MALHEUR NATIONAL FOREST

SOIL RESOURCE INVENTORY

Pacific Northwest Region

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PURPOSE AND PREFACE

This Soil Resource Inventory of the Malheur National Forest was made to provide basic soil, bedrock, and landform information for land use planning, as a base for extensive project planning and preliminary design, and land management decision-making. The inventory is part of the Regional soils program developed by the Soils Group of Watershed. It also is part of the overall "Soil Resource Data Bank" on the Forest. The Soil Resource Inventory will provide soils information to the land manager as an aid to multiple use management as directed by Public Law 86-517. The 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.

The Soil Resource Inventory will also help the Malheur National Forest meet its soil resource objective which is: Soil Characteristics (one basic component of the ecosystem) will establish capabilities and control practices within the ecosystem.

The Soil Resource Inventory Report is divided into three parts. They are: Soil Resource Inventory of the Malheur National Forest - Basic Soil Information and Interpretive Tables; Soil Resource Inventory - Atlas of Maps; and Malheur National Forest Soil Resource Inventory Field Book. The Field Book is designed as a ready reference book for land managers to take to the field and will be periodically recalled and updated.

Field mapping was conducted from August 1970 through July 1973 by Soil Scientist Garwin Carlson and Earle Rother. Supervision was provided by Loren Herman. Report was written by Garwin Carlson. During the course of the survey, valuable assistance, advice and cooperation received from Forest personnel was sincerely appreciated.

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USE

The Soil Resource Inventory (SRI) has its primary use at the planning level. Soils, landforms, and bedrock characteristics are defined at an 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 technical specialists, including soil scientists.

There are many uses for the information in this report. Some are quite simple and apparent, while others have not yet been conceived. The real work lies ahead in effectively and fully using this information. The use of this information is achieved best by those with full understanding of the interrelationships of the basic earth features.

Land managers and planners in the different functional fields can get soil resource information from this report. They can get a broad overview of the soils, their hazards, and limitations. Problem areas can be determined on a broad scale and priorities set for areas needing more detailed soils information. In order to facilitate its use, a key is furnished for the different functional fields, emphasizing the different sections that are important in their respective fields.

KEY TO USE

TIMBER

Basic Soils Information and Interpretive Tables

Soil Interpretation Tables
Check all the soil interpretations

Table of Landtype Features and Qualities:
1. Depth of soil to bedrock
2. Soil texture
3. Drainage class

Mapping Unit and Landtype Descriptions

Hydrologic Interpretations
Plant Available Water

Landtype Bedrock Characteristics Table
1. Composition
2. Fracture System

Landtype Vegetative Characteristics Table
1. Plant Community Type
2. Production Potentials

Soil Resource Inventory Field Book

RANGE

Basic Soils Information and Interpretive Tables

Soil Interpretation Tables
1. Erosion Tables
2. Detrimental Compaction Hazard
3. Mixing and Displacement Hazard
4. Potential for High Surface Soil Temperatures
5. Frost Heave Potential
6. Potential Fertilizer Response

Table of Landtype Features and Qualities
1. Depth of Soil to Bedrock
2. Drainage Class

Mapping Unit and Landtype Descriptions

Hydrologic Interpretations
Plant Available Water

Landtype Vegetation Characteristics Table
1. Vegetative Covers
2. Production Potentials
3. Plant Community Types

Soil Resource Inventory Field Book
Constraints

ENGINEERING

Basic Soil Information and Interpretive Tables:

Soil Interpretation Tables
1. Erosion Tables
2. Stability
3. Dustiness Hazard
4. Muddiness Hazard

Table of Landtype Features and Qualities
1. Percent Slope Range
2. Depth of Soil to Bedrock
3. Drainage Class
4. Engineering Classification (Unified)

Mapping Unit and Landtype Descriptions

Landtype Bedrock Characteristics Table
1. Bedrock Composition
2. Fracture System
3. Hardness

Soil Resource Inventory Field Book
Constraints

FIRE

Basic Soils Information and Interpretive Tables

Soil Interpretation Tables:
1. Erosion Tables
2. Detrimental Compaction Hazard
3. Mixing and Displacement Hazard

Mapping Unit and Landtype Descriptions

Landtype Vegetative Characteristic Tables

Soil Resource Inventory Field Book
Constraints

LANDS OR LAND EXCHANGES

Basic Soils Information and Interpretive Tables

Mapping Unit and Landtype Descriptions

Landtype Vegetative Characteristics Table
Annual Production Potential

WATERSHED

Basic Soils Information and Interpretive Tables

Soil Interpretation Tables
Erosion Tables

Table of Landtype Features and Qualities
1. Landform
2. Depth of Soil to Bedrock
3. Effective Rooting Depth
4. Permeability
5. Infiltration
6. Surface Drainage Intensity and Pattern

Mapping Unit and Landtype Descriptions

Hydrologic Interpretations - all aspects

Landtype Vegetative Characteristics Tables

Soil Resource Inventory Field Book

DEFINITIONS OF SYMBOLS AND NUMBERS FOUND ON THE SOIL MAPS

This section defines the numbers and symbols found on the soil maps.

Mapping Units and Landtypes

Mapping units are shown on the soil maps as numbers. Mapping units contain a dominant landtype which accounts for at least 70 percent of the mapping unit 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

Commonly, two or three numbers (46/47,41/46/85) occur in a mapping delineation. This is called a Mapping Unit Complex. The mapping units within these delineations are present in an arrangement too complex or too small to separate at the one-inch per mile scale. Where a two-mapping-unit complex occurs, each mapping unit makes up 40 to 60 percent of the complex, and for a three-mapping-unit complex, each mapping unit makes up 30 to 40 percent of the complex. Refer to each mapping unit for information desired.

Miscellaneous Mapping Units

Mapping Units 1, 3, 5, 7, 8, 9, 10 and 16 are considered miscellaneous landtypes that are too variable to be described by a profile description. They are described by a short narrative description. Soil materials are too variable to make some of the interpretations. More detailed mapping is necessary if additional information is needed.

Unstable Areas

If the mapping unit has an X suffix such as 48X, this denotes that the delineated area has had slides and slumps in the past. More intensive investigation is advised if an activity is planned in those areas.

Symbols

Symbols used in this survey are listed below:

 - Rock outcrop

8X, 48X - Unstable areas

 - Wet spots and small marshes

 - Modal site locations site where sample taken

 - Avalanche or debris slide track

SOIL HAZARD RATINGS

Mapping Unit	Surface Erosion	Compaction	Displacement	Puddling	Natural Stability
1	L	M-H	L	L-H	VS
3	L-M	M-H	L	L-H	VS
5	L	M	H	L	VS
7	L-H	M-H	M	L-H	S-MS
8	L-H	M-H	M	L-M	S-US
9	L-M	M	H	L	S-US
10	L-M	M	H	L	S-US
11	L	H	M	L	VS
12	L	M	M	L	VS
13	M	H	M	L	VS
14	L	M	H	L	VS
15	L	L-M	M	L	VS
16	NR	NR	NR	NR	Variable
17	L-M	M	H	L	S
18	M-H	L-M	L-M	L	S
19	L-M	M	H	L	S
31	L-M	M	M	L	VS
32	M	M	H	L	VS
33	H	M	M	L	VS
34	VH	L-M	M	L	VS
35	VH	L-M	L	L	VS
36	M	M	H	L	VS
37	M-H	L-M	L	L	VS
41	L-M	M-H	L-M	L	VS
42	M	M	H	L	VS
43	M-H	M-H	L-M	L	S
44	VH	L-M	L-M	L	S-VS
45	VH	L-M	M	L	S-VS
46	M-H	L-M	L-M	L	VS
47	H	L	L-M	L	VS
48	M	M	H	L	S
58	L	M	H	L	VS
59	M	M	H	L	S
62	L-M	L	H	L	S-VS
63	M	M	H	L	S-VS
65	L-M	M	H	L	S-VS
68	M-H	M-H	M-H	L	S-VS
71	L	M-H	M	L	VS
73	VH	L-M	M	L	S
74	VH	L-M	L	L	VS
75	L	M	H	L	VS
77	H	L	L	L	VS
81	M-H	H	L	M-H	MS-S
82	L	M	H	L	MS-S
83	L	M	H	L	S
85	H	L	L	M	S
86	M	M	H	L	MS-S
87	VH	L	L	M	S
88	M-H	M-H	L	M-H	MS-S
94	L-M	M	H	L	VS

Mapping Unit	Surface Erosion	Compaction	Displacement	Puddling	Natural Stability
95	L	M	H	L	VS
96	M-H	M-H	L-M	L	VS
97	VH	L-M	L-M	L	S
98	H	L	L	L	VS
99	VH	L	L	L	S
114	L	M	H	L	S-VS
121	L-M	M-H	M	L	VS
122	M	M	H	L	S
123	M-H	M-H	M	L	S
124	L	M	H	L	VS
125	H	L-M	L	L	VS
126	M	M	H	L	S
127	L	M	H	L	VS
128	VH	L-M	L	L	S
132	M	M	H	L	VS
133	M-H	L-M	M	L	VS
134	VH	L	M	L	VS
141	L-M	M-H	L-M	L	VS
142	L	M	H	L	VS
143	M-H	M-H	L-M	L	S
148	M	M	H	L	S
158	L	M	H	L	VS
159	M	M	H	L	S
162	M	M	H	L	VS
163	M-H	L	M	L	VS
164	L	M	H	L	VS
166	M	M	H	L	VS
167	L	M	H	L	VS
168	VH	L	L-M	L	VS
172	L-M	M	H	L	VS
176	L-M	M	H	L	VS
181	M-H	M-H	L	H	MS-VS
182	L	M	H	M-H	MS-S
183	L	M	H	M-H	MS-S
184	H	M-H	L	M	S
185	M-H	M-H	L	H	MS-S
186	M	M	H	L-M	MS
187	VH	L-M	L	M	S
188	H	H	L	M-H	MS
189	M	M	H	L-M	MS-S

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL INTERPRETATIONS

			EROSION RELATED TO ROADS					STABILITY HAZARD	
Land-type	Surface Soil Erosion Potential [1]	Subsoil Erosion Potential [2]	Dry Ravel Potential on Natural Slopes	Cutslope Erosion Potential [3]	Fillslope Erosion Potential	Dry Ravel on Cuts & Fills	Erosion Potential on Road Running Surface (unsurfaced)	Natural Stability [4]	Expected Stability Changes from Road Building
1	Low [5]	Moderate	Low	Low	Low to moderate	Low	Low	Very stable	Unchanged
3	Low [5]	Moderate	Low	Low	Low to moderate	Low	Low	Very stable	Unchanged
5	Low [5]	Moderate	Low	Moderate	Moderate	Low	Moderate to high	Very stable	Unchanged
7	High	Variable	Moderate to high	Not rated	Low	Moderate to high	Moderate	Stable to moderately stable	Increased slump potential
8	High	Variable	Moderate	Moderate	Moderate	Moderate	Moderate	Stable to unstable	Increased slump potential
9	Very high	Variable	Low	High	High	Low to moderate	Moderate to high	Stable to unstable	Increased slump potential
10	Very high	Variable	Low	High	High	Low to moderate	High	Stable to unstable	Increased slump potential
11	Low	Moderate	Low	Moderate	Moderate	Low to moderate	Low to moderate	Very stable	Unchanged
12	Low	Low	Low	Low	Low	Moderate	Low	Very stable	Unchanged
13	Moderate	Moderate	Low	Moderate	Moderate	Low	Moderate	Very stable	Unchanged
14	Low to moderate	Low	Low	Moderate	Moderate	Low to moderate	Moderate	Very stable	Unchanged
15	Low	Low	Low	Low	Low	High	Low	Very stable	Unchanged
16	Not rated	Not rated	Variable	Not rated	Not rated	Variable	Not rated	Variable	Variable
17	High	Moderate	Low	Moderate	High	Low to moderate	Moderate to high	Stable	Unchanged
18	Moderate	Moderate	Low to moderate	Moderate	High	Low to moderate	Moderate	Stable	Unchanged
19	Very high	High	Low	High	High	Low to moderate	High	Stable	Increase in small slumps (less than 50 cu. yrds.) in road cuts.
31	Low	Moderate	Low	Low	Low	Moderate	Low	Very stable	Bedrock failures may occur where the bedrock has an adverse bedding plane.
32	High to very high	High	Low	Moderate	Moderate	High	Moderate to high	Very stable	Bedrock failures may occur where the bedrock has an adverse bedding plane.
33	High	High	Moderate	Moderate	Moderate	High	Low to Moderate	Very stable	Bedrock failures may occur where the bedrock has an adverse bedding plane.
34	High	High	Moderate to high	Low	Low	High	Low	Very stable	Bedrock failures may occur where the bedrock has an adverse bedding plane.
35	High	Not rated	High	Not rated	Low	High	Low	Very stable	Bedrock failures may occur where the bedrock has an adverse bedding plane.
36	Very high	High	Low	High	High	High	Moderate to high	Very stable	Bedrock failures may occur where the bedrock has an adverse bedding plane.
37	Moderate	Not rated	Low	Not rated	Low	Moderate	Low	Very stable	Bedrock failures may occur where the bedrock has an adverse bedding plane.
41	Low to moderate	Low to moderate	Low	Low	Moderate	Low	Moderate	Very stable	Unchanged
42	Low to moderate	Low to moderate	Low	Moderate	Moderate	Low	Moderate	Very stable	Unchanged
43	High	High	Moderate	Moderate	Moderate	Moderate	Moderate	Stable	Increased potential for slumps & bedrock failures along interflow zones.

1/ When protective vegetation and litter are removed.
2/ Erosion potential after 8" of soil material has been removed.
3/ Soils less than 8" deep not rated.
4/ Mapping Units with an "X" behind the MU number on the soil field sheets (i.e., 8X, 48X) have had slides & slumps in the past. They will be more unstable and should have more intensive investigation if an activity is planned in those areas.
5/ Has high potential for gully erosion.

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TABLE OF SOIL INTERPRETATIONS

				EROSION RELATED TO ROADS				STABILITY HAZARD	
Land-type	Surface Soil Erosion Potential [1]	Subsoil Erosion Potential [2]	Dry Ravel Potential on Natural Slopes	Cutslope Erosion Potential [3]	Fillslope Erosion Potential	Dry Ravel on Cuts & Fills	Erosion Potential on Road Running Surface(unsurfaced)	Natural Stability [4]	Expected Stability Changes from Road Building
44	High	High	Moderate	Low	Low	Moderate	Low	Very stable to stable	Increased potential for slumps & bedrock failures along interflow zones.
45	High	Not rated	Moderate to high	Not rated	Low	Moderate	Low	Very stable to stable	Increased potential for slumps and bedrock failures along interflow zones.
46	Moderate	Moderate	Low	Low	Low	Low	Low	Very stable	Unchanged
47	Moderate	Not rated	Low	Not rated	Low	Low	Low	Very stable	Unchanged
48	High to very high	High	Low to moderate	Moderate	Moderate	Moderate	Moderate to high	Stable	Increased potential for slumps & bedrock failures along interflow zones.
58	Moderate	Moderate	Low	Moderate	High	Low	High	Very stable	Unchanged
59	Very high	High	Low	High	High	Moderate	High	Stable	Increased potential for slumps & bedrock failures along interflow zones.
62	Low to moderate	High	High	High	High	High	High	Very stable to stable	Increased potential for slumps on road cuts.
63	High to very high	Moderate to high	Low to moderate	High	High	Low to moderate	High	Very stable to stable	Unchanged
65	High to very high	Moderate to high	Low to moderate	Moderate	Moderate	Low to moderate	High	Very stable to stable	Unchanged
68	Moderate to high	Moderate to high	Low to moderate	Moderate	Moderate	Low to moderate	Moderate to high	Very stable to stable	Unchanged
71	Low	Low to moderate	Low	Low	Moderate	Low	Moderate to high	Very stable	Unchanged
73	High	High	Moderate to high	Low	Low	Moderate	Low	Stable	Increased potential for small slumps (less than 50 cu. yds.) on road cuts.
	derate	Moderate to high	Low	Low	Low	Low	Low	Very stable	Unchanged
75	Moderate	Low to moderate	Low	Moderate	Moderate	Low	Moderate to high	Very stable	Unchanged
77	Low	Not rated	Low	Not rated	Low	Low	Low	Very stable	Unchanged
81	Low to moderate	Moderate	Low	Moderate	Moderate	Low	Moderate	Stable to moderately stable	Moderate increase in small (less than 50 cu. yds.) slumps on road cuts.
82	Low to moderate	Moderate	Low	Moderate	Moderate	Low	Moderate	Stable to moderately stable	Moderate increase in small (less than 50 cu.yds.) slumps on road cuts.
83	Moderate	Moderate	Low	Moderate	High	Low	Moderate to high	Stable	Moderate increase in small (less than 50 cu. yds.)slumps on road cuts.
85	Moderate	High	Low	Low	Low	Low	Low to moderate	Stable	Unchanged
86	Very high	High	Low	Moderate	Moderate	Low	Moderate to high	Stable to moderately stable	Moderate increase in small (less than 50 cu.yds.) slumps on road cuts.
87	High	High	Low to moderate	Low	Low	Low	Low to moderate	Stable	Unchanged.
88	High	High	Low to moderate	Moderate	Moderate	Low	Moderate	Stable to moderately stable	Moderate increase in small (less than 50 cu. yds.) slumps on road cuts.
94	Moderate to high	Moderate to high	Low	High	High	Moderate	High	Very stable	Unchanged
95	Moderate	High	Low	Moderate	Moderate	Moderate	Moderate	Very stable	Moderate potential for road-cut and fill failures.

1/ When protective vegetation and litter are removed.
2/ Erosion potential after 8" of soil material has been removed.
3/ Soils less than 8" deep not rated.
4/ Mapping Units with an "X" behind the MU number on the soil field sheets (i.e., 8X, 48X) have had slides & slumps in the past. They will be more unstable and should have more intensive investigation if an activity is planned in those areas.

