SOIL RESOURCE INVENTORY (SRI)

Data Dictionary

Willamette National Forest

July 1994

Note of explanation about this document

The format of the Soil Resource Inventory (SRI) data dictionary differs somewhat from that of the other data dictionaries prepared to date. This data dictionary was originally developed as part of a larger document,the *Soil Resource Inventory (SRI) Handbook*, to accompany the 1992 update to the soils mapping on the Willamette National Forest. In addition to the descriptions of soil types included in this data dictionary, the *SRI Handbook* will include fuller introductory material as well as substantial appendices containing definitions of terms and of management interpretations. The *Handbook* at this time is still in draft version and under review, so the data dictionary is being prepared as a stand alone reference to accompany the data layer in GIS.

The original SRI, produced in 1973, has formed the basis for subsequent versions. This document includes the preface from the original 1973 SRI since it provides useful background and contextual information and also helps to document the development of the current version. In 1980 another version was produced which was basically a condensation of the 1973 version. As such it relied heavily on the original documentation and mapping. It did not include the soil complexes.

Since that time, we have seen the advent of GIS on forest. Beginning in 1990 an updated version of the soils mapping was digitized and attributed to form a new GIS layer. This became the version referred to as the 1992 Update and represents a major change in how the soils information is processed and stored.

This document contains the following main sections.

- **Background and introduction**
  The preface from the original SRI (1973) is followed by a section which documents and explains the changes which resulted from the 1992 update.

- **GIS layer description**
  This page includes information on the mapped component of the SRI.

- **List of soil types (mapping units) and mapping unit descriptions**
  This section contains a listing of soil types and a description of each soil type mapped.

- **Legend of mapping unit complexes**
  This section contains a list of soil complexes showing the percentage of soil types comprising each.

- **Soils: fields & codes reference guide**
  This section contains a table displaying the fields (items) in the ArcInfo polygon attribute table file for the soils layer. Following the table is a brief explanation of each field. This information is for use with ArcInfo and ArcView data sets.

Preface: 1973 Soil Resource Inventory

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

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

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

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Field mapping was conducted from November 1971 through December 1972 by Soil Scientists Harold A. Legard and LeRoy C. Meyer. Supervision was provided by Loren Herman.

During the course of the survey, valuable assistance, advise, and cooperation received from Forest personnel was sincerely appreciated.

Introduction: 1992 Update

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

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

The update to the 1973 version was begun in 1990 and completed in 1992.
The process used for updating the SRI follows approved Forest Service guidelines and procedures and is very similar to that used in the original (1973) survey. However, some significant changes have been made, specifically in the unsuited classification.
The following section outlines the major points of the update and the significant changes. Significant changes were in definitions of complexes, mapping process, unsuited classification, and mapping transfer process.

Major Points and Changes: 1992 Update

Map Unit Description

Map unit descriptions are the same as in the 1973 survey. No new mapping units (soils) were found during the update. All of the original map units and descriptions were adequate to accurately map the soils in the update.

Definitions of Complexes

Major changes occurred in the map unit complexes. Many complexes in the original survey were difficult to map, were confusing, and were too small to justify mapping. These could be combined with other complexes without losing the integrity of the mapping process. For instance, in the original survey, 2 complexes were mapped as 60% SRI 23 and 40% SRI 33, or 40% SRI 33 and 60% SRI 23. In the update, these two complexes were combined into one — 50% 23 and 50% 33. This was done in several similar cases to eliminate many complexes from the original survey. This should make the mapping both more accurate and easier to use. Other complexes were combined to make map units more mappable.

Suffixes

Three suffixes were added to some map units to identify specific situations. These are:

W = Wet Areas
S = Southerly Exposure
U = Unsuited

"W" was used only with map unit SRI 15 in riparian areas. It indicates soil similar to 15 but occurring in poorly drained, wet conditions with vegetation such as alder, big leaf maple, and other water loving plants.

"S" was used with several map units in the southern half of the Forest to indicate south exposures. South exposures are important on some map units where soils are shallow, rocky, droughty, have very high summer temperatures, are subject to brush vegetation after harvest and are extremely difficult to regenerate. However, they can be regenerated within 5 years and are currently considered suited.

"U" indicates unsuited classification. It occurs on south exposures and with map units 210, 310, and 610 only. The north exposures these map units are considered suited.

Unsuited Criteria

The unsuited criteria are the same as adopted by the Forest Service and interpreted by the Willamette National Forest.

All of SRI 710, 910, 210U, 310U, 610U, 62, 920, and a small acreage of 35 are considered unsuited. This is for planning purposes only and does not eliminate on-site investigations. The following are definitions of unsuited lands:

1. Steep, shallow, rocky soils (Map units 710, 910, 210U, 310U, 610U).
   — > 60% slopes
   — > 70% course fragments in soil
   — > Up to 40% rock outcrop
   — < 1 inch available water per 10 inches of soil.
   — < 3 feet soil
   — Local experience demonstrates lack of regeneration success in 5 years.

2. Droughty soils, recent lava flows and volcanic materials - SRI 62, 920.
   — Recent lava flow
   — < 35% slopes
   — > 70% course fragments in soil
   — < 3 feet soils
   — < 1 inch available water per 10 inches soil
   — Up to 40% rock outcrop
   — Cannot regenerate trees in 5 years

3. Actively unstable (moving) lands - Portions of SRI 35 and other land types delineated with a dotted line (see SRI maps).
   — Tension cracks in soil mass
   — Raw exposed soil in main and secondary scarps
   — Pressure ridges
   — Disrupted surface drainage
   — Tipped and down timber
   — Existing technology proven unsuccessful

The major change in unsuited classification is that SRI 81, 5, 91 are no longer considered unsuited for soil reasons. However, 81 and 5 may be economically infeasible to harvest since full suspension logging is recommended.

Mapping Process

The mapping process followed standard procedures and guidelines adopted by the Forest Service. It consisted of pre-field mapping on aerial photos, followed by on-ground field checking throughout the Forest. Field work consisted of checking the soil, slopes, landform, geology, and vegetation and identifying pre-established map units. After field checking, final mapping was completed on the photos. All photo work was done by stereoscopic study of landform, slope, vegetation, and classifying the land into map units.

The photo scale of the original survey (flown in 1955) was 1:70,000. The scale and date of photography of the update was 1:32,000 and 1:40,000 in 1986 and 1987. This scale enlarges the mapping area by four times over the original, allowing for more detail and accuracy.

Interpretations

Approximately 55 management interpretations were developed in the original (1973) survey. These were not changed in the update. The changes made in the map unit complexes do not affect the interpretations as all component parts of complexes are the same and are in the map unit descriptions.

Interpretation for this update are the same as for the original SRI. All interpretation, definitions and ratings found in the 1973 Atlas apply to this update.

Map Transfers Process

The process of transferring the mapping from aerial photos to digitized tape was done by the Forest Service Geometronic Service Center located in Salt Lake City, Utah. It is a much faster and more accurate method of transfers than that used in 1973. This provides a more usable base for future use and needs.

The digitized tapes from Salt Lake City were sent to the GIS Section of the Willamette National Forest.

The SRI layer arrived in digital format in December of 1990 from Salt Lake City. This information was down-loaded to the DG, imported into MOSS format and check plots were created to review the contents of the map files. Upon initial inspection, minor edge-matching and attribute mistakes were noticed. In March of 1991, the SRI layer was plotted to review the edge-matching and the attribute numbers.

In mid-April 1991, the check plots were compared with delineations of soil types which were sketched onto the aerial photos. Edits and corrections are noted on the Forest-wide check plots in blue pencil. This process took approximately two weeks. In October 1991, the map files were down-loaded from the Data General to the Everex PC to make the corrections.

In early 1992 the SRI layer was plotted on Vellum paper at 1:24,000 scale. An Administrative layer was on the same plot to make sure all polygons outside the Forest boundary, as well as on private lands, were closed.

In April 1992, the check plots were compared with the attributes on the aerial photos. Also, the vellum check plots were overlaid on full quad mylar topographic maps and the line work was corrected to match the contours and breaks in the slope. Most of these line corrections occurred along stream features (#15). SRI delineations were checked as well as comparing delineations to topography (with the topographic map underneath). These corrections were captured in LTPLUS and became the new updated SRI base layer for the Willamette National Forest. As new ground verified information becomes available, it will be incorporated into the base layer.

Definitions of Mapping Units

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

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

Mapping Unit Complexes

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

Mapping Unit Descriptions

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

Information in Mapping Unit Descriptions

The first paragraph states the primary soil and the most common inclusions found within the Mapping Unit. The second paragraph gives a brief generalized description of the primary soil. The third paragraph briefly describes the bedrock occurring in the Mapping Unit. The fourth paragraph described the landform and slope. The fifth paragraph describes the elevation and timber type. The sixth paragraph describes the drainage class and permeability rates.

Range of Profile Characteristics

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

[1] Mapping units contain a dominant taxonomic unit.

GIS Layer Description

GIS Layer name: Soil Resource Inventory
GIS Layer file name: SRI

Note: Extensions to the file name vary depending on data format and extent of coverage. Contact SO GIS shop if assistance is needed.

GIS Data type: Polygon

Definition: This layer contains the delineations of the soil landtype mapping units defined in the 1992 update to the SRI

Responsible specialist: SO Soils or Hydrology
Source data custodian: SO GIS and Soils

GIS Manuscript/
Source base custodian: SO GIS
Digital data custodian: SO GIS

Public data access: Available
Forest Service data access: Unrestricted

Vertical integration: Administrative Boundaries (ADMN)

GIS link to database: No associated database.

Coding: Each soil type or complex is identified by a one to four character code. Each soil type also has an accompanying set of attributes included in the PAT file in ArcInfo.

