoil Layer:

Range of Depth to Bedrock:

Drainage Class:

Surface Soil Permeability Class:

Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>2640</td>
<td>70% Unit 26 and 30% Unit 40</td>
</tr>
<tr>
<td>4140</td>
<td>70% Unit 41 and 30% Unit 40</td>
</tr>
<tr>
<td>41T40</td>
<td>70% Unit 41T and 30% Unit 40</td>
</tr>
<tr>
<td>4240</td>
<td>70% Unit 42 and 30% Unit 40</td>
</tr>
<tr>
<td>42T40</td>
<td>70% Unit 42T and 30% Unit 40</td>
</tr>
<tr>
<td>9140</td>
<td>70% Unit 91 and 30% Unit 40</td>
</tr>
<tr>
<td>9240</td>
<td>70% Unit 92 and 30% Unit 40</td>
</tr>
</tbody>
</table>

SMU 40  VII-36
SOIL DESCRIPTION

Soil 41 is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are very thin coarse sands or loamy sands. Subsoils are thin gravelly loams or gravelly sandy loams.

Typically, Soil 41 occurs on steep smooth slopes.

GEOLOGY

Bedrock consists of hard andesite or basalt.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 90 percent
Elevation: 1600 to 3500 feet
Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate.

VEGETATION

It supports Site Class IV and V Douglas-fir, along with hemlock and Pacific silver fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

<table>
<thead>
<tr>
<th>Litter</th>
<th>Surface Layers</th>
<th>Subsoil Layer</th>
<th>Range of Depth to Bedrock</th>
<th>Drainage Class</th>
<th>Surface Soil Permeability Class</th>
<th>Subsoil Permeability Class</th>
<th>U.S.D.A. Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2 inches</td>
<td>Very thin coarse sands and loamy sands, brownish gray</td>
<td>Thin gravelly loam and gravelly sandy loams, dark yellowish brown</td>
<td>1 to 3 feet</td>
<td>Well</td>
<td>Rapid</td>
<td>Moderate</td>
<td>Typic udivitrands, pumiceous, mixed, frigid</td>
</tr>
</tbody>
</table>

This Mapping Unit is similar to Soil:
MU 42 - Remarks: MU 42 is highly dissected.
MU 51 - Remarks: MU 51 has volcanic sediment, tuffs and breccia as its bedrock.
MU 58 - Remarks: MU 58 is the gentle version of MU 41.
MU 91 & 92 - Remarks: These units have no or only a trace of ash or pumice on the surface.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1641</td>
<td>60% Unit 16 and 40% Unit 41</td>
</tr>
<tr>
<td>4116</td>
<td>60% Unit 41 and 40% Unit 16</td>
</tr>
<tr>
<td>4140</td>
<td>70% Unit 41 and 30% Unit 40</td>
</tr>
<tr>
<td>4151</td>
<td>50% Unit 41 and 50% Unit 51</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 41T is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are very thin coarse sands or loamy sands. Subsoils are thin gravelly loams or gravelly sandy loams.

Typically, Soil 41T occurs on steep smooth slopes.

GEOLGY

Bedrock consists of hard andesite or basalt.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 90 percent
Elevation: 3500 to 5000 feet
Soil Temperature Regime: Cryic

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are low.

VEGETATION

It supports Pacific silver fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands and loamy sands, brownish gray
Subsoil Layer: Thin gravelly loam and gravelly sandy loams, dark yellowish brown

Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic vitricryands, pumiceous

This Mapping Unit is similar to Soil:
MU 42 - Remarks: MU 42 is highly dissected.
MU 51 - Remarks: MU 51 has volcanic sediment, tuffs and breccia as its bedrock.
MU 58 - Remarks: MU 58 is the gentle version of MU 41.
MU 91 & 92 - Remarks: These units have no or only a trace of ash or pumice on the surface.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1H41T</td>
<td>60% Unit 18 and 40% Unit 41T</td>
</tr>
<tr>
<td>41T18</td>
<td>60% Unit 41T and 40% Unit 18</td>
</tr>
<tr>
<td>41T40</td>
<td>70% Unit 41T and 30% Unit 40</td>
</tr>
</tbody>
</table>

SMU 41T    VII-38
SOIL DESCRIPTION

Soil 42 is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are very thin coarse sands or loamy sands. Subsoils are thin gravelly loams or gravelly sandy loams.

Typically, Soil 42 occurs on steep dissected slopes.

GEOLOGY

Bedrock consists of hard andesites or basalts.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 90 percent
Elevation: 1600 to 4000 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate.

VEGETATION

It supports Site Class IV and V Douglas-fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands and loamy sands, gray brown

Subsoil Layer: Thin gravelly loam and gravelly sandy loams, dark yellowish brown

Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic udivitrands, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil:
MU 41 - Remarks: MU 41 has smooth sideslopes.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1642</td>
<td>60% Unit 16 and 40% Unit 42</td>
</tr>
<tr>
<td>4216</td>
<td>60% Unit 42 and 40% Unit 16</td>
</tr>
<tr>
<td>4240</td>
<td>70% Unit 42 and 30% Unit 40</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 42T is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are very thin coarse sands or loamy sands. Subsoils are thin gravelly loams or gravelly sandy loams.

Typically, Soil 42T occurs on steep dissected slopes.

GEOLGY

Bedrock consists of hard andesites or basalts.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 90 percent
Elevation: 3500 to 5000 feet
Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate.

VEGETATION

It supports Site Class V Douglas-fir, along with hemlock and Pacific silver fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands and loamy sands, gray brown

Subsoil Layer: Thin gravelly loam and gravelly sandy loams, dark yellowish brown

Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic udiflitrands, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil MU 41T - Remarks: MU 41T has smooth sideslopes.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>42T18</td>
<td>60% Unit 42T and 40% Unit 18</td>
</tr>
<tr>
<td>42T40</td>
<td>70% Unit 42T and 30% Unit 40</td>
</tr>
</tbody>
</table>

SMU 42T
SOIL DESCRIPTION

Soil 43 is a moderately deep to deep nonplastic to slightly plastic soil derived from aeolian and residual materials. Surface soils are sandy loams. Subsoils include layers of gravelly sandy loams and silty clay loams. Typically, Soil 20 occurs on gentle smooth sideslopes, terraces and basins.

GEOLOGY

Bedrock consists of hard, competent, highly fractured andesites and basalts.

MANAGEMENT

Erosion potential is low. Displacement potential is moderate. Compaction potential is high. Nutrient cycling and regeneration potential are moderate.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 800 to 2000 feet
Soil Temperature Regime: Mesic

VEGETATION

It supports Site Class III and IV Douglas-fir along with hemlock and western redcedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin sandy loams, dark grayish brown
Subsoil Layer: Gravelly sandy loams and silty clay loams, dark yellowish brown

Range of Depth to Bedrock: 3 to 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Typic hapludands, medial, mixed, mesic

This Mapping Unit is similar to Soil:
MU 44 - Remarks: MU 44 is the steeper version of MU 43.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

VII-41

SMU 43
SOIL DESCRIPTION

Soil 44 is a moderately deep to deep nonplastic soil derived from alluvial deposits of ash and some pumice. Surface soils are sandy loams or fine sandy loams. Subsoils are gravelly loams.

Typically, Soil 44 occurs on moderately steep, smooth, slightly dissected slopes.

GEOLoGY

Bedrock consists of hard, competent, highly fractured andesite and basalt.

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are high.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 60 percent
Elevation: 1000 to 3000 feet
Soil Temperature Regime: Mesic

VEGETATION

It supports Site Class III and IV Douglas-fir, along with hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 3 inches
Surface Layers: Sandy loams and fine sandy loams, light brown

Subsoil Layer: Gravelly loams, brownish yellowish

Range of Depth to Bedrock: 3 to 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Typic hapludands, medial, mesic

This Mapping Unit is similar to Soil MU 20 - Remarks: MU 20 is the gentle version of MU 44.

Associated Mapping Unit Complexes:

Number Components
None

SMU 44

VII-42
SOIL DESCRIPTION

Soil 45 is shallow to moderately deep nonplastic soil derived from residuum and glacial till. Surface soils are very thin sandy loams or loamy sands. Subsoils are thin to moderately thick gravelly loams or gravelly sandy loams. Typically, Soil 45 occurs on benchy landforms.

GEOLOGY

Bedrock consists of hard and competent andesites, basalts, and breccias.

TOPOGRAPHY AND CLIMATE

Slope: Less than 30 percent
Elevation: 4000 to 6000 feet

Soil Temperature Regime: Cryic

MANAGEMENT

Erosion potential is moderate. Displacement potential is moderate to high. Compaction potential is moderate to low. Nutrient cycling and regeneration potential are low.

VEGETATION

It supports Site Class V Douglas-fir, along with hemlock and Pacific silver fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 4 inches
Surface Layers: Very thin sandy loams and loamy sands, dark brown
Subsoil Layer: Gravelly loams and gravelly sandy loams, dark grayish brown

Range of Depth to Bedrock: 1 to 6 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Rapid

U.S.D.A. Soil Classification: Typic vitricrands, pumicous

This Mapping Unit is similar to Soil: SMU 46 does not support commercial harvest

Associated Mapping Unit Complexes:

Number Components
None

VII-43
SOIL DESCRIPTION

Soil 46 is shallow to moderately deep nonplastic soil derived from residuum and glacial till. Surface soils are very thin loamy sands. Subsoils are thin to moderately thick gravelly loams or gravelly sandy loams.