TABLE OF SOIL INTERPRETATIONS

				EROSION RELATED TO ROADS				STABILITY HAZARD	
Land-type	Surface Soil Erosion Potential [1]	Subsoil Erosion Potential [2]	Dry Ravel Potential on Natural Slopes	Cutslope Erosion Potential [3]	Fillslope Erosion Potential	Dry Ravel on Cuts & Fills	Erosion Potential on Road Running Surface(unsurfaced)	Natural Stability [4]	Expected Stability Changes from Road Building
96	Moderate	High	Low	Moderate	Moderate	Moderate	Moderate	Very stable	Moderate potential for road cut and fill failures.
97	Very high	High	High	High	High	Moderate	Moderate	Stable	Moderate potential for road cut and fill failures.
98	High	Not rated	Moderate	Not rated	Low	Moderate	Moderate	Very stable	Moderate potential for road cut and fill failures.
99	Very high	Not rated	High	Not rated	Low	Moderate	Moderate	Stable	Moderate potential for road cut and fill failures.
114	Moderate to high	Moderate to high	Low	High	High	Low to moderate	High	Very stable to stable	Increase in small slumps (less than 50 cu. yds.) in road cuts.
121	Low	Moderate	Low	Low	Moderate	Moderate to high	Low	Very stable	Unchanged
122	High to very high	High	Low	Moderate	Moderate	Moderate to high	Moderate to high	Stable	Unchanged
123	High	High	Low to moderate	Moderate	Moderate	Moderate	Moderate	Stable	Unchanged
124	Low to moderate	Moderate	Low	Moderate	Moderate	Moderate to high	Moderate	Very stable	Unchanged
125	Moderate	High	Low	Low	Low	Moderate to high	Low	Very stable	Unchanged
126	Very high	High	Low	High	High	Moderate to high	High	Stable	Unchanged
127	Low to moderate	Moderate	Low	Moderate	High	Moderate to high	High	Very stable	Unchanged
128	High	High	Moderate to high	Low	Moderate	Moderate to high	Low	Stable	Unchanged
132	High to very high	High	Low	Moderate	Moderate	Moderate	Moderate to high	Very stable	Unchanged
133	High	High	Moderate	Moderate	Moderate	Moderate	Low to moderate	Very stable	Unchanged
134	High	High	Moderate to high	Low	Low	High	Low	Very stable	Unchanged
141	Low	Low to moderate	Low	Low	Moderate	Low	Moderate	Very stable	Unchanged
142	Low to moderate	Low to moderate	Low	Moderate	Moderate	Low	Moderate	Very stable	Unchanged
143	High	High	Moderate	Moderate	Moderate	Moderate	Moderate	Stable	Slight increase in small (less than 50 cu. yds.) slump potential in road cuts.
148	High to very high	High	Low to moderate	Moderate	Moderate	Moderate	Moderate to high	Stable	Slight increase in small (less than 50 cu.yds.) slump potential in road cuts.
158	Moderate	Moderate	Low	Moderate	High	Low	High	Very stable	Unchanged
159	Very high	High	Low	High	High	Moderate	High	Stable	Slight increase in small (less than 50 cu.yds.) slump potential in road cuts.
162	High to very high	High	Low	Moderate	Moderate	Moderate	Moderate to high	Very stable	Slight increase in small (less than 50 cu.yds.) slump potential in road cuts.
163	High	High	Moderate	Moderate	Low to moderate	Moderate	Moderate	Very stable	Slight increase in small (less than 50 cu.yds.) slump potential in road cuts.
164	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Very stable	Unchanged

1/ When protective vegetation and litter are removed.
2/ Erosion potential after 8" of soil material has been removed.
3/ Soils less than 8" deep not rated.
4/ Mapping Units with an "X" behind the MU number on the soil field sheets (i.e., 8X, 48X) have had slides & slumps in the past. They will be more unstable and should have more intensive investigation if an activity is planned in those areas.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL INTERPRETATIONS

Land-type	EROSION RELATED TO ROADS							STABILITY HAZARD	
	Surface Soil Erosion Potential [1]	Subsoil Erosion Potential [1/2]	Dry Ravel Potential on Natural Slopes	Cutslope Erosion Potential [3]	Fillslope Erosion Potential	Dry Ravel on Cuts & Fills	Erosion Potential on Road Running Surface(unsurfaced)	Natural Stability [4]	Expected Stability Changes from Road Building
166	Very high	High	Low	High	High	Moderate	High	Very stable	Slight increase in small (less than 50 cu. ft.) slump potential in road cuts.
167	Moderate	Moderate	Low	High	High	Moderate	High	Very stable	Unchanged
168	High	High	Moderate to high	Low	Low	Moderate	Low	Very stable	Slight increase in small (less than 50 cu. ft.) slump potential in road cuts.
172	Moderate to high	High	Low surface-high subsoil	Moderate	High	High	High	Very stable	Slight increase in small (less than 50 cu. yds) slump potential in road cuts.
176	Moderate to high	High	Low surface-high subsoil	Moderate	High	High	High	Very stable	Slight increase in small (less than 50 cu. yds.) slump potential in road cuts.
181	Low to moderate	Moderate	Low	Moderate	High	Low	Moderate	Moderately stable to unstable	Greatly increased potential for slumps in road cuts.
182	Moderate	Moderate	Low	Moderate	High	Low	Moderate	Stable to moderately stable	Moderate increase in potential for slumps road cuts.
183	Moderate	Moderate	Low	Moderate	High	Low	Moderate to high	Stable to moderately stable	Some increased potential for slumps in road cuts.
184	Moderate	Moderate	Low	Low	Low	Low	Moderate	Stable	Unchanged
185	Low to moderate	Low to moderate	Low	Moderate	High	Low	Moderate	Stable to moderately stable	Moderate increase in potential for slumps in road cuts.
186	High to very high	High	Low	Moderate	Moderate	Low	Moderate to high	Moderately stable	Moderate increase in potential for slumps in road cuts.
187	High	High	Low to moderate	Low	Low	Low to moderate	Moderate	Stable	Unchanged.
188	High	High	Low	Moderate	Moderate	Low	Moderate	Moderately stable	Moderate increase in potential for slumps in road cuts.
[illegible]	ery high	High	Low	High	Moderate	Low	High	Stable to moderately stable.	Moderate increase in potential for slumps in road cuts.

1/ protective vegetation and litter are removed.
2/ Erosion potential after 8" of soil material has been removed.
3/ Soils less than 8" deep not rated.
4/ Mapping Units with an "X" behind the MU number on the soil field sheets (i.e., 8X, 48X) have had slides & slumps in the past. They will be more unstable and should have more intensive investigation if an activity is planned in those areas.

SOIL RESOURCE INVENTORY
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TABLE OF SOIL INTERPRETATIONS

not Roads

Land-type	Detrimental Compaction Hazard	Mixing and Displacement Hazard	Dustiness Hazard	Muddiness Hazard	Potential for High Surface Soil Temperature [1/]	Frost Heave Potential [2/]	Potential Fertilizer Response
1	High	Low	Low	High	Low	Low	Moderate to high
3	High	Low	Low	Moderate to high	Low to moderate	Low to moderate	Moderate to high
5	Low	High	High	Low	Low	High [1/]	High
7	Low	Moderate	Low	Low	High	Low	Low
8	Low to moderate	Moderate	Moderate	Low to moderate	High	Low	Low
9	Low	Moderate	High	Low	Moderate	Moderate [1/]	Moderate
10	Low	High	High	Low	Low	High [1/]	High
11	High	Moderate	Moderate	High	Moderate to high	Low	Low
12	Low	Moderate	Moderate	Low	Moderate to high	Low	Low
13	High	Moderate	Moderate	High	Moderate to high	Low	Low
14	Low	Moderate	Moderate	Low	Moderate	Moderate [1/]	Moderate
15	Low	Moderate	Low	Low	High	Low	Low
16	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
17	Surface-low Subsoil-moderate	Surface-high Subsoil-low	Surface-high Subsoil-low	Low	Low	High [1/]	Moderate
18	Low to moderate	Low to moderate	Moderate	Moderate	Low	Moderate	Low
19	Surface-low Subsoil-low	Surface-high Subsoil-low	Surface-high Subsoil-low	Low	Low	High [1/]	Moderate
31	Low	Moderate	Moderate	Low	High	Low	Low
32	Low	Moderate	High	Low	Moderate	Moderate [1/]	Moderate
33	Low	Moderate	Moderate	Low	High	Low	Low
34	Low	Moderate	Moderate	Low	High	Low	Low
35	Low	High	Moderate	Low	High	Low	Low
36	Low	High	High	Low	Low	High [1/]	High
37	Low	Moderate to high	Moderate	Low	High	Low	Low
41	Moderate to high	Low to moderate	Moderate	Moderate to high	High	Low	Low
42	Low to moderate	Moderate	High	Low to moderate	Moderate	Moderate [1/]	Moderate
43	Moderate to high	Low to moderate	Moderate	Moderate to high	High	Low	Low
44	Low to moderate	Low to moderate	Low to moderate	Low to moderate	High	Low	Low
45	Low	Moderate	Low	Low	High	Low	Low
46	Low to moderate	Low to moderate	Low to moderate	Low to moderate	High	Low to moderate	Low
47	Low	Low to moderate	Low	Low	High	Low to moderate	Low
48	Low to moderate	Moderate	High	Low to moderate	Moderate	Moderate [1/]	Moderate
58	Low	High	High	Low	Low	High [1/]	High
59	Low	High	High	Low	Low	High [1/]	High
62	Low	High	Low	Low	High	Low	Low
63	Low	High	High	Low	Low	High [1/]	High
65	Low	High	High	Low	Moderate	Moderate [1/]	Moderate
68	Low	Moderate to high	High	Low to moderate	High	Low	Low
71	Low	Moderate	Moderate	Moderate	High	Low	Low

1/ Rated with protective cover removed.
2/ Ash surface soils are rated moderate to high without ground cover or litter, and low with ground cover.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL INTERPRETATIONS

Land-type	Detrimental Compaction Hazard	Mixing and Displacement Hazard	Dustiness Hazard	Muddiness Hazard	Potential for High Surface Soil Temperature [1]	Frost Heave Potential [2]	Potential Fertilizer Response
73	Low	Moderate	Moderate	Low	High	Low	Low
74	Low	Moderate	Moderate	Low	High	Low to moderate	Low
75	Low	Moderate	High	Low	Moderate	Moderate [1]	Moderate
77	Low	Low	Low	Low	High	Low to moderate	Low
81	High	Low	Low	High	High	Low	Moderate
82	Surface-low Subsoil-high	Moderate Low	High Low	Low to moderate	Moderate	Moderate [1]	Moderate to high
83	Surface-low Subsoil-high	High-surface Low-subsoil	High Low	Low	Low	High [1]	High
85	High	Low	Low	Moderate to high	High	Low to moderate	Low
86	Surface-low Subsoil-high	Surface-moderate Subsoil-low	High Low	Low to moderate	Moderate	Moderate [1]	Moderate
87	High	Low	Low	Moderate to high	High	Low	Low
88	High	Low	Low	High	High	Low	Low
94	Surface-Low Subsoil-Moderate	Surface-High Subsoil-Low to moderate	High	Low	Low	High [1]	High
95	Surface-Low Subsoil-Moderate	Surface-Moderate Subsoil-Low to moderate	High	Low to moderate	Low-moderate	Moderate [1]	Low
96	Moderate	Low to moderate	Moderate	Moderate	High	Low	Low
97	Moderate	Low to moderate	Moderate	Moderate	High	Low	Low
	Low	Moderate to high	Low	Low	High	Low to moderate	Low
	Low	Moderate to high	Low	Low	High	Low	Low
[illegible]	Low	High	High	Low	Low	High	High
121	Low	Moderate	Moderate	Low to moderate	High	Low	Low
122	Low	Moderate	High	Low	Moderate to low	Moderate [1]	Moderate
123	Low	Moderate	Moderate	Low to moderate	High	Low	Low
124	Low	Moderate	High	Low	Moderate to low	Moderate [1]	Moderate
125	Low	Moderate	Moderate	Low	High	Low to moderate	Low
126	Low	Surface-high Subsoil-moderate	High	Low	Low	High [1]	High
127	Low	Surface-high Subsoil-moderate	High	Low	Low	High [1]	High
128	Low	Moderate	Moderate	Low	High	Low	Low
132	Moderate	Moderate	High	Low	Moderate	Moderate [1]	Moderate
133	Moderate	Moderate	Moderate	Moderate	High	Low	Low
134	Low	Moderate	Moderate	Low to moderate	High	Low	Low
141	Moderate to high	Low to moderate	Moderate	Moderate	High	Low	Low
142	Low to moderate	Moderate	High	Low to moderate	Low to moderate	Moderate [1]	Moderate
143	Moderate to high	Low to moderate	Moderate	Moderate	High	Low	Low
148	Low to moderate	High	High	Low to moderate	Low to moderate	Moderate [1]	Moderate
158	Low	High	High	Low	Low	High [1]	High
159	Low	High	High	Low	Low	High [1]	High

1/ Rated with protective cover removed.
2/ Ash surface soils are rated moderate to high without ground cover or litter, and low with ground cover.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL INTERPRETATIONS

Land-type	Detrimental Compaction Hazard	Mixing and Displacement Hazard	Dustiness Hazard	Muddiness Hazard	Potential for [1] High Surface Soil Temperature	Frost Heave [2] Potential	Potential Fertilizer Response
162	Low	Moderate	High	Low	Low to moderate	Moderate [1]	Low to moderate
163	Moderate to high	Moderate	Low to moderate	Moderate	Moderate to high	Low	Low
164	Low	Moderate	High	Low	Low	Moderate [1]	Moderate
166	Low	Surface-High Subsoil-moderate	High	Low	Low	High [1]	High
167	Low	Surface-High Subsoil-Moderate	High	Low	Low	High [1]	High
168	Moderate to high	Moderate	Low to moderate	Moderate	High	Low	Low
172	Low	High	High	Low	Moderate	Moderate [1]	Low
176	Low	High	High	Low	Low	High [1]	Moderate to high
181	High	Low	Low	High	Moderate to high	Low	Moderate
182	Surface-low Subsoil-high	Surface-moderate Subsoil-low	Surface-high Subsoil-moderate	Low to moderate	Moderate	Moderate [1]	Moderate
183	Surface-low Subsoil-high	Surface-high Subsoil-low	High	Low	Low	High [1]	High
184	Moderate	Low	Low	High	High	Low to moderate	Low
185	High	Low	Low	High	Moderate	Low	Moderate
186	Surface-low Subsoil-high	Surface-moderate Subsoil-low	High	Low to moderate	Low to moderate	Moderate [1]	Moderate
187	Moderate	Low	Low	High	High	Low	Low
188	High	Low	Low	Moderate to high	High	Low	Low
189	Surface-low Subsoil-high	Surface-high Subsoil-low	High	Low	Low	High [1]	High

1/ Rated with protective cover removed.
2/ Ash surface soils are rated moderate to high without ground cover or litter, and low with ground cover.

TABLE OF LANDTYPE FEATURES AND QUALITIES

type	Landform	General Aspect	% Slope Range	Bedrock Composition	Depth of Soil to Bedrock (inches) 3/	Effective Rooting Depth (inches) 4/	Texture 1/	Estimated Soil Bulk Density 1/
1	Flat to gently sloping valley bottoms	Variable	0-15	Not rated	48+	18	Variable	0.9-1.1 1.0-1.2
3	Flat to gently sloping valley bottoms	Variable	0-15	Not rated	48+	20	Variable	0.9-1.1 1.0-1.2
5	Flat to gently sloping valley bottoms	Variable	0-15	Not rated	48	20	Variable	0.6-0.8 0.9-1.1
7	Sideslopes	South	15-100	Not rated	Less than 18	Variable	Variable	Variable
8	Sideslopes	South	15-100	Not rated	Variable	Variable	Variable	Variable
9	Sideslopes	Variable	15-100	Not rated	Variable	Variable	Variable	Variable
10	Sideslopes	North	15-100	Not rated	Variable	Variable	Variable	Variable
11	Glacial outwash flats	Variable	0-15	Not rated	120+	30	Loam Clay loam	1.0-1.1 1.1-1.2
12	Glacial outwash flats	South, east, west	0-30	Not rated	96+	36	Cobbly loam Very cobbly loam	Not rated
13	Sideslopes	South, east, west	5-30	Not rated	30	30	Loam Loam	1.0-1.1 1.1-1.2
14	Terrace & glacial outwash areas	South, east, west	5-30	Not rated	120+	36	Silt loam 2/ Cobbly loam	Not rated
15	Glacial outwash flats	South	0-10	Not rated	120+	24	Cobbly loam Very cobbly loam	Not rated
16	Rock faces, outcrops and talus slopes	Variable	50 +	Not rated	Variable	Variable	Not rated	Not rated
17	Ridgetops and sideslopes	Variable	10-70	Not rated	36	36	Silt loam 2/ Gravelly clay loam	0.6-0.8 0.9-1.1
18	Ridgetops and sideslopes	Variable	10-70	Not rated	18	18	Gravelly loam	0.9-1.1
19	Glacial troughs and outwash areas	Variable	10-50	Not rated	96+	36	Silt loam 2/ Cobbly loam	0.6-0.8 0.8-1.0
31	Flat ridgetops	South	0-30	Interbedded graywacke, shale, mudstone & siltstone	18	18	Gravelly loam Gravelly loam	1.0-1.1 1.0-1.1
	Steep sideslopes	Variable	30-70	Same as Landtype 31	20	20	Silt loam 2/ Gravelly loam	0.6-0.8 1.0-1.1
32	Steep sideslopes	South	30-70	Same as Landtype 31	18	18	Gravelly loam Gravelly loam	1.0-1.1 1.0-1.1
34	Ridgetops & steep sideslopes	Variable	10-70	Same as Landtype 31	8	8	Very gravelly loam	1.0-1.1
35	Steep sideslope	South	30-70	Sand as Landtype 31	6	6	Very gravelly loam	Not rated
36	Steep sideslopes	North	30-70	Same as Landtype 31	30	30	Silt loam 2/ Gravelly loam	0.6-0.8 1.0-1.1
37	Flat ridgetops & toeslopes	Variable	0-30	Same as Landtype 31	8	8	Very gravelly loam	Not rated
41	Upland flats & moderately sloping sideslopes	South	0-30	Basalt, andesite & tuffaceous interflow material	18	18	Gravelly loam Cobbly clay loam	1.0-1.1 1.1-1.2
42	Upland flats & moderately sloping sideslopes	Variable	0-30	Same as Landtype 41	24	24	Silt loam 2/ Cobbly clay loam	0.7-0.9 1.1-1.2
43	Steep sideslopes	South	30-70	Same as Landtype 41	18	18	Gravelly loam Cobbly clay loam	1.0-1.1 1.1-1.2
44	Steep sideslopes	South	30-70	Same as Landtype 41	12	12	Gravelly loam	1.0-1.1
45	Steep sideslopes	South	30-70	Same as Landtype 41	8	8	Very gravelly loam	Not rated
46	Upland flats & moderately sloping sideslopes	South	0-30	Same as Landtype 41	12	12	Gravelly loam	1.0-1.2
47	Upland flats & moderately sloping sideslopes	South	0-30	Same as Landtype 41	8	8	Cobbly loam	Not rated
48	Steep sideslopes	Variable	30-70	Same as Landtype 41	24	24	Silt loam 2/ Cobbly clay loam	0.6-0.8 1.0-1.1
58	Upland flats & moderately sloping sideslopes	North - & variable at upper elevations	0-30	Same as Landtype 41	30	30	Silt loam 2/ Gravelly & cobbly clay loam	0.6-0.8 1.0-1.1

1/ Where two figures or ratings are given, upper figure or rating is for the surface soil, and lower is for subsoil.
2/ Recent volcanic ash soil material.
3/ Average landtype soil depths.
4/ Average landtype effective rooting depth.

TABLE OF LANDTYPE FEATURES AND QUALITIES

Land-type	Landform	General Aspect	% Slope Range	Bedrock Composition	Depth of Soil to Bedrock 3/ (inches)	Effective Rooting Depth 4/ (inches)	Texture 1/	Estimated Soil Bulk Density 1/
59	Steep sideslopes	North	30-70	Basalt, andesite & tuffaceous interflow material.	30	30	Silt loam 2/ Cobbly clay loam	0.6-0.8 1.0-1.1
62	Steep sideslopes	Variable	30-70	Pyroclastics	24	24	Loamy sand	1.0-1.1
64	Upland flats & sideslopes	North & variable at upper elevations	5-50	Rhyolite, rhyolitic ejecta & tuffaceous sediments.	36	36	Silt loam 2/ Gravelly loam	0.6-0.7 0.8-1.0
65	Upland flats & sideslopes	Variable	5-50	Rhyolite, rhyolitic ejecta & tuffaceous sediments.	30	30	Silt loam 2/ Gravelly loam	0.6-0.7 0.8-1.0
68	Upland flats & sideslopes	South	5-50	Rhyolite, rhyolitic ejecta & tuffaceous sediments.	24	24	Gravelly loam Gravelly loam	0.8-1.0 0.8-1.0
71	Upland flats	South	0-30	Rhyolite	18	18	Gravelly loam Gravelly clay loam	0.8-1.0 0.9-1.1
73	Steep sideslopes	Variable	30-70	Rhyolite	10	10	Gravelly loam	0.9-1.0
74	Upland flats & moderately sloping sideslopes	South	0-30	Rhyolite	12	12	Gravelly loam	0.9-1.0
75	Upland flats	Variable	0-30	Rhyolite	24	24	Silt loam 2/ Gravelly clay loam	0.6-0.8 0.9-1.1
77	Upland flats & moderately sloping sideslopes	Variable	0-30	Rhyolite	6	6	Very gravelly loam	0.9-1.0
81	Upland flats, sideslopes & toeslopes	South	0-30	Altered tuffs & breccias	36	24	Clay loam Gravelly clay	1.0-1.2 1.0-1.2
82	Upland flats, sideslopes & toeslopes	Variable	0-30	Altered tuffs & breccias	36	36	Silt loam 2/ Gravelly clay	0.7-0.9 1.0-1.2
83	Upland flats, sideslopes & toeslopes	North	0-40	Altered tuffs & breccias	42	42	Silt loam 2/ Gravelly clay	0.6-0.8 1.0-1.2
85	Upland flats, sideslopes	Variable	0-30	Altered tuffs & breccias	15	15	Gravelly clay loam	1.0-1.2
86	Steep sideslopes	Variable	30-70	Altered tuffs & breccias	30	30	Silt loam 2/ Cobbly clay	0.7-0.9 1.0-1.2
87	Steep sideslopes	Variable	30-70	Altered tuffs & breccias	12	12	Gravelly clay loam	1.0-1.2
88	Steep sideslopes	South	30-70	Altered tuffs & breccias	30	30	Clay loam Cobbly clay	1.0-1.2 1.0-1.2
94	Ridgetops & sideslopes	North	10-40	Serpentine, peridotite and metavolcanics	30	30	Silt loam 2/ Gravelly loam	0.6-0.8 1.0-1.2
95	Ridgetops & sideslopes	Variable	0-30	Serpentine, peridotite and metavolcanics	18	18	Silt loam 2/ Gravelly loam	0.7-0.9 1.0-1.2
96	Ridgetops & sideslopes	Variable	0-30	Serpentine, peridotite and metavolcanics	15	15	Gravelly loam	1.0-1.2
97	Steep sideslopes	Variable	30-100	Serpentine, peridotite and metavolcanics	15	15	Gravelly loam	1.0-1.2
98	Ridgetops & sideslopes	Variable	0-30	Serpentine, peridotite and metavolcanics	6	6	Very gravelly loam	1.0-1.2
99	Steep sideslopes	Variable	30-100	Serpentine, peridotite and metavolcanics	6	6	Very gravelly loam	1.0-1.2
114	Glacial troughs & outwash areas	Variable	5-50	Not rated	72+	36	Silt loam 2/ Cobbly loam	0.6-0.8 0.8-1.0
121	Ridgetops	South	0-30	Argillite & metasedimentary rocks	18	18	Gravelly loam Gravelly loam	1.0-1.2 1.0-1.2
122	Steep sideslopes	Variable	30-70	Argillite & metasedimentary rocks	24	24	Silt loam 2/ Gravelly loam	0.7-0.9 1.0-1.2
123	Steep sideslopes	South	30-70	Argillite & metasedimentary rocks	18	18	Gravelly loam Gravelly loam	1.0-1.2 1.0-1.2
124	Ridgetops	Variable	0-30	Argillite & metasedimentary rocks	24	24	Silt loam 2/ Gravelly loam	0.7-0.9 1.0-1.2

1/ Where two figures or ratings are given upper figure or rating is for the surface soil, and lower is for subsoil.
2/ Recent volcanic ash soil material.
3/ Average landtype soil depths.
4/ Average landtype effective rooting depth.