See attached **Soil List, Legend of Complexes, Fields & Codes Reference Guide, and Mapping Unit Descriptions** for code descriptions

Data dictionary revision date: July 1994

Soil Types

0-9	57
12	61
13	62
14	63
15	64
16	66
17	67
19	68
21	69
21S	71
22	73
23	74
25	75
31	81
31S	82
33	85
35	91
44	92
54	93
55	94
56	95

Note:
The mapping unit descriptions which follow have been taken verbatim from the draft version of the *SRI Handbook*. As such, there may be some **minor** changes to these descriptions in the final version. The basic information presented here should stay the same.

Three suffixes: W = wet
S = southerly
U = unsuited

Mapping Unit Descriptions [1]

0 - Perpetual Snow, Ice, Rock Outcrop, and Talus

Areas near or above timberline on glaciated peaks of the High Cascades. This mapping unit is highly variable and is found on slopes ranging from 30% to greater than 100%. Bedrock materials consist of andesites, basalts, breccias, and various types of pyroclastic materials. All areas have been influenced by glacial activity. Vegetation consists of lichens, sedges, and a few hardy trees and shrubs near timberline.

1 - Rock Outcrop, Andesites and Basalts

Hard, fresh andesite and basalt rock outcrops commonly forming cliffs and “rock knobs”.

This mapping unit is usually associated with volcanic dikes, vents, and plugs. Minor amounts of various volcanic materials or sediments may be present. Material from this mapping unit is well suited for road rock. This mapping unit is an inclusion in mapping unit 3 when its lateral extent becomes so small that it is impractical to map separately.

2 - Rock Outcrop, Volcanic Breccias and Tuffs

Volcanic breccias, tuffs, agglomerates, conglomerates; clastic and pyroclastic sediments generally more easily weathered than mapping unit 1. Typically, outcrops are massive with few fractures. Bedding planes are often present with minor dikes and flows of andesite or basalt. Locally, these materials have been altered by hydrothermal and volcanic activity to extremely hard and resistant materials that stand out as “hoodoos” above the forest canopy. Outcrops of mapping unit 2 often support grasses and forbs locally. Generally, materials from this mapping unit are not as well suited for road rock as mapping unit 1. This mapping unit is an inclusion in mapping unit 3 when its lateral extent becomes so small that it is impractical to map separately.

[1] Mapping units 0 through 9 are miscellaneous landtypes and are not described in detail.

3 - Talus, Rock Outcrop, Avalanche Chutes, and Low-Site Timber

This mapping unit is a variety of rock outcrop, talus, and soils highly variable in depth, rock content, and moisture status. This mapping unit is generally found along upper sideslopes, ridgetops, and in areas of cirque topography. Timber found on this mapping unit is of low quality and quantity. Mapping units 1,2,6, & 7 are inclusions in this mapping unit when they become too small to map separately. Severe management problems occur within this mapping unit because of soil, climatic, and topographic limitations.

4 - Recent Volcanic Lava Flows

Fresh, recent volcanic lava flows of the High Cascades. Vegetation is sparse and found in pockets of soil material on the lava flows. Slopes are generally less than 30%.

5 - Cinder Cones

Recent cinder cones of the High Cascades having slight or no glacial modification. Soils are very cindery, sandy loams developing on volcanic ejecta making up the cinder cones. Vegetation consists of lodgepole pine, Douglas-fir, and true fir, mountain hemlock tree species. Slopes range from 40% to greater than 80%. The soil and parent material on these cinder cones tend to be loose and unconsolidated and ravel and erode severely when disturbed.

6 - Wet Non-Forest Land

Areas that have high water tables or become seasonally ponded. This mapping unit is highly variable in topographic position and is found in depressions, along streamside areas, and steep sideslopes. Boulder fields are often found within this unit on steep slopes. Vegetation consists of sedges, rushes, grasses, tag alder, devil's club, and willow. This mapping unit is an inclusion in mapping unit 3 when its lateral extent becomes so small that it is impractical to map separately.

7 - Dry Non-Forest Land

Dry non-forested areas supporting various grasses, forbs, sedges, and shrubs. These areas are usually found in the Upper Forest Zone and upper limits of the Principal Forest Zone along ridge lines and areas of cirque topography. Soils are shallow to moderately deep and contain less than 30% rock outcrop visible on the mapping photos. Often this mapping unit is an inclusion in mapping unit 3 when its lateral extent becomes so small it is impractical to map by itself. Small patches of low quality timber may be included in this mapping unit.

8 - Steep Dissected Landforms from Volcanic Breccias and Tuffs

Steep dissected land forms developing on green and red breccias and tuffs. Soil materials consist of residuum and colluvium and may range from less than one foot deep along ridge tops to more than 20 feet deep along drainages. Soil drainage, texture, coarse fragment content, and depth are highly variable. Occasional dikes and sills of andesite and basalt may occur. Douglas-fir site class may range from V along ridge lines to III along steep drainages. Due to the small scale used for this mapping, separation of the variabilities within this miscellaneous land type is impractical. Severe management restrictions exist on these steep dissected landforms.

9 - Steep Dissected Landforms, from Andesites, Basalts, and Breccias

Steep dissected landforms developing on andesites, basalts, and breccias. Soil materials consist of residuum and colluvium and are usually shallow and very stony. Rock outcrops, cliffs, and talus are often associated with this unit. The soils are usually coarse-textured and excessively drained. Stream channels are usually scoured to bedrock. Site class IV and V Douglas-fir, hemlock, and true fir at higher elevations, are found on this mapping unit. Severe management restrictions exist on these steep dissected landforms.

Mapping Unit 12

Mapping Unit 12 consists dominantly of Landtype 12 and minor amounts of Landtype 16 and 66.

Landtype 12 is a moderately deep, slightly plastic soil derived from residual and colluvial materials. Surface soils are thin shotty loams. Subsoils are moderately thick silt loams and cobbly silty clay loams.

Bedrock materials are variable and consist of competent, moderately hard to soft volcanic materials including andesites and basalts. Compacted glacial till may also locally be present. Depth to bedrock is greater than 3 feet and usually is 6 to 8 feet.

Typically, Landtype 12 occurs on even, smooth benches with slopes less than 25 percent.

This landtype ranges in elevation from 1,600 to 2,500 feet and supports Site Class Low III and IV Douglas-fir with occasional Big leaf maple. The landtype is well drained. Permeability is rapid in the surface soil and rapid to moderate in the subsoil.

Range of Profile Characteristics of Landtype 12

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 2 inches thick.

Surface Layers

Dark brown to brown shotty loams and silt loams; weak, fine, granular, and subangular blocky structure;
20 to 35 percent rounded shot and 20 percent gravel by volume;
slightly sticky, nonplastic;
pH 5.5; 7 to 8 inches thick.

Subsoil Layers

Brown to dark brown silt loams ranging to cobbly silty clay loams;
moderate to strong, medium and fine subangular blocky structure becoming massive at depth;
15 to 40 percent subangular to rounded gravels and cobbles by volume;
slightly sticky to sticky, slightly plastic;
pH ranges from 5.0 to 6.5; 48 to 60 inches thick.

Mapping Unit 13

Mapping Unit 13 consists dominantly of Landtype 13 and minor amounts of Landtypes 16, 23,33, 44, and 55.

Landtype 13 is a deep to very deep, slightly plastic soil derived from glacial and colluvial materials. Surface soils are thin gravelly loams. Subsoils are thick gravelly loams, silt loams, and silty clay loams.

Bedrock is variable but consists primarily of moderately competent breccias and tuffaceous materials with minor amounts of andesites and basalts. Weak to moderately compacted till occurs intermittently throughout the mapping unit. Depth to bedrock is usually greater than 10 feet.

Typically, Landtype 13 occurs on uneven to hummocky benches, basins, terraces, and valley bottoms with slopes ranging to 40 percent. Small, local, steeper pitches may be present. Small local ponds are commonly present.

This landtype ranges in elevation from 2,500 to 4,000 feet and supports Site Class IV and Low III Douglas-fir and hemlock with occasional Western red cedar and Pacific silver-fir at higher elevations.

The landtype is generally well drained but has temporary local small ponds due to deep-seated failures. Permeability is rapid in the surface soils and moderate to locally slow in the subsoils.

Range of Profile Characteristics of Landtype 13

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1/2 to 2 inches thick.

Surface Layers:

Dark brown to dark yellowish brown gravelly loams; weak, fine, granular structure;
20 to 50 percent small subangular to rounded gravel by volume;
non-sticky to slightly sticky, non-plastic;
pH ranges from 5.0 to 6.5; 9 to 15 inches thick.

Subsoil Layers:

Dark yellowish brown to dark brown gravelly loams, silt loams, and silty clay loams;
weak to moderate, fine to medium subangular blocky structure becoming massive at depth;
30 to 40 percent rounded to subangular gravels and cobbles by volume;
slightly sticky, slightly plastic to nonplastic;
pH ranges from 5.5 to 7.0; 63 to 120 inches thick.

Mapping Unit 14

Mapping Unit 14 consists dominantly of Landtype 14 and minor amounts of Landtypes 23, 25, and 33.

Landtype 14 is a deep to very deep, slightly plastic to plastic Landtype derived from residual and colluvial materials. Surface soils are thin shotty loams and silt loams. Subsoils are thick silt loams, silty clay loams, and clay loams.

Bedrock materials are variable and consist of competent, weathered andesites, basalts, breccias, and tuffs. Depth to bedrock is usually greater than 12 feet but locally may be near 6 feet.

Typically, Landtype 14 occurs on elevated flats, benches, and terraces that are smooth to somewhat uneven with slopes ranging from 5 to 35 percent.

This landtype ranges in elevation from 1,000 to 3,300 feet and supports Site Class II and High III Douglas-fir, Western red cedar and occasionally Western hemlock.

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

Range of profile Characteristics of Landtype 14

Litter:

Needles, leaves, twigs, and decomposing organic matter.
2 to 3 inches thick.