Typically, Soil 46 occurs on somewhat rough and irregular benchy topography at higher elevations.

GEOLOGY

Bedrock consists of hard and competent andesites, basalts, and breccias.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 4000 to 6000 feet
Soil Temperature Regime: Cryic

MANAGEMENT

Erosion potential is moderate. Displacement potential is moderate to high. Compaction potential is moderate to low. Nutrient cycling and regeneration potential are low.

VEGETATION

Vegetation consists of scattered noncommercial trees and alpine meadows.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 4 inches
Surface Layers: Very thin loamy sands, dark brown
Subsoil Layer: Gravelly loams and gravelly sandy loams, dark grayish brown
Range of Depth to Bedrock: 1 to 6 feet
Drainage Class: Well with local wet spots
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Rapid

U.S.D.A. Soil Classification: Typic vitricryands, pumiceous

This Mapping Unit is similar to Soil: SMU 45 supports commercial timber

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>463</td>
<td>60% Unit 46 and 40% Unit 3</td>
</tr>
</tbody>
</table>

SMU 46  VII-44
SOIL DESCRIPTION

Mapping Unit 50 consists of pyroclastic rock outcrop and inclusions of soil. The most common inclusions are Soils 6, 7, and 51.

GEOLOGY

The pyroclastic rock outcrop is composed of breccias and volcanic sediments. This rock is generally hard and competent.

TOPOGRAPHY AND CLIMATE

Slope:
Elevation:
Soil Temperature Regime:

MANAGEMENT

VEGETATION

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter:
Surface Layers:
Subsoil Layer:

Range of Depth to Bedrock:
Drainage Class:
Surface Soil Permeability Class:
Subsoil Permeability Class:

U.S.D.A. Soil Classification:

This Mapping Unit is similar to Soil: MU 70

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>5150</td>
<td>70% Unit 51 and 30% Unit 50</td>
</tr>
<tr>
<td>5250</td>
<td>70% Unit 52 and 30% Unit 50</td>
</tr>
</tbody>
</table>

VII-45  SMU 50
SOIL DESCRIPTION

Soil 51 is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are very thin coarse sands. Subsoils are thin, gravelly loams or gravelly sandy loams. Typically, Soil 51 occurs on steep, smooth sideslopes.

GEOLOGY

Bedrock consists of hard and competent, moderately fractured breccias and volcanic sediments.

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

<table>
<thead>
<tr>
<th>Litter: 1 to 2 inches</th>
<th>Surface Layer: Very thin coarse sands, light brownish gray</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsoil Layer: Gravelly loam and gravelly sandy loams, dark brown</td>
<td></td>
</tr>
<tr>
<td>Range of Depth to Bedrock: 1 to 3 feet</td>
<td></td>
</tr>
<tr>
<td>Drainage Class: Well</td>
<td></td>
</tr>
<tr>
<td>Surface Soil Permeability Class: Rapid</td>
<td></td>
</tr>
<tr>
<td>Subsoil Permeability Class: Moderate</td>
<td></td>
</tr>
<tr>
<td>U.S.D.A. Soil Classification: Typic udivirands, pumiceous, mixed, frigid</td>
<td></td>
</tr>
</tbody>
</table>

This Mapping Unit is similar to Soil:
MU 52 - Remarks: MU 52 is highly dissected or an incised drainage.
MU 41 - Remarks: MU 41 has andesite, basalt or hard andesitic breccia as its bedrock.
MU 58 - Remarks: MU 58 is the gentle version of MU 51.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1651</td>
<td>60% Unit 16 and 40% Unit 51</td>
</tr>
<tr>
<td>4151</td>
<td>50% Unit 41 and 50% Unit 51</td>
</tr>
<tr>
<td>5116</td>
<td>60% Unit 51 and 40% Unit 16</td>
</tr>
<tr>
<td>5130</td>
<td>70% Unit 51 and 30% Unit 30</td>
</tr>
<tr>
<td>5351</td>
<td>60% Unit 53 and 40% Unit 51</td>
</tr>
</tbody>
</table>

MAPPING UNIT 51

Mapping Unit 51 consists of Soil 51 and inclusions of other soils. The most common inclusions are Soils 16, 18, 53, 52, and 41.

Mapping unit 51 is similar to Mapping Unit 52 with the exception of landform and inclusions.

TOPOGRAPHY AND CLIMATE

Slope: 30 and 90 percent
Elevation: 1500 to 3500 feet

Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class IV and V Douglas-fir, along with hemlock, cedar, noble fir, and Pacific silver fir.
SOIL DESCRIPTION
Soil 51T is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are very thin coarse sands. Subsoils are thin, gravelly loams or gravelly sandy loams.
Typically, Soil 51T occurs on steep, smooth sideslopes.

GEOLOGY
Bedrock consists of hard and competent, moderately fractured breccias and volcanic sediments.

TOPOGRAPHY AND CLIMATE
Slope: 30 and 90 percent
Elevation: 3500 to 5000 feet
Soil Temperature Regime: Cryic

MANAGEMENT
Erosion potential is moderate. Nutrient cycling and regeneration potential are low.

VEGETATION
It supports noble fir and Pacific silver fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands, light brownish gray
Subsoil Layer: Gravelly loam and gravelly sandy loams, dark brown

Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic vitricryands, pumiceous

This Mapping Unit is similar to Soil:
MU 52 - Remarks: MU 52 is highly dissected or an incised drainage.
MU 41 - Remarks: MU 41 has andesite, basalt or hard andesitic breccia as its bedrock.
MU 58 - Remarks: MU 58 is the gentle version of MU 51T.

Associated Mapping Unit Complexes:
Number Components
51T18 60% Unit 51T and 40% Unit 18

VII-47
SMU 51T
SOIL DESCRIPTION
Soil 52 is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are very thin coarse sands. Subsoils are thin, gravelly loams or gravelly sandy loams. Typically, Soil 52 occurs on steep, dissected sideslopes.

GEOLOGY
Bedrock is composed of hard and competent, moderately fractured breccias and volcanic sediments.

MANAGEMENT
Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands, light brownish gray
Subsoil Layer: Gravelly loam and gravelly sandy loams, dark brown
Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate
U.S.D.A. Soil Classification: Typic udivitrands, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil:
MU 51 - Remarks: MU 51 has slightly dissected to smooth slopes.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>5216</td>
<td>60% Unit 52 and 40% Unit 16</td>
</tr>
<tr>
<td>5250</td>
<td>70% Unit 52 and 30% Unit 50</td>
</tr>
</tbody>
</table>

MAPPING UNIT 52
Mapping Unit 52 consists of Soil 52 and inclusions of other soils. The most common inclusions are Soils 16, 18, and 51.
Mapping unit 52 is similar to Mapping Unit 51 with the exceptions of landforms and inclusions.

TOPOGRAPHY AND CLIMATE
Slope: 30 to 90+ percent
Elevation: 1500 to 4500 feet
Soil Temperature Regime: Frigid

VEGETATION
It supports Site Class IV and V Douglas-fir, along with hemlock, cedar, noble fir, and Pacific silver fir.
SOIL DESCRIPTION

Soil 53 is a moderately deep to deep, slightly plastic to plastic soil derived from residuum and colluvium. Surface soils are very thin, fine and coarse sands. Subsoils are thick loams and clay loams. Typically, Soil 53 occurs on somewhat uneven sideslopes.

GEOLOGY

Bedrock is composed of moderately hard and moderately competent breccias and volcanic sediments.

TOPOGRAPHY AND CLIMATE

Slope: 20 and 70 percent
Elevation: 1000 to 3800 feet
Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Displacement potential is moderate. Compaction potential is moderate. Mass wasting potential is moderate to high. Nutrient cycling and regeneration potential are moderate.

VEGETATION

It supports Site Class III and IV Douglas-fir, along with hemlock, and western redcedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Very thin coarse sands, light brownish gray
Subsoil Layer: Thick loams and clay loams, dark brown
Range of Depth to Bedrock: 3 to 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Moderate
Subsoil Permeability Class: Slow
U.S.D.A. Soil Classification: Typic udifluvents, pumices, mixed, frigid

This Mapping Unit is similar to Soil:
MU 51 - Remarks: MU 51 has experienced less weathering, has shallower soils which can be lighter textured.
MU 57 - Remarks: MU 57 has experienced deeper weathering, has deeper soils which can be heavier textured.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>5351</td>
<td>60% Unit 53 and 40% Unit 51</td>
</tr>
<tr>
<td>5357</td>
<td>60% Unit 53 and 40% Unit 57</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 54 is a deep to very deep plastic soil derived from aeolian, residual and colluvial materials. Surface soils are thin ashy sandy loams. Subsoils are thick clays and clay loams.

Typically, Soil 54 occurs on gentle hummocky and landflow topography.

GEOLOGY

Bedrock consists of soft, incompetent, volcanic sediments and breccias.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 60 percent
Elevation: 1200 to 4600 feet

Vegetation

It supports Site Class III and IV Douglas-fir along with hemlock and cedar.

MANAGEMENT

Erosion potential is slight to moderate. Displacement potential is high. Compaction potential is moderate to low. Mass wasting potential is high. Nutrient cycling and regeneration potential are moderate.