TABLE OF LANDTYPE FEATURES AND QUALITIES

Land type	Landform	General Aspect	% Slope Range	Bedrock Composition	Depth of Soil to Bedrock 3/ (inches)	Effective Rooting Depth 4/ (inches)	Texture 1/	Estimated Soil Bulk Density 1/
125	Ridgetops	South	0-30	Argillite and metasedimentary rocks	9	9	Gravelly loam	1.0-1.2
126	Steep sideslopes	North	30-70	Argillite and metasedimentary rocks	30	30	Silt loam 2/ Gravelly loam	0.6-0.8 1.0-1.2
127	Ridgetops	North, east, west	0-30	Argillite and metasedimentary rocks	30	30	Silt loam 2/ Gravelly loam	0.6-0.8 1.0-1.2
128	Steep sideslopes	South	30-70	Argillite and metasedimentary rocks	9	9	Gravelly loam	1.0-1.2
132	Steep sideslopes	Variable	30-70	Chert conglomerate	20	20	Silt loam 2/ Gravelly loam	0.7-0.9 1.0-1.2
133	Steep sideslopes	South	30-70	Chert conglomerate	18	18	Gravelly loam Gravelly loam	1.0-1.2 1.0-1.2
134	Ridgetops and steep sideslopes	Variable	10-70	Chert conglomerate	8	8	Very gravelly loam	1.0-1.2
141	Upland flats & moderately sloping sideslopes	South	0-30	Andesite, basalt, and rhyolitic interflow material,	18	18	Gravelly loam Cobbly loam	1.0-1.2 1.0-1.2
142	Upland flats & moderately sloping sideslopes	Variable	0-30	Same as Landtype 141	24	24	Silt loam 2/ Cobbly loam	0.7-0.9 1.0-1.2
143	Steep sideslopes	South	30-70	Same as Landtype 141	18	18	Gravelly loam Cobbly loam	1.0-1.2 1.0-1.2
148	Steep sideslopes	Variable	30-70	Same as Landtype 141	24	24	Silt loam 2/ Cobbly loam	0.7-0.9 1.0-1.2
158	Upland flats & moderately sloping sideslopes	North	0-30	Same as Landtype 141	30	30	Silt loam 2/ Cobbly loam	0.6-0.8 1.0-1.2
159	Steep sideslopes	North	30-70	Same as Landtype 141	30	30	Silt loam 2/ Cobbly loam	0.6-0.8 1.0-1.2
162	Steep sideslopes	Variable	30-70	Gabbro, peridotite, serpentine	24	24	Silt loam 2/ Gravelly loam	0.7-0.9 1.0-1.2
163	Steep sideslopes	South	30-70	Same as Landtype 162	18	18	Gravelly loam	1.0-1.2
16	t ridgetops and sideslopes	Variable	0-30	Same as Landtype 162	24	24	Silt loam 2/ Gravelly clay loam	0.7-0.9 1.0-1.2
16	ep sideslopes	Northerly	30-70	Same as Landtype 162	30	30	Silt loam 2/ Gravelly loam	0.6-0.8 1.0-1.2
167	Flat ridgetops and sideslopes	Northerly	0-30	Same as Landtype 162	30	30	Silt loam 2/ Gravelly clay loam	0.6-0.8 1.0-1.2
168	Steep sideslopes	Variable	30-70	Same as Landtype 162	12	12	Gravelly loam	1.0-1.2
172	Sideslopes	Variable	30-70	Granodiorite	30	30	Silt loam 2/ Gravelly loamy sand	0.6-0.8 1.1-1.3
176	Upland flats & sideslopes	Variable	5-50	Granodiorite	36	36	Silt loam 2/ Gravelly loamy sand	0.6-0.8 1.1-1.3
181	Toeslope areas	South	0-30	Altered tuffs, mudflow breccias and conglomerates, basalt and andesite,	72	30	Clay	1.0-1.2
182	Lower slope areas & sideslopes	East, west, north	0-30	Same as Landtype 181	30	30	Silt loam 2/ Clay	0.7-0.9 1.0-1.2
183	Upland ridgetops, sideslopes	North	0-30	Same as Landtype 181	36	36	Silt loam 2/ Clay	0.6-0.8 1.0-1.2
184	Upland ridgetops and sideslopes	Variable	0-30	Same as Landtype 181	10	10	Gravelly clay loam	1.0-1.2
185	Seepy sideslope areas	Variable	0-30	Same as Landtype 181	15	15	Clay	1.0-1.2
186	Steep sideslopes	East, west, north	30-70	Same as Landtype 181	30	30	Silt loam 2/ Gravelly clay loam	0.7-0.9 1.0-1.2
187	Steep sideslopes	Variable	30-70	Same as Landtype 181	9	9	Gravelly clay loam	1.0-1.2
188	Steep sideslopes	South	30-70	Same as Landtype 181	24	24	Clay loam Gravelly clay loam	1.0-1.2 1.0-1.2
189	Steep sideslopes	North	30-70	Same as Landtype 181	36	36	Silt loam 2/ Gravelly clay loam	0.6-0.8 1.0-1.2

1/ Where two figures or ratings are given, upper figure or rating is for the surface soil, and lower is for subsoil.
2/ Recent volcanic ash soil material.
3/ Average landtype soil depths.
4/ Average landtype effective rooting depth.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF LANDTYPE FEATURES AND QUALITIES

Land-type	Permeability 2/ 1/	Infiltration Class 2/	Drainage Class	Surface Drainage Intensity & Pattern	Engineering Classification (unified) 1/	Elevation Range (feet)
1	Moderate	Moderate	Poorly drained	Not rated	OL CL	3200 - 6500
3	Moderate	Moderate	Somewhat poorly to moderately well drained.	Not rated	CL CL	3200 - 6500
5	Rapid	Rapid	Well to moderately well drained.	Not rated	ML GW	3200 - 6000
7	Variable	Variable	Variable	Variable	Variable	3600 - 7500
8	Variable	Variable	Variable	Variable	Variable	3200 - 6000
9	Variable	Variable	Variable	Variable	ML Variable	3200 - 6800
10	Variable	Variable	Variable	Variable	ML Variable	3600 - 7500
11	Moderate	Moderate	Well drained	Few - parallel	CL CL	4500 - 5000
12	Rapid	Rapid	Well drained	Few - parallel	GMu GMu	4500 - 5500
13	Moderate	Moderate	Well drained	Common - dendritic	CL CL	4000 - 5000
14	Rapid Moderate	Rapid	Well drained	Few to common - parallel	ML GMu	4500 - 5500
15	Very rapid	Rapid	Excessively drained	Common - parallel	GW	5000 - 5200
16	Not rated	Not rated	Not rated	Not rated	Not rated	7000 - 9000
17	Rapid Moderate	Rapid	Moderately well drained	Common - dendritic	ML GMu	7500 - 9000
18	Moderate	Moderate	Moderately well drained	Common - dendritic	GMu	7500 - 9000
19	Rapid Moderate	Rapid	Moderately well drained	Common - angulate	ML GMu	7500 - 8500
31	Moderate	Moderate	Well drained	Common - dendritic	GMu GMu	4000 - 6000
32	Rapid Moderate	Rapid	Well drained	Common to many - dendritic	ML GMu	4000 - 6000
33	Moderate	Moderate	Well drained	Common to many - dendritic	GMu GMu	4000 - 6000
34	Moderate	Moderate	Excessively drained	Common to many - dendritic	GMu	4000 - 6000
35	Rapid	Moderate	Excessively drained	Common to many - dendritic	GMu	4000 - 6000
36	Rapid Moderate	Rapid	Well drained	Common to many - dendritic	ML GMu	4000 - 6000
37	Rapid	Moderate	Excessively drained	Common to many - dendritic	GMu	4000 - 5000
41	Moderate Moderate to slow	Moderate	Well to moderately well drained	Few - dendritic	GMu GMu, GC	3600 - 6000
42	Rapid Moderate to slow	Rapid	Well to moderately well drained	Few - dendritic	ML GMu, GC	3600 - 6500
43	Moderate Moderate to slow	Moderate	Well drained	Few to common - dendritic	GMu GMu, GC	3600 - 6000
44	Moderate	Moderate	Excessively drained	Few to common - dendritic	GMu	3600 - 6500
45	Moderate	Moderate	Excessively drained	Common - dendritic	GMu	3600 - 5600
46	Moderate	Moderate	Excessively drained	Few - dendritic	GMu	3600 - 6000
47	Moderate	Moderate	Excessively drained	Few - dendritic	GMu	3600 - 6000
48	Rapid Moderate to slow	Rapid	Well drained	Common - dendritic	ML GMu, GC	3600 - 6500
58	Rapid Moderate to slow	Rapid	Well drained	Few- dendritic	ML GMu, GC	4000 - 6500
59	Rapid Moderate to slow	Rapid	Well drained	Common - dendritic	ML GMu, GC	4000 - 6500

1/ Where two figures or ratings are given, upper figure or rating is for the surface soil, and lower is for subsoil.
2/ Dry clay soils will have rapid infiltration and permeability until wet.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF LANDTYPE FEATURES AND QUALITIES

Land-type	Permeability 1/ 2/	Infiltration Class 2/	Drainage Class	Surface Drainage Intensity & Pattern	Engineering Classification (unified) 1/	Elevation Range (feet)
62	Very rapid	Rapid	Excessively drained	Few to common - dendritic	SP	4500 - 5500
64	Rapid Moderate	Rapid	Well drained	Common - dendritic	ML GMu, SMd	4500 - 6500
65	Rapid Moderate	Rapid	Well drained	Common - dendritic	ML GMu, SMd	4500 - 6500
68	Moderate Moderate	Rapid	Well drained	Common - dendritic	GMu, SMd GMu, SMu	4500 - 6000
71	Moderate	Moderate	Well drained	Few - dendritic	GMu, SMd GMu, SMd	4500 - 6000
73	Moderate	Moderate	Excessively drained	Common - dendritic	GMd, SMd	4500 - 6000
74	Moderate	Moderate	Excessively drained	Few - dendritic	GMd, SMd	4500 - 6000
75	Rapid Moderate	Rapid	Well drained	Few - dendritic	ML GMd, SMd	4500 - 6000
77	Moderate	Moderate	Excessively drained	Few - dendritic	GMd, SMd	4500 - 6000
81	Very slow 2/	Slow 2/	Somewhat poorly to poorly drained	Common - dendritic	CH CH, GC	3500 - 6000
82	Rapid Very slow	Rapid	Somewhat poorly to poorly drained	Common - dendritic	ML CH, GC	3500 - 6200
83	Rapid Very slow	Rapid	Moderately well drained	Common - dendritic	ML CH, GC	4000 - 6500
85	Slow 2/	Slow 2/	Moderately well to somewhat poorly drained	Common - dendritic	GC	3600 - 5600
86	Rapid Very slow	Rapid	Moderately well to somewhat poorly drained	Many - dendritic	ML CH, GC	3500 - 6200
87	Slow 2/	Slow 2/	Moderately well to somewhat poorly drained	Many - dendritic	GC	3600 - 5600
88	Very slow 2/	Slow 2/	Moderately well to somewhat poorly drained	Many - dendritic	CH, GC GC	3500 - 6000
91	Rapid Moderate	Rapid	Well drained	Common - dendritic	ML GMu	5500 - 7500
94	Rapid Moderate to slow	Rapid	Well drained to moderately well drained	Common - dendritic	ML GMu	3500 - 7000
96	Moderate to slow	Moderate	Well drained to moderately well drained	Common - dendritic	GMu	3500 - 7000
97	Moderate to slow	Moderate	Well drained	Many - dendritic	GMu	3500 - 7000
98	Moderate	Moderate	Excessively drained	Common - dendritic	GMu	3200 - 7000
99	Moderate	Moderate	Excessively drained	Many - dendritic	GMu	3200 - 7000
114	Rapid Moderate	Rapid	Well drained	Few to common - dendritic	ML GMu	6000 - 7500
121	Moderate	Moderate	Well drained	Common - dendritic	GMu, SMu GMu, SMu	3500 - 5000
122	Rapid Moderate	Rapid	Well drained	Common to many - dendritic	ML GMu, SMu	3500 - 6000
123	Moderate	Moderate	Well drained	Common to many - dendritic	GMu, SMu GMu, SMu	3500 - 5000
124	Rapid Moderate	Rapid	Well drained	Common - dendritic	ML GMu, SMu	3500 - 6000
125	Moderate	Moderate	Well to excessively drained	Common - dendritic	GMu, SMu	3500 - 5500
126	Rapid Moderate	Rapid	Well drained	Common - dendritic	ML GMu, SMu	4000 - 6200
127	Rapid Moderate	Rapid	Well drained	Common - dendritic	ML GMu, SMu	4000 - 6200
128	Moderate	Moderate	Well to excessively drained	Common to many - dendritic	GMu, SMu	3500 - 5500
132	Rapid Moderate	Rapid	Well drained	Common - dendritic	ML GMu	4500 - 5500
133	Moderate	Moderate	Well drained	Common - dendritic	GMu GMu	4500 - 5500
134	Moderate	Moderate	Excessively drained	Common - dendritic	GMu	4500 - 5500

1/ Where two figures or ratings are given, upper figure or rating is for the surface soil, and lower is for subsoil.
2/ Dry clay soils will have rapid infiltration and permeability until wet.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF LANDTYPE FEATURES AND QUALITIES

Land-type	Permeability 2/ 1/	Infiltration Class	Drainage Class	Surface Drainage Intensity & Pattern	Engineering Classification (unified) 1/	Elevation Range (feet)
141	Moderate	Moderate	Well drained	Few - dendritic	SMu, GMu GMu	4000 - 6000
142	Rapid Moderate	Rapid	Well drained	Few - dendritic	ML GMu	4500 - 7000
143	Moderate	Moderate	Well drained	Common to many - dendritic	SMu, GMu GMu	4000 - 6000
148	Rapid Moderate	Rapid	Well drained	Common to many - dendritic	ML GMu	4500 - 7000
158	Rapid Moderate	Rapid	Well drained	Few - dendritic	ML GMu	5000 - 7000
159	Rapid Moderate	Rapid	Well drained	Common to many - dendritic	ML GMu	4500 - 7000
162	Rapid Moderate	Rapid	Well drained	Common to many - dendritic	ML GMu, SMd	5000 - 7000
163	Moderate	Moderate	Well drained	Common - dendritic	GMu, SMd GMu, SMd	4500 - 6000
164	Rapid Moderate	Rapid	Well drained	Few to common - dendritic	ML GMu, SMd	5000 - 7000
166	Rapid Moderate	Rapid	Well drained	Common - dendritic	ML GMu, SMd	5500 - 7000
167	Rapid Moderate	Rapid	Well drained	Few - dendritic	ML GMu, SMd	5500 - 7000
168	Moderate	Moderate	Well drained	Common - dendritic	GMu, SMd	4500 - 6500
172	Rapid Very rapid	Rapid	Excessively drained	Common - dendritic	ML SW, GP	4500 - 6500
176	Rapid Very rapid	Rapid	Well drained	Common - dendritic	ML SW, GP	5000 - 7000
181	Very slow 2/	Very slow 2/	Poorly drained	Common - dendritic	CH CH	3600 - 4200
182	Rapid Very slow	Rapid	Moderately well drained	Common - dendritic	ML CH	3600 - 6200
183	Rapid Very slow	Rapid	Moderately well drained	Common - dendritic	ML CH, CL	4500 - 6200
184	Very slow 2/	Very slow 2/	Somewhat poorly drained	Common - dendritic	GC, GMu	3600 - 6200
185	Very slow 2/	Very slow 2/	Poorly drained	Common - dendritic	CH	3600 - 4800
186	Rapid Very slow	Rapid	Moderately well drained	Common to many - dendritic	ML CH, CL, GMu	3600 - 6200
187	Very slow 2/	Very slow 2/	Moderately well drained	Common to many - dendritic	GC, GMu	3600 - 6200
188	Very slow 2/	Very slow 2/	Moderately well drained	Common to many - dendritic	GC GC, CH, GMu	3600 - 6000
189	Rapid Very slow	Rapid	Well drained	Common to many - dendritic	ML GC, CH, GMu	4500 - 6200

1/ Where two figures or ratings are given, upper figure or rating is for the surface soil, and lower is for subsoil.
2/ Dry clay soils will have rapid infiltration and permeability until wet.

MAPPING UNIT 1 - WET MEADOWLAND [1/]

Mapping Unit 1 consists of 70 percent or more of Landtype 1 and may have inclusions of various other landtypes.

Typically, Landtype 1 occurs along stream bottoms and large springy areas. These areas remain wet throughout the year. These soils may have a surface peat layer or are high in organic matter, and are generally more than 36 inches deep. Soil textures include silt loams to clay loams, silty clay loams and some clays. Slope gradient ranges from 0 to 15 percent. Nebraska sedge, ovalhead sedge, and bentgrass are the dominant grass and sedges on this mapping unit.

Dominant use of this mapping unit is for grazing livestock. These soils, unless lightly stocked, should be dry enough to carry stock without breaking the sod and destroying the cover.

MAPPING UNIT 3 - MOIST AND DRY MEADOWS [1/]

Mapping Unit 3 consists of 70 percent or more of Landtype 3 and may have inclusions of various other landtypes.

Typically, Landtype 3 occurs along stream bottoms and other areas that are wet for a portion of the summer. These areas may or may not be sub-irrigated during the growing season. The surface soils are generally high in organic matter. Soil texture ranges from silt loams to loams to clay loams and some clays. Soil depth is greater than 24 inches. Slope gradient ranges from 0 to 15 percent. Dominant vegetation on this mapping unit is Kentucky bluegrass and tufted hairgrass.

These soils can be highly susceptible to gully and streambank erosion if ground cover and streambank vegetation are allowed to deteriorate. Close coordination is necessary between range, wildlife, and soil specialists to protect these soil areas from erosion and repair past damages.

MAPPING UNIT 5 - COLD FROST POCKET SOILS [1/]

Mapping Unit 5 consists of 70 percent or more of Landtype 5, and may have inclusions of various other landtypes.

Typically, Landtype 5 occurs in areas that have an accumulation of recent volcanic ash in cold air settlement areas. These areas occur around meadow areas, in depression or basin-like areas, and along stream bottoms. Dominant vegetative types are lodgepole pine and grouse huckleberry which are cold soil indicator species. Typically, the soil has 15 to 24 inches of recent volcanic ash over a variety of soil textures. Slope gradient ranges from 0-15 percent.

See page 111 for general management discussion of soils with volcanic ash surface soils.

1/ Mapping Units 1, 3 and 5 are miscellaneous landtypes with a wide range of undefined soil characteristics.

MAPPING UNIT 7

MISCELLANEOUS DROUGHTY, NONFORESTED SOILS LESS THAN 15 INCHES DEEP 1/

Mapping Unit 7 consists of 70 percent or more of Landtype 7, and may have inclusions of various other landtypes.

Typically, Landtype 7 occurs on slopes that range from 15 to 100 percent and, generally, have a south aspect. Soil texture varies from loam to clay. Dominant vegetation consists of juniper, few scattered ponderosa pine, big sagebrush, low sagebrush, mahogany, fescue, wheatgrass, and Sandberg bluegrass. Bedrock is variable and highly stratified.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 8

MISCELLANEOUS PONDEROSA PINE-TYPE SOILS 1/

Mapping Unit 8 consists of 70 percent or more of Landtype 8, and may have inclusions of various other landtypes.

Typically, Landtype 8 occurs on slopes that range from 15 to 100 percent and, generally have a south aspect. Bedrock is typically highly stratified and variable. Soil texture varies from loam to clay. Dominant vegetation consists of ponderosa pine, fescue, elk sedge, wheatgrass, and Sandberg bluegrass.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep). See page 110 for general management discussion of clayey forested soils.

1/ Mapping Units 7 and 8 are miscellaneous landtypes with a wide range of undefined soil characteristics.