Surface Layers:

Very dark grayish brown to dark brown shotty loams and silt loams;
weak to moderate, fine and medium granular and subangular structure;
less than 15 percent rounded to subangular gravels and cobbles by volume;
nonsticky to slightly sticky, nonplastic to slightly plastic;
pH ranges from 6.0 to 7.0; 9 to 14 inches thick.

Subsoil Layers:

Dark brown, dark yellowish brown, and dark grayish brown, silt loams, silty clay loams, and clay loams;
moderate to strong, fine and medium, subangular blocky structure becoming massive near bedrock;
trace of rounded to subangular gravels and cobbles;
slightly sticky to sticky, slightly plastic to plastic;
pH ranges from 5.5 to 6.5;
62 to 88+ inches thick.

Mapping Unit 15

Mapping Unit 15 consists dominantly of Landtype 15 and minor amounts of Landtypes 14, 16, 17, 66, and 67.

Landtype 15 is a very deep nonplastic Landtype derived from alluvium, glacial outwash, and glacial till. Surface soils are generally thin loams, sandy loams, and loamy sands. Subsoils are usually very thick, gravelly to very gravelly cobbly sandy loams.

Bedrock materials consist of various kinds found in the survey area. Depth to bedrock is usually greater than 12 feet but locally may be as little as 6 feet.

Typically, Landtype 15 occurs along streams in valley bottoms with slopes less than 20 percent. Locally, this landtype is subject to flooding.

This landtype ranges in elevation from approximately 900 to 3,600 feet and supports Site Class III Douglas-fir which tends toward Site Class II at lower elevations and Site Class IV at higher elevations.

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

Range of Profile Characteristics of Landtype 15

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Very dark grayish brown loams and gravelly sandy loams;
single grain to weak, fine and very fine granular and subangular blocky structure; 15 to 40 percent rounded to subangular gravels and cobbles by volume;
nonsticky, nonplastic;
pH ranges from 6.0 to 6.5;
3 to 17 inches thick.

Subsoil Layers:

Dark brown to brown gravelly cobbly sandy loams;
massive; weakly compacted;
35 to 70 percent rounded to subangular gravels and cobbles, trace to 10 percent stones by volume;
nonsticky, nonplastic;
pH 6.0 to 6.5;
100 to 120 inches plus in thickness.

Mapping Unit 16

Mapping Unit 16 consists dominantly of Landtype 16 and minor amounts of Landtypes 13, 15, 17 and 66.

Landtype 16 is a deep to very deep, nonplastic to slightly plastic landtype derived from colluvium, glacial till, and alluvium. Surface soils are usually thin gravelly loams and sandy loams. Subsoils are usually thick gravelly cobbly loams that locally may range to sandy loams or silt loams.

Bedrock materials are variable and consist of competent to moderately competent andesites, basalts, tuffs, and breccias. Depth to bedrock varies from 6 to greater than 12 feet.

Typically, Landtype 16 occurs on moderate to steep mid-slopes, toe-slopes, and valley bottoms that are smooth to somewhat dissected. Slopes range from 20 to 70 percent.

This landtype ranges in elevation from 1500 to 4500 feet and supports Site Class III and IV Douglas-fir.

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

Range of Profile Characteristics of Landtype 16

Litter:

Needles, leaves, twigs, and decomposing organic matter.
2 to 3 inches thick.

Surface Layers:

Very dark grayish brown to dark brown, shotty loams and gravelly loams;
weak, fine, granular and subangular blocky structure;
30 to 60 percent, rounded and subangular gravels, cobbles, and stones by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges from 6.0 to 6.5; 27 to 44 inches thick.

Subsoil Layers:

Dark brown to dark yellowish brown, gravelly cobbly loams ranging to gravelly sandy loams and gravelly stony loams; massive;
40 to 75 percent rounded to angular gravels, cobbles, and stones by volume;
weak to moderate compaction;
nonsticky to slightly sticky, nonplastic;
pH ranges from 6.0 to 6.5; 69 to 76+ inches thick.

Mapping Unit 17

Mapping Unit 17 consists dominantly of Landtype 17 and minor amounts of Landtypes 15, 16, 44 and 64.

Landtype 17 is a deep to very deep, nonplastic land type derived from alluvium, glacial outwash, and glacial till. Surface soils are generally thin sandy loams. Subsoils are usually thick very gravelly cobbly sandy loams.

Bedrock materials consist of various kinds found in the survey area. Depth to bedrock is greater than 12 feet but locally may be as little as 6 feet.

Typically, Landtype 17 occurs along streams in valley bottom with slopes less than 20 percent. Locally this landtype is subject to flooding.

This landtype ranges in elevation from 3,500 feet to the upper limits of the Principal Forest Zone and supports Site Class IV and V Douglas-fir, Western hemlock, Pacific silver fir, and Western red cedar.

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

Range of Profile Characteristics of Landtype 17

Same as for Landtype 15

Mapping Unit 19

Mapping Unit 19 consists dominantly of Landtype 19 and minor amounts of Landtypes 13, 55 and 67.

Landtype 19 is a deep, nonplastic landtype derived from glacial till and volcanic breccias. Surface soils are thin gravelly loams. Subsoils are thick gravelly cobbly loams.

Bedrock is composed of moderately competent volcanic breccias that may locally be highly weathered and soft. Depth to bedrock is usually greater than 10 feet.

Typically, Landtype 19 occurs on uneven to hummocky glacial benches and basins with slopes ranging to 45 percent.

This landtype ranges in elevation from 4,000 to 4,700 feet and supports Site Class II Pacific silver fir, Site Class IV Douglas-fir and Western hemlock.

The landtype is generally well drained, but may be locally poorly drained causing local ponding. Permeability is rapid to very rapid in the surface soils and rapid to slow in the subsoils.

Range of Profile Characteristics of Landtype 19

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Dark brown to dark yellowish brown, gravelly cobbly loams;
weak, find and medium, granular and subangular blocky structure;
35 to 65 percent subangular and rounded gravels, cobbles, stones by volume; slightly sticky, nonplastic;
pH 6.5; 55 inches thick.

Subsoil Layers:

Dark yellowish brown gravelly cobbly loams and gravelly sandy loams; massive;
60 to 65 percent subangular gravels, cobbles, stones by volume;
slightly sticky, nonplastic;
weak to moderate compaction;
pH 6.0; 33 to 60 inches thick.

Mapping Unit 21

Mapping Unit 21 consists dominantly of Landtype 21 and minor amounts of Landtypes 23, 31, and 61.

Landtype 21 is a shallow nonplastic to slightly plastic landtype derived from residuum and colluvium. Surface soils are thin gravelly loams. Subsoils are thin gravelly loams and clay loams.

Bedrock is moderately hard, competent to moderately competent, reddish volcanic breccias and tuffs. Depth to bedrock is usually less than 3 feet.

Typically, Landtype 21 occurs on steep, smooth to moderately dissected upper sideslopes and ridges with slopes ranging from 60 to 90+ percent slopes.

This landtype ranges in elevation from near 3,000 to 5,000 feet and supports Site Class IV and locally V Douglas-fir, along with Western hemlock and occasional true fir at higher elevations.

The soil is well to excessively drained. Permeability is very rapid in the surface soils and rapid to very rapid in the subsoils.

Range of Profile Characteristics of Landtype 21

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1/2 to 1 inch thick.

Surface Layers:

Dark brown gravelly loams, shotty loams and loams;
weak fine granular and subangular blocky structure;
25 to 60 percent rounded and subangular gravel and cobbles by volume;
slightly sticky and nonplastic;
pH ranges from 6.0 to 6.5; 6 to 14 inches thick.

Subsoil Layers:

Dark brown to dark yellowish brown loams to clay loams; moderate fine and medium subangular blocky structure to massive;
30 to 55 percent subangular gravels and cobbles by volume;
slightly sticky and slightly plastic;
pH 6.0; 23 to 32 inches thick.

Mapping Unit 21s

Same as 21
except South, rocky, hot and droughty slopes.

Mapping Unit 22

Mapping Unit 22 consists dominantly of Landtype 22 and minor amounts of Landtypes 14, 23 and 33.

Landtype 22 is a moderately deep, plastic landtype derived from residuum. Surface soils are generally thin shotty silt loams. Subsoils are generally thin to moderately thick silty clay loams and clays.

Bedrock is composed of incompetent, soft, reddish breccias and tuffs. Depth to bedrock ranges from 3 to 6 feet.

Typically, Landtype 22 occurs on gentle, smooth flats with slopes less than 20 percent.

This landtype ranges in elevation from 2,000 to 2,400 feet and supports Site Class III and II Douglas-fir, Western red cedar and Western hemlock.

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

Range of Profile Characteristics of Landtype 22

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Very dark grayish brown shotty silt loams;
weak, fine, subangular blocky structure;
30 percent shot and trace subangular gravel by volume;
slightly sticky, non-plastic;
pH 6.5; 6 to 8 inches thick.

Subsoil Layers:

Brown to reddish brown silty clay loams and clays;
moderate to strong, fine and medium; subangular blocky structure becoming massive at depth;
0 to 15 percent subangular to rounded stones by volume;
sticky, plastic;
pH 6.0; 30 to 64 inches thick.

Mapping Unit 23

Mapping Unit 23 consists dominantly of Landtype 23 and minor amounts of Landtypes 14, 16, 21, 25 and 33.

Landtype 23 is a moderately deep to deep, slightly plastic to plastic landtype derived from colluvium and residuum. Surface soils are generally thin shotty loams. Subsoils are generally clay loams, silty clay loams, and clays.

Bedrock is composed of moderately competent, soft to moderately hard, reddish breccias and tuffs. Depth to bedrock ranges from 3 to 8 feet.

Typically, Landtype 23 occurs on moderate, smooth to somewhat hummocky, lower sideslopes and benches with slopes ranging from 20 to 60 percent.

This landtype ranges in elevation from 1,000 to 3,500 feet and supports Site Class II & III Douglas-fir, Western red cedar, and occasional Western hemlock.