VEGETATION

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 3 inches
Surface Layers: Thin ashy sandy loams, dark brown
Subsoil Layer: Thick clay loam and clays, dark brown

Range of Depth to Bedrock: 6 to 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Typic udivitrands, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil MU 59 - Remarks: MU 59 has only a very thin ash surface layer.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>5654</td>
<td>60% Unit 56 and 40% Unit 54</td>
</tr>
<tr>
<td>5754</td>
<td>60% Unit 57 and 40% Unit 54</td>
</tr>
</tbody>
</table>

SMU 54    VII-50
SOIL DESCRIPTION

Soil 56 is a shallow to moderately deep nonplastic to slightly plastic soil, derived from aeolian residual and colluvial materials. Surface soils consist of interlayers of coarse sands, loams and pumice. Subsoils consist of very gravelly loams or very gravelly silt loams.

Typically, Soil 56 occurs on steep unstable drainages.

GEOLOGY

Bedrock consists of moderately hard, thinly bedded volcanic sediments that are subject to large mass movements.

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate. Mass wasting potential is high.

VEGETATION

It supports Site Class III and IV Douglas-fir, along with hemlock, true fir, and cedar.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 70 percent
Elevation: 1000 to 4000 feet
Soil Temperature Regime: Frigid

GEOLOGY TOPOGRAPHY AND CLIMATE

Bedrock consists of moderately hard, thinly bedded volcanic sediments that are subject to large mass movements.

U.S.D.A. Soil Classification: Typic udivitrands, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil MU 52 - Remarks: MU 52 is more stable and generally will have shallower soil depths.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>3556</td>
<td>60% Unit 35 and 40% Unit 56</td>
</tr>
<tr>
<td>5654</td>
<td>60% Unit 56 and 40% Unit 54</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 57 is a very deep nonplastic (surface) to plastic (subsoil) soil derived from aeolian, residual and colluvial materials. Surface soils consist of thin to thick interlayers of coarse sands, fine sandy loams, and pumice. Subsoils are generally clay loams.

Typically, Soil 57 occurs on uneven, somewhat dissected toeslopes.

GEOLOGY

Bedrock consists of moderately hard to soft volcanic sediments and breccias, and generally occurs 12 feet or more beneath the soil surface.

TOPOGRAPHY AND CLIMATE

Bedrock consists of moderately hard to soft volcanic sediments and breccias, and generally occurs 12 feet or more beneath the soil surface.

Slope: 0 to 60 percent
Elevation: 1600 to 4000 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is slight to moderate. Displacement potential is high. Compaction potential is moderate to low. Nutrient cycling potential is moderate. Mass wasting potential is high.

VEGETATION

It supports Site Class III and IV Douglas-fir along with western redcedar, hemlock, and Pacific silver fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 3 inches
Surface Layers: Thin coarse sands, sandy loams, and pumice, light yellowish brown

Subsoil Layer: Gravelly clay loams, dark brown

Range of Depth to Bedrock: 6 to 12 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Typic udifranks, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil MU 53 - Remarks: MU 53 better natural stability, more competent bedrock, soil not as deep.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>5357</td>
<td>60% Unit 53 and 40% Unit 57</td>
</tr>
<tr>
<td>3157</td>
<td>60% Unit 51</td>
</tr>
<tr>
<td>5754</td>
<td>60% Unit 57</td>
</tr>
</tbody>
</table>

SMU 57 VII-52
SOIL DESCRIPTION

Soil 58 is a shallow to moderately deep nonplastic soil derived from residuum. Surface soils are very thin sandy loams or loamy sands. Subsoils are gravelly loams or gravelly sandy loams.

Typically, Soil 58 occurs on smooth, benchy sideslopes and toeslopes.

GEOLOGY

Bedrock is composed of hard and competent andesites, breccias, or volcanic sediments.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 1700 to 3500 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Displacement and compaction potential are moderate. Nutrient cycling and regeneration potential is moderate.

VEGETATION

It supports predominantly Site Class IV (some Site Class III locally) Douglas-fir along with hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Surface Layers: Very thin coarse sands, light brownish gray

Subsoil Layer: Gravelly loam and gravelly sandy loams, dark brown

Range of Depth to Bedrock: 1 to 3 feet

Drainage Class: Well

Surface Soil Permeability Class: Rapid

Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic udifluvents, pumiceous, mixed, frigid

This Mapping Unit is similar to Soil: MU 51 - Remarks: MU 51 is the steep version of MU 58

Associated Mapping Unit Complexes:

Number Components
None

VII-53 SMU 58
SOIL DESCRIPTION

Soil 59 is a deep to very deep, slightly plastic to plastic soil derived from aeolian, residual, and colluvial materials. Surface soils are fine sandy loams or sandy loams. Subsoils are clay loams and clays. Typically, Soil 59 occurs on gentle to steep, hummocky, slump and landflow topography.

GEOLOGY

Bedrock is composed of soft, incompetent, highly fractured volcanic breccias.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 50 percent
Elevation: 2000 to 3500 feet
Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Displacement potential is moderate. Compaction potential is moderate to high. Nutrient cycling and regeneration potential is moderate.

VEGETATION

It supports Site Class III and IV Douglas-fir, along with hemlock, Pacific silver fir, and western redcedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 2 to 3 inches
Surface Layers: Thin ashy sandy loams, dark brown
Subsoil Layer: Thick clay loam and clays, dark brown

Range of Depth to Bedrock: 6 to 12 feet
Drainage Class: Imperfectly
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Typic udivirands, pumicous, mixed, frigid

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>5923</td>
<td>60% Unit 59 and 40% Unit 23</td>
</tr>
</tbody>
</table>
Mapping Unit 70 consists of volcanic sediment bedrock and inclusions of Soils 71, 72, and 73.

**SOIL DESCRIPTION**

**GEOLOGY**
The rock outcrop of volcanic and marine sediments.

**TOPOGRAPHY AND CLIMATE**
Slope:
Elevation:
Soil Temperature Regime:

**MANAGEMENT**

**VEGETATION**

**RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL**

- **Litter:**
- **Surface Layers:**

- **Subsoil Layer:**

- **Range of Depth to Bedrock:**
- **Drainage Class:**
- **Surface Soil Permeability Class:**
- **Subsoil Permeability Class:**

**U.S.D.A. Soil Classification:**

This Mapping Unit is similar to Soil: MU 50

**Associated Mapping Unit Complexes:**

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>7170</td>
<td>70% Unit 71 and 30% Unit 70</td>
</tr>
<tr>
<td>7270</td>
<td>70% Unit 72 and 30% Unit 70</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 71 is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are thin gravelly sandy loams. Subsoils and thin gravelly loams.

Typically, Soil 71 occurs on steep, slightly dissected sideslopes.

GEOLOGY

Bedrock consists of hard to moderately hard volcanic breccias or marine sedimentary rock.

TOPOGRAPHY AND CLIMATE

Bedrock consists of hard to moderately hard volcanic breccias or marine sedimentary rock. Elevation 1000 to 4000 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate.

VEGETATION

It supports Site Class IV and V Douglas-fir along with hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layer: Thin gravelly sandy loam, very dark grayish brown

Subsoil Layer: Thin gravelly loams, dark brown

Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic udorthents, ashy over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>7122</td>
<td>60% Unit 71 and 40% Unit 72</td>
</tr>
<tr>
<td>7173</td>
<td>50% Unit 71 and 50% Unit 73</td>
</tr>
</tbody>
</table>

SMU 71  VII-56
SOIL DESCRIPTION

Soil 72 is a shallow to moderately deep nonplastic soil derived from residuum and colluvium. Soils are gravelly loams or gravelly sandy loams.

Typically, Soil 72 occurs on steep dissected sideslopes.

MAPPING UNIT 72

Mapping Unit 72 consists of Soil 72 and inclusions of other soils. The most common inclusions are Soils 22, 71, 73, 75, and 77.

Mapping Unit 72 is similar to Mapping Unit 70 with the exception of landform and inclusions.

GEOLOGY

Bedrock consists of hard to moderately hard volcanic breccias or marine sedimentary rock.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 70+ percent
Elevation: 1500 to 4500 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate.

VEGETATION

It supports Site Class IV and V Douglas-fir along with hemlock and true fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loam, dark yellowish brown

Subsoil Layer: Thin gravelly loams, dark brown

Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Typic udorthents, ashy over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil: MU 71 - MU 72 has dissected side slopes

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>7222</td>
<td>60% Unit 72 and 40% Unit 22</td>
</tr>
<tr>
<td>7270</td>
<td>70% Unit 72 and 30% Unit 70</td>
</tr>
<tr>
<td>7273</td>
<td>60% Unit 72 and 40% Unit 73</td>
</tr>
<tr>
<td>7274</td>
<td>60% Unit 72 and 40% Unit 74</td>
</tr>
<tr>
<td>7277</td>
<td>60% Unit 72 and 40% Unit 77</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 73 is a shallow to moderately deep nonplastic soil derived from residuum and colluvium. Surface soils are thin generally nongravely to gravelly loam or silt loam. Subsoils thin to thick nongravely to gravelly loam, silt loam, clay loam, or sandy clay.

Typically, Soil 73 occurs on moderately steep to steep even to somewhat uneven smooth to slightly dissected toeslopes and sideslopes.

GEOLGY

Bedrock consists of soft to moderately hard volcanic breccias or marine sedimentary rock.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 70 percent
Elevation: 800 to 3500 feet
Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are moderate. Mass wasting potential is moderate to low.