MAPPING UNIT 9

MISCELLANEOUS MIXED PONDEROSA PINE-FIR TYPE SOILS [1/]

Mapping Unit 9 consists of 70 percent or more of Landtype 9, and may have inclusions of various other landtypes.

Typically, Landtype 9 occurs on slopes that range from 15 to 100 percent and a variable aspect. The soils typically have an 8 to 12 inch recent volcanic ash surface layer over a variety of subsoil material. Bedrock is generally highly stratified and variable. Dominant vegetation is ponderosa pine, white fir, Douglas-fir, pinegrass, and elk sedge.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 10

MISCELLANEOUS ASSOCIATED SPECIES TYPE SOILS [1/]

Mapping Unit 10 consists of 70 percent or more of Landtype 10 and may have inclusions of various other landtypes.

Typically, Landtype 10 occurs on slopes that range from 15 to 100 percent, and, generally, have a north aspect. The soils typically have 15 to 24 inches of recent volcanic ash over a variety of subsoil material. Bedrock is generally highly stratified and variable. Dominant vegetation is white fir, Douglas-fir, larch, lodgepole pine, huckleberry, pinegrass, and Columbia brome.

See page 111 for general management discussion of soils with volcanic ash surface soils.

1/ Mapping Units 9 and 10 are Miscellaneous Landtypes with a wide range of undefined soil characteristics.

MAPPING UNIT 11

Mapping Unit 11 consists of 70 percent or more of Landtype 11 and may have inclusions of Landtype 31.

Typically, Landtype 11 occurs on glacial outwash areas with slopes less than 15 percent and variable aspect. It supports ponderosa pine, fescue, wheatgrass, elk sedge, and Sandberg bluegrass.

Elevation ranges from 4,500 to 5,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 31 has similar vegetation but has bedrock at 12 to 24 inches.

Landtype 11 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a loam surface soil and a clay loam subsoil. Soil material is derived from glacial outwash. Soil depth is greater than 120 inches. Gravel content ranges from 5 to 10 percent by volume. This soil has a slightly sticky and slightly plastic surface soil and a sticky and plastic subsoil when wet.

Bedrock occurs at depths greater than 120 inches and composition was not determined.

Range of Profile Characteristics of Landtype 11

Litter:	Leaves, needles, and decomposing organic matter, 0 to 1 inch thick, covering 40 to 60 percent of the soil surface.
Surface Rock Fragments:	None.
Surface Layers:	Very dark gray to very dark grayish brown loam; weak, fine, and very fine crumb structure; 5 to 10 percent rounded gravel by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.6 to 6.5; 12 to 18 inches thick.
Subsoil Layers:	Dark brown to brown clay loam; moderate, fine to very fine angular blocky structure; 5 to 10 percent rounded gravel by volume; sticky and plastic when wet; pH ranges from 6.0 to 6.5; greater than 30 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 12

Mapping Unit 12 consists of 70 percent or more of Landtype 12 and may have inclusions of Landtype 14 and various other landtypes.

Typically, Landtype 12 occurs on southerly-facing terrace and glacial outwash areas with slopes less than 30 percent. It supports ponderosa pine, elk sedge, wheatgrass, fescue, and Sandberg bluegrass.

Elevation ranges from 4,500 to 5,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways. Landtype 14 has an ash surface soil and supports a mixed pine-fir vegetation. Landtype 12 occurs in and near a variety of other landtypes too numerous to mention.

Landtype 12 has a well drained soil with a rapid permeability in the surface soil and rapid in the subsoil. It has a gravelly and cobbly loam surface soil and a cobbly to very cobbly loam subsoil. Soil material is derived from glacial outwash materials. Soil depth is greater than 96 inches. It is slightly sticky and slightly plastic when wet.

Bedrock occurs at depths greater than 96 inches and composition was not determined.

Range of Profile Characteristics of Landtype 12

Litter:	Leaves, needles, and decomposing organic matter, 0 to 1 inch thick covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	20 to 30 percent of the soil surface is rounded gravel and cobble.
Surface Layers:	Very dark gray to dark grayish brown gravelly and cobbly loam; weak, fine to very fine crumb structure; 30 to 45 percent rounded gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.6 to 6.5; 10 to 15 inches thick.
Subsoil Layers:	Dark brown cobbly to very cobbly loam; weak, fine to very fine, subangular blocky structure; 45 to 60 percent rounded cobble and gravel by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 6.5; greater than 30 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 13

Mapping Unit 13 consists of 70 percent or more of Landtype 13 and may have inclusions of Landtypes 41 and 46.

Typically, Landtype 13 occurs on sideslopes with gradients less than 30 percent and variable aspect.

It supports juniper, big sagebrush,bitterbrush, fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 4,000 to 5,000 feet.

The included landtypes in the apping nit differ from the dominant landtype in the following ways: Landtype 41 has ponderosa pine vegetation. Landtype 46 generally has lower plant available water, and shallower soils. Its vegetation is similar but lower in vigor.

Landtype 13 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a loam surface soil and subsoil. Bedrock can be basalt, andesite, rhyolite or soft tuffaceous materials. Soil depth ranges from 15 to 48 inches. Gravel and cobble content ranges from 5 to 35 percent by volume. It is slightly sticky and slightly plastic when wet.

Range of Profile Characteristics of Landtype 13

Litter:	Leaves and decomposing organic matter; 0 to 1 inch thick covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	10 to 30 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Black to very dark grayish brown loam; weak, fine to very fine, crumb structure; 5 to 30 percent angular and flat gravel and cobble; slightly sticky and slightly plastic when wet; pH ranges from 5.6 to 6.5; 10 to 15 inches thick.
Subsoil Layers:	Dark brown to brown loam; moderate, fine to very fine, subangular blocky structure; 20 to 35 percent flat and angular gravel and cobble; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 5 to 36 inches deep.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 14

Mapping Unit 14 consists of 70 percent or more of Landtype 14 and may have inclusions of Landtype 12 and various other landtypes.

Typically, Landtype 14 occurs on terrace and glacial outwash areas with gradients less than 30 percent and variable aspect.

It supports ponderosa pine, white fir, and Douglas-fir with a ground cover of pinegrass and elk sedge.

Elevation ranges from 4,500 to 5,500 feet.

The included landtypes in the Mapping Unit differ from the dominant landtype in the following ways: Landtype 12 does not have the ash surface soil and supports a ponderosa pine vegetation. Landtype 14 occurs near a variety of other landtypes too numerous to mention.

Landtype 14 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a cobbly and gravelly loam subsoil derived from glacial outwash. Soil depth is greater than 120 inches. Gravel, cobble, and stone content ranges from 35 to 50 percent by volume. This soil is nonsticky and nonplastic in the surface soil and slightly sticky and slightly plastic in the subsoil when wet.

Bedrock occurs at depths greater than 120 inches and composition was not determined.

Range of Profile Characteristics of Landtype 14

Litter:	Leaves, needles, and decomposing organic matter; 0 to 2 inches thick covering 50 to 75 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is rounded gravel and cobble.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 8 to 12 inches thick.
Subsoil Layers:	Dark brown to brown cobbly and gravelly loam; weak, fine to very fine, subangular blocky structure; 35 to 50 percent rounded cobble and gravel by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.6 to 6.5; greater than 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 15

Mapping Unit 15 consists of 70 percent or more of Landtype 15 and may have inclusions of Landtypes 12 and Miscellaneous Landtypes 1 and 3.

Typically, Landtype 15 occurs on glacial outwash areas with a south aspect and slopes less than 10 percent. It supports low sagebrush and various other native and introduced grass species.

Elevation ranges from 5,000 to 5,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 12 has more fine soil material and higher water-holding capacity which supports ponderosa pine and lodgepole pine. Part of Landtype 15 is irrigated and is mapped as Miscellaneous Mapping Units 1 and 3.

Landtype 15 has an excessively drained soil with very rapid permeability in the surface soil and very rapid in the subsoil. It has a cobbly to very cobbly loam surface soil and a very cobbly sandy loam subsoil derived from glacial outwash. Soil depth is greater than 120 inches. Cobble and gravel content ranges from 40 to 80 percent by volume. This soil is nonsticky and nonplastic when wet.

Bedrock occurs at depths greater than 120 inches and composition was not determined.

Range of Profile Characteristics of Landtype 15

Litter:	Variable.
Surface Rock Fragments:	40 to 60 percent of the soil surface is rounded gravel.
Surface Layers:	Very dark grayish brown cobbly and gravelly to very cobbly and gravelly loam; weak, fine to very fine crumb structure; 40 to 60 percent rounded cobble and gravel by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Brown to dark brown very cobbly sandy loam; single grained; 60 to 80 percent rounded cobble and gravel by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; greater than 30 inches thick.

This landtype does not fit into any general management group. Wind erosion can be a problem on this soil if too much vegetation is removed at one time or the windbreak effect of the lodgepole pine is removed.

MAPPING UNIT 16 [1/]

Rock outcrops and nonvegetated rock talus material. This landtype is a mixture of rock outcrops, rocky talus material and approximately 30 percent soil by area. Most of the landtype occurs above 7,000 feet and has a variety of bedrock materials.

1/ Mapping Unit 16 is a miscellaneous landtype with a wide range of bedrock materials.

MAPPING UNIT 17

Mapping Unit 17 consists of 70 percent or more of Landtype 17 and may have inclusions of Landtypes 18, 19 and miscellaneous Landtype 16.

Typically, Landtype 17 occurs on ridgetops and sideslopes with slopes up to 70 percent and variable aspect.

It supports whitebark pine and subalpine fir with a ground cover of alpine sagebrush, fleeceflower, and elk sedge.

Elevation ranges from 7,500 to 9,000 feet.

The included landtypes in the Mapping Unit differ from the dominant landtype in the following ways: Landtype 18 does not have the ash surface soil and has only low ground-type vegetation. Landtype 19 occurs in glacial trough but has similar vegetation. Miscellaneous Mapping Unit 16 consists of rock outcrops and rocky talus slopes.

Landtype 17 has a moderately well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly to stony loam to clay loam subsoil derived from various bedrocks. Soil depth ranges from 18 to 48 inches. Gravel, cobble, and stone content ranges from 35 to 50 percent in the subsoil. This soil has a nonsticky and nonplastic surface soil and a sticky and plastic subsoil when wet.

Bedrock occurs at depths less than 48 inches and composition was not determined.

Range of Profile Characteristics of Landtype 17

Litter:	Leaves, needles, and decomposing organic matter; 1 to 2 inches thick, covering 70 to 80 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is flat and rounded rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.0 to 6.5; 8 to 12 inches thick.
Subsoil Layers:	Very dark grayish brown to dark brown gravelly to stony loam and clay loam; moderate, fine to very fine, angular blocky structure; 35 to 50 percent flat and angular gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.0 to 6.5; 10 to 40 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

This soil has severe mangement problems due to its landscape position at high elevations. It has a short growing season and cold soils. Eroded soils and soils with inadequate ground cover are extremely difficult to revegetate due to the severe climatic conditions. Close coordination is needed between range, wildlife, and soil specialists to protect these soils.

MAPPING UNIT 18

Mapping Unit 18 consists of 70 percent or more of Landtype 18 and may have inclusions of Landtypes 17, 19 and miscellaneous Landtype 16.

Typically, Landtype 18 occurs on high-elevation ridgetops and sideslopes with gradients up to 70 percent and variable aspect.

It supports alpine sagebrush elk sedge, and alpine fescue.

Elevation ranges from 7,500 to 9,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 17 has an ash surface soil and supports whitebark pine and alpine fir vegetation. Landtype 19 occurs in glacial troughs and has whitebark pine, lodgepole pine and alpine fir vegetation. Miscellaneous Mapping Unit 16 is the rock outcrops and rocky talus slopes.

Landtype 18 has a moderately well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a gravelly and cobbly to very gravelly and cobbly loam to clay loam soil derived from a variety of bedrock materials. Soil depth ranges from 12 to 30 inches. Gravel and cobble content ranges from 35 to 60 percent by volume. This soil is sticky and plastic when wet.

Bedrock occurs at depths less than 30 inches and bedrock composition was not determined.

Range of Profile Characteristics of Landtype 18

Litter: Leaves and decomposing organic matter, 0 to ½" thick covering 20 to 30 percent of the soil surface.

Surface Rock Fragments: 30 to 50 percent of the soil surface is rock fragments.

Surface Layers: Black to very dark grayish brown gravelly and cobbly loam to clay loam, to very gravelly and cobbly loam to clay loam, weak to moderate, fine to very fine granular structure; 35 to 60 percent flat and angular gravel, cobble, and stones by volume; sticky and plastic when wet; pH ranges from 5.0 to 6.5; 12 to 30 inches thick.

This soil has severe management problems due to its landscape position at high elevations above the general forested zone. It has a short growing season and cold soils. The vegetative cover offers minimal protection from erosional forces. Eroded soils and soils with inadequate ground cover are extremely difficult to revegetate due to the severe climatic conditions. Close coordination is needed between range, wildlife, and soil specialists to protect these soils.

MAPPING UNIT 19

Mapping Unit 19 consists of 70 percent or more of Landtype 19 and may have inclusions of Landtypes 17, 18, 114 and Miscellaneous Landtype 16.

Typically, Landtype 19 occurs in glacial troughs with variable aspects.

It supports subalpine fir, whitebark pine and lodgepole pine with a ground vegetation of elk sedge, fleeceflower, and alpine sagebrush.

Elevation ranges from 7,500 to 8,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 17 and 18 do not occur in glacial trough positions and have bedrock at less than 48 inches. Landtype 114 occurs in glacial troughs but at lower elevations in the commercial forest zone and has white fir, Douglas-fir, and larch vegetation.

Landtype 19 has a moderately well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly and cobbly subsoil derived from glacial activity. Soil depth is greater than 96 inches. Gravel, cobble, and stone content ranges from 35 to 60 percent by volume in the subsoil. This soil has a nonsticky and nonplastic surface soil, and a slightly sticky, slightly plastic subsoil when wet.

Bedrock occurs at depths greater than 96 inches and bedrock composition was not determined.

Range of Profile Characteristics of Landtype 19

Litter:	Leaves, needles, and organic matter, 1 to 3 inches thick covering 90 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.0 to 6.5; 12 to 24 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam to very gravelly and cobbly loam; weak, fine, subangular blocky structure; 35 to 60 percent rounded gravel, cobble, and stones; slightly sticky and slightly plastic when wet; pH ranges from 5.0 to 6.5; greater than 30 inches thick.

See Page 111 for general management discussion of soils with volcanic ash surface soils.

This soil has severe management problems due to its landscape position at high elevations. It has a short growing season and cold soils. Eroded soils and soils with inadequate ground cover are extremely difficult to revegetate due to the severe climatic conditions. Cloose coordination is needed between range, wildlife, and soil specialists to protect these soils.

MAPPING UNIT 31

Mapping Unit 31 consists of 70 percent or more of Landtype 31 and may have inclusions of Landtypes 32, 33, and 34.

Typically, Landtype 31 occurs on ridgetops with gradients less than 30 %.

It supports ponderosa pine with a ground cover of fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 32 and 33 occur on steep sideslopes with gradients over 30 percent. Landtype 34 has shallower soils which support mahogany and juniper-type vegetation.

Landtype 31 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a gravelly loam soil derived from weathered graywacke, siltstone, mudstone, and shale. Soil depth ranges from 12 to 24 inches. Gravel and cobble content increases with soil depth and ranges from 30 to 50 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of soft to moderately hard, interbedded graywacke, shale, mudstone and siltstone. It is highly fractured and competent.

Range of Profile Characteristics of Landtype 31

Litter:	Needles, leaves, and decomposing organic matter. ¼ to 1 inch thick, covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	20 to 40 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark gray to dark brown gravelly loam; weak, very fine crumb structure; 30 to 45 percent flat and angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 10 inches thick.
Subsoil Layers:	Brown to dark brown gravelly or cobbly loam; weak fine to very fine subangular blocky structure; 35 to 50 percent flat and angular gravel and cobble by volume; slightly sticky, slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 14 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 32

Mapping Unit 32 consists of 70 percent or more of Landtype 32 and may have inclusions of Landtypes 33, 34, and 36.

Typically, Landtype 32 occurs on steep sideslopes with gradients 30 to 70 percent and variable aspect.

It supports ponderosa pine, Douglas-fir, and white fir with a ground cover of elk sedge and pinegrass.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the Mapping Unit differ from the dominant landtype in the following ways: Landtypes 33 and 36 have similar landforms but differ in soil depth. Landtype 33 has a southerly aspect and supports a ponderosa pine-type vegetation. Landtype 36 has a northerly aspect and supports associated species. Landtype 34 occurs on exposed ridges and has shallower soils that support mahogany and juniper-type vegetation.

Landtype 32 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil 6 to 12 inches thick derived from recent volcanic ash. The subsoil is a gravelly loam derived from weathered graywacke, siltstone, shale and mudstone. Gravel and cobble increase with depth in the subsoil with a range of 35 to 50 percent. Soil depth ranges from 18 inches to 30 inches. The surface soil is nonsticky and nonplastic when wet.

Bedrock is composed of soft to moderately hard, interbedded graywacke, shale, mudstone, and siltstone. It is highly fractured and competent.

Range of Profile Characteristics of Landtype 32

Litter:	Needles, leaves and decomposing organic matter. ½ to 2 inches thick, covering 50 to 70 percent of the soil surface.
Surface Rock Fragments:	0 to 20 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark gray to very dark grayish brown silt loam; massive structure; can have up to 10 percent gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 6.0 to 7.0; 6 to 12 inches thick.
Subsoil Layers:	Very dark grayish brown to brown gravelly loam; weak, fine to very fine subangular blocky structure; 35 to 50 percent flat and angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 12 to 24 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 33

Mapping Unit 33 consists of 70 percent or more of Landtype 33 and may have inclusions of Landtypes 31, 32, and 34.

Typically, Landtype 33 occurs on steep, southerly-facing sideslopes with gradients of 30 to 70 percent.

It supports Ponderosa pine with a ground cover of elk sedge, wheatgrass, fescue and Sandberg bluegrass.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the Mapping Unit differ from the dominant landtype in the following ways: Landtype 31 has similar vegetation but occurs on ridgetops with gradients less than 30 percent. Landtype 32 has similar landform but variable aspect and an ash surface soil with mixed pine-fir vegetation. Landtype 34 occurs on exposed ridges and has shallower soils with mahogany and juniper vegetation.

Landtype 33 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a gravelly loam soil derived from weathered graywacke, siltstone, mudstone and shale. Soil depth ranges from 12 to 24 inches. Gravel and cobble content increase with soil depth and ranges from 30 to 50 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of soft to moderately hard, interbedded graywacke, shale, mudstone, and siltstone. It is highly fractured and competent.

Range of Profile Characteristics of Landtype 33

Litter:	Needles, leaves, and decomposing organic matter. ¼ to 1 inch thick covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	20 to 40 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark gray to dark brown gravelly loam; weak, very fine crumb structure; 30 to 45 percent flat and angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 10 inches thick.
Subsoil Layers:	Brown to dark brown gravelly or cobbly loam; weak fine to very fine subangular blocky structure; 35 to 50 percent flat and angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 14 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 34

Mapping Unit 34 consists of 70 percent or more of Landtype 34 and may have inclusions of Landtypes 32, 33, and 35.

Typically, Landtype 34 occurs on exposed ridges and sideslopes with a gradient of 10 to 70 percent.

It supports juniper, mahogany, big sagebrush, ponderosa pine with a ground cover of Sandberg bluegrass, wheatgrass, and fescue.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 32, 33, and 35 occur on steep sideslopes with gradients over 30 percent. Landtypes 32 and 33 have deeper soils and support mixed pine-fir and ponderosa pine respectively. Landtype 35 has shallower soils and supports mostly grasses and some shrubs.

Landtype 34 has an excessively drained soil with moderate permeability. It is a gravelly to very gravelly loam soil derived from weathered graywacke, shale, siltstone, and mudstone. Soil depth ranges from 6 to 12 inches. Gravel and cobble content ranges from 35 to 60 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of soft to moderately hard interbedded graywacke, shale, mudstone, and siltstone. It is highly fractured and competent.

Range of Profile Characteristics of Landtype 34

Litter:	Needles, leaves, and decomposing organic matter, ¼ to 1 inch thick, covering less than 30 percent of the soil surface.
Surface Rock Fragments:	30 to 60 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown gravelly to very gravelly loam; weak fine to very fine granular structure; 35 to 65 percent flat and angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 12 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 35

Mapping Unit 35 consists of 70 percent or more of Landtype 35 and may have inclusions of Landtypes 33, 34, and 37.

Typically, Landtype 35 occurs on steep, southerly-facing sideslopes with gradients of 30 to 70 percent.

It supports big sagebrush, rabbitbrush, Sandberg bluegrass, wheatgrass, and fescue.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 33 has similar landform but deeper soil and pine-type vegetation. Landtype 34 has somewhat similar landform but also has deeper soil with mahogany and juniper-type vegetation. Landtype 37 has vegetation similar to Landtype 35, but has slope gradients less than 30 percent.