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

Range of Profile Characteristics of Landtype 23

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Dark brown to very dark grayish brown shotty loams;
moderate, fine and medium, granular structure;
15 to 40 percent shot by volume;
slightly sticky, nonplastic;
pH ranges from 6.0 to 7.0; 1 to 14 inches thick.

Subsoil Layers:

Reddish brown to dark brown silty clay loams, clay loams and clays;
moderate to strong, medium, subangular blocky structure becoming massive at depth;
10 to 35 percent angular and subangular gravels and cobbles by volume;
pH ranges from 6.5 to 4.5; 47 to 61 inches thick.

Mapping Unit 25

Mapping Unit 25 consists dominantly of Landtype 25 and minor amounts of Landtypes 14, 23, 33, and 35.

Landtype 25 is a deep plastic landtype derived from residuum and colluvium. Surface soils are thin loams, silty clay loams, and clay loams. Subsoils are clay loams, silty clay loams and clays.

Bedrock is incompetent, saprolitic, reddish breccias and tuffs that weather quickly to clayey materials and become plastic when remolded. Depth to bedrock varies from 6 to greater than 12 feet.

Typically, Landtype 25 occurs on hummocky, uneven landforms associated with unstable areas. Slopes range from 15 to 40 percent.

This landtype ranges in elevation from 900 to 3,500 feet and supports Site Class III and II Douglas-fir and Western red cedar.

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

Range of Profile Characteristics of Landtype 25

Litter:

Needles, leaves, twigs and decomposing organic matter.
1 to 3 inches thick.

Surface Layers:

Dark reddish brown to very dark grayish brown, loams silty clay loams and clay loams;
moderate to strong, fine and medium, granular and subangular blocky structure;
slightly sticky, slightly plastic;
trace to 30 percent angular to subangular gravels and cobbles by volume,
pH ranges from 5.5 to 6.5; 5 to 15 inches thick.

Subsoil Layers:

Reddish brown to dark yellowish brown, clay loams, silty clay loams, and clays;
moderate to strong, fine and medium, subangular blocky structure becoming massive at depth;
trace to 55 percent angular gravels, cobbles and stones by volume;
slightly sticky to sticky, plastic;
pH ranges from 4.8 to 6.5; 67 to 120+ inches thick.

Mapping Unit 31

Mapping Unit 31 consists dominantly of Landtype 31 and minor amounts of Landtypes 21, 33, and 61.

Landtype 31 is a shallow, nonplastic to slightly plastic landtype derived from residuum and colluvium. Surface soils are gravelly to very gravelly loams. Subsoils are thin gravelly to gravelly cobbly loams and clay loams.

Bedrock is composed of competent to moderately competent, hard to moderately hard, green and greenish tinted tuffs and breccias. Depth to bedrock is usually less than 3 feet.

Typically, Landtype 31 occurs on steep, smooth to moderately dissected sideslopes and ridges with slopes ranging from 60 to greater than 90 percent.

This landtype ranges in elevation from 2,500 to 4,500 feet and supports Site Class IV and locally Site Class V Douglas-fir. Pacific silver fir is commonly present at higher elevations and madrone is present on drier sites at lower elevations. Western hemlock is common at all elevations.

The Landtype is excessively drained. Permeability is very rapid in the surface soils and rapid to very rapid in the subsoils.

Range of Profile Characteristics of Landtype 31

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 inch thick.

Surface Layers:

Very dark grayish brown to dark grayish brown gravelly loamsthat may range from sandy loams to silt loams;
weak, fine, and very fine, granular and subangular blocky structure;
trace to 70 percent angular and subangular gravels and cobbles by volume;
nonsticky to slightly sticky, nonplastic to slightly plastic;
pH ranges from 6.0 to 6.5; 3 to 19 inches thick.

Subsoil Layers:

Dark brown to light olive brown gravelly and gravelly cobbly loams and clay loams;
moderate, very fine to medium, subangular blocky structure;
40 to 70 percent angular and subangular gravel and cobbles by volume;
nonsticky to slightly sticky, nonplastic to slightly plastic;
pH ranges from 5.5 to 6.5; 17 to 33 inches thick.

Mapping Unit 31s

Same as 31
except South, rocky, hot and droughty slopes.

Mapping Unit 33

Mapping Unit 33 consists dominantly of Landtype 33 and minor amounts of Landtypes 14, 16, 23, 31, and 35.

Landtype 33 is a moderately deep to locally deep, slightly plastic to plastic landtype derived from colluvium and residuum. Surface soils are thin loams and silt loams. Subsoils are clay loams and gravelly clay loams.

Bedrock is composed of moderately competent to incompetent, soft to moderately hard, green and greenish tinted breccias and tuffs. Depth to bedrock ranges from 3 to 8 feet.

Typically, Landtype 33 occurs on moderate, uneven to hummocky lower sideslopes, and benches with slopes ranging from 20 to 60 percent.

This landtype ranges in elevation from 1,000 to 3,500 feet and supports Site Class III Douglas-fir, Western red cedar, and Western hemlock. Ponderosa pine is occasionally found on this landtype in the vicinity of Hills Creek Reservoir.

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

Range of Profile Characteristics of Landtype 33

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Very dark grayish brown to dark brown loams and silt loams;
weak to moderate fine granular structure, trace to 35 percent angular and subangular gravel by volume;
slightly sticky, slightly plastic;
pH ranges from 5.5 to 6.5; 5 to 19 inches thick.

Subsoil Layers:

Dark brown to olive brown clay loams and gravelly or cobbly clay loams and clays;
moderate to strong, fine and medium, subangular blocky structure becoming massive at depth;
10 to 50 percent soft to hard, angular and subangular gravels and cobbles by volume; slightly sticky to sticky, slightly plastic to plastic;
clay films, pH ranges from 5.3 to 6.5; 35 to 55 inches thick.

Mapping Unit 35

Mapping Unit 35 consists dominantly of Landtype 35 and minor amounts of Landtypes 16, 23, and 33.

Landtype 35 is a deep to very deep, plastic landtype derived from colluvium, and residuum. Surface soils are thin clay loams. Subsoils are thick to very thick clays and clay loams.

Bedrock is composed of incompetent, saprolitic, green and greenish tinted breccias and tuffs. Depth to bedrock is greater than 6 feet and commonly is not observed in road cutbanks. Rock fragments in soil profile are commonly soft and easily broken by hand.

Typically, Landtype 35 occurs on gentle to moderate, hummocky, unstable areas such as slump basins and landflows with slopes ranging from 5 to 40 percent.

This landtype ranges in elevation from 1,000 to 3,500 feet and supports Site Class III and II Douglas-fir, Western red cedar, Western hemlock and occasional Ponderosa pine in the vicinity of Hills Creek Reservoir.

The landtype is somewhat poorly to poorly drained. Permeability is moderate to slow in the surface soils and slow to very slow in the subsoils.

Range of Profile Characteristics of Landtype 35

Litter:

Needles, leaves, twigs and decomposing organic matter.
2 inches thick.

Surface Layers:

Very dark grayish brown to dark brown clay loams;
moderate to strong, very fine and fine, subangular blocky structure;
trace to 20% subangular gravel by volume;
slightly sticky to sticky, slightly plastic to plastic;
pH ranges from 5.3 to 6.0; 11 to 14 inches thick.

Subsoil Layers:

Dark brown to reddish brown clays and clay loams; moderate to strong, medium and fine; subangular blocky structure becoming massive at depth;
trace to 45 percent subangular gravels and cobbles by volume;
slightly sticky to sticky,
plastic to very plastic;
mottled, dark reddish brown, reddish yellow and brown;
pH ranges from 5.2 to 6.5; 66 to 120+ inches thick.

Mapping Unit 44

Mapping Unit 44 consists dominantly of Landtype 44 and minor amounts of Landtypes 21, 23, 61, and 64.

Landtype 44 is a moderately deep, nonplastic landtype derived from glacial till and colluvium. Surface soils are thin gravelly or shotty loams. Subsoils are thin to moderately thick gravelly or cobbly loams and sandy loams.

Bedrock is composed of competent, hard to moderately hard, volcanic breccias. Depth to bedrock ranges from 3 to 6 feet.

Typically, Landtype 44 occurs on steep, smooth sideslopes of glacial origin with slopes ranging from 40 to 80 percent.

This landtype ranges in elevation from 3,500 to 5,000 feet and supports Site Class IV Douglas-fir with Western hemlock and occasional Pacific silver fir at higher elevations.

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

Range of Profile Characteristics of Landtype 44

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Dark grayish brown to very dark grayish brown gravelly loams, shotty loams and loam; weak to moderate, fine and medium, granular structure;
20 to 50 percent rounded and subangular shot, gravels, cobbles and stone by volume; slightly sticky, nonplastic;
pH 6.0; 3 to 10 inches thick.

Subsoil Layers:

Dark brown to dark yellowish brown gravelly sandy loams, cobbly loams & loams; weak to moderate, fine and medium subangular blocky structure becoming massive at depth;
25 to 55 percent subangular and angular gravels, cobbles, and stone by volume; slightly sticky, nonplastic;
pH 6.0; 35 to 51 inches thick.

Mapping Unit 54

Mapping Unit 54 consists dominantly of Landtype 54 and minor amounts of Landtypes 44, 57, and 64.

Landtype 54 is a moderately deep, nonplastic to slightly plastic landtype derived from volcanic ejecta (pumice), colluvium, and glacial materials. Surface soils are thin deposits of pumice. Subsoils are thin gravelly silt loams.

Bedrock is composed of competent, hard and moderately hard, volcanic breccias, andesites and basalts. Depth to bedrock is 3 to 6 feet.

Typically, Landtype 54 occurs on moderate, smooth to somewhat uneven sideslopes ranging from 35 to 65 percent slope.

This landtype ranges in elevation from 4,000 to 5,500 feet and supports Site Class V Douglas-fir with Western hemlock, Noble fir and occasional Mountain hemlock.

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

Range of Profile Characteristics of Landtype 54

Litter:

Needles, leaves, twigs and decomposing organic matter.