VEGETATION

It supports Site Class III and IV Douglas-fir along with hemlock and cedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loam, brown

Subsoil Layer: Thin to thick gravelly loam, silt loam, clay loam, and sandy clay, dark brown

Range of Depth to Bedrock: 3 to 12 feet
Drainage Class: Well to moderately well
Surface Soil Permeability Class: Rapid to moderate
Subsoil Permeability Class: Slow

U.S.D.A. Soil Classification: Andic haplumbrspts, asby over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>7173</td>
<td>50% Unit 71 and 50% Unit 73</td>
</tr>
<tr>
<td>7273</td>
<td>60% Unit 72 and 40% Unit 73</td>
</tr>
<tr>
<td>7322</td>
<td>60% Unit 73 and 40% Unit 22</td>
</tr>
<tr>
<td>7377</td>
<td>60% Unit 73 and 40% Unit 77</td>
</tr>
</tbody>
</table>

SMU 73  VII-58
SOIL DESCRIPTION

Soil 74 is a shallow to moderately deep nonplastic soil derived from residuum and colluvium with a thin surface of ash and pumice. Surface soils are fine sandy loams or loams. Subsoils are loams. Typically, Soil 74 occurs on moderately steep to steep, smooth sideslopes.

MAPPING UNIT 74

Mapping Unit 74 consists of Soil 74 and inclusions of other soils. The most common inclusions are Soils 71 and 73. Mapping Unit 74 is similar to Mapping Unit 73 with the exception of Site Class and vegetative differences.

GEOLOGY

Bedrock consists of soft to moderately hard volcanic breccias.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 70 percent
Elevation: 3000 to 4500 feet
Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are low. Mass wasting potential is moderate to low.

VEGETATION

It supports Site Class V and IV Douglas-fir along with Pacific silver fir and hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Fine sandy loam or loams, dark yellowish brown

Subsoil Layer: Loams, dark brown

Range of Depth to Bedrock: 2 to 6 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic haploxerpts, ashy over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil: None

U.S.D.A. Soil Classification

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>7274</td>
<td>60% Unit 72 and 40% Unit 74</td>
</tr>
</tbody>
</table>
### SOIL DESCRIPTION
Soil 75 is a shallow to moderately deep nonplastic to slightly plastic soil derived from residuum. Surface soils are very thin to thin nongravely to gravelly loamy sand, sandy loam or loam. Subsoils are thin to moderately thick gravelly loam or sandy loam.
Typically, Soil 75 occurs on gentle, even ridgetops and benches.

### GEOLOGY
Bedrock consists of hard to moderately hard volcanic sediments.

### TOPOGRAPHY AND CLIMATE
Slope: 0 to 30 percent
Elevation: 1000 to 4000 feet
Soil Temperature Regime: Frigid

### MANAGEMENT
Erosion, compaction, and displacement potentials are moderate. Nutrient cycling and regeneration potential are moderate to high.

### VEGETATION
It supports Site Class IV and V Douglas-fir along with hemlock.

### RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
- **Litter:** 1 to 2 inches
- **Surface Layers:** Thin gravelly sandy loam, dark brown
- **Subsoil Layer:** Thin gravelly loams, yellowish brown
- **Range of Depth to Bedrock:** 1 to 3 feet
- **Drainage Class:** Well
- **Surface Soil Permeability Class:** Rapid
- **Subsoil Permeability Class:** Moderate to slow

**U.S.D.A. Soil Classification:** Typic udorthents, ashy over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil: None

**Associated Mapping Unit Complexes:**

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 77 is a moderately deep to deep slightly plastic to plastic soil derived from residuum and colluvium. Surface soils are loams. Subsoils are clay loams.

Typically, Soil 77 occurs on steep, uneven and/or dissected landforms on slopes.

GEOLOGY

Bedrock consists of soft to moderately hard volcanic breccias and sediments.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 60+ percent
Elevation: 1500 to 3500 feet

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Mass wasting potential is high. Nutrient cycling and regeneration potential are moderate to high.

VEGETATION

It supports Site Class III and IV Douglas-fir along with hemlock and cedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loam, brown

Subsoil Layer: Thin to thick gravelly loam, silt loam, clay loam, and sandy clay, light brown

Range of Depth to Bedrock: 3 to 12 feet
Drainage Class: Moderately well
Surface Soil Permeability Class: Rapid to moderate
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Andic haplumbrepts, ashy over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>7377</td>
<td>60% Unit 73 and 40% Unit 77</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION
Soil 81 is a shallow nonplastic soil derived from residuum and colluvium. Surface soils are thin gravelly sandy loams. Subsoils are thin gravelly loams.
Typically, Soil 81 occurs on steep, slightly dissected sideslopes.

MAPPING UNIT 81
Mapping Unit 81 consists of Soil 81 and inclusions of other soils. The most common inclusions are Soils 82, 83, and 85.
Mapping Unit 81 is similar to Mapping Unit 82 with the exception of landform and inclusions, and to Mapping Unit 51 with the exception that Mapping Unit 81 does not contain surface ash.

GEOLOGY
Bedrock consists of hard to moderately hard volcanic breccias or sedimentary rock.

TOPOGRAPHY AND CLIMATE
Slope: 30 to 70+ percent
Elevation: 1000 to 4000 feet
Soil Temperature Regime: Frigid

MANAGEMENT
Erosion potential is moderate. Nutrient cycling and regeneration potential are low to moderate.

VEGETATION
It supports Site Class IV and V Douglas-fir along with hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loam, very dark grayish brown
Subsoil Layer: Thin gravelly loams, dark brown
Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate
U.S.D.A. Soil Classification: Andic haplustropts, medial over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil:
MU 82 - Remarks: MU 82 is the dissected version of MU 81.
MU 51 - Remarks: MU 51 has a surface layer of ash.
MU 85 - Remarks: MU 85 is the gentle version of MU 81.

Associated Mapping Unit Complexes:
Number Components
5681 50% Unit 56 and 50% Unit 81
8122 60% Unit 81 and 40% Unit 22
8150 70% Unit 81 and 30% Unit 50
8183 50% Unit 81 and 50% Unit 83
8184 50% Unit 81 and 50% Unit 84
8191 50% Unit 81 and 50% Unit 91

SMU 81 VII-62
SOIL DESCRIPTION

Soil 82 is a shallow to moderately deep nonplastic soil derived from residuum and colluvium. Soils are gravelly loams or gravelly sandy loams.

Typically, Soil 82 occurs on steep, dissected sideslopes.

GEOLOGY

Bedrock consists of hard to moderately hard volcanic breccias or sedimentary rock.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 70+ percent
Elevation: 1500 to 4500 feet
Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are low to moderate.

VEGETATION

It supports Site Class IV and V Douglas-fir along with hemlock and true fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loam, dark yellowish brown
Subsoil Layer: Thin gravelly loams, dark brown

Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic haplumbrepts, medial over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil:
MU 81 - Remarks: MU 81 has few drainages.
MU 52 - Remarks: MU 52 has a surface layer of ash.
MU 85 - Remarks: MU 85 is moderately stable with 4' of soil.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>8222</td>
<td>60% Unit 82 and 40% Unit 22</td>
</tr>
<tr>
<td>8250</td>
<td>70% Unit 82 and 30% Unit 50</td>
</tr>
<tr>
<td>8283</td>
<td>60% Unit 82 and 40% Unit 83</td>
</tr>
<tr>
<td>8284</td>
<td>60% Unit 82 and 40% Unit 84</td>
</tr>
<tr>
<td>8287</td>
<td>60% Unit 82 and 40% Unit 87</td>
</tr>
<tr>
<td>8288</td>
<td>60% Unit 82 and 40% Unit 88</td>
</tr>
</tbody>
</table>

VII-63

SMU 82
SOIL DESCRIPTION

Soil 83 is a shallow to moderately deep nonplastic soil derived from residuum and colluvium. Surface soils are thin generally nongravelly to gravelly loam or silt loam. Subsoils are thin to thick nongravelly to gravelly loam, silt loam, clay loam, or sandy clay.

Typically, Soil 83 occurs on moderately steep to steep even to somewhat uneven smooth to slightly dissected toeslopes and sideslopes.

GEOLGY

Bedrock consists of hard to moderately hard volcanic breccias and sedimentary rocks.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 70 percent
Elevation: 800 to 3500

Soil Temperature Regime: Frigid

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are low to moderate.

VEGETATION

It supports Site Classes III and IV Douglas-fir along with hemlock and cedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin nongravelly loam and silt loam, dark brown

Subsoil Layer: Thin to thick gravelly loam, silt loam, clay loam, and sandy clay, dark brown

Range of Depth to Bedrock: 3 to 12 feet
Drainage Class: Well to moderately well

Surface Soil Permeability Class: Rapid to moderate
Subsoil Permeability Class: Slow

U.S.D.A. Soil Classification: Andic haplumbrepts, medial over clayey, mixed, frigid

This Mapping Unit is similar to Soil MU 84 - Remarks: MU 84 is at higher elevations and supports lower site timber.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>8183</td>
<td>60% Unit 81 and 40% Unit 83</td>
</tr>
<tr>
<td>8283</td>
<td>60% Unit 82 and 40% Unit 83</td>
</tr>
<tr>
<td>8322</td>
<td>60% Unit 83 and 40% Unit 22</td>
</tr>
<tr>
<td>8387</td>
<td>60% Unit 83 and 40% Unit 87</td>
</tr>
</tbody>
</table>

SMU 83    VII-64
SOIL DESCRIPTION
Soil 84 is a shallow to moderately deep nonplastic soil derived from residuum and colluvium. Surface soils are fine sandy loams or loams. Subsoils are loams.
Typically, Soil 84 occurs on moderately steep to steep, smooth sideslopes.