Landtype 35 has an excessively drained soil with rapid permeability. It is a gravelly to very gravelly sandy loam soil derived from weathered graywacke, shale, mudstone, and siltstone. Soil depth ranges from 4 to 8 inches. Gravel and cobble content ranges from 45 to 70 percent. This soil is nonsticky and nonplastic when wet.

Bedrock is composed of soft to moderately hard, interbedded graywacke, shale, mudstone, and siltstone. It is highly fractured and competent.

Range of Profile Characteristics of Landtype 35

Litter:	Leaves, grass litter and decomposing organic matter, less than ½ inch thick covering less than 10 percent of the soil surface.
Surface Rock Fragments:	60 to 80 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown gravelly to very gravelly sandy loam, weak, very fine granular structure; 45 to 70 percent flat and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 6.0 to 7.0; 4 to 8 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 36

Mapping Unit 36 consists of 70 percent or more of Landtype 36 and may have inclusions of Landtypes 32 and 34.

Typically, Landtype 36 occurs on steep, northerly-facing sideslopes with gradients of 30 to 70 percent.

It supports white fir, Douglas-fir, larch, and lodgepole pine with a ground cover of huckleberry, pinegrass, and Columbia brome.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 32 has similar landform but has a shallower ash surface soil which supports mixed pine-fir vegetation. Landtype 34 has much shallower soils on exposed ridge positions that support mahogany-juniper vegetation.

Landtype 36 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil 12 to 18 inches thick derived from recent volcanic ash. Its subsoil is a gravelly loam derived from weathered graywacke, siltstone, shale, and mudstone. Gravel and cobble increase with depth in the subsoil and ranges from 35 to 50 percent. Soil depth ranges from 24 to 36 inches. The surface soil is nonsticky and nonplastic when wet.

Bedrock is composed of soft to moderately hard, interbedded graywacke, shale, mudstone, and siltstone. It is highly fractured and competent.

Range of Profile Characteristics of Landtype 36

Litter:	Needles, leaves, and decomposing organic matter. ½ to 2 inches thick covering 70 to 90 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to dark brown silt loam; massive structure; nonsticky and nonplastic when wet; pH ranges from 6.0 to 7.0; 12 to 18 inches thick.
Subsoil Layers:	Very dark grayish brown to brown gravelly loam; weak fine to very fine subangular blocky structure; 35 to 50 percent flat and angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 12 to 24 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 37

Mapping Unit 37 consists of 70 percent or more of Landtype 37 and may have inclusions of Landtypes 34 and 35.

Typically, Landtype 37 occurs on exposed ridgetops and toeslopes with gradients less than 30 percent.

It supports big sagebrush, rabbitbrush, Sandberg bluegrass, fescue, and wheatgrass.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the Mapping Unit differ from the dominant landtype in the following ways: Landtype 34 has slightly deeper soils that support mahogany and juniper-type vegetation. Landtype 35 has steeper slope gradients but has vegetation similar to Landtype 37.

Landtype 37 has an excessively drained soil with rapid permeability. Landtype 37 is a gravelly to very gravelly sandy loam soil derived from weathered graywacke, shale, mudstone, and siltstone. Soil depth ranges from 6 to 12 inches. Gravel and cobble content ranges from 40 to 60 percent. This soil is nonsticky and nonplastic when wet.

Bedrock is composed of soft to moderately hard, interbedded graywacke, shale, mudstone, and siltstone. It is highly fractured and competent.

Range of Profile Characteristics of Landtype 37

Litter:	Leaves, grass litter, and decomposing organic matter less than ½ inch thick covering less than 10 percent of the soil surface.
Surface Rock Fragments:	40 to 70 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown gravelly to very gravelly sandy loam; weak, very fine granular structure; 40 to 60 percent flat and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 6.0 to 7.0; 6 to 12 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 41

Mapping Unit 41 consists of 70 percent or more of Landtype 41 and may have inclusions of Landtypes 42, 43, 46 and 81.

Typically, Landtype 41 occurs on upland flats and sideslopes with a southerly aspect and gradients less than 30 percent.

It supports ponderosa pine with a ground cover of elk sedge, wheatgrass, fescue, and Sandberg bluegrass.

Elevation ranges from 3,600 to 6,000 feet.

The included landtypes in the Mapping Unit differ from the dominant landtype in the following ways: Landtype 42, 46, and 81 have similar landforms but differ in soil texture and depth. Landtype 42 has an ash surface soil and supports a mixed pine-fir vegetation. Landtype 46 has a shallower soil and supports mahogany and juniper-type vegetation. Landtype 81 has a clay loam to clay soil with a similar pine vegetation. Landtype 43 has a steeper landform, slope gradients over 30 percent, and similar vegetation.

Landtype 41 has a well to moderately well drained soil with moderate permeability in the surface soil and moderate to slow in the subsoil. It has a gravelly loam and clay loam soil material derived from basalt, andesite, and tuffaceous interflow material. Soil depth ranges from 12 to 30 inches. Gravel and cobble content increase with depth and ranges from 20 to 60 percent. This soil is slightly sticky to very sticky and slightly plastic to very plastic when wet.

Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 41

Litter:	Needles, leaves, twigs, and decomposing organic matter, 0 to 1 inch thick covering 40 to 60 percent of the soil surface.
Surface Rock Fragments:	10 to 30 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to dark brown gravelly loam; weak, fine to very fine crumb and granular structure; 20 to 45 percent platy and angular gravel and cobble by volume; slightly sticky to sticky, and slightly plastic to plastic when wet; pH ranges from 5.6 to 6.5; 6 to 10 inches thick.
Subsoil Layers:	Dark brown to brown with some reddish brown gravelly or cobbly clay loam; moderate to strong, fine and very fine, angular and subangular blocky structure; 35 to 60 percent platy and angular gravel and cobble by volume ; sticky to very sticky and plastic to very plastic when wet; pH ranges from 5.6 to 6.5; 6 to 18 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep)

MAPPING UNIT 42

Mapping Unit 42 consists of 70 percent or more of Landtype 42 and may have inclusions of Landtypes 41, 46, 48, 58, and 82.

Typically, Landtype 42 occurs on upland flats and sideslopes with gradients less than 30 percent and variable aspect.

It supports ponderosa pine, Douglas-fir, and white fir with a ground cover of elk sedge and pinegrass. Elevation ranges from 3,600 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 41, 46, 58, and 82 have similar landforms, but differ in soil texture and depth. Landtypes 41 and 46 have shallower soils and support pine and mahogany-juniper, respectively. Landtype 82 has clay loam to clay subsoils. Landtype 58 has a deeper ash surface and northerly soil aspect with associated species. Landtype 48 has similar vegetation but has slope gradients over 30 percent.

Landtype 42 has a well to moderately well drained soil with rapid permeability in the surface soil and moderate to slow in the subsoil. It has a silt loam surface soil 6 to 12 inches thick derived from recent volcanic ash. The subsoil is a gravelly to cobbly loam and clay loam soil derived from weathered basalt, andesite, and tuffaceous interflow material. Soil depth ranges from 12 to 36 inches. Gravel and cobble content increase with depth in the subsoil and range from 30 to 50 percent. This soil is nonsticky and nonplastic in the surface soil and sticky to very sticky and plastic to very plastic in the subsoil.

Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 42

Litter:	Needles, leaves, twigs and decomposing organic matter, 0 to 2 inches thick, covering 60 to 80 percent of the soil surface.
Surface Rock Fragments:	0 to 20 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; 0 to 10 percent gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark brown to brown with some reddish brown gravelly or cobbly clay loam; moderate to strong, fine and very fine, angular and subangular blocky structure; 30 to 50 percent platy and angular gravel and cobble by volume; sticky to very sticky and plastic to very plastic when wet; pH ranges from 5.6 to 6.5; 6 to 24 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 43

Mapping Unit 43 consists of 70 percent or more of Landtype 43 and may have inclusions of Landtypes 41, 44, and 45.

Typically, Landtype 43 occurs on steep southerly-facing sideslopes with gradients of 30 to 70 percent.

It supports ponderosa pine with a ground cover of elk sedge, wheatgrass, fescue, and Sandberg bluegrass.

Elevation ranges from 3,600 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 44 and 45 have similar landforms but have shallower soil depths and support big sagebrush, mahogany, and juniper with a ground cover of wheatgrass, fescue and Sandberg bluegrass. Landtype 41 has similar vegetation but has slope gradients less than 30 percent.

Landtype 43 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a gravelly loam and clay loam soil derived from weathered basalt, andesite, and tuffaceous interflow material. Soil depth ranges from 12 to 30 inches. Gravel and cobble content increases with depth and ranges from 20 to 60 percent. This soil is slightly sticky to very sticky, and slightly plastic to very plastic when wet.

Bedrock is composed of hard basalt and andesite, with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 43

Litter:	Needles, leaves, and decomposing organic matter, 0 to 1 inch thick, covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	10 to 30 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to dark brown gravelly loam; weak, fine to very fine crumb and granular structure; 20 to 45 percent platy and angular gravel and cobble by volume; slightly sticky to sticky and slightly plastic to plastic when wet; pH ranges from 5.6 to 6.5; 6 to 10 inches thick.
Subsoil Layers:	Dark brown to brown, with some reddish brown gravelly or cobbly clay loam; moderate to strong, fine and very fine angular and subangular blocky structure; 35 to 60 percent platy and angular gravel and cobble by volume; sticky to very sticky and plastic to very plastic when wet; pH ranges from 5.6 to 6.5; 6 to 18 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep.)

MAPPING UNIT 44

Mapping Unit 44 consists of 70 percent or more of Landtype 44 and may have inclusions of Landtypes 43, 45, and 48.

Typically, Landtype 44 occurs on steep sideslopes with gradients of 30 to 70 percent.

It supports juniper, mahogany, and big sagebrush with a ground cover of wheatgrass, fescue, and Sandberg bluegrass.

Elevation ranges from 3,600 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 43 and 48 have similar landforms but have deeper soils which support pine and mixed pine-fir vegetation. Landtype 45 has similar landform and shallower soils which support low and big sagebrush, Sandberg bluegrass, wheatgrass, and fescue.

Landtype 44 has an excessively drained soil with moderate permeability.

It has a gravelly and cobbly loam soil derived from weathered basalt and andesite. Soil depth ranges from 8 to 15 inches. Gravel and cobble content ranges from 30 to 60 percent. This soil is slightly sticky to sticky, and plastic when wet.

Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 44

Litter:	Leaves and decomposing organic matter, 0 to 1 inch thick, covering less than 20 percent of the soil surface.
Surface Rock Fragments:	40 to 60 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to dark brown gravelly and cobbly loam; weak to moderate, fine to very fine crumb and granular structure; 30 to 60 percent platy and angular gravel and cobble by volume; slightly sticky to sticky and plastic when wet; pH ranges from 5.6 to 6.5; 8 to 15 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 45

Mapping Unit 45 consists of 70 percent or more of Landtype 45 and may have inclusions of Landtypes 43, 44, and 48.

Typically, Landtype 45 occurs on steep sideslopes with gradients of 30 to 70 percent.

It supports big and low sagebrush, wheatgrass, fescue, and Sandberg bluegrass.

Elevation ranges from 3,600 to 5,600 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 43, 44, and 48 all have similar landform and have deeper soils than Landtype 45. Landtype 43 has ponderosa pine-type vegetation. Landtype 44 has big sagebrush, juniper-type vegetation, and Landtype 48 has mixed pine-fir vegetation.

Landtype 45 has an excessively drained soil with moderate permeability. It has a gravelly to very gravelly and cobbly loam soil derived from weathered basalt andesite. Soil depth ranges from 4 to 12 inches. Gravel and cobble content ranges from 30 to 70 percent. This soil is slightly sticky to sticky and plastic when wet.

Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 45

Litter:	Leaves and decomposing organic matter, 0 to ½ inch thick covering less than 10 percent of the soil surface.
Surface Rock Fragments:	40 to 70 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to dark brown gravelly and cobbly loam; weak, fine and very fine, crumb and granular structure; 30 to 70 percent platy and angular gravel and cobble by volume; slightly sticky to sticky and plastic when wet; pH ranges from 5.6 to 6.5; 4 to 12 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 46

Mapping Unit 46 consists of 70 percent or more of Landtype 46 and may have inclusions of Landtypes 41, 42, and 47.

Typically, Landtype 46 occurs on upland flats and sideslopes with gradients less than 30 percent.

It supports juniper, mahogany, scattered ponderosa pine and big sagebrush with a ground cover of Sandberg bluegrass and wheatgrass.

Elevation ranges from 3,600 to 6,000 feet.

The included landtypes in the Mapping Unit differ from the dominant landtype in the following ways: Landtypes 41, 42, and 47 have similar landform but differ in soil depth and vegetation. Landtypes 41 and 42 have deeper soil and support pine and mixed pine-fir. Landtype 47 is shallower and supports low and rigid sagebrush, wheatgrass, and Sandberg bluegrass.

Landtype 46 has an excessively drained soil with moderate permeability. It has a gravelly and cobbly loam soil derived from weathered basalt and andesite. Soil depth ranges from 8 to 15 inches. Gravel and cobble content ranges from 30 to 60 percent. This soil is slightly sticky to sticky, and plastic when wet.

Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 46

Litter:	Leaves and decomposing organic matter, 0 to 1 inch thick covering less than 20 percent of the soil surface.
Surface Rock Fragments:	30 to 60 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to dark brown gravelly and cobbly loam; weak to moderate, fine and very fine, crumb and granular structure; 30 to 60 percent platy and angular gravel and cobble by volume; slightly sticky to sticky and plastic when wet; pH 5.6 to 6.5; 8 to 15 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 47

Mapping Unit 47 consists of 70 percent or more of Landtype 47 and may have inclusions of Landtypes 45 and 46.

Typically, Landtype 47 occurs on upland flats and sideslopes with gradients less than 30 percent.

It supports stiff and low sagebrush with a ground cover of wheatgrass and Sandberg bluegrass.

Elevation ranges from 3,600 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 45 has similar vegetation but has a landform of steep sideslopes with gradients of 30 to 70 percent. Landtype 46 has similar landform but slightly deeper soils that support big sagebrush, mahogany, and juniper vegetation.

Landtype 47 has an excessively drained soil with moderate permeability. Landtype 47 is a gravelly to very gravelly and cobbly loam soil derived from weathered basalt and andesite. Soil depth ranges from 4 to 12 inches. Gravel and cobble content ranges from 30 to 70 percent. This soil is slightly sticky to sticky and plastic when wet.

Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 47

Litter:	Leaves and decomposing organic matter, 0 to ½ inch thick, covering less than 10 percent of the soil surface.
Surface Rock Fragments:	40 to 90 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to dark brown, gravelly to very gravelly and cobbly loam; weak, fine to very fine, crumb and granular structure; 30 to 70 percent platy and angular gravel and cobble by volume; slightly sticky to sticky and plastic when wet; pH ranges from 5.6 to 6.5; 4 to 12 inches thick.

See Page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 48

Mapping Unit 48 consists of 70 percent or more of Landtype 48 and may have inclusions of Landtypes 43, 44, and 59.

Typically, Landtype 48 occurs on steep sideslopes with gradients of 30 to 70 percent with variable aspect.

It supports ponderosa pine, Douglas-fir, and white fir, with a ground cover of elk sedge and pinegrass.

Elevation ranges from 3,600 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 43, 44, and 59 have landforms similar to Landtype 48, but differ in soil depth and vegetation. Landtypes 43 and 44 have shallower soils that support pine or mahogany and juniper vegetation. Landtype 59 has a deeper ash surface and a northerly aspect that supports associated species.

Landtype 48 has a well drained soil with rapid permeability in the surface soil and moderate to slow in the subsoil. It has a silt loam surface soil 6 to 12 inches thick derived from recent volcanic ash. The subsoil is a gravelly to cobbly loam and clay loam soil derived from weathered basalt, andesite, and tuffaceous interflow material. Soil depth ranges from 18 to 48 inches. Gravel and cobble increase with depth in the subsoil and range from 30 to 50 percent. This soil has nonsticky and nonplastic surface soil. Subsoil is sticky to very sticky and plastic to very plastic when wet. Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 48

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches thick covering 60 to 70 percent of the soil surface.
Surface Rock Fragments:	0 to 20 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; 0 to 10 percent gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark brown to brown with some reddish brown gravelly or cobble loam and clay loam; moderate to strong, fine angular and subangular blocky structure; 30 to 50 percent platy and angular gravel and cobble by volume; sticky to very sticky and plastic to very plastic when wet; pH ranges from 5.6 to 6.5; 12 to 36 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 58

Mapping Unit 58 consists of 70 percent or more of Landtype 58 and may have inclusions of Landtypes 42 and 59.

Typically, Landtype 58 occurs on upland flats and sideslopes with gradients less than 30 percent.

It supports white fir, Douglas-fir, larch, and lodgepole pine with a ground cover of huckleberry, pinegrass, and Columbia brome.

Elevation ranges from 4,000 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 42 has similar landform but has a shallower ash surface soil and supports mixed pine-fir vegetation. Landtype 59 has vegetation similar to Landtype 58 but has a landform of steep sideslopes with slope gradients of 30 to 70 percent.

Landtype 58 has a well drained soil with rapid permeability in the surface soil and moderate to slow in the subsoil. It has a silt loam surface soil 15 to 24 inches thick derived from recent volcanic ash. The subsoil is a gravelly to cobbly loam and clay loam soil derived from weathered basalt, andesite, and tuffaceous interflow material. Soil depth ranges from 24 to 48 inches. Gravel and cobble content increases with depth in the subsoil and ranges from 30 to 50 percent. This soil has a nonsticky and nonplastic surface soil and a sticky to very sticky and plastic to very plastic subsoil when wet.

Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 58

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches thick, covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Dark brown to brown silt loam, massive structure; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 15 to 24 inches thick.
Subsoil Layers:	Dark brown to brown with some reddish brown gravelly or cobbly loam and clay loam; moderate to strong, fine, subangular to angular blocky structure; 30 to 50 percent platy and angular gravel and cobble by volume; sticky to very sticky and plastic to very plastic when wet; pH ranges from 5.6 to 6.5; 9 to 24 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils

MAPPING UNIT 59

Mapping Unit 59 consists of 70 percent or more of Landtype 59 and may have inclusions of Landtypes 44, 48, and 58.

Typically, Landtype 59 occurs on steep, northerly-facing sideslopes with a gradient of 30 to 70 percent.

It supports white fir, Douglas-fir, larch, and lodgepole pine with a ground cover of huckleberry, pinegrass, and Columbia brome.

Elevation ranges from 4,000 to 6,500 feet.

The included landtypes in the Mapping Unit differ from the dominant landtype in the following ways: Landtypes 44 and 48 have landforms similar to Landtype 59 but have shallower soils that support either a juniper-mahogany or mixed pine-fir vegetation. Landtype 58 differs in landform but has similar vegetation. It has slope gradient less than 30 percent.

Landtype 59 has a well drained soil with rapid permeability in the surface soil and moderate to slow in the subsoil. It has a silt loam surface soil 12 to 24 inches thick derived from recent volcanic ash. The subsoil is gravelly to cobbly loam and clay loam soil derived from weathered basalt, andesite and tuffaceous interflow material. Soil depth ranges from 18 to 48 inches. Gravel and cobble increase with depth in the subsoil and range from 30 to 50 percent. This soil has a nonsticky and nonplastic soil surface soil, and a sticky to very sticky and plastic to very plastic subsoil when wet.

Bedrock is composed of hard basalt and andesite with some soft to moderately hard tuffaceous interflow material. The basalt and andesite are moderately to highly fractured and competent. The tuffaceous interflow material is massive.

Range of Profile Characteristics of Landtype 59

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches thick covering 70 to 90 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is flat and angular rock fragments.
Surface Layers:	Dark brown to brown silt loam; massive structure; nonsticky and nonplastic when wet; less than 15 percent gravel and cobble; pH ranges from 5.6 to 6.5; 12 to 18 inches thick.
Subsoil Layers:	Dark brown to brown with some reddish brown gravelly or cobbly loam and clay loam; moderate to strong, fine subangular to angular blocky structure; 30 to 50 percent platy and angular gravel and cobble by volume; sticky to very sticky and plastic to very plastic when wet; pH ranges from 5.6 to 6.5; 6 to 36 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 62

Mapping Unit 62 consists of 70 percent or more of Landtype 62 and may have inclusions of Landtypes 65 and 68.

Typically, Landtype 62 occurs on steep sideslopes with gradients of 30 to 70 percent and variable aspect. It supports ponderosa pine with a ground cover of wheatgrass and fescue. Elevation ranges from 4,500 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 65 and 68 have loamy soil material. Landtype 65 supports a mixed pine-fir vegetation.