Surface Layers:

Strong brown, 2 inch minus pumice;
single grain; nonsticky, nonplastic;
pH 7.0; 20 to 33 inches thick.

Subsoil Layers:

Dark brown gravelly silt loams; moderate, fine and medium, subangular blocky structure;
40 to 65 percent subangular to rounded gravels and cobbles by volume;
pH 6.5; 21 to 35 inches thick.

Mapping Unit 55

Mapping Unit 55 consists dominantly of Landtype 55 and minor amounts of Landtypes 19, 21, 31, and 44.

Landtype 55 is a shallow to moderately deep, slightly plastic to plastic landtype derived from residuum and colluvium. Surface soils consist of gravelly loams and loams. Subsoils consist of gravelly silt loams, silty clay loams, and clay loams.

Bedrock is composed of moderately competent, soft to moderately hard, volcanic breccias and tuffs. Depth to bedrock ranges from less than 3 feet to greater than 8 feet.

Typically, Landtype 55 occurs on broad uneven to somewhat hummocky ridge tops and benches with slopes ranging up to 40 percent.

This landtype ranges in elevation from 3,500 to 4,500 feet and supports Site Class IV Douglas-fir and Site Class III Noble fir with Western hemlock and Pacific silver fir also present.

The landtype is moderately well drained but may be locally poorly drained causing ponding. Permeability is rapid in the surface soils and moderate to slow in the subsoils.

Range of Profile Characteristics of Landtype 55

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 1 1/4 inches thick.

Surface Layers:

Very dark grayish brown to dark yellowish brown gravelly loams, weak to moderate, fine and medium, granular an subangular blocky structure;
trace to 50 percent angular gravels and cobbles by volume;
slightly sticky, slightly plastic;
pH ranges from 5.5 to 6.0; 7 to 36 inches thick.

Subsoil Layers:

Yellowish brown to olive brown, gravelly silt loams, gravelly clay loams, and silty clay loams; massive;
trace to 50 percent angular to subangular gravels and cobbles by volume;
slightly sticky to sticky, slightly plastic to plastic;
pH ranges from 4.5 to 5.7; 26 to 40 inches thick.

Mapping Unit 56

Mapping Unit 56 consists dominantly of Landtype 56 and minor amounts of Landtypes 54 and 57.

Landtype 56 is a deep, nonplastic landtype derived from volcanic ejecta and glacial till. Surface soils are thin deposits of pumice. Subsoils are thick gravelly cobbly loams and sandy loams.

Bedrock is composed of competent, hard, moderately fractured andesites. Depth to bedrock is greater than 10 feet.

Typically, Landtype 56 occurs on glacial valley bottoms with slopes less than 30 percent.

This landtype ranges in elevation from 4,000 to 5,000 feet and supports Site Class IV and Low III Douglas-fir and Site Class Low II Noble fir along with Pacific silver fir and Western hemlock.

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

Range of Profile Characteristics of Landtype 56

Litter:

Needles, leaves, twigs, and decomposing organic matter.
2 inches thick.

Surface Layers:

Strong brown to yellowish brown pumice and ash, 1/4 inch(-); single grain; nonsticky, nonplastic;
pH 6.5; 12 to 20 inches thick.

Subsoil Layers:

Dark brown to brown, gravelly, cobbly loams and sandy loams;
moderate, fine and medium, subangular blocky structure becoming massive with depth, moderately compacted below 38 inches;
25 to 70 percent rounded to subangular gravel cobbles and stones by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges 6.0 to 7.0; 100 to 120 inches (+) thick.

Mapping Unit 57

Mapping Unit 57 consists dominantly of Landtype 57 and minor amounts of Landtypes 54 and 56.

Landtype 57 is a deep to very deep, nonplastic landtype derived from volcanic ejecta and glacial till. Surface soils and thin deposits of pumice and ash. Subsoils are thick to very thick, nonplastic, gravelly sandy loams and gravelly cobbly sandy loams.

Bedrock is composed of competent, hard, moderately fractured andesites. Depth to bedrock varies from 10 to greater than 12 feet.

Typically, Landtype 57 occurs on moderate, smooth and somewhat uneven sideslopes of glacial origin with slopes ranging from 30 to 60 percent.

This landtype ranges in elevation from 4,000 to 5,500 feet and supports Site Class IV and V Douglas-fir with Pacific silver fir, Western hemlock and Noble fir present.

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

Range of Profile Characteristics of Landtype 57

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 1 1/2 inches thick.

Surface Layers:

Strong brown to yellowish brown pumice and ash;
single grained;
nonsticky, nonplastic;
pH ranges from 6.5 to 7.0; 20 to 22 inches thick.

Subsoil Layers:

Dark yellowish brown to very dark grayish brown gravelly and gravelly cobbly sandy loams;
weak, fine, subangular blocky structure becoming massive with weak to moderate compaction below 3 feet;
40 to 80 percent rounded to subangular gravels, cobbles and stones by volume;
nonsticky, nonplastic;
pH 6.5; 78 to 120 inches thick.

Mapping Unit 61

Mapping Unit 61 consists dominantly of Landtype 61 and minor amounts of Landtypes 21, 31, 44, and 64.

Landtype 61 is a shallow, nonplastic landtype derived from residuum and colluvium. Surface soils are thin gravelly to very gravelly loams. Subsoils are thin gravelly or cobbly loams.

Bedrock is composed of competent, hard, highly to moderately fractured andesites and basalts. Depth to bedrock is usually less than 3 feet.

Typically, Landtype 61 occurs on steep, smooth to moderately dissected sideslopes and ridges with slopes ranging from about 60 to greater than 90 percent.

This landtype ranges in elevation from 1,000 to 5,000 feet and supports Site Class IV and V Douglas-fir and hemlock. Pacific silver fir and Western while pine occur at higher elevations.

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

Range of Profile Characteristics of Landtype 61

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 inch thick.

Surface Layers:

Dark brown gravelly to very gravelly loams; weak, fine, granular structure;
30 to 60 percent rounded, angular and subangular gravels by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges from 6.0 to 7.0; 6 to 7 inches thick.

Subsoil Layers:

Dark yellowish brown to dark brown, gravelly or cobbly loams ranging to sandy loams and silt loams ; massive;
50 to 75 percent angular to subangular gravels, cobbles and stones by volume;
nonsticky to slightly sticky, nonplastic;
pH 6.0; 11 to 15 inches thick.

Mapping Unit 62

Mapping Unit 62 consists dominantly of Landtype 62 and minor amounts of Landtype 4.

Landtype 62 is a shallow to moderately deep, nonplastic landtype derived from recent lava flows. Soils consist of cindery, gravelly loamy sands and sands that locally may range to loams.

Bedrock is composed of competent, recent lava flows from the high Cascades. Depth to bedrock ranges from the surface to 6 feet.

Typically, Landtype 62 occurs on recent lava flows. Overall landscape slope is less than 35 percent, but the actual surface may be very irregular due to collapsed lava tubes, and pressure ridges.

This landtype ranges in elevation from 3,300 to 4,000 feet and supports Site Class IV and V Douglas-fir.

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

Range of Profile Characteristics of Landtype 62

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1/2 inch thick.

Surface Layers:

Very dark grayish brown to dark brown cobbly gravelly loamy sands; massive;
50 to 60 percent subangular, angular and rounded gravels, cobbles, and stones by volume;
nonsticky, nonplastic;
pH ranges from 6.0 to 7.5; 30 to 48 inches thick.

Mapping Unit 63

Mapping Unit 63 consists dominantly of Landtype 63 and minor amounts of Landtypes 13, 4, and 66.

Landtype 63 is a moderately deep, nonplastic landtype derived from residual materials. Surface soils are thin loams. Subsoils are thin to moderately thick loams and silt loams.

Bedrock is composed of competent, hard, highly to moderately fractured andesites and basalts. Depth to bedrock ranges from 3 to 6 feet.

Typically, Landtype 63 occurs on gentle, smooth, high elevation lava flows with slopes less than 35 percent.

This landtype ranges in elevation from 3,200 to 4,400 feet and supports Site Class Low III and High IV Douglas-fir.

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

Range of Profile Characteristics of Landtype 63

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1/2 to 1 1/2 inches thick.

Surface Layers:

Very dark grayish brown to dark brown loams; weak, fine, granular structure;
10 to 30 percent angular to rounded gravels, cobbles and stones by volume;
nonsticky, nonplastic,
pH ranges from 6.0 to 6.5; 13 to 19 inches thick.

Subsoil Layers:

Brown loams and silt loams;
weak, fine and medium subangular blocky structure becoming massive at depth;
10 to 35 percent angular to rounded gravels and cobbles by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges from 6.0 to 7.0; 19 to 35 inches thick.

Mapping Unit 64

Mapping Unit 64 consists dominantly of Landtype 64 and minor amounts of Landtypes 21, 44, and 61.

Landtype 64 is a moderately deep, nonplastic landtype derived from glacial till and colluvium. Surface soils are thin gravelly sandy loams and loams. Subsoils are thin to moderately thick, gravelly or cobbly sandy loams and loams.

Bedrock is composed of competent, hard, highly fractured andesites and basalts. Depth to bedrock ranges from 3 to 6 feet.

Typically, Landtype 64 occurs on moderate to steep, smooth sideslopes that have been glacially modified with slopes ranging from 40 to 80 percent.

This landtype ranges in elevation from 3,500 to 5,000 feet and supports Site Class IV Douglas-fir with Pacific silver fir, Western white pine, Western red cedar and Western hemlock.

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

Range of Profile Characteristics of Landtype 64

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 3 inches thick.

Surface Layers:

Dark brown gravelly sandy loams and fine sandy loams;
massive to weak, fine and medium granular structure;
10 to 45 percent subangular to rounded gravels and cobbles by volume;
nonsticky, nonplastic;
pH ranges from 6.0 to 6.5; 13 to 23 inches thick.