GEOLOGY
Bedrock consists of soft to moderately hard volcanic breccias.

Mapping Unit 84
Mapping Unit 84 consists of Soil 84 and inclusions of other soils. The most common inclusions are Soils 81 and 83. Mapping Unit 84 is similar to Mapping Unit 83 with the exception of Site Class and vegetative differences.

TOPOGRAPHY AND CLIMATE
Slope: 30 to 70 percent
Elevation: 3000 to 4500 feet
Soil Temperature Regime: Cryic

MANAGEMENT
Erosion potential is moderate. Nutrient cycling and regeneration potential are low.

VEGETATION
It supports Site Class V and IV Douglas-fir along with Pacific silver fir and hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter: 1 to 2 inches
Surface Layers: Sandy loam, dark yellowish brown
Subsoil Layer: Loams, dark brown
Range of Depth to Bedrock: 2 to 6 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic cryaquepts, medial over loamy skeletal, mixed

This Mapping Unit is similar to Soil MU 83 - Remarks: MU 83 occurs at lower elevations and supports higher site timber.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>8184</td>
<td>50% Unit 81 and 50% Unit 84</td>
</tr>
<tr>
<td>8284</td>
<td>60% Unit 82 and 40% Unit 84</td>
</tr>
<tr>
<td>9284</td>
<td>60% Unit 92 and 40% Unit 84</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 85 is a shallow to moderately deep nonplastic to slightly plastic soil derived from residuum. Surface soils are very thin to thin gravelly to gravelly loamy sand, sandy loam or loam. Subsoils are thin to moderately thick gravelly loam or sandy loam.

Typically, Soil 85 occurs on gently, even ridgetops and benches.

GEOLGY

Bedrock consists of hard to moderately hard volcanic sediments.

MANAGEMENT

Erosion, compaction, and displacement potentials are moderate. Nutrient cycling and regeneration potential are moderate.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 1000 to 4000 feet

Soil Temperature Regime: Frigid

VEGETATION

It supports Site Class IV and V Douglas-fir along with hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loam, dark brown

Subsoil Layer: Thin gravelly loams, yellowish brown

Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic haplumbrepts, medial over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil:
MU 58 - Remarks: MU 58 has a surface layer of ash and pumice.
MU 81 - Remarks: MU 81 is the steep version of MU 85.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

SMU 85  VII-66
SOIL DESCRIPTION
Soil 87 is moderately deep to deep slightly plastic to plastic soil derived from residuum and colluvium. Surface soils are loams. Subsoils are clay loams.
Typically, Soil 87 occurs on steep, uneven and/or dissected landforms.

GEOLOGY
Bedrock consists of soft to moderately hard volcanic breccias and sediments.

MANAGEMENT
Erosion potential is moderate. Mass wasting potential is high. Nutrient cycling and regeneration potential are moderate to high.

TOPOGRAPHY AND CLIMATE
Slope: 30 to 60% percent
Elevation: 1500 to 3500 feet
Soil Temperature Regime: Frigid

VEGETATION
It supports Site Class III and IV Douglas-fir along with hemlock and cedar.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
Litter: 1 to 2 inches
Surface Layers: Thin nongravely loam and silt loam, brown
Subsoil Layer: Thin to thick gravelly loam, silt loam, clay loam, and sandy clay, light brown

Range of Depth to Bedrock: 3 to 12 feet
Drainage Class: Moderately well
Surface Soil Permeability Class: Rapid to moderate
Subsoil Permeability Class: Moderate to slow

U.S.D.A. Soil Classification: Andic haplumbrepts, medial over clayey, mixed, frigid

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>8287</td>
<td>60% Unit 82 and 40% Unit 87</td>
</tr>
<tr>
<td>8387</td>
<td>60% Unit 83 and 40% Unit 87</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION
Soil 88 is moderately deep to deep nonplastic to slightly plastic soil derived from residuum. Surface soils are thin loams. Subsoils are moderately thick to thick loam to clay loam.
Typically, Soil 88 occurs on gentle even to somewhat uneven benches or toeslopes.

GEOLOGY
Bedrock consists of moderately hard volcanic breccias.

TOPOGRAPHY AND CLIMATE
Slope: 0 to 30 percent
Elevation: 1000 to 3500 feet
Soil Temperature Regime: Frigid

MANAGEMENT
Erosion potential is moderate. Displacement potential is moderate. Compaction potential is moderate to high. Nutrient cycling and regeneration potential are moderate.

VeGETATION
It supports predominately Site Class III and IV Douglas-fir along with hemlock.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL
<table>
<thead>
<tr>
<th>Litter: 1 to 2 inches</th>
<th>Surface Layer: Thin loam, dark brown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsoil Layer: Moderately thick to thick loam to clay loam, yellowish brown</td>
<td></td>
</tr>
<tr>
<td>Range of Depth to Bedrock: 4 to 12 feet</td>
<td></td>
</tr>
<tr>
<td>Drainage Class: Well</td>
<td></td>
</tr>
<tr>
<td>Surface Soil Permeability Class: Rapid</td>
<td></td>
</tr>
<tr>
<td>Subsoil Permeability Class: Moderate</td>
<td></td>
</tr>
<tr>
<td>U.S.D.A. Soil Classification: Andic haplumbrepts, medial over clayey, mixed, frigid</td>
<td></td>
</tr>
</tbody>
</table>

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:
- Number
- Components
  None

SMU 88
VII-68
SOIL DESCRIPTION

Soil 89 is a deep to very deep plastic soil derived from residuum. Surface soils are clay loams. Subsoils are very gravelly clay loams to very gravelly sandy clay loams.

Typically, Soil 89 occurs on gentle, uneven toeslopes.

GEOLOGY

Bedrock consists of soft volcanic breccias.

MANAGEMENT

Surface erosion and displacement potential are low. Mass wasting and compaction potential are high. Nutrient cycling and regeneration potential are moderate.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 1000 to 2500 feet
Soil Temperature Regime: Mesic

VEGETATION

It supports Site Class III and IV Douglas-fir along with red alder.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Clay loam, dark brown

Subsoil Layer: Very gravelly clay loam and very gravelly sandy clay loam, dark grayish brown

Range of Depth to Bedrock: 8 to 12 feet
Drainage Class: Imperfectly
Surface Soil Permeability Class: Moderate to slow
Subsoil Permeability Class: Slow

U.S.D.A. Soil Classification: Aquic hapludolls, fine, montmorillonitic, mixed, mesic

This Mapping Unit is similar to Soil: None

Associated Mapping Unit Complexes:

Number Components
None
SOIL DESCRIPTION

Soil 91 is a shallow nonplastic soil derived from residuum and colluvium. Soils range from loam to sandy loam. Typically, Soil 91 occurs on steep, somewhat dissected sideslopes.

GEODEMY

Bedrock consists of hard andesites.

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are low to moderate.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 60% percent
Elevation: 1600 to 3200 feet
Soil Temperature Regime: Frigid

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loam, dark brown
Subsoil Layer: Thin gravelly loams, dark brown
Range of Depth to Bedrock: 1 to 3 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate
U.S.D.A. Soil Classification: Andic haplumbrepta, medial over loamy skeletal, mixed, frigid
This Mapping Unit is similar to Soil:
MU 94 - Remarks: MU 94 is the gentle version of MU 91.
MU 92 - Remarks: MU 92 occurs at higher elevations and supports lower site class timber.
Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>8191</td>
<td>50% Unit 81 and 50% Unit 91</td>
</tr>
<tr>
<td>9116</td>
<td>60% Unit 91 and 40% Unit 16</td>
</tr>
<tr>
<td>9122</td>
<td>60% Unit 91 and 40% Unit 22</td>
</tr>
<tr>
<td>9140</td>
<td>70% Unit 91 and 30% Unit 40</td>
</tr>
</tbody>
</table>

This Mapping Unit is similar to Soil:
MU 94 - Remarks: MU 94 is the gentle version of MU 91.
MU 92 - Remarks: MU 92 occurs at higher elevations and supports lower site class timber.
Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>8191</td>
<td>50% Unit 81 and 50% Unit 91</td>
</tr>
<tr>
<td>9116</td>
<td>60% Unit 91 and 40% Unit 16</td>
</tr>
<tr>
<td>9122</td>
<td>60% Unit 91 and 40% Unit 22</td>
</tr>
<tr>
<td>9140</td>
<td>70% Unit 91 and 30% Unit 40</td>
</tr>
</tbody>
</table>

SMU 91
VII-70
SOIL DESCRIPTION

Soil 92 is a shallow to moderately deep nonplastic soil derived from residuum and colluvium. Surface soils are gravelly loam. Subsoils are cobbly sandy loam.

Typically, Soil 92 occurs on steep sideslopes.

GEOLOGY

Bedrock consists of hard andesites or basalts.

TOPOGRAPHY AND CLIMATE

Slope: 30 to 70 percent
Elevation: 3000 to 4700 feet
Soil Temperature Regime: Cryic

MANAGEMENT

Erosion potential is moderate. Nutrient cycling and regeneration potential are low.