Landtype 62 has an excessively drained soil with very rapid permeability. Landtype 62 is a loamy sand to sand soil derived from soft, grainy, pyroclastic material. Soil depth ranges from 18 to 36 inches. This soil is nonsticky and nonplastic when wet.

Bedrock is composed of soft, grainy pyroclastic material. It is massive and incompetent.

Range of Profile Characteristics of Landtype 62

Litter:	Needles, leaves, and decomposing organic matter, 0 to 1 inch thick covering less than 20 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Dark brown to brown loamy sand to sand; single grained; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 18 to 36 inches thick.

MANAGEMENT DISCUSSION - LANDTYPE 62

Landtype 62 has a severe mixing and displacement hazard due to its soil texture and slope. The loamy sand to sand soil material is at or very near its maximum stable angle (steepest angle at which it will stay in place). This becomes more critical as the soil material dries. Any impact or activity on this soil will move excessive soil material downhill. This soil should have no further removal of trees.

MAPPING UNIT 63

Mapping Unit 63 consists of 70 percent or more of Landtype 63 and may have inclusions of Landtypes 65.

Typically, Landtype 63 occurs on northerly-facing upland flats and sideslopes with gradients less than 50 percent. It supports white fir, Douglas-fir, lodgepole pine, and larch with a ground cover of pinegrass, huckleberry, and Columbia brome.

Elevation ranges from 4,500 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtypes in the following ways: Landtype 65 has similar landform but has a more variable aspect. Ash surface soil is thinner and has mixed pine-fir vegetation.

Landtype 63 has a well drained soil with rapid permeability in the surface soil and moderate to moderately rapid in the subsoil. It has a silt loam surface soil 15 to 24 inches thick derived from recent volcanic ash. The subsoil is a gravelly loam soil derived from tuffaceous sediments, rhyolitic ejecta and rhyolite. Soil depth ranges from 24 to 48 inches. Gravel and cobble content increases with depth in the subsoil and ranges from 30 to 50 percent. This soil is nonsticky and nonplastic in the surface soil, and nonsticky to slightly sticky and nonplastic to slightly plastic in the subsoil when wet.

Bedrock is composed of a mixture of soft to moderately hard tuffaceous sediments, rhyolitic ejecta, and hard to moderately hard rhyolite. The tuffaceous sediments and rhyolitic ejecta are massive to slightly fractured and incompetent to moderately competent. The rhyolite is massive to moderately fractured and competent.

Range of Profile Characteristics of Landtype 63

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches thick, covering 70 to 90 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 15 to 24 inches thick.
Subsoil Layers:	Dark brown to brown gravelly loam; weak, fine, subangular blocky structure; 30 to 50 percent platy and angular gravel and cobble by volume; nonsticky to slightly sticky and nonplastic to slightly plastic when wet; pH ranges 6.0 to 7.0; 9 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 65

Mapping Unit 65 consists of 70 percent or more of Landtype 65, and may have inclusions of Landtypes 63, 68, and 75.

Typically, Landtype 65 occurs on upland flats and sideslopes with gradients less than 50 percent and variable aspect. It supports ponderosa pine, Douglas-fir and white fir with ground cover of pinegrass and elk sedge.

Elevation ranges from 4,500 to 6,500 feet. The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 63 has similar landforms but has deeper ash surface soils, northerly aspect, and associated species. Landtype 68 has similar landforms and a more southerly aspect which supports a ponderosa pine vegetation. Landtype 75 just occurs on upland flats with slopes less than 30 percent and rhyolitic bedrock.

Landtype 65 has a well drained soil with rapid permeability in the surface soil, and moderate to moderately rapid in the subsoil. It has a silt loam surface soil 8 to 12 inches thick derived from recent volcanic ash. The subsoil is a gravelly loam soil derived from tuffaceous sediments, rhyolitic ejecta and rhyolite. Soil depth ranges from 24 to 48 inches. Gravel and cobble content increases with depth in the subsoil and ranges from 30 to 50 percent. This soil has a nonsticky and nonplastic surface soil, and nonsticky to slightly sticky and nonplastic to slightly plastic when wet subsoil.

Bedrock is composed of a mixture of soft to moderately hard tuffaceous sediments, rhyolitic ejecta, and hard to moderately hard rhyolite. The tuffaceous sediments and rhyolitic ejecta are massive to slightly fractured and incompetent to moderately competent. The rhyolite is massive to moderately fractured and competent.

Range of Profile Characteristics of Landtype 65

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches thick, covering 60 to 80 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; less than 10 percent gravel and cobble; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 8 to 12 inches thick.
Subsoil Layers:	Dark brown to brown gravelly loam; weak, fine, subangular blocky structure; 30 to 50 percent platy and angular gravel and cobble; nonsticky to slightly sticky and nonplastic to slightly plastic when wet; pH ranges from 6.0 to 7.0; 16 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 68

Mapping Unit 68 consists of 70 percent or more of Landtype 68 and may have inclusions of Landtypes 65, 71, and 74.

Typically, Landtype 68 occurs on southerly-facing upland flats and sideslopes with gradients less than 50 percent. It supports ponderosa pine with a ground cover of fescue, elk sedge, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 4,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 65 has similar landforms, but has an ash surface soil and variable aspect. Vegetation is mixed pine-fir. Landtype 71 occurs only on upland flats on rhyolite bedrock but has similar vegetation. Landtype 74 has shallower soils that support juniper and mahogany vegetation.

Landtype 68 has a well drained soil with moderately rapid permeability in the surface soil, and moderate in the subsoil. It has a gravelly loam soil derived from tuffaceous sediments, rhyolitic ejecta and rhyolite. Soil depth ranges from 18 to 36 inches. Gravel and cobble content increases with depth and ranges from 20 to 50 percent. This soil is nonsticky to slightly sticky and nonplastic to slightly plastic when wet.

Bedrock is composed of a mixture of soft to moderately hard tuffaceous sediments, rhyolitic ejecta and hard to moderately hard rhyolite. The tuffaceous sediments and rhyolitic ejecta are massive to slightly fractured and incompetent to moderately competent. The rhyolite is massive to moderately fractured and competent.

Range of Profile Characteristics of Landtype 68

Litter:	Needles, leaves, and decomposing organic matter, 0 to 1 inch thick covering 40 to 60 percent of the soil surface.
Surface Rock Fragments:	20 to 40 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark gray to dark brown loam and gravelly loam; weak, fine crumb structure; 20 to 40 percent platy and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 8 to 12 inches thick.
Subsoil Layers:	Dark brown to brown gravelly loam; weak, fine subangular blocky structure; 30 to 50 percent platy and angular gravel and cobble by volume; nonsticky to slightly sticky and nonplastic to slightly plastic when wet; pH ranges from 6.0 to 7.0; 10 to 24 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 71

Mapping Unit 71 consists of 70 percent or more of Landtype 71 and may have inclusions of Landtypes 68 and 74.

Typically, Landtype 71 occurs on upland flats with slope gradients less than 30 percent. It supports ponderosa pine and bitterbrush with a ground cover of Ross sedge, elk sedge, fescue, and wheatgrass.

Elevation ranges from 4,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 68 has similar vegetation but has a variety of hard and soft bedrock materials that weather to loams. It also occurs on sideslopes with gradients up to 50 percent. Landtype 74 has similar landform, but has shallower soils with mahogany and juniper vegetation.

Landtype 71 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a loam to gravelly loam surface soil and a gravelly and cobbly clay loam subsoil. Soil material is derived from rhyolite bedrock. Soil depth ranges from 12 to 24 inches. Gravel and cobble content increases with depth and ranges from 20 to 50 percent. This soil has a nonsticky and nonplastic surface soil, and a sticky and plastic subsoil when wet.

Bedrock is composed of moderately hard to hard rhyolite. It is massive to moderately fractured and competent.

Range of Profile Characteristics of Landtype 71

Litter:	Needles, leaves, and decomposing organic matter, 0 to 1 inch covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	30 to 50 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Dark brown loam to gravelly loam; weak, fine to very fine crumb structure; 20 to 40 percent platy gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.8 to 6.5; 6 to 10 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly clay loam; moderate fine to very subangular blocky structure; 30 to 50 percent platy gravel and cobble when wet; sticky and plastic; pH ranges from 5.8 to 6.5; 6 to 18 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 73

Mapping Unit 73 consists of 70 percent or more of Landtype 73 and may have inclusions of Landtypes 68, 71, and 74)

Typically, Landtype 73 occurs on steep, exposed sideslopes with gradients of 30 to 70 percent and variable aspect.

It supports juniper, mahogany, big sagebrush, scattered ponderosa pine and a ground cover of wheatgrass, fescue, and Sandberg bluegrass.

Elevation ranges from 4,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 68 has a variety of bedrock material and deeper soils which support pine vegetation. Landtype 74 occurs on upland flats with slopes less than 30 percent and vegetation similar to Landtype 73. Landtype 71 has slope gradients less than 30 percent with pine vegetation.

Landtype 73 has an excessively drained soil with moderate permeability. It has a gravelly and cobbly loam soil 6 to 15 inches deep, derived from rhyolite bedrock. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of moderately hard to hard rhyolite. It is massive to moderately fractured and competent.

Range of Profile Characteristics of Landtype 73

Litter:	Leaves and decomposing organic matter, 0 to 1 inch, covering less than 10 percent of the soil surface.
Surface Rock Fragments:	30 to 60 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Dark brown gravelly and cobbly loam; fine to very fine crumb and subangular blocky structure; 30 to 50 percent platy, gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.7 to 6.5; 6 to 15 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 74

Mapping Unit 74 consists of 70 percent or more of Landtype 74, and may have inclusions of Landtypes 71, 73, and 68.

Typically, Landtype 74 occurs on upland flats with slope gradients less than 30 percent. It supports juniper, mahogany, big sagebrush, scattered ponderosa pine, and a ground cover of wheatgrass, fescue, and Sandberg bluegrass.

Elevation ranges from 4,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 71 has similar landform but has deeper soils which support pine vegetation. Landtype 73 has steep sideslopes with gradients over 30 percent, but has similar vegetation. Landtype 68 has a variety of soft and hard bedrock materials and deeper soils which support a pine type of vegetation.

Landtype 74 has an excessively drained soil with moderate permeability. It has a gravelly and cobbly loam soil 10 to 15 inches deep derived from rhyolite bedrock. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of moderately hard to hard rhyolite. It is massive to moderately fractured and competent.

Range of Profile Characteristics of Landtype 74

Litter:	Leaves and decomposing organic matter, 0 to 1 inch thick, covering less than 10 percent of the soil surface.
Surface Rock Fragments:	40 to 60 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Dark brown gravelly and cobbly loam; fine to very fine crumb and subangular blocky structure; 30 to 50 percent platy gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.8 to 6.5; 10 to 15 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 75

Mapping Unit 75 consists of 70 percent or more of Landtype 75 and may have inclusions of Landtypes 65 and 74.

Typically, Landtype occurs on upland flats with slope gradients less than 30 percent.

It supports ponderosa pine, Douglas-fir, and white fir with a ground cover of elk sedge and pinegrass.

Elevation ranges from 4,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 65 has a variety of soft and hard rhyolitic bedrock materials and can have slope gradients up to 50 percent but has similar vegetation. Landtype 74 has similar landform but has shallower soils which support a mahogany-juniper vegetation.

Landtype 75 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil 6 to 10 inches thick derived from recent volcanic ash with a gravelly and cobbly loam subsoil derived from rhyolite bedrock. Soil depth ranges from 15 to 30 inches. Gravel and cobble increase with depth in the subsoil and range from 30 to 50 percent. This soil has a nonsticky and nonplastic surface soil and a slightly sticky to sticky and plastic subsoil when wet.

Bedrock is composed of moderately hard to hard rhyolite. It is massive to moderately fractured and competent.

Range of Profile Characteristics of Landtype 75

Litter:	Needles, leaves, and decomposing organic matter, 1 to 2 inches thick, covering 40 to 60 percent of the soil surface.
Surface Rock Fragments:	0 to 20 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; nonsticky and nonplastic when wet; 0 to 20 percent platy gravel and cobble by volume; pH ranges from 5.8 to 6.5; 6 to 10 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly clay loam; moderate fine to very fine subangular to angular blocky structure; 30 to 50 percent platy gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.8 to 6.5; 9 to 24 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 77

Mapping Unit 77 consists of 70 percent or more of Landtype 77 and may have inclusions of Landtypes 73 and 74.

Typically, Landtype 77 occurs on upland flats with slope gradients less than 30 percent. It supports low and stiff sagebrush and Sandberg bluegrass.

Elevation ranges from 4,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 74 has similar landform but has slightly deeper soils that support mahogany and juniper-type vegetation. Landtype 73 has steep sideslopes with gradients over 30 percent and with slightly deeper soils which supports mahogany and juniper.

Landtype 77 has an excessively drained soil with moderate permeability. It has a gravelly and cobbly loam soil 4 to 8 inches deep, derived from rhyolite bedrock. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of moderately hard to hard rhyolite. It is massive to moderately fractured and competent.

Range of Profile Characteristics of Landtype 77

Litter:	Leaves and decomposing organic matter, 0 to ½" thick, covering less than 10 percent of the soil surface.
Surface Rock Fragments:	50 to 100 percent of the soil surface is platy and angular. rock fragments.
Surface Layers:	Brown to dark brown cobbly and gravelly loam; weak, fine and very fine crumb and subangular blocky structure; 40 to 60 percent platy gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.8 to 6.5; 4 to 8 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 81

Mapping Unit 81 consists of 70 percent or more of Landtype 81 and may have inclusions of Landtypes 41, 82, 85, and 88.

Typically, Landtype 81 occurs on upland flats, sideslopes, and toeslopes with slope gradients less than 30 percent. It supports ponderosa pine with a ground cover of fescue, elk sedge, and pinegrass.

Elevation ranges from 3,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 41 has basalt or andesite bedrock and similar vegetation. Landtype 82 has similar landform but has an ash surface soil and has mixed pine-fir vegetation. Landtype 85 has shallower soils which support low and big sagebrush. Landtype 88 has vegetation similar to Landtype 81, but occurs on steep sideslopes with gradient over 30 percent.

Landtype 81 has a moderately well to poorly drained soil with moderately slow permeability in the surface soil, and very slow in the subsoil. It has a clay loam surface soil and a gravelly and cobbly clay loam and clay subsoil. Soil material is derived from altered tuffs and breccias. Soil depth ranges from 24 to 72 inches. Gravel and cobble increase with depth and range from 10 to 50 percent. This soil is sticky to very sticky, and plastic to very plastic when wet.

Bedrock is composed of soft to moderately hard altered tuffs and breccias. It is massive to slightly fractured and incompetent.

Range of Profile Characteristics of Landtype 81

Litter:	Needles, leaves, and decomposing organic matter, 0 to 1 inch thick, covering 50 to 70 percent of the soil surface.
Surface Rock Fragments:	5 to 30 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Black to very dark grayish brown clay loam; moderate, fine to very fine, granular structure; 10 to 40 percent angular and rounded gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 10 to 15 inches thick.
Subsoil Layers:	Dark reddish brown to dark grayish brown gravelly and cobbly clay loam and clay; strong, fine to very fine, angular blocky structure; 20 to 50 percent angular and rounded gravel and cobble by volume; sticky to very sticky and very plastic when wet; pH ranges from 5.6 to 6.5; 14 to 60 inches thick.

See page 110 for general management discussion of clayey forested soils.

MAPPING UNIT 82

Mapping Unit 82 consists of 70 percent or more of Landtype 82 and may have inclusions of Landtypes 42, 81, 83, and 86.

Typically, Landtype 82 occurs on upland flats, sideslopes, and toeslopes with gradients less than 30 percent. It supports ponderosa pine, Douglas-fir, and white fir with a ground cover of pinegrass and elk sedge.

Elevation ranges from 3,500 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 42 has basalt or andesite bedrock and similar vegetation. Landtype 81 has similar landform but does not have an ash surface soil and has pine vegetation. Landtype 83 has a thicker ash surface soil with a northerly aspect and associated species. Landtype 86 has similar vegetation but has steep sideslopes with gradients over 30 percent.

Landtype 82 has a moderately well to somewhat poorly drained soil with rapid permeability in the surface soil and very slow in the subsoil. It has a silt loam surface soil 6 to 12 inches thick derived from recent volcanic ash. The subsoil is a gravelly or cobbly clay loam to clay 18 to 60 inches thick. Total soil depth ranges from 24 to 72 inches. Subsoil material is derived from altered tuffs and breccias. Coarse rock fragments increase with depth in the subsoil and range from 20 to 50 percent. This soil has a nonsticky and nonplastic surface soil and sticky to very sticky and plastic to very plastic subsoil when wet.

Bedrock is composed of soft to moderately hard altered tuffs and breccias. It is massive to slightly fractured and incompetent.

Range of Profile Characteristics of Landtype 82

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches thick covering 60 to 80 percent of the soil surface.
Surface Rock Fragments:	5 to 10 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; 5 to 10 percent angular and rounded gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark reddish brown to dark grayish brown gravelly and cobbly clay loam and clay; strong, fine to very fine angular blocky structure; 20 to 50 percent angular and rounded gravel and cobble by volume; sticky and very plastic when wet; pH ranges from 5.6 to 6.5; 18 to 60 inches thick.

See page 110 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 83

Mapping Unit 83 consists of 70 percent or more of Landtype 83 and may have inclusions of Landtypes 82 and 58.

Typically, Landtype 83 occurs on upland flats and northerly-facing sideslopes with gradients less than 40 percent. It supports white fir, Douglas-fir, larch, and lodgepole pine with a ground cover of huckleberry, pinegrass, and Columbia brome.

Elevation ranges from 4,000 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 82 has similar landform but a shallower ash surface soil which supports mixed pine-fir vegetation. Landtype 58 has similar vegetation but has basalt and andesite bedrock.

Landtype 83 has a moderately well drained soil with rapid permeability in the surface soil and very slow in the subsoil. It has a silt loam surface soil 12 to 18 inches thick derived from recent volcanic ash. The subsoil is a gravelly or cobbly clay loam to clay, derived from altered tuffs and breccias. Soil depth ranges from 24 to 72 inches. Coarse rock fragments increase with depth in the subsoil and range from 20 to 50 percent. The surface soil is nonsticky and nonplastic when wet. Subsoil is sticky to very sticky and plastic to very plastic when wet.

Bedrock is composed of soft to moderately hard altered tuffs and breccias. It is massive to slightly fractured and incompetent.

Range of Profile Characteristics of Landtype 83

Litter: Needles, leaves, and decomposing organic matter, 1 to 3 inches, covering 70 to 90 percent of the soil surface.

Surface Rock Fragments: None

Surface Layers: Very dark grayish brown to brown silt loam; massive structure; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 12 to 18 inches thick.

Subsoil Layers: Dark reddish brown to dark grayish brown gravelly and cobbly clay loam to clay; strong fine to very fine angular blocky structure; 20 to 50 percent angular and rounded gravel and cobble by volume; sticky to very sticky and very plastic when wet; pH ranges from 5.6 to 6.5; 18 to 60 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 85

Mapping Unit 85 consists of 70 percent or more of Landtype 85 and may have inclusions of Landtypes 46 and 81.

Typically, Landtype 85 occurs on upland flats and sideslopes with gradients less than 30 percent. It supports juniper, scattered ponderosa pine, low sagebrush, fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 3,600 to 5,600 feet.

The included landtypes in the mapping unit differ from the dominant landtypes in the following ways: Landtype 46 has similar vegetation and landform but has andesite and basalt bedrock. Landtype 81 has similar landforms and deeper soils that support ponderosa pine.

Landtype 85 has a moderately well to somewhat poorly drained soil with slow permeability. It has a gravelly and cobbly to very gravelly and cobbly clay loam to clay soil, derived from altered tuffs and breccias. Soil depth ranges from 8 to 24 inches. Gravel and cobble content ranges from 30 to 60 percent. This soil is sticky and plastic to very plastic when wet.

Bedrock is composed of soft to moderately hard altered tuffs and breccias. It is massive to slightly fractured and incompetent.

Range of Profile Characteristics of Landtype 85

Litter:	Needles, leaves and decomposing organic matter, 0 to 1 inch thick, covering 20 to 30 percent of the soil surface.
Surface Rock Fragments:	30 to 80 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark gray to dark brown, gravelly and cobbly to very cobbly and gravelly clay loam to clay; moderate to strong, fine to very fine granular and angular blocky structure; 30 to 60 percent angular and rounded gravel and cobble by volume; sticky and plastic to very plastic when wet; pH ranges from 5.6 to 6.5; 8 to 24 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 86

Mapping Unit 86 consists of 70 percent or more of Landtype 86 and may have inclusions of Landtypes 48 and 82.

Typically, Landtype 86 occurs on steep sideslopes with gradients over 30 percent. It supports ponderosa pine, white fir, and Douglas-fir with a ground vegetation of elk sedge and pinegrass.

Elevation ranges from 3,500 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 48 has similar landform and vegetation but has andesite and basalt bedrock. Landtype 82 has similar vegetation but has slope gradients less than 30 percent.