Subsoil Layers:

Dark brown to dark yellowish brown gravelly or cobbly sandy loams and loams;
massive to weak, fine and medium subangular blocky structure;
45 to 60 percent rounded to subangular gravels and cobbles by volume;
nonsticky, nonplastic;
pH ranges from 5.8 to 7.0; 15 to 35 inches thick.

Mapping Unit 66

Mapping Unit 66 consists dominantly of Landtype 66 and minor amounts of Landtypes 13, 16, 19, and 67.

Landtype 66 is a deep to very deep, nonplastic landtype derived from volcanic ejecta and glacial till. Surface soils are thin sandy loams. Subsoils are thick gravelly or cobbly sandy loams and loams.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock is usually greater than 6 feet.

Typically, Landtype 66 occurs on gentle, smooth to somewhat uneven glaciated lava flows with slopes less than 40 percent.

This landtype ranges in elevation from 2,800 to 4,100 feet and supports Site Class Low III and IV Douglas-fir, Western hemlock, Western red cedar and occasional Pacific silver fir.

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

Range of Profile Characteristics of Landtype 66

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Dark brown to dark yellowish brown sandy loams, fine sandy loams, shotty sandy loams, and loams;
to weak, fine, granular structure;
trace to 35 percent rounded to subangular gravels and cobbles by volume; nonsticky, nonplastic;
pH ranges from 5.0 to 7.0; 6 to 21 inches thick.

Subsoil Layers:

Dark yellowish brown, dark brown, and reddish brown gravelly sandy loams and loams; weak to moderate, fine and medium, subangular blocky structure becoming massive with weak to strong compaction;
40 to 70 percent rounded to subangular gravels, cobbles, and stone by volume; nonsticky, nonplastic;
pH ranges from 5.5 to 7.0; 61 to 136 inches thick.

Mapping Unit 67

Mapping Unit 67 consists dominantly of Landtype 67 and minor amounts of Landtypes 16, 19, and 66.

Landtype 67 is a moderately deep to deep, nonplastic landtype derived from glacial till and volcanic ejecta. Surface soils are thin sandy loams and loams. Subsoils are thin to moderately thick gravelly and cobbly sandy loams.

Bedrock is composed of competent, hard, andesites and basalts. Depth to bedrock ranges from 4 to 10 feet.

Typically, Landtype 67 occurs on gentle, smooth to uneven glaciated lava flows with slopes less than 40%.

This landtype ranges in elevation from 3,500 to 4,500 feet and supports Site Class IV and V Douglas-fir, Western hemlock, Pacific silver fir, Western red cedar, and occasional Engelmann spruce.

The landtype is well drained but may locally be poorly drained causing ponding. Permeability is rapid in the surface soils and rapid to slow in the subsoils.

Range of Profile Characteristics of Landtype 67

Litter:

Needles, leaves, twigs, and decomposing organic matter.
3/4 to 1 1/2 inches thick.

Surface Layers:

Very dark grayish brown to dark brown sandy loams and loams; weak, fine and very fine granular structure;
20 to 30 percent rounded to subangular gravels and cobbles by volume; nonsticky, nonplastic;
pH ranges 6.5 to 7.0; 1 1/2 to 5 inches thick.

Subsoil Layers:

Dark brown to dark gray gravelly sandy loams, and gravelly cobbly loams;
weak to moderate, fine and very find subangular blocky structures becoming massive with moderate to strong compaction at depth;
35 to 75 percent rounded to subangular gravels, cobbles, and stones by volume; nonsticky, nonplastic;
pH ranges from 6.5 to 7.0; 40 to 117 inches thick.

Mapping Unit 68

Mapping Unit 68 consists dominantly of Landtype 68 and minor amounts of Landtype 81 and 82.

Landtype 68 is a moderately deep, nonplastic landtype derived from black volcanic sands and cinders. Surface soils are thick sands and loamy sands. Subsoils are moderately thick sands and cinders.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock is usually 3 to 6 feet.

Typically, Landtype 68 occurs on moderate, smooth sideslopes with slopes ranging from 30 to 60 percent.

This landtype ranges in elevation from 3,700 to 4,300 feet and supports Site Class IV and V Douglas-fir with Pacific silver fir, Grand fir, and Western white pine.

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

Range of Profile Characteristics of Landtype 68

Litter:

Needles, leaves, twigs, and decomposing organic matter.
2 inches thick.

Surface Layers:

Very dark grayish brown sands and angular cinders; single grain;
nonsticky, nonplastic,
pH 6.0 to 6.5;
14 inches thick.

Subsoil Layers:

Dark brown to black cinders;
single grain;
nonsticky, nonplastic;
pH 6.5;
40+ inches thick.

Mapping Unit 69

Mapping Unit 69 consists dominantly of Landtype 69 and minor amounts of Landtypes 82 and 85.

Landtype 69 is a deep to very deep landtype derived from black volcanic sands overlying glacial till. Surface soils are thin sands. Subsoils are thin to thick sands over glacial till.

Bedrock is composed of competent, hard, andesite, and basalts. Depth to bedrock is greater than 8 feet.

Typically, Landtype 69 occurs on gentle, high elevation flats near recent volcanic cinder cones, with slopes less than 30 percent.

This landtype ranges in elevation from 3,700 to 4,300 feet and supports Site Class IV and V Douglas-fir.

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

Range of Profile Characteristics of Landtype 69

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 inch thick.

Surface Layers:

Black to dark brown sands;
single grain, nonsticky, nonplastic;
pH ranges from 6.0 to 6.5;
to 100+ inches,thick.

Mapping Unit 71

Mapping Unit 71 consists dominantly of Landtype 71 and minor amounts of Landtype 74.

Landtype 71 is a shallow, nonplastic landtype derived from residual and colluvial materials. Surface soils are thin sandy loams and loams. Subsoils are thin gravelly sandy loams, fine sandy loams, and loams.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock is usually less than 3 feet.

Typically, Landtype 71 occurs on steep, smooth to uneven upper sideslopes and ridges with slopes ranging from 45 to 90 percent.

This landtype ranges in elevation from 4,400 to 6,000 feet and supports True fir-Mountain hemlock type vegetation.

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

Range of Profile Characteristics of Landtype 71

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1/2 to 1 inch thick.

Surface Layers:

Very dark gray to very dark grayish brown sandy loams and loams;
weak, fine, granular structure;
trace to 45 percent angular gravels and cobbles by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges from 5.0 to 6.0; 6 to 12 inches thick.

Subsoil Layers:

Dark brown to dark yellowish brown gravelly sandy loams and loams, weak, fine and medium, subangular blocky structure;
45 to 70 percent angular gravels, cobbles and stones by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges from 5.5 to 7.0; 12 to 26 inches thick.

Mapping Unit 73

Mapping Unit 73 consists dominantly of Landtype 73 and minor amounts of Landtype 82, 92, and 93.

Landtype 73 is a shallow to moderately deep, nonplastic landtype derived from residual, glacial, and volcanic materials. Surface soils are thin sandy loams and loams. Subsoils are thin to moderately thick loams ranging to silt loams.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock is usually less than 3 feet to 6 feet.

Typically, Landtype 73 occurs on gentle, uneven high elevation flats and benches with slopes less than 30 percent. Small meadows and rock outcrops occur within this landtype.

This landtype ranges in elevation from 3,800 to 5,300 feet and supports True fir-Mountain hemlock vegetation including Western white pine, Lodgepole pine, and occasional Engelmann spruce.

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

Range of Profile Characteristics of Landtype 73

Litter:

Needles, leaves, twigs, and decomposing organic matter.
Sparse to 1/2 inch thick.

Surface Layers:

Very dark grayish brown to dark reddish brown sandy loams and loams;
weak, fine and very fine, granular structure;
5 to 25 percent subangular to rounded gravels and cobbles by volume;
nonsticky, nonplastic;
pH ranges from 5.5 to 7.0; 6 to 9 inches thick.

Subsoil Layers:

Dark reddish brown to dark brown loams, ranging to silt loams, moderate, fine and medium, subangular blocky structure becoming massive at depth;
15 to 35 percent subangular and rounded gravels and cobbles by volume;
slightly sticky, nonplastic;
pH ranges from 6.0 to 6.5; 30 to 60 inches thick.

Mapping Unit 74

Mapping Unit 74 consists dominantly of Landtype 74 and minor amounts of Landtypes 44, 64, and 71.

Landtype 74 is a moderately deep, nonplastic landtype derived from glacial till, colluvium, and volcanic materials. Surface soils are thin sandy loams and gravelly or cobbly loams. Subsoils are gravelly or cobbly sandy loams and loams.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock ranges from 3 to 6 feet.

Typically, Landtype 74 occurs on moderate, smooth to uneven sideslopes of glacial origin, with slopes ranging from 35 to 55 percent slope.

This landtype ranges in elevation from 4,800 to 5,500 feet and supports True fir-Mountain hemlock vegetation with lesser amounts of Lodgepole pine and subalpine fir. Few scattered Douglas-fir may occur at lower elevations.

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

Range of Profile Characteristics of Landtype 74

Litter:

Needles, leaves, twigs, and decomposing organic matter.
Sparse to 1 inch thick.

Surface Layers:

Very dark grayish brown to dark brown gravelly or cobbly loams and sandy loams;
weak, fine, granular structure to massive;
10 to 45 percent angular gravels and cobbles by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges from 6.0 to 6.5; 10 to 16 inches thick.

Subsoil Layers:

Dark brown to dark yellowish brown gravelly or cobbly sandy loams and loams;
moderate, fine and medium, subangular structure becoming massive at depth;
45 to 65 percent rounded, angular and subangular gravels, cobbles and stones by volume;
nonsticky to slightly sticky, nonplastic to slightly plastic;
pH ranges from 6.0 to 6.5; 28 to 32+ inches thick.

Mapping Unit 75

Mapping Unit 75 consists dominantly of Landtype 75 and minor amounts of Landtypes 73 and 74.