VEGETATION

It supports Site Class V Douglas-fir along with true fir.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Sandy loam, very dark brown
Subsoil Layer: Loams, dark brown

Range of Depth to Bedrock: 2 to 6 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic cryumbrepts, medial over loamy skeletal, mixed

This Mapping Unit is similar to Soil:
MU 95 - Remarks: MU 95 is the gentle version of MU 92.
MU 91 - Remarks: MU 91 occurs at lower elevations and supports higher site class timber.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1892</td>
<td>50% Unit 18 and 50% Unit 92</td>
</tr>
<tr>
<td>9240</td>
<td>70% Unit 92 and 30% Unit 40</td>
</tr>
</tbody>
</table>

SMU 92
**SOIL DESCRIPTION**

Soil 93 is a shallow to moderately deep nonplastic soil derived from aeolian cinders and ash. Surface soils are sandy loams. Subsoils are fine sandy loams or sandy loams.

Typically, Soil 93 occurs on smooth gentle sideslopes and terraces.

**MAPPING UNIT 93**

Mapping Unit 93 consists of Soil 93 and inclusions of other soils. The most common inclusions are Soils 14 and 94.

Mapping Unit 93 is similar to Mapping Unit 94 with the exception of inclusions, slope range and vegetation.

**GEOLOGY**

**TOPOGRAPHY AND CLIMATE**

Slope: 0 to 30 percent

Elevation: 2500 to 4000 feet

Soil Temperature Regime: Frigid

**MANAGEMENT**

Erosion and displacement potential are moderate.

Compaction potential is high. Nutrient cycling and regeneration potential are low to moderate.

**VEGETATION**

It supports Site Class III and IV ponderosa pine along with Douglas-fir.

**RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL**

| Litter: | 1 to 2 inches |
| Surface Layers: | Thin gravelly sandy loam, brown |
| Subsoil Layer: | Thin gravelly loams, yellowish brown |
| Range of Depth to Bedrock: | 1 to 6 feet |
| Drainage Class: | Well |
| Surface Soil Permeability Class: | Rapid |
| Subsoil Permeability Class: | Moderate |
| U.S.D.A. Soil Classification: | Andic haplumbrepts, medial over loamy skeletal, mixed, frigid |

This Mapping Unit is similar to Soil MU 94. Remarks: MU 94 supports a mixed stand of timber.

**Associated Mapping Unit Complexes:**

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>2493</td>
<td>50% Unit 24 and 50% Unit 93</td>
</tr>
</tbody>
</table>

SMU 93    VII-72
SOIL DESCRIPTION

Soil 94 is a shallow to moderately deep nonplastic soil derived from aeolian cinders and ash. Surface soils are sandy loams. Subsoils are cobbly sandy loams.

Typically, Soil 94 occurs on gentle sideslopes and terraces.

GEOLOGY

Bedrock consists of hard andesites or basalts.

MANAGEMENT

Erosion and displacement potential are moderate. Compaction potential is high. Nutrient cycling and regeneration potential are low to moderate.

VEGETATION

It supports Site Class IV Douglas-fir along with grand fir, Pacific silver fir, hemlock and larch.

GEOLOGY TOPOGRAPHY AND CLIMATE

Bedrock consists of hard andesites or basalts. Skpe to 30 percent

Elevation: 2000 to 3300 feet

Soil Temperature Regime: Frigid

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Thin gravelly sandy loam, brown

Subsoil Layer: Thin gravelly loams, yellowish brown

Range of Depth to Bedrock: 1 to 3 feet

Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic haplumbrepts, medial over loamy skeletal, mixed, frigid

This Mapping Unit is similar to Soil:
MU 91 - Remarks: MU 91 is the steep version of MU 94.
MU 93 - Remarks: MU 93 supports P. pine with DF.
MU 95 - Remarks: MU 95 occurs at higher elevations and supports lower site class timber.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1594</td>
<td>50% Unit 15 and 50% Unit 94</td>
</tr>
</tbody>
</table>
SOIL DESCRIPTION

Soil 95 is a shallow to moderately deep nonplastic soil derived from residuum and colluvium. Surface soils are gravelly loams. Subsoils are cobbly sandy loams.

Typically, Soil 95 occurs on gentle ridgetops and benches.

GEOLGY

Bedrock consists of hard andesites or basalts.

TOPOGRAPHY AND CLIMATE

Slope: 0 to 30 percent
Elevation: 3200 to 4400 feet

Soil Temperature Regime: Cryic

MANAGEMENT

Erosion and displacement potential are moderate. Compaction potential is high. Nutrient cycling and regeneration potential are low.

VEGETATION

It supports Site Class V Douglas-fir along with true firs.

RANGE OF SOIL PROFILE CHARACTERISTICS OF SOIL

Litter: 1 to 2 inches
Surface Layers: Sandy loam, very dark brown

Subsoil Layer: Loams, dark brown

Range of Depth to Bedrock: 2 to 6 feet
Drainage Class: Well
Surface Soil Permeability Class: Rapid
Subsoil Permeability Class: Moderate

U.S.D.A. Soil Classification: Andic cryumbrepts, medial over loamy skeletal, mixed

This Mapping Unit is similar to Soil:
MU 92 - Remarks: MU 92 is the steep version of MU 95.
MU 94 - Remarks: MU 94 occurs at lower elevations and supports higher site class timber.

Associated Mapping Unit Complexes:

<table>
<thead>
<tr>
<th>Number</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1795</td>
<td>50% Unit 17 and 50% Unit 95</td>
</tr>
</tbody>
</table>

Mapping Unit 95 consists of Soil 95 and inclusions of other soils. The most common inclusions are Soils 92 and 94.

Mapping Unit 95 is similar to Mapping Unit 94 with the exception of inclusions, elevation and Site Class, and Mapping Unit 92 with the exception of landform and inclusions.
MAPPING UNIT CHARACTERISTICS, FEATURES AND QUALITIES DEFINITIONS AND TABLE
These terms are found in the Table of Some Mapping Unit Characteristics, Features, and Qualities. They describe properties of the mapping unit that result from soil characteristics, bedrock characteristics, topography and site.

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

**Infiltration Rate Classes**

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

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

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

**Drainage class** 1/ - The rapidity and extent of removal of water from the soil. Based on soil permeability, infiltration, internal drainage and topographic position.

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>Intensity Classes</th>
<th>Other Commonly Used Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Few - 0 to 1 drainage miles per a square mile</td>
<td>smooth or nondissected</td>
</tr>
<tr>
<td>Common - 1 to 3 drainage miles per square mile</td>
<td>smooth or nondissected</td>
</tr>
<tr>
<td>Many - 3 to 5 drainage miles per square mile</td>
<td>slightly dissected</td>
</tr>
<tr>
<td>Abundant - greater than 5 drainage miles per square mile</td>
<td>dissected</td>
</tr>
</tbody>
</table>

**Patterns**

*Dendritic* - Drainages branch in random directions.

*Parallel* - Drainages are relatively parallel.

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

1/ Very poorly drained and somewhat excessively drained classes are not used.
Site Class - Class limits correspond to height (site index) of Douglas-fir at 100 years.

- **Class I** - greater than 185 S.I.
- **Class II** - 185 S.I. to 155 S.I.
- **Class III** - 155 S.I. to 125 S.I.
- **Class IV** - 125 S.I. to 95 S.I.
- **Class V** - less than 95 S.I.

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

- **High** - These soils generally have medium to fine texture, dark surface colors; are slightly acid to slightly alkaline and have abundant incorporated organic matter. Nutrient quantities are adequate and readily available. Productivity is high as evidenced by timber site classes of I and II.

- **Moderate** - These soils generally have one or more soil factors that limit nutrient quantity and/or availability. Productivity is moderate as evidenced by timber site classes of low II to high IV.

- **Low** - These soils generally have several factors that are limiting. They may be coarse textured, strongly acid or strongly alkaline, and lacking in sufficient organic matter. Nutrient quantity and/or availability is seriously limiting. Productivity is low as evidenced by timber site class IV and V.

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

- **Slope** - Range of slope of mapping unit.

- **Elevation** - Altitude above mean sea level expressed in feet.