Landtype 86 has a moderately well to somewhat poorly drained soil with rapid permeability in the surface soil and very slow in the subsoil. It has a silt loam surface 6 to 12 inches thick derived from recent volcanic ash. The subsoil is a gravelly or cobbly clay loam to clay. Subsoil material is derived from altered tuffs and breccias; total soil depth ranges from 24 to 72 inches. Coarse rock fragments increase with depth in the subsoil and range from 20 to 50 percent. This soil has a nonsticky and nonplastic surface soil, and sticky to very sticky and plastic to very plastic subsoil when wet.

Bedrock is composed of soft to moderately hard altered tuffs and breccias. It is massive to slightly fractured and incompetent.

Range of Profile Characteristics of Landtype 86

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches thick covering 50 to 70 percent of the soil surface.
Surface Rock Fragments:	0 to 20 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; 10 to 20 percent angular and rounded gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark reddish brown to dark grayish brown gravelly and cobbly clay loam and clay; strong fine to very fine angular blocky structure; 20 to 50 percent angular and rounded gravel and cobble by volume; sticky to very sticky and very plastic when wet; pH ranges 5.6 to 6.5; 18 to 60 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 87

Mapping Unit 87 consists of 70 percent or more of Landtype 87 and may have inclusions of Landtypes 44 and 88.

Typically, Landtype 87 occurs on steep sideslopes with gradients of 30 to 70 percent. It supports juniper, scattered ponderosa pine, low sagebrush, fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 3,500 to 5,600 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 44 has similar vegetation and landform but has basalt and andesite bedrock. Landtype 88 has deeper soil that supports ponderosa pine.

Landtype 87 has a moderately well to somewhat poorly drained soil with slow permeability. It has a gravelly and cobbly to very gravelly and cobbly clay loam to clay soil derived from altered tuffs and breccias. Soil depth ranges from 6 to 18 inches. Gravel and cobble content ranges from 40 to 80 percent. This soil is sticky and plastic to very plastic when wet.

Bedrock is composed of soft to moderately hard altered tuffs and breccias. It is massive to slightly fractured and incompetent.

Range of Profile Characteristics of Landtype 87

Litter:	Needles, leaves, and decomposing organic matter, 0 to 1 inch thick, covering 10 to 20 percent of the soil surface.
Surface Rock Fragments:	30 to 60 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark gray to dark brown, gravelly and cobbly to very gravelly and cobbly clay loam to clay; moderate to strong, fine to very fine, granular and angular blocky structure; 30 to 60 percent angular and rounded gravel and cobble by volume; sticky and plastic to very plastic when wet; pH ranges from 5.6 to 6.5; 6 to 18 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 88

Mapping Unit 88 consists of 70 percent or more of Landtype 88 and may have inclusions of Landtypes 81, 87, and 43.

Typically, Landtype 88 occurs on steep, southerly-facing sideslopes with gradients of 30 to 70 percent.

It supports ponderosa pine with a ground cover of fescue and elk sedge. Elevation ranges from 3,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 81 has similar soil and vegetation characteristics but occurs on slope gradients less than 30 percent. Landtype 87 has similar landform but has shallower soils which support juniper and low sagebrush. Landtype 43 has similar vegetation and landform but has basalt and andesite bedrock.

Landtype 88 has a moderately well to somewhat poorly drained soil with moderately slow permeability in the surface soil and very slow in the subsoil. It has a clay loam surface soil and a gravelly and cobbly clay loam and clay subsoil. Soil material is derived from altered tuffs and breccias. Soil depth ranges from 24 to 72 inches. Gravel and cobble increase with depth and range from 20 to 50 percent by volume. This soil is sticky to very sticky and plastic to very plastic when wet.

Bedrock is composed of soft to moderately hard altered tuffs and breccias. It is massive to slightly fractured and incompetent.

Range of Profile Characteristics of Landtype 88

Litter:	Needles, leaves, and decomposing organic matter, 0 to 1 inch thick, covering 30 to 60 percent of the soil surface.
Surface Rock Fragments:	10 to 30 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark gray to very dark grayish brown clay loam to cobbly clay loam; moderate, fine to very fine granular structure; 20 to 40 percent angular and rounded gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 8 to 12 inches thick.
Subsoil Layers:	Dark reddish brown to dark grayish brown gravelly and cobbly clay loam and clay; strong fine to very fine angular blocky structure; 20 to 50 percent angular and rounded gravel and cobble by volume; sticky to very sticky and very plastic when wet; pH ranges from 5.6 to 6.5; 14 to 60 inches thick.

See Page 110 for general management discussion of clayey forested soils.

MAPPING UNIT 94

Mapping Unit 94 consists of 70 percent or more of Landtype 94 and may have inclusions of Landtype 95.

Typically, Landtype 94 occurs on northerly-facing ridgetops and sideslopes with gradients less than 40 percent. It supports white fir, Douglas-fir, lodgepole pine and larch with a ground cover of huckleberry, pinegrass and Columbia brome.

Elevation ranges from 5,500 to 7,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 95 has similar landform but has shallower soils that support a mixed pine-fir vegetation.

Landtype 94 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil 10 to 18 inches thick derived from recent volcanic ash. Subsoil is a gravelly and cobbly loam to clay loam derived from serpentine and peridotite bedrock. Soil depth ranges from 24 to 60 inches. Gravel and cobble increase with depth in the subsoil and range from 20 to 40 percent. This soil has a nonsticky and nonplastic surface soil and a sticky and plastic subsoil when wet.

Bedrock is composed of hard to moderately hard serpentine and peridotite with minor amounts of metavolcanics. It is moderately to highly fractured and moderately competent to competent.

Range of Profile Characteristics of Landtype 94

Litter:	Leaves, needles, and decomposing organic matter, 1 to 3 inches thick, covering 75 to 90 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; nonsticky and nonplastic when wet; pH ranges from 6.0 to 7.0; 10 to 18 inches thick.
Subsoil Layers:	Dark brown to reddish brown, gravelly and cobbly loam to clay loam; moderate fine to very fine angular and subangular blocky structure; 20 to 40 percent platy and angular gravel and cobble by volume; sticky and plastic when wet; pH ranges from 6.5 to 7.5; 14 to 50 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 95

Mapping Unit 95 consists of 70 percent or more of Landtype 95 and may have inclusions of Landtypes 94, 96, and 98.

Typically, Landtype 95 occurs on ridgetops and sideslopes with gradients less than 30 percent and variable aspect.

It supports ponderosa pine, white fir, and Douglas-fir with a ground cover of pinegrass and elk sedge.

Elevation ranges from 3,500 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 94, 96, and 98 have landforms similar to Landtype 95. They differ in soil depth and vegetation. Landtype 94 has deeper soils and associated species. Landtypes 96 and 98 have shallower soils which support pine and mahogany-juniper types, respectively.

Landtype 95 has a well to moderately well drained soil with rapid permeability in the surface soil and moderate to slow in the subsoil. It has a silt loam surface soil 4 to 10 inches thick derived from recent volcanic ash. Subsoil is a gravelly and cobbly loam to clay derived from serpentine and peridotite bedrock. Soil depth ranges from 12 to 24 inches. Gravel and cobble increase with depth in the subsoil, and range from 20 to 40 percent. This soil is sticky to very sticky and plastic to very plastic when wet.

Bedrock is composed of hard to moderately hard serpentine and peridotite with minor amounts of metavolcanics. It is moderately to highly fractured and moderately competent to competent.

Range of Profile Characteristics of Landtype 95

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches thick, covering 50 to 70 percent of the soil surface.
Surface Rock Fragments:	Less than 10 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark grayish brown to dark brown silt loam; weak, very fine crumb structure; 10 to 20 percent platy and angular rock fragments by volume; nonsticky and nonplastic when wet; pH ranges from 6.0 to 7.0; 4 to 10 inches thick.
Subsoil Layers:	Dark brown to reddish brown, loam to clay to gravelly and cobbly loam to clay; moderate fine to very fine subangular and angular blocky structure; 20 to 40 percent platy and angular gravel and cobble by volume; sticky to very sticky and plastic to very plastic when wet; pH ranges from 6.5 to 7.5; 8 to 20 inches thick.

MAPPING UNIT 95

See page 111 for general management discussion of soils with volcanic ash surface soils.

Soil materials derived from serpentine and peridotite generally have a fertility problem caused by an adverse calcium to magnesium ratio which interferes with the uptake of calcium into the plants. This results in lower vigor vegetation and less effective ground cover for erosion protection. Also, wood fiber and herbage production are lowered. These factors should be taken into consideration when management activities are planned in these areas.

MAPPING UNIT 96

Mapping Unit 96 consists of 70 percent or more of Landtype 96 and may have inclusions of Landtypes 95, 97, and 98.

Typically, Landtype 96 occurs on southerly-facing ridgetops and sideslopes with gradients less than 30 percent.

It supports ponderosa pine with a ground cover of wheatgrass, fescue, Sandberg bluegrass, and elk sedge.

Elevation ranges from 3,500 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 95 and 98 have similar landforms but different soil depth. Landtype 95 has deeper soils with an ash surface which supports mixed pine-fir vegetation. Landtype 98 is shallower and supports mahogany and juniper vegetation. Landtype 97 has steeper sideslopes with gradients over 30 percent and similar vegetation.

Landtype 96 has a well to moderately well drained soil with moderate permeability in the surface soil and moderate to slow in the subsoil. It has a loam to clay loam and a gravelly and cobbly loam to clay soil derived from serpentine and peridotite bedrock. Soil depth ranges from 12 to 24 inches. Gravel and cobble content increases with soil depth and ranges from 20 to 40 percent. This soil is sticky and plastic to very plastic when wet.

Bedrock is composed of hard to moderately hard serpentine and peridotite with minor amounts of metavolcanics. It is moderately to highly fractured and moderately competent to competent.

Range of Profile Characteristics of Landtype 96

Litter:	Leaves, needles, and decomposing organic matter, 0 to 1 inch thick, covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	25 to 50 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Dark brown to dark reddish brown loam to clay and gravelly to cobbly loam to clay loam; moderate fine to very fine granular and angular blocky structure; 20 to 40 percent platy and angular gravel and cobble by volume; sticky to very sticky and plastic to very plastic when wet; pH ranges from 6.5 to 7.5; 12 to 24 inches thick.

See page 109 for general management discussion of clayey forested soils.

See page 110 for general management discussion of clayey forested soils.

MAPPING UNIT 96 (Cont.)

Soil materials derived from serpentine and peridotite generally have a fertility problem caused by an adverse calcium to magnesium ratio which interferes with the uptake of calcium into the plants. This results in lower vigor vegetation and less effective ground cover for erosion protection. Also, wood fiber and herbage production are lowered. These factors should be taken into consideration when management activities are planned in these areas.

MAPPING UNIT 97

Mapping Unit 97 consists of 70 percent or more of Landtype 97 and may have inclusions of Landtypes 95, 96, and 99.

Typically, Landtype 97 occurs on steep sideslopes with gradients of 30 to 70 percent and variable aspect. It supports ponderosa pine, Douglas-fir, and white fir with a ground cover of pinegrass, elk sedge, and fescue.

Elevation ranges from 3,500 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 95 and 96 have landforms with slopes less than 30 percent. Landtype 99 has similar landforms but shallower soils which support mahogany and juniper vegetation.

Landtype 97 has a well drained soil with moderate permeability in the surface soil and moderate to moderately slow in the subsoil. It has a gravelly and cobbly loam to clay soil derived from serpentine and peridotite bedrock. Soil depth ranges from 12 to 24 inches. Gravel and cobble increase with soil depth and range from 40 to 60 percent. This soil is sticky and plastic when wet.

Bedrock is composed of hard to moderately hard serpentine and peridotite with minor amounts of metavolcanics. It is moderately to highly fractured and moderately competent to competent.

Range of Profile Characteristics of Landtype 97

Litter:	Needles, leaves, and decomposing organic matter, 0 to 1 inch thick, covering 20 to 40 percent of the soil surface.
Surface Rock Fragments:	30 to 60 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Dark brown to dark reddish brown gravelly to cobbly loam to clay; moderate fine to very fine granular and angular blocky structure; 40 to 60 percent platy and angular gravel and cobble by volume; sticky and plastic when wet; pH ranges from 6.5 to 7.5; 12 to 24 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

See page 110 for general management discussion of clayey forested soils.

Soil materials derived from serpentine and peridotite generally have a fertility problem caused by an adverse calcium to magnesium ratio which interferes with the uptake of calcium into the plants. This results in lower vigor vegetation and less effective ground cover for erosion protection. Also, wood fiber and herbage production are lowered. These factors should be taken into consideration when management activities are planned in these areas.

MAPPING UNIT 98

Mapping Unit 98 consists of 70 percent or more of Landtype 98 and may have inclusions of Landtypes 95, 96, and 99.

Typically, Landtype 98 occurs on ridgetops and sideslopes with slope gradients less than 30 percent. It supports junipers, big sagebrush, mahogany, wild onion, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 3,200 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 95 and 96 have similar landforms but have deeper soils that support mixed pine-fir or pine vegetation. Landtype 99 has similar vegetation but has steep sideslope with gradients over 30 percent.

Landtype 98 has an excessively drained soil with moderate permeability It has a gravelly and cobbly to very gravelly and cobbly loam to clay loam soil derived from serpentine and peridotite bedrock. Soil depth ranges from 4 to 12 inches. Gravel and cobble content ranges from 50 to 80 percent. This soil is slightly sticky and slightly plastic.

Bedrock is composed of hard to moderately hard serpentine and peridotite with minor amounts of metavolcanics. It is moderately to highly fractured and moderately competent to competent.

Range of Profile Characteristics of Landtype 98

Litter:	Leaves and decomposing organic matter, 0 to 1 inch thick, covering less than 10 percent of the soil surface.
Surface Rock Fragments:	30 to 60 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Dark brown to dark reddish brown gravelly and cobbly to very gravelly and cobbly loam to clay loam; weak to moderate, fine to very fine granular and angular blocky structure; 50 to 80 percent gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.5 to 7.5; 4 to 12 inches thick.

See page109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

Soil materials derived from serpentine and peridotite generally have a fertility problem caused by an adverse calcium to magnesium ratio which interferes with the uptake of calcium into the plants. This results in lower-vigor vegetation and less effective ground cover for erosion protection. Also, wood fiber and herbage production are lowered. These factors should be taken into consideration when management activities are planned in these areas.

MAPPING UNIT 99

Mapping Unit 99 consists of 70 percent or more of Landtype 99 and may have inclusions of landtypes 97 and 98.

Typically, Landtype 99 occurs on steep sideslopes with gradients of 30 to 70 percent and variable aspects.

It supports juniper, big sagebrush, mahogany, wild onion, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 3,200 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 97 has similar landform but has deeper soils that support pine and fir. Landtype 98 has similar vegetation but has slopes less than 30 percent.

Landtype 99 has an excessively drained soil with moderate permeability. It has a gravelly and cobbly to very gravelly and cobbly loam and clay loam soil derived from serpentine and peridotite bedrock. Soil depth ranges from 4 to 12 inches. Gravel and cobble content ranges from 50 to 80 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of hard to moderately hard serpentine and peridotite with minor amounts of metavolcanics. It is moderately to highly fractured and moderately competent to competent.

Range of Profile Characteristics of Landtype 99

Litter:	Leaves and decomposing organic matter, 0 to 1 inch thick, covering less than 10 percent of the soil surface.
Surface Rock Fragments:	40 to 80 percent of the soil surface is angular and platy rock fragments.
Surface Layers:	Dark brown to dark reddish brown gravelly and cobbly to very gravelly and cobbly loam to clay loam; weak to moderate, fine to very fine granular and angular blocky structure, 50 to 80 percent platy and angular, gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.5 to 7.5; 4 to 12 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

Soil materials derived from serpentine and peridotite generally have a fertility problem caused by an adverse calcium to magnesium ratio which interferes with the uptake of calcium into the plants. This results in lower vigor vegetation and less effective ground cover for erosion protection. Also, wood fiber and herbage production are lowered. These factors should be taken into consideration when management activities are planned in these areas.

MAPPING UNIT 114

Mapping Unit 114 consists of 70 percent or more of Landtype 114 and may have inclusions of Landtypes 19, 158, and 159.

Typically, Landtype 114 occurs in glacial troughs and glacial outwash areas with variable aspects and slope gradients less than 30 percent. It supports white fir, Douglas-fir, lodgepole pine, and larch with a ground vegetation of huckleberry, pinegrass, and Columbia brome.

Elevation ranges from 6,000 to 7,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 19 occurs at higher elevations and supports high-elevation species. Landtypes 158 and 159 have andesite and basalt bedrock at depths less than 48 inches.

Landtype 114 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash, and a cobbly loam subsoil derived from glacial activity. Soil depth is greater than 72 inches. Gravel, cobble, and stone content ranges from 35 to 50 percent in the subsoil. This soil has a nonsticky and nonplastic surface soil, and a slightly sticky and slightly plastic subsoil when wet.

Bedrock occurs at depths greater than 72 inches and bedrock composition was not determined.

Range of Profile Characteristics of Landtype 114

Litter:	Leaves, needles, and decomposing organic matter, 1 to 3 inches thick, covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 12 to 18 inches thick.
Subsoil Layers:	Brown to dark brown cobbly loam; weak, fine, subangular blocky structure; 35 to 50 percent rounded gravel, cobble, and stones by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.6 to 6.5; greater than 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 121

Mapping Unit 121 consists of 70 percent or more of Landtype 121 and may have inclusions of Landtypes 123, 124, and 125.

Typically, Landtype 121 occurs on southerly-facing ridgetops and sideslopes with gradients less than 30 percent. It supports ponderosa pine with a ground cover of fescue, wheatgrass, elk sedge, and Sandberg bluegrass.

Elevation ranges from 3,500 to 5,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 123 has similar vegetation but has slopes over 30 percent. Landtypes 124 and 125 have landforms similar to Landtype 121, but have different soil depths. Landtype 124 has deeper soils and an ash surface soil which has a mixed pine-fir vegetation. Landtype 125 has shallower soils and mahogany-juniper vegetation.

Landtype 121 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a loam to gravelly loam surface soil, and a gravelly and cobbly loam subsoil. Soil material is derived from argillite and other miscellaneous rock types. Soil depth ranges from 12 to 30 inches. Gravel and cobble content increases with depth and ranges from 20 to 50 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of argillite and other miscellaneous unidentified older metasedimentary rock. It is hard to moderately hard, highly fractured, and competent.

Range of Profile Characteristics of Landtype 121

Litter:	Needles, leaves, and decomposing organic matter; 0 to 1 inch thick covering 40 to 60 percent of the soil surface.
Surface Rock Fragments:	20 to 40 percent of the soil surface is flat, angular rock fragments.
Surface Layers:	Very dark gray to very dark grayish brown loam to gravelly loam; weak, fine and very fine crumb structure; 20 to 45 percent flat angular gravel by volume with some cobble; slightly sticky and slightly plastic when wet; pH ranges from 5.8 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly loam; weak, fine to very fine subangular blocky structure; 35 to 50 percent flat, angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 24 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 122

Mapping Unit 122 consists of 70 percent or more of Landtype 122 and may have inclusions of Landtypes 123, 124, and 126.

Typically, Landtype 122 occurs on steep sideslopes with gradients of 30 to 70 percent and variable aspect. It supports ponderosa pine, white fir, and Douglas-fir, with a ground cover of pinegrass and elk sedge.

Elevation ranges from 3,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 123 and 126 have similar landform and slope but have different soil depths and aspects which are reflected in different vegetation. Landtype 123 has shallower soils, southerly aspect, and ponderosa pine vegetation. Landtype 126 has a deeper ash soil, northerly aspect, and an associated type of vegetation. Landtype 124 has similar vegetation but slopes less than 30 percent.

Landtype 122 has a well drained soil with rapid permeability in the surface soil, and moderate in the subsoil. It has a silt loam surface soil 6 to 12 inches thick derived from recent volcanic ash. The subsoil is a gravelly and cobbly loam derived from argillite and other miscellaneous rock types. Soil depth ranges from 12 to 36 inches. Gravel and cobble content increases with depth in the subsoil and ranges from 35 to 50 percent. This soil has a nonsticky and nonplastic surface soil, and a slightly sticky and slightly plastic subsoil when wet.

Bedrock is composed of argillite and other miscellaneous unidentified older metasedimentary rock. It is hard to moderately hard, highly fractured, and competent.

Range of Profile Characteristics of Landtype 122

Litter:	Needles, leaves, and decomposing organic matter 0 to 2 inches thick, covering 60 to 80 percent of the soil surface.
Surface Rock Fragments:	Less than 10 percent of the soil surface is flat angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; 0 to 20 percent flat angular gravel by volume; nonsticky and nonplastic when wet; pH ranges from 5.8 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly loam; weak, fine to very fine subangular blocky structure; 35 to 50 percent flat, angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 123

Mapping Unit 123 consists of 70 percent or more of Landtype 123 and may have inclusions of Landtypes 121, 122, and 128.