Landtype 75 is a moderately deep to deep, nonplastic soil derived from glacial till and volcanic materials. Surface soils are thin gravelly fine sandy loams. Subsoils are moderately thick to thick gravelly and gravelly cobbly sandy loams and fine sandy loams.

Bedrock is composed of competent, hard andesites, basalts, and volcanic breccias. Depth to bedrock ranges from 4 to 8+ feet.

Typically, Landtype 75 occurs on gentle, smooth to uneven glacial valley bottoms and cirque basins with slopes less than 35 percent.

This landtype ranges in elevation from 4,500 to 5,000+ feet and supports True fir-Mountain hemlock vegetation. Small amounts of Douglas-fir may occur at lower elevations.

The landtype is well drained but may be locally poorly drained causing ponding. Permeability is rapid to very rapid in the surface soils and rapid to moderate in the subsoils.

Range of Profile Characteristics of Landtype 75

Litter:

Needles, leaves, twigs, and decomposing organic matter.
1 1/2 to 2 inches thick.

Surface Layers:

Very dark grayish brown to very dark gray gravelly fine sandy loams and fine sandy loams;
weak, fine, granular structure to massive;
trace to 45 percent angular to rounded gravels and cobbles by volume;
nonsticky, nonplastic;
pH ranges from 5.5 to 6.5; 11 to 18 inches thick.

Subsoil Layers:

Dark brown to dark grayish brown gravelly and gravelly cobbly sandy loams; weak, fine, subangular blocky structure becoming massive with weak to moderate compaction;
35 to 70 percent subangular and rounded gravels, cobbles, and stones by volume;
nonsticky, nonplastic;
pH ranges from 5.0 to7.0; 37 to 78 inches thick.

Mapping Unit 81

Mapping Unit 81 consists dominantly of Landtype 81 and minor amounts of Landtypes 71 and 91.

Landtype 81 is a shallow, nonplastic landtype derived from black volcanic sands and cinders. Surface soils are thin loamy sands. Subsoils are thin gravelly loamy sands.

Bedrock is composed of competent hard to moderately hard volcanic materials including andesites and basalts. Depth to bedrock is usually less than 3 feet.

Typically, Landtype 81 occurs on moderate to steep, smooth to uneven sideslopes and ridges in areas adjacent to recent volcanic activity. This landtype contains up to 30 percent surface rock. Slopes are greater than 40 percent.

This landtype ranges in elevation from 4,300 to 5,000 feet and supports True fir-Mountain hemlock vegetation along with Lodgepole pine. Site Class for Lodgepole pine is VI and VII where measured.

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

Range of Profile Characteristics of Landtype 81

Litter:

Needles, leaves, twigs, and decomposing organic matter.
Sparse to 1 inch thick.

Surface Layers:

Black loamy sands; single grain;
trace of angular and subangular gravels and cobbles;
nonsticky, nonplastic;
pH ranges from 6.0 to 6.5; 3 to 7 inches thick.

Subsoil Layers:

Dark brown to dark yellowish brown loamy fine sands and gravelly loamy sands;
massive;
20 to 60 percent angular and subangular gravels and cobbles by volume;
nonsticky, nonplastic;
pH ranges from 6.5 to 7.0; 22 to 31 inches thick.

Mapping Unit 82

Mapping Unit 82 consists dominantly of Landtype 82 and minor amounts of Landtype 81 and 85.

Landtype 82 is a shallow to moderately deep landtype derived from black volcanic sands and residuum. Surface soils are thin to moderately thick sands. Subsoils are thin to moderately thick sands and loamy sands.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock ranges from less than 1 foot to greater than 5 feet.

Typically, Landtype 82 occurs on flat, benchy, lava flows near areas of recent volcanic activity. Up to 35 percent rock outcrop occurs within this mapping unit. Slopes are less than 30 percent except for small steep pitches on benches.

This landtype ranges in elevation from 4,000 to 4,500 feet and supports True fir-Mountain hemlock vegetation. Lodgepole pine is common following fires. Site Class for Lodgepole pine is VI and VII where measured.

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

Range of Profile Characteristics of Landtype 82

Litter:

Needles, leaves, twigs, and decomposing organic matter.
Sparse.

Surface Layers:

Black sands and coarse sands; single grain; trace subangular gravels and cobbles;
nonsticky, nonplastic;
pH ranges from 6.0 to 7.0;
16 to 40 inches thick.

Subsoil Layers:

Dark brown to black loamy sands and sands;
massive;
trace of subangular gravels, cobbles, and stones;
nonsticky, nonplastic, pH 6.0 to 7.0;
10 to 20 inches thick.

Mapping Unit 85

Mapping Unit 85 consists dominantly of Landtype 85 and minor amounts of Landtype 82.

Landtype 85 is a deep to very deep, nonplastic landtype derived from black volcanic sands and cinders. Surface soils are thin sands. Subsoils are thick sands and cinders.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock is usually greater than 8 feet.

Typically, Landtype 85 occurs on gentle, high-elevation flats near areas of recent volcanic activity. Slopes are usually less than 15 percent. In areas devoid of vegetation and favorable to high winds, sand "blow-outs" occur.

This landtype ranges in elevation from 3,700 to 4,500 feet and supports True fir-Mountain hemlock vegetation. Lodgepole pine is common following fires. Lodgepole pine Site Class is VI & VII where measured.

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

Range of Profile Characteristics of Landtype 85

Litter:

Needles, leaves, twigs, and decomposing organic matter.
Sparse to 1/2 inch thick.

Surface Layers:

Black angular sands;
single grain;
nonsticky, nonplastic;
pH ranges from 6.0 to 6.5;
2 to 8 inches thick.

Subsoil Layers:

Very dark grayish brown to black angular sands.
angular cindery sands and cinders;
single grain; nonsticky, nonplastic;
pH ranges from 6.5 to 7.0;
81 to 120+ inches thick.

Mapping Unit 91

Mapping Unit 91 consists dominantly of Landtype 91 and minor amounts of Landtypes 71 and 81.

Landtype 91 is a shallow, nonplastic landtype derived from volcanic ejecta, residual and colluvial materials. Surface soils are thin cobbly sandy loams. Subsoils are thin cobbly stony loams and sandy loams.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock is usually less than 3 feet.

Typically, Landtype 91 occurs on steep, smooth to moderately dissected sideslopes and ridges with slopes greater than 55 percent. Up to 30 or 40 percent stones and cobbles may be found on the soil surface.

This landtype ranges in elevation from 4,500 to 6,000 feet and supports True fir-Mountain hemlock vegetation.

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

Range of Profile Characteristics of Landtype 91

Litter:

Needles, leaves, twigs and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Very dark grayish brown, gravelly or cobbly sandy loams; weak, fine, granular structure;
40 to 70 percent rounded subangular gravels, cobbles and stones by volume;
nonsticky, nonplastic;
pH ranges from 5.5 to 6.5; 8 to 12 inches thick.

Subsoil Layers:

Dark brown, gravelly or cobbly stony sandy loams and loams;
massive;
40 to 80 percent rounded to subangular gravels, cobbles and stones by volume;
nonsticky, nonplastic;
pH ranges from 6.5 to 7.0; 14 to 24 inches thick.

Mapping Unit 92

Mapping Unit 92 consists dominantly of Landtype 92 and minor amounts of Landtypes 91 and 93.

Landtype 92 is a shallow to moderately deep, nonplastic landtype derived from volcanic ejecta (pumice and ash) and glacial till. Surface soils are thin deposits of pumice and ash. Subsoils are thin to moderately thick gravelly or cobbly sandy loams and loams.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock is usually less than 3 feet to 6 feet.

Typically, Landtype 92 occurs on high elevation glacial flats and benches with slopes less than 35 percent. Up to 30 percent rock outcrop occurs within the mapping unit.

This landtype ranges in elevation from 4,300 to 6,000 feet and supports True fir-Mountain hemlock vegetation with some Lodgepole pine and Western white pine. Site Class for Pacific silver fir is III. Noble fir IV, Mountain hemlock V and Lodgepole pine VI, where measured.

The landtype is excessively drained. Permeability is rapid to very rapid in the surface soils and rapid to slow in the subsoils.

Range of Profile Characteristics of Landtype 92

Litter:

Needles, leaves, twigs and decomposing organic matter.
Sparse to 1 inch thick.

Surface Layers:

Strong brown to light yellowish brown pumice and ash;
single grain;
nonsticky, nonplastic;
pH ranges from 6.0 to 7.0; 11 to 26 inches thick.

Subsoil Layers:

Very dark grayish brown to dark yellowish brown, gravelly or cobbly sandy loams and loams;
weak (locally moderate), fine and medium subangular blocky structure becoming massive; moderate to strong compaction at depth; 45 to 75 percent rounded to subangular gravels, cobbles, and stones by volume;
nonsticky, nonplastic;
pH ranges from 6.0 to 7.0; 29 to 59 inches thick.

Mapping Unit 93

Mapping Unit 93 consists dominantly of Landtype 93 and minor amounts of Landtypes 92 and 95.

Landtype 93 is a moderately deep to deep, nonplastic landtype derived from volcanic ejecta, (pumice and ash), glacial till, and colluvial materials. Surface soils are thin deposits of pumice and ash. Subsoils are moderately thick to thick gravelly sandy loams and loams.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock ranges from 3 feet to greater than 6 feet.

Typically, Landtype 93 occurs on high elevation glacial flats and terraces with slopes less than 40 percent.

This landtype ranges in elevation from 4,000 to 5,800 feet and supports True fir-Mountain hemlock vegetation. Occasional Douglas-fir may be present at lower elevations. Site Class III to V Pacific silver fir, where measured.

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

Range of Profile Characteristics of Landtype 93

Litter:

Needles, leaves, twigs and decomposing organic matter.
1 to 1 1/2 inches thick.