---

1/ Very poorly drained and somewhat excessively drained classes are not used.
# SOIL CHARACTERISTICS, FEATURES, AND QUALITIES

<table>
<thead>
<tr>
<th>Soil Mapping No.</th>
<th>Infiltration rate</th>
<th>Drainage Class</th>
<th>Surface Drainage Intensity and Pattern</th>
<th>Prod. Site Class</th>
<th>Fertility</th>
<th>Landform</th>
<th>Slope</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rapid</td>
<td>Well</td>
<td>Few, Parallel</td>
<td>N/A</td>
<td>Low</td>
<td>Alluvial, terrace &amp; outwash plain</td>
<td>0-20</td>
<td>1000-4000</td>
</tr>
<tr>
<td>2</td>
<td>Rapid</td>
<td>Well</td>
<td>Few, Parallel</td>
<td>N/A</td>
<td>Low</td>
<td>Lava flow</td>
<td>0-20</td>
<td>1000-6000</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Imperfectly to poorly</td>
<td>Common, Dendritic</td>
<td>N/A</td>
<td>Moderate</td>
<td>Depressional wet meadows</td>
<td>0-15</td>
<td>1000-6000</td>
</tr>
<tr>
<td>4</td>
<td>Variable</td>
<td>Well</td>
<td>Common, Dendritic</td>
<td>N/A</td>
<td>N/A</td>
<td>Mountaintops above timberline</td>
<td>30-100+</td>
<td>5000-13,000</td>
</tr>
<tr>
<td>5</td>
<td>Rapid</td>
<td>Well</td>
<td>Few, Parallel</td>
<td>IV &amp; V</td>
<td>Low</td>
<td>Volcanic cinder cones</td>
<td>20-50</td>
<td>2000-5000</td>
</tr>
<tr>
<td>6</td>
<td>Rapid</td>
<td>Well</td>
<td>Common, Dendritic</td>
<td>N/A</td>
<td>Low</td>
<td>Rugged ridgetop and upper sideslopes</td>
<td>10-90+</td>
<td>3000-5000</td>
</tr>
<tr>
<td>7</td>
<td>Rapid</td>
<td>Well</td>
<td>Common, Dendritic</td>
<td>IV</td>
<td>Low</td>
<td>Rugged ridgetops and upper sideslopes</td>
<td>50-90</td>
<td>3000-5000</td>
</tr>
<tr>
<td>8</td>
<td>Rapid</td>
<td>Well</td>
<td>Abundant, Parallel</td>
<td>IV &amp; V</td>
<td>Low</td>
<td>Steep, highly dissected sideslopes</td>
<td>60-100+</td>
<td>2500-5000</td>
</tr>
<tr>
<td>9</td>
<td>Rapid</td>
<td>Excessively</td>
<td>Many, Dendritic</td>
<td>N/A</td>
<td>Low</td>
<td>Steep canyon walls</td>
<td>70-100+</td>
<td>3000-6500</td>
</tr>
<tr>
<td>10</td>
<td>Rapid</td>
<td>Excessively</td>
<td>Many, Dendritic</td>
<td>N/A</td>
<td>Low</td>
<td>Uneven and unstable valley fill material from Mount St. Helens landslide</td>
<td>0-55</td>
<td>1200-4500</td>
</tr>
<tr>
<td>11</td>
<td>Rapid</td>
<td>Excessively</td>
<td>Few to common, Parallel &amp; Dendritic</td>
<td>IV &amp; V</td>
<td>Low</td>
<td>Outwash plain</td>
<td>0-20</td>
<td>2500-5000</td>
</tr>
<tr>
<td>12</td>
<td>Rapid</td>
<td>Well</td>
<td>Common to many, Dendritic</td>
<td>III &amp; IV</td>
<td>Low to Moderate</td>
<td>Smooth, gentle slopes and valley bottoms</td>
<td>0-30</td>
<td>2000-3800</td>
</tr>
<tr>
<td>13</td>
<td>Rapid</td>
<td>Well</td>
<td>Few, Parallel &amp; Dendritic</td>
<td>II</td>
<td>High</td>
<td>Terrace</td>
<td>0-15</td>
<td>1200-2500</td>
</tr>
<tr>
<td>14</td>
<td>Rapid</td>
<td>Well to Moderately well</td>
<td>Many to Abundant, Dendritic</td>
<td>III &amp; IV</td>
<td>Moderate</td>
<td>Valley bottoms</td>
<td>0-20</td>
<td>900-2500</td>
</tr>
<tr>
<td>15</td>
<td>Rapid</td>
<td>Well</td>
<td>Few to common, Dendritic</td>
<td>III &amp; IV</td>
<td>Moderate</td>
<td>Valley bottoms and toeslopes</td>
<td>0-30</td>
<td>1300-3800</td>
</tr>
<tr>
<td>16</td>
<td>Rapid</td>
<td>Well</td>
<td>Common, Dendritic</td>
<td>III &amp; IV</td>
<td>Moderately</td>
<td>Steep, smooth, slightly dissected sideslopes</td>
<td>30+</td>
<td>1300-3800</td>
</tr>
<tr>
<td>17</td>
<td>Rapid</td>
<td>Well</td>
<td>Few to common, Dendritic</td>
<td>V</td>
<td>Low</td>
<td>Higher elevation, cirque basins and glacial flats</td>
<td>0-30</td>
<td>3000-5500</td>
</tr>
<tr>
<td>18</td>
<td>Rapid</td>
<td>Well</td>
<td>Common, Dendritic</td>
<td>V</td>
<td>Low</td>
<td>Higher elevation, glacial sideslopes, uneven sideslopes</td>
<td>30+</td>
<td>3000-5500</td>
</tr>
</tbody>
</table>

IX - 1 SMU CHARACTERISTICS TABLE
<table>
<thead>
<tr>
<th>Soil Mapping No.</th>
<th>Infiltration Rate</th>
<th>Drainage Class</th>
<th>Surface Drainage Intensity and Pattern</th>
<th>Prod. Site Class</th>
<th>Fertility</th>
<th>Landform</th>
<th>Slope</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Rapid</td>
<td>Well to moderately well</td>
<td>Common, Dendritic</td>
<td>II, III, IV</td>
<td>Moderate</td>
<td>Uneven sideslopes</td>
<td>20-80</td>
<td>1200-3000</td>
</tr>
<tr>
<td>21</td>
<td>Rapid</td>
<td>Well</td>
<td>Few to common, Dendritic</td>
<td>III &amp; IV</td>
<td>Moderate</td>
<td>Valley bottoms and toeslopes</td>
<td>0-30</td>
<td>2000-4000</td>
</tr>
<tr>
<td>22</td>
<td>Rapid</td>
<td>Well</td>
<td>Common, Dendritic</td>
<td>III &amp; V</td>
<td>Moderate</td>
<td>Steep, smooth sideslopes</td>
<td>30-70</td>
<td>2000-4000</td>
</tr>
<tr>
<td>23</td>
<td>Moderately slow to slow</td>
<td>Poorly to imperfectly</td>
<td>Many, Dendritic</td>
<td>IV</td>
<td>Low to Moderate</td>
<td>Gentle, depressional areas</td>
<td>0-20</td>
<td>2000-4500</td>
</tr>
<tr>
<td>24</td>
<td>Rapid</td>
<td>Well</td>
<td>Few to many, Dendritic</td>
<td>IV &amp; V</td>
<td>Low to Moderate</td>
<td>Smooth slopes</td>
<td>20-50</td>
<td>2500-5000</td>
</tr>
<tr>
<td>25</td>
<td>Rapid</td>
<td>Excessively to well</td>
<td>Common, Dendritic &amp; Parallel</td>
<td>III, IV &amp; V</td>
<td>Low</td>
<td>Valley bottoms and gentle toeslopes</td>
<td>0-30</td>
<td>2400-4500</td>
</tr>
<tr>
<td>26</td>
<td>Rapid</td>
<td>Excessively to well</td>
<td>Common, Dendritic &amp; Parallel</td>
<td>III, IV &amp; V</td>
<td>Low</td>
<td>Steep sideslopes</td>
<td>30+</td>
<td>2100-5200</td>
</tr>
<tr>
<td>27</td>
<td>Rapid</td>
<td>Well</td>
<td>Common, Dendritic</td>
<td>II</td>
<td>High</td>
<td>Gently sloping, smooth sideslopes</td>
<td>0-30</td>
<td>1200-2000</td>
</tr>
<tr>
<td>28</td>
<td>Rapid</td>
<td>Well to Moderately Well</td>
<td>Common, Parallel to Dendritic</td>
<td>I &amp; II</td>
<td>High</td>
<td>Gently sloping, valley bottoms</td>
<td>0-30</td>
<td>1200-1500</td>
</tr>
<tr>
<td>29</td>
<td>Rapid</td>
<td>Well</td>
<td>Many, Parallel &amp; Dendritic</td>
<td>IV &amp; V</td>
<td>Low to Moderate</td>
<td>Smooth ridgetops and flats</td>
<td>0-30</td>
<td>3000-5000</td>
</tr>
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SMU CHARACTERISTICS TABLE IX - 2
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SMU CHARACTERISTICS TABLE
Soil Mapping Units in Frigid Soil Temperature Regime

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BEDROCK CHARACTERISTICS AND TABLE
BEDROCK CHARACTERISTICS

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

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

Color - is in narrative terms for fresh unweathered surfaces.

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

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

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

Soft - Rock can be broken by hand.

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

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

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

Slightly fractured - Only occasional fractures noted.

Massive - No fractures or very few fractures noted.

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

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

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

Irregular - Rough, irregular, fragmented fracture surfaces.

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

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

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

Incompetent - Failures are common to rock unit. Rocks of the unit are soft, deeply weathered and have high potential for mass movement.
SOIL RESOURCE INVENTORY
GIFFORD PINCHOT NATIONAL FOREST

TABLE OF BEDROCK CHARACTERISTICS OF MAPPING UNITS

<table>
<thead>
<tr>
<th>Mapping Unit No.</th>
<th>Composition</th>
<th>Color (fresh surface)</th>
<th>Hardness</th>
<th>Degree of Fracturing</th>
<th>Fracture System</th>
<th>Fracture Surface</th>
<th>Competency</th>
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<td>Blocky</td>
<td>Regular</td>
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<td>High</td>
<td>Random Hard</td>
<td>Irregular</td>
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<td>Random</td>
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<td>Blocky and Columnar, Some Platy</td>
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1/ Bedrock of these units was not rated. Depth to bedrock is greater than 12' or bedrock composition is highly variable.
SOIL INTERPRETATIONS
SOIL INTERPRETATIONS

There are 24 soil interpretations included in this Chapter. These can be subdivided into 5 groups as listed below.