Surface Layers:

Dark yellowish brown, strong brown, and very dark gray, pumice and ash;
single grain;
nonsticky, nonplastic;
pH ranges from 6.0 to 7.0;
18 to 26 inches thick.

Subsoil Layers:

Very dark grayish brown to dark yellowish brown gravelly sandy loams and loams;
weak, fine and medium, subangular blocky structure becoming massive with moderate to strong compaction at depth;
50 to 75 percent rounded to subangular gravels, cobbles, and stones by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges from 6.0 to 7.5; 29 to 102 inches thick.

Mapping Unit 94

Mapping Unit 94 consists dominantly of Landtype 94 and minor amounts of Landtypes 91 and 95.

Landtype 94 is a moderately deep, nonplastic landtype derived from volcanic ejecta, (pumice and ash), glacial till, and colluvial materials. Surface soils are thin to moderately deep deposits of pumice and ash. Subsoils are moderately thick gravelly sandy loams and loams.

Bedrock is composed of competent, hard andesites and basalts. Depth to bedrock ranges from 3 feet to 6 feet.

Typically, Landtype 94 occurs on moderate, smooth to uneven glacial slopes of 35 to 60 percent.

This landtype ranges in elevation from 4,500 to 6,000 feet and supports True fir-Mountain hemlock vegetation.

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

Range of Profile Characteristics of Landtype 94

Litter:

Needles, leaves, twigs and decomposing organic matter.
1/2 to 1 1/2 inches thick.

Surface Layers:

Yellowish brown to strong brown pumice and ash; single grain;
nonsticky, nonplastic;
pH ranges from 6.0 to 7.0;
20 to 41 inches thick.

Subsoil Layers:

Brown to dark brown sandy loams and loams; massive;
50 to 70 percent rounded to subangular gravels, cobbles, and stones by volume;
nonsticky, nonplastic;
pH ranges from 6.0 to 7.0;
20 to 31 inches thick.

Mapping Unit 95

Mapping Unit 95 consists dominantly of Landtype 95 and minor amounts of Landtypes 93 and 94.

Landtype 95 is a deep to very deep, nonplastic landtype derived from volcanic ejecta, (pumice and ash), glacial till, and alluvium. Surface soils are thin deposits of pumice and ash. Subsoils are thick to very thick gravelly sandy loams and loams.

Bedrock is composed of competent, hard andesites and basalts and volcanic breccias. Depth to bedrock is greater than 8 feet.

Typically, Landtype 95 occurs along glacial troughs, valley bottoms, and some cirque basins with slopes less than 35 percent.

This landtype ranges in elevation from 4,500 to 5,500 feet and supports True fir-Mountain hemlock vegetation with occasional Douglas-fir at lower elevations. Site Class for Mountain hemlock is III, Noble fir IV and Douglas-fir V, where measured.

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

Range of Profile Characteristics of Landtype 95

Litter:

Needles, leaves, twigs and decomposing organic matter.
1 to 2 inches thick.

Surface Layers:

Strong brown to yellowish brown pumice and ash; single grain;
nonsticky, nonplastic;
pH ranges from 6.0 to 7.0;
20 to 26 inches thick.

Subsoil Layers:

Dark Brown to very dark grayish brown gravelly sandy loams and loams;
weak, fine, subangular blocky structure becoming massive;
moderately compact at depth;
40 to 65 percent rounded and subangular gravels, cobbles, and stones by volume;
nonsticky to slightly sticky, nonplastic;
pH ranges from 6.0 to 6.5;
76 to 120+ inches thick.

Legend of Complexes

Complex	Percent & Components
132	60% MU13, 40% MU23
133	60% MU13, 40% MU33
142	60% MU14, 40% MU23
161	50% MU16, 50% MU61
162	50% MU16, 50% MU23
164	50% MU16, 50% MU44
165	50% MU16, 50% MU25
168	50% MU16, 50% MU21
201	60% MU21, 40% MU31
201S	60% MU21, 40% MU31 SOUTH
203	35% MU21, 35% MU31, 30% MU16
210	60% MU21, 40% MU2
210S	60% MU21, 40% MU2 SOUTH
210U	60% MU21, 40% MU2 UNSUITED
212	50% MU21, 50% MU23
233	50% MU23, 50% MU33
233P	50% MU23, 50% MU33 PINE
235	50% MU23, 50% MU25
235P	50% MU23, 50% MU25 PINE
252	60% MU25, 40% MU13
255	60% MU25, 40% MU35
301	60% MU31, 40% MU21
301S	60% MU31, 40% MU21 SOUTH
310	60% MU31, 40% MU2
310S	60% MU31, 40% MU2 SOUTH
310U	60% MU31, 40% MU2 UNSUITED
311	60% MU31, 40% MU16

Complex	Percent & Components
313	50% MU31, 50% MU33
316	60% MU31, 60% MU61
335	50% MU33, 50% MU35
335P	50% MU33, 50% MU35 PINE
356	60% MU35, 40% MU16
441	50% MU44, 50% MU21
444	50% MU44, 50% MU64
571	50% MU57, 50% MU61
601	60% MU61, 40% MU31
602	60% MU61, 40% MU21
610	60% MU61, 40% MU1
610U	60% MU61, 40% MU1 UNSUITED
614	50% MU61, 50% MU64
615	60% MU61, 40% MU44
616	35% MU61, 35% MU16, 30% MU21
710	60% MU71, 40% MU1
714	50% MU71, 50% MU74
821	60% MU82, 40% MU81
825	60% MU82, 40% MU85
910	60% MU91, 40% MU1
914	60% MU91, 40% MU94
920	60% MU92, 40% MU1
923	50% MU92, 50% MU93
924	60% MU92, 40% MU94
926	60% MU92, 40% MU6
941	60% MU94, 40% MU91

Soils: Fields & Codes Reference Guide

Field (Item) Name: SRI Type
Full Name: Soil Resource Inventory soil type
Codes: (see list of soil types)

Field (Item) Name: stablility
Full Name: Natural stability
Codes:
I = Very stable
II = Stable
III = Moderately stable
IV = Unstable
V = Very unstable

Field (Item) Name: timbersuit
Full Name: Suitability for timber production
Codes:
UN = Unsuited
SU = Suited

Field (Item) Name: erosion
Full Name: Surface soil erosion potential
Codes:
SL = Slight
MOD= Moderate
SEV = Severe
VS = Very severe

Field (Item) Name: Why?UN
Full Name: Why unsuited
Codes:
RD = Regeneration difficulty
VU = Very unstable

Field (Item) Name: sediment
Full Name: Silt & clay sediment yield potential
Codes:
L = Low
M = Moderate
H = High

Field (Item) Name: site_class
Full Name: Timber site class (productivity)
Codes:
1 = Class I
2 = ClassII
3 = Class III
4 = Class IV
5 = Class V
>5 = less productive than Class V

Field (Item) Name: wateryield
Full Name: Water yield class
Codes:
I = ClassI
II = Class II
III = Class III

The fields and codes displayed here come from the ArcInfo polygon attribute table file for the soils layer. In ArcInfo each soil type or soil complex will have these attributes attached to it. Following this table is a brief explanation of each field (item). This information is for use with ArcInfo and ArcView data sets.

Soils: Fields & Codes Description

Field Name	Full Name
Timbersuit	Suitability for timber production
Why?UN	Why unsuited
Site-class	Timber site class
Stability	Natural stability
Erosion	Surface soil erosion potential
Sediment	Silt & clay sediment yield potential
Wateryield	Water yield class

Suitability for Timber Production

In general this classification refers to the suitability of the land to maintain timber production. Unsuited and unmanageable landtypes occur in two basic categories: those that are unregenerable and those where timber harvest will cause irreversible resource damage.

Regeneration Difficulty	Landtypes that are either noncommercial forest land or non reforestable within five years.
Irreversible Resource Damage (Instability)	Landtypes where timber harvest will result in irreversible resource damage primarily because they are actively unstable or potentially highly unstable

Timber Site Classes

Class limits correspond to height (site index) of Douglas-fir at 100 years. This is a combined evaluation of measured and observed production of timber and forage types.

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.

Natural Stability

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

I.	**Very stable**	No evidence of failure.
II.	**Stable**	Occasional failures are observed.
Ill.	**Moderately stable**	Several failures are observed.
IV.	**Unstable**	Many failures are observed.
V.	**Very unstable**	Entire area shows evidence of recent and past failures.

Surface Soil Erosion Potential

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

Very slight	Practically no loss of surface soil materials is expected.
Slight	Little loss of soil materials is expected. Some minor sheet and rill erosion may occur.
Moderate	Some loss of surface soil materials can be expected. Rill erosion and some small gullies or sheet erosion may be occurring. Sheet erosion can be determined by some soil pedestals and observable accumulation of soil materials along the upslope edge of rocks and debris. At this level of erosion there is a possible fertility loss.
Severe	Considerable loss of surface soil materials can be expected. Rill erosion, numerous small gullies or evidence that considerable loss from sheet erosion may occur. Sheet erosion is indicated by frequent occurrence of soil pedestals and considerable accumulation of soil materials along the upslope edge of rocks and debris. This is accompanied by a probable fertility loss.
Very severe	Large loss of surface soil material can be expected in the form of many large gullies and/or numerous small gullies or large loss from sheet erosion. Sheet erosion loss is exhibited by numerous examples of soil pedestals and extensive accumulation of soil materials along the upslope edge of rocks and debris. This is accompanied by a fertility loss.

Silt and Clay Sediment Yield Potential

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

Low	Sedimentation levels of silt and clay particles are not expected to be significant following management activities. Soils are generally moderately coarse-textured.
Moderate	Sedimentation levels of silt and clay particles may be significantly increased following management activities with moderate loss of water quality and damage to fisheries. Soils are generally medium textured.
High	Sedimentation levels of silt and clay particles are expected to be high following management activities. Streams become turbid and there is considerable loss of water quality and damage to fisheries. Soils are generally fine to moderately fine-textured.

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 11	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.