Soil and Water

1. Surface Soil Erosion Potential
2. Concentrated Water Erosion Potential
3. Displacement Potential
4. Compaction Potential
5. Natural Stability
6. Expected Mass Movement as a Result of Activities
7. Water Yield Class
8. Hydrologic Group
9. Bedrock Hydrologic Characteristics

Recreation

10. Soil Suitability for Recreation Area Development
11. Soil Limitation for Recreation Development
12. Soil and Site Damage Susceptibility
13. Trail Suitability
14. Limitation for Trails

Timber Management

15. Potential for Regeneration
16. Timber Harvest Guidelines
17. Tractor
18. High Lead
19. Suspended Logging Systems

Road Development

20. Road Location Guidelines
21. Probability of Cutbank Failures
22. Susceptibility to Cutbank Sloughing and Raveling

Other Interpretations (Grouping and Factors)

23. Planning and Land Class
24. Inherent Stability Factor

NOTE:

The interpretation discussion (definition) must be read carefully and understood before applying the interpretation with a soil mapping unit. For example, "Surface Erosion Potential" recognize that this interpretation applies to the situation where all vegetative cover and litter is removed.
Soil Mapping Units 6, 7, 8, and 9 interpretations apply to all their suffix extension, i.e., 7-7E, 7F, and 7K. For soil mapping units found with 'N' or 'S,' use the interpretation with the number.

The Timber Management interpretations concerning logging systems generally give an okay, not okay, or upper limit for the system. Specific to these interpretations, they must be tempered to the site specific situation. Tractor logging includes both track and rubber tired skidders. No tractor harvest equipment should be permitted on slopes over 30 percent. "Loader loggers" are not included in this interpretation. This loader logger has demonstrated successful operation on the more compactible soils and on slopes up to 35 percent. No harvest should occur on slopes over 100 percent.
Surface Soil Erosion Potential

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

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

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

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

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

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

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Concentrated Water Erosion Potential

This rating is based on expected losses of soil material when water is concentrated in an inside road ditch or skid trail.

**Low** - Little loss of soil materials is expected. Some minor rill and gully erosion may occur.

**Moderate** - Some loss of soil materials can be expected. Rill and gully erosion occurs.

**High** - Large loss of soil material can be expected in the form of large gullies and/or numerous small gullies.

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Displacement Potential

Detrimental Displacement. Soil displacement is the removal and horizontal movement of soil from one place to another by mechanical forces such as a blade. Detrimental displacement is the removal of more than 50 percent of the topsoil or humus enriched A1 and/or AC horizons from an area of 100 square feet or more which is at least 5 feet in width. Mixing of surface soil layers by disc-plow operations, or removal of surface soil layers by hand scalping are not considered as detrimental displacement.

### SUSCEPTIBILITY TO DISPLACEMENT

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Assumption: Ratings are based on dry soil conditions.

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Compaction Potential

Detrimental Compaction. Compaction of soil increases soil bulk density and decreases porosity as a result of the application of mechanical forces such as weight and vibration. Detrimental compaction is that beyond the limits described. Because of the unique physical properties and management problems of volcanic ash and pumice soils, a different criterion for determining detrimental compaction has been established for them.

(a) Volcanic Ash/Pumice Soils. An increase in soil bulk density of 20 percent or more over the undisturbed level.

(b) Other Soils. An increase in soil bulk density of 15 percent or more over the undisturbed level, a macropore space reduction of 50 percent or more, and/or a reduction below the 15 percent level as measured by an air permeameter.

SUSCEPTIBILITY TO COMPACTION

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<td>clay, sc, sic</td>
<td>vfsi, fsl, sil, l, cl, sicl</td>
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<td>Cobbles and stones (% by vol.)</td>
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<td>20-40</td>
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<td>Organic carbon (1%) 6-12 inches</td>
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<td>Duff thickness (in.)</td>
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<td>Soil structure of family control section</td>
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<td>moderate fine, medium, coarse, single grain</td>
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Assumption: Soil moisture content is between 0.1 and 2 Bar tension

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Natural Stability

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

I. **Very Stable** - No evidence of failure.

II. **Stable** - Occasional failures are observed.

III. **Moderately Stable** - Several failures are observed.

IV. **Unstable** - Many failures are observed.

V. **Very Unstable** - Entire area shows evidence of recent and past failures.

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**Expected Mass Movement as a Result of Man's Activities**

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

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

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

*Greatly Increased* - The expected mass movement is much greater than that of the natural state.

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**Water Yield Class**

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

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

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

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

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Hydrologic Group

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

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

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

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

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

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### Bedrock Hydrologic Characteristics

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

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

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

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

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

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XII - 21
INTERP 9
Soil Suitability for Recreation Area Development

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

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

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

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

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

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Soil Limitations for Recreation Development

This indicates the major limitations to recreation development.

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Soil and Site Damage Susceptibility

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

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

Moderate - These soils are no readily compacted or eroded and vegetative types are somewhat hardy. In general, these soils and site can sustain continual use but require some rehabilitation.

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

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**Trail Suitability**

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

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

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

*Well* - These soils have no limitations for trail development.

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XII - 29        INTERP 13
Limitations for Trails

This indicates the limitations to trails.

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XII - 31

INTERP 14
**Potential for Regeneration**

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

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

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

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

*NC* - Noncommercial lands

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**Timber Harvest Guidelines - (Yes or No)**

Soil mapping units interpreted as "no" harvest align with timberland suitability classification (FSM 2415.2), which are water, nonforest, or unproductive. See "Soil Mapping Unit Suffixes" for "not suitable" land. "Yes" implies that harvest may occur on these areas. Slopes in excess of 90 percent should be reviewed carefully for erosion and stability concerns.

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High Lead Cable System

Shown here is a drawing of what is known as the "High Lead Logging" configuration. Here the lower main line is used for the skidding line. The upper secondary line is looped out around the woods with several blocks on the back side of the job. As the area is logged the blocks are disconnected one at a time, causing the main line to realign itself with the next tail block, thus changing roads.

No carriage is required in this configuration, just butt rigging. This doesn't have to be anything fancy, but is the place where the main line, the haulback line and the chokers all come together. This is essentially a ground logging system, in that the logs normally drag on the ground on their way to the landing. It is called 'lead' because the main line is elevated and this assists the logs in riding over obstacles.

In many ways, the high lead system is simply 2 winch lines: One to drag logs in to the machine and a second to drag the winch line back out in the woods. Unlike the shotgun system, it will work on flat ground, and in locations where it is not possible to get enough deflection to keep the yarding lines off the ground. The rigging is simple, and only a 2 drum machine is required. The useful distance for this logging method is usually recognized as being 800 feet, with occasional reaches to 1000 feet for long corners. It is best used for uphill logging, usable on the flat and nearly unusable on downhill logging, because in the latter configuration you are pulling the logs down into the obstacles assuring that you will never get a log to pull free.

This method has been around for a long time, and is just one step improved from a single drum yander which required the cable to be pulled out by hand or with a horse. It is the principal alternative available on a 2 drum machine where a shotgun system won't work. Other systems need three lines, though the North Bend system uses a standing skyline which is never lowered so you can pull up a skyline and either tie it off or anchor it to a dozer or even a second yander since no ability to raise or lower the skyline is required during the logging operation.
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Road Location Guidelines

Road construction is generally permitted within the slope restrictions described for each soil mapping unit. "No" suggests that resource impacts would be unacceptable. Proposed road location outside the interpretation range would warrant further review. Field review may reveal that the area can be crossed with a road within the allowable impact and economic constraints. Remember that the mapping usually originated from one inch to the mile photo and locally within a mapped area. The situation may not fit the mapping unit description or be within the guideline limits.

A - Minimum frequency on slopes of greater than 60%.

B - Minimum frequency on slopes between 30% and 60%.

C - Minimum frequency

Minimum frequency is a suggestion that transportation planning will occur in the area to assure that road location and design will meet environmental objectives first and foremost.

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XII - 43
INTERP 20

2048
**Probability of Cutbank Failures**

This interpretation based on observed existing conditions indicates the probability of failures in cutbanks following road construction or excavation for buildings. Failures are considered to be at least 10 cubic yards of material in volume. Ratings are based on cutbanks of at least 10 feet in height and refer to more than a 50 percent chance for failures.

I. **Very Stable** - Practically no probability chance of cutbank failures.

II. **Stable** - Probability of no more than 3 failures per mile of road cutbank.

III. **Moderately Stable** - Probability of 4 to 8 failures per mile of road cutbank.

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

V. **Very Unstable** - Probability of more than 15 failures per mile of road cutbanks.

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**SMU Interpretation**

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XII - 45

INTERP 21
Susceptibility to Cutbank Sloughing and Raveling

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

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

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

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

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XII - 46
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### Planning Land Class

Land Class was used in Forest Planning as a means to describe the Forest land base, cumulative effects, and transportation costs.

1A. Deep ash/pumice soil landforms on gentle slopes
1B. Deep ash/pumice soil landforms on steep slopes
2. Gentle sloping landforms
3. Steep, non-dissected sideslope landforms
4. Steep, dissected sideslope landforms
5. Unstable landforms
6. Nonforest/Unproductive landforms

2 through 6 are landforms where ash/pumice surface layers are thin or nonexistent.

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XII - 49

INTERP 23
Inherent Stability Factor

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XII - 51

INTERP 24
## Forest and District

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