Typically, Landtype 123 occurs on steep, southerly-facing sideslopes with gradients of 30 to 70 percent. It supports ponderosa pine with a ground cover of fescue, wheatgrass, elk sedge, and Sandberg bluegrass.

Elevation ranges from 3,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 122 and 128 have similar landforms but differ in soil depth which is reflected in vegetation. Landtype 122 has deeper soils and a mixed pine-fir vegetation. Landtype 128 is shallower and has juniper and mahogany. Landtype 121 has similar vegetation but has slopes less than 30 percent.

Landtype 123 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a loam to gravelly loam surface soil, and a gravelly and cobbly loam subsoil. Soil material is derived from argillite and other miscellaneous rock types. Soil depth ranges from 12 to 30 inches. Gravel and cobble content increases with depth and ranges from 25 to 50 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of argillite and other miscellaneous unidentified older metasedimentary rock. It is hard to moderately hard, highly fractured and competent.

Range of Profile Characteristics of Landtype 123

Litter:	Needles, leaves, and decomposing organic matter; 0 to 1 inch thick covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	30 to 50 percent of the surface is flat angular rock fragments.
Surface Layers:	Very dark gray to very dark grayish brown loam to gravelly loam; weak fine, and very fine crumb structure; 25 to 50 percent flat, angular gravel by volume with some cobble; slightly sticky and slightly plastic when wet; pH ranges from 5.8 to 6, to 12 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly loam; weak, fine to very fine subangular blocky structure; 35 to 50 percent flat angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 24 inches thick.

See page 109 for general management discussion of loamy forested soils (More than 12 inches deep).

MAPPING UNIT 124

Mapping Unit 124 consists of 70 percent or more of Landtype 124 and may have inclusions of Landtypes 121, 122, and 127.

Typically, Landtype 124 occurs on ridgetops and sideslopes with gradients less than 30 percent and variable aspect.

It supports ponderosa pine, white fir and Douglas-fir with a ground cover of elk sedge and pinegrass. Elevation ranges from 3,500 to 6,000 feet. The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 121 and 127 have similar landforms and slopes but have different soil depths which are reflected in the vegetation. Landtype 121 has a shallower soil and ponderosa pine vegetation. Landtype 127 has a deeper ash surface soil with associated species. Landtype 122 has similar vegetation but slopes over 30 percent.

Landtype 124 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. Landtype 124 has a silt loam surface soil 6 to 12 inches thick derived from recent volcanic ash. The subsoil is a gravelly and cobbly loam derived from argillite and other miscellaneous rock types. Soil depth ranges from 12 to 36 inches. Gravel and cobble content increases with depth in the subsoil and ranges from 35 to 50 percent. This soil has a nonsticky and nonplastic surface soil, and a slightly sticky and slightly plastic subsoil when wet.

Bedrock is composed of argillite and other miscellaneous unidentified older metasedimentary rock. It is hard to moderately hard, highly fractured and competent.

Range of Profile Characteristics of Landtype 124

Litter:	Needles, leaves, and decomposing organic matter 0 to 2" inches thick, covering 60 to 80 percent of the soil surface.
Surface Rock Fragments:	Less than 10 percent of the soil surface is flat angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; 0 to 20 percent flat, angular gravel by volume; nonsticky and nonplastic when wet; pH ranges from 5.8 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly loam; weak, fine to very fine subangular blocky structure; 35 to 50 percent flat, angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 125

Mapping Unit 125 consists of 70 percent or more of Landtype 125 and may have inclusions of Landtypes 121 and 128.

Typically, Landtype 125 occurs on ridgetops and sideslopes with gradients less than 30 percent. It supports juniper, mahogany, scattered ponderosa pine, fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 3,500 to 5,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 121 has deeper soil and similar landform with ponderosa pine vegetation. Landtype 128 has similar soils and vegetation, but occurs on slopes greater than 30 percent.

Landtype 125 has an excessively drained soil with moderate permeability. It has a gravelly and cobbly loam soil derived from argillite and other miscellaneous rock types. Soil depth ranges from 6 to 18 inches. Gravel and cobble content ranges from 35 to 50 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of argillite and other miscellaneous unidentified older metasedimentary rock. It is hard to moderately hard, highly fractured, and competent.

Range of Profile Characteristics of Landtype 125

Litter:	Leaves and decomposing organic matter; 0 to 1 inch thick covering less than 10 percent of the soil surface.
Surface Rock Fragments:	50 to 70 percent of the soil surface is flat angular rock fragments.
Surface Layers:	Very dark grayish brown to brown gravelly and cobbly loam; weak, fine granular and crumb structure; 35 to 50 percent flat, angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.8 to 6.5; 6 to 18 inches deep.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 126

Mapping Unit 126 consists of 70 percent or more of Landtype 126 and may have inclusions of Landtypes 122 and 127.

Typically, Landtype 126 occurs on steep, northerly-facing sideslopes with gradients of 30 to 70 percent. It supports white fir, Douglas-fir, larch and lodgepole pine with a ground cover of pinegrass, huckleberry, and Columbia brome.

Elevation ranges from 4,000 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 127 has similar vegetation but has slopes less than 30 percent. Landtype 122 has similar landform and slope but has shallower soils which support mixed pine-fir vegetation.

Landtype 126 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil 12 to 18 inches thick derived from recent volcanic ash. The subsoil is a gravelly and cobbly loam derived from argillite and other miscellaneous rock types. Soil depth ranges from 24 to 48 inches. Gravel and cobble content increases with depth in the subsoil and ranges from 35 to 50 percent. This soil is nonsticky and nonplastic in the surface soil and slightly sticky and slightly plastic in the subsoil when moist.

Bedrock is composed of argillite and other miscellaneous unidentified older metasedimentary rock. It is hard to moderately hard, highly fractured and competent.

Range of Profile Characteristics of Landtype 126

Litter:	Leaves, needles, and decomposing organic matter, 1 to 3 inches thick covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; less than 10 percent gravel and cobble by volume; nonsticky and nonplastic when moist; pH ranges from 5.8 to 6.5; 12 to 18 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly loam; weak, fine to very fine subangular blocky structure; 35 to 50 percent flat angular gravel and cobble by volume; slightly sticky and slightly plastic when moist; pH ranges from 6.0 to 7.0; 12 to 36 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 127

Mapping Unit 127 consists of 70 percent or more of Landtype 127 and may have inclusions of Landtypes 124 and 126.

Typically, Landtype 127 occurs on upland flats and northerly-facing side-slopes with gradients less than 30 percent. It supports white fir, Douglas-fir, larch, and lodgepole pine with a ground cover of huckleberry, pine-grass, and Columbia brome.

Elevation ranges from 4,000 to 6,200 feet.

The included landtype in the mapping unit differ from the dominant land-type in the following ways: Landtype 124 has similar landform and slope but has shallower soils and mixed pine-fir vegetation. Landtype 126 has similar vegetation but has slopes over 30 percent.

Landtype 127 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. Landtype 127 has a silt loam surface soil 12 to 18 inches thick derived from recent volcanic ash. The subsoil is a gravelly and cobbly loam derived from argillite and other miscellaneous rock types. Soil depth ranges from 24 to 48 inches. Gravel and cobble content increases with depth in the subsoil. It has a nonsticky and nonplastic surface soil and a slightly sticky and slightly plastic subsoil when moist.

Bedrock is composed of argillite and other miscellaneous unidentified older metasedimentary rock. It is hard to moderately hard, highly fractured, and competent.

Range of Profile Characteristics of Landtype 127

Litter:	Leaves, needles, and decomposing organic matter, 1 to 3 inches thick, covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; less than 5 percent gravel and cobble by volume; nonsticky and nonplastic when moist; pH ranges from 5.8 to 6.5; 12 to 18 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly loam; weak, fine to very fine subangular blocky structure; 35 to 50 percent flat, angular gravel and cobble by volume; slightly sticky and slightly plastic when moist; pH ranges from 6.0 to 7.0; 12 or 36 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 128

Mapping Unit 128 consists of 70 percent or more of Landtype 128 and may have inclusions of Landtypes 122, 123, and 125.

Typically, Landtype 128 occurs on steep sideslopes with gradients of 30 to 70 percent. It supports juniper, mahogany, scattered ponderosa pine, with a ground cover of fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 3,500 to 5,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 122 and 123 have similar landforms but have deeper soils. Landtype 122 has mixed pine-fir and Landtype 123 has ponderosa pine vegetation. Landtype 125 has similar soils and vegetation but has slopes less than 30 percent.

Landtype 128 has an excessively drained soil with moderate permeability. Landtype 128 is a gravelly and cobbly loam soil derived from argillite and miscellaneous rock types. Soil depth ranges from 6 to 18 inches. Gravel and cobble content ranges from 35 to 50 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of argillite and other miscellaneous unidentified older metasedimentary rock. It is hard to moderately hard, highly fractured and competent.

Range of Profile Characteristics of Landtype 128

Litter:	Leaves and decomposing organic matter, 0 to 1 inch thick covering less than 10 percent of the soil surface.
Surface Rock Fragments:	50 to 70 percent of the soil surface is flat, angular rock fragments.
Surface Layers:	Very dark grayish brown to brown gravelly and cobbly loam; weak, fine to very fine granular and crumb structure; 35 to 50 percent flat, angular gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 5.8 to 6.5; 6 to 18 inches deep.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 132

Mapping Unit 132 consists of 70 percent or more of Landtype 132 and may have inclusions of Landtypes 32 and 133.

Typically, Landtype 132 occurs on steep sideslopes with gradients of 30 to 70 percent and variable aspect. It supports ponderosa pine, white fir, and Douglas-fir with a ground cover of elk sedge and pinegrass.

Elevation ranges from 4,500 to 5,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 32 has a similar vegetation and landform but is underlain with interbedded sedimentary bedrock. Landtype 133 has similar landform and slope but has shallower soils with ponderosa pine vegetation.

Landtype 132 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil 6 to 10 inches thick derived from recent volcanic ash. The subsoil is a gravelly and cobbly loam soil derived from chert conglomerate. Soil depth ranges from 18 to 30 inches. Gravel and cobble content in the subsoil ranges from 35 to 50 percent. This soil has a nonsticky and nonplastic surface soil and a slightly sticky and slightly plastic subsoil when wet.

Bedrock is composed of hard, slightly fractured chert conglomerate which is competent.

Range of Profile Characteristics of Landtype 132

Litter:	Needles, leaves, and decomposing organic matter, 0 to 2 inches covering 50 to 70 percent of the soil surface.
Surface Rock Fragments:	0 to 20 percent of the soil surface is rounded rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive structure; 0 to 20 percent rounded gravels by volume; nonsticky and nonplastic when wet; pH ranges 6.0 to 7.0; 6 to 12 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly loam; weak, fine to very fine subangular blocky structure; 35 to 50 percent rounded gravel and cobble; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 24 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 133

Mapping Unit 133 consists of 70 percent or more of Landtype 133 and may have inclusions of Landtypes 33, 132, and 134.

Typically, Landtype 133 occurs on steep, southerly-facing sideslopes with gradients of 30 to 70 percent.

It supports ponderosa pine with a ground cover of fescue, wheatgrass, elk sedge, and Sandberg bluegrass.

Elevation ranges from 4,500 to 5,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 33 has similar vegetation and landform but is underlain with interbedded sedimentary bedrock. Landtype 132 has similar landform and slope but has an ash surface soil and mixed pine-fir vegetation. Landtype 134 occurs on exposed ridges and sideslope, and has shallower soils with mahogany and juniper vegetation.

Landtype 133 has a well drained soil with moderate permeability in the surface soil and moderate in the subsoil. It has a gravelly loam surface soil and a gravelly and cobbly loam subsoil derived from chert conglomerate. Soil depth ranges from 12 to 24 inches. Gravel and cobble content increases with depth and ranges from 30 to 60 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of a hard, slightly fractured chert conglomerate which is competent.

Range of Profile Characteristics of Landtype 133

Litter:	Needles, leaves, and decomposing organic matter 0 to 1 inch thick, covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	20 to 40 percent of the soil surface is rounded rock fragment.
Surface Layers:	Very dark grayish brown to brown gravelly loam; weak, fine to very fine crumb structure; 30 to 45 percent rounded gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 10 inches thick.
Subsoil Layers:	Dark brown to brown gravelly and cobbly loam; weak, fine to very fine subangular blocky structure; 40 to 50 percent rounded gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 18 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 134

Mapping Unit 134 consists of 70 percent or more of Landtype 134 and may have inclusions of Landtypes 34 and 133.

Typically, Landtype 134 occurs on exposed ridgetops and sideslopes with a gradient of 10 to 70 percent. It supports mahogany, juniper, scattered ponderosa pine, fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 4,500 to 5,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 34 differs only in bedrock materials. It has interbedded sedimentary bedrock. Landtype 133 has deeper soils and occurs mostly on the steep sideslopes and has ponderosa pine vegetation.

Landtype 134 has an excessively drained soil with moderate permeability. It has a gravelly to very gravelly loam soil derived from chert conglomerate. Soil depth ranges from 6 to 12 inches. Gravel and cobble content ranges from 35 to 60 percent. This soil is slightly sticky and slightly plastic when wet.

Bedrock is composed of a hard, slightly fractured chert conglomerate which is competent.

Range of Profile Characteristics of Landtype 134

Litter:	Leaves and decomposing organic matter; 0 to 1 inch thick covering less than 30 percent of the soil surface.
Surface Rock Fragments:	30 to 60 percent of the soil surface is rounded rock fragments.
Surface Layers:	Very dark grayish brown to dark brown gravelly to very gravelly loam; weak, fine to very fine crumb structure; 35 to 60 percent rounded gravel and cobble by volume; slightly sticky and slightly plastic when wet; pH ranges from 6.0 to 7.0; 6 to 12 inches thick.

See page 109 for general management discussion of loamy and clayey non-forested soils (generally less than 15 inches deep).

MAPPING UNIT 141

Mapping Unit 141 consists of 70 percent or more of Landtype 141 and may have inclusions of Landtypes 46, 142, and 143.

Typically, Landtype 141 occurs on upland flats and sideslopes with gradients less than 30 percent and with a general south aspect. It supports ponderosa pine with a ground vegetation of fescue, wheatgrass, elk sedge, and Sandberg bluegrass.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 46 and 142 have similar landforms but differ in soil depth. Landtype 46 has a shallower soil and mahogany-juniper vegetation. Landtype 142 has deeper soils, an ash surface soil, and mixed pine-fir vegetation. Landtype 143 has soils and vegetation similar to Landtype 141, but has slopes over 30 percent.

Landtype 141 has a well drained soil with moderate permeability in the surface soil, and moderate in the subsoil. It has a loam to gravelly loam surface soil and a gravelly and cobbly loam subsoil. Soil material is derived from andesite, basalt, and softer interflow materials. Soil depth ranges from 12 to 30 inches. Gravel and cobble content increases with depth, and ranges from 20 to 60 percent by volume. This soil is sticky and slightly plastic to plastic when wet.

Bedrock is composed of hard andesite and basalt with soft to moderately hard interflow material composed of tuffaceous rhyolitic material. Generally these bedrock materials are competent.

Range of Profile Characteristics of Landtype 141

Litter:	Leaves, needles, and decomposing organic matter, 0 to 1 inch thick, covering 40 to 50 percent of the soil surface.
Surface Rock Fragments:	10 to 20 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark gray to very dark grayish brown loam to gravelly loam; weak, fine to very fine crumb structure; 20 to 45 percent gravel and cobble by volume; sticky and slightly plastic when wet; pH ranges from 5.6 to 6.5; 6 to 10 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam; moderate fine to very fine subangular and angular blocky structure, 35 to 60 percent gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 6 to 24 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 142

Mapping Unit 142 consists of 70 percent or more of Landtype 142 and may have inclusions of Landtypes 46, 141, 148, and 158.

Typically, Landtype 142 occurs on upland flats and sideslopes with gradients less than 30 percent and has a variable aspect becoming more southerly as elevation increases.

It supports ponderosa pine, Douglas-fir and white fir with a ground vegetation of elk sedge and pinegrass.

Elevation ranges from 4,500 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 46, 141, and 158 have similar landforms, but differ in soil depth. Landtypes 46 and 141 have shallower soils with mahogany-juniper and ponderosa pine vegetation, respectively. Landtype 158 has a deeper ash surface soil and associated species. Landtype 148 has vegetation similar to Landtype 142 but has slopes over 30 percent.

Landtype 142 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly and cobbly loam subsoil derived from andesite, basalt, and soft interflow materials. Soil depth ranges from 12 to 36 inches. Gravel and cobble content ranges up to 50 percent by volume. This soil is nonsticky and nonplastic in the surface soil, and sticky and plastic in the subsoil when wet.

Bedrock is composed of hard andesite and basalt with soft to moderately hard interflow material composed of tuffaceous rhyolitic material. Generally, these bedrock materials are competent.

Range of Profile Characteristics of Landtype 142

Litter:	Leaves, needles, and decomposing organic matter, 0 to 2 inches thick, covering 60 to 80 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0 to 10 percent platy and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam; moderate, fine to very fine, subangular and angular blocky structure; 35 to 50 percent gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 6 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 143

Mapping Unit 143 consists of 70 percent or more of Landtype 143 and may have inclusions of Landtypes 44, 141, and 148.

Typically, Landtype 143 occurs on steep southerly sideslopes with gradients over 30 percent. It supports ponderosa pine with a ground vegetation of fescue, wheatgrass, elk sedge, and Sandberg bluegrass.

Elevation ranges from 4,000 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 44 and 148 have similar slopes but differ in soil depth. Landtype 44 has shallower soils and supports mahogany and juniper. Landtype 148 is deeper and has an ash surface soil with mixed pine-fir vegetation. Landtype 141 has soils and vegetation similar to Landtype 143 but has gradients less than 30 percent.

Landtype 143 has a well drained soil with moderate permeability in the surface soil, and moderate in the subsoil. It has a loam to gravelly loam surface soil, and a gravelly and cobbly loam subsoil derived from andesite, basalt, and soft interflow materials. Soil depth ranges from 12 to 30 inches. Gravel and cobble content ranges up to 60 percent by volume. This soil is sticky and slightly plastic in the surface soil, and sticky and plastic in the subsoil when wet.

Bedrock is composed of hard andesite and basalt with soft to moderately hard interflow material composed of tuffaceous rhyolitic material. Generally, these bedrock materials are competent.

Range of Profile Characteristics of Landtype 143

Litter:	Leaves, needles, and decomposing organic matter, 0 to 1 inch-thick covering 30 to 50 percent of the soil surface.
Surface Rock Fragments:	10 to 30 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark gray to very dark gravish brown loam to gravelly loam; weak, fine to very fine crumb structure; 20 to 45 percent gravel and cobble by volume; sticky and slightly plastic when wet; pH ranges from 5.6 to 6.5; 6 to 10 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam; moderate, fine to very fine subangular and angular blocky structure; 35 to 60 percent gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 6 to 24 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 148

Mapping Unit 148 consists of 70 percent or more of Landtype 148 and may have inclusions of Landtypes 44, 142, 143, and 159.

Typically, Landtype 148 occurs on steep sideslopes with slopes over 30 percent and has a variable aspect becoming more southerly as elevation increases. It supports ponderosa pine, Douglas-fir, and white fir with a ground vegetation of elk sedge and pinegrass.

Elevation ranges from 4,500 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 44 has shallower soils that support juniper-mahogany vegetation. Landtype 142 has similar soils and vegetation but has gradients less than 30 percent. Landtype 143 has a general southerly aspect and supports ponderosa pine. Landtype 159 has a deeper ash surface soil and a general northerly aspect which supports associated species.

Landtype 148 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly and cobbly loam subsoil derived from andesite, basalt, and soft interflow materials. Soil depth ranges from 12 to 48 inches. Gravel and cobble content ranges up to 50 percent by volume. This soil is nonsticky and nonplastic in the surface soil, and sticky and plastic in the subsoil.

Bedrock is composed of hard andesite and basalt with soft to moderately hard interflow material composed of tuffaceous rhyolitic material. Generally, these bedrock materials are competent.

Range of Profile Characteristics of Landtype 148

Litter:	Leaves, needles, and decomposing organic matter, 0 to 2 inches thick covering 60 to 70 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0 to 10 percent platy and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam; moderate, fine to very fine subangular and angular blocky structure; 35 to 50 percent angular and platy gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 6 to 42 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 158

Mapping Unit 158 consists of 70 percent or more of Landtype 158 and may have inclusions of Landtypes 114, 142, and 159.

Typically, Landtype 158 occurs on upland flats and northerly sideslopes with gradients less than 30 percent. It supports white fir, Douglas-fir, larch, and lodgepole pine, with a ground vegetation of pinegrass, huckleberry, and Columbia brome.

Elevation ranges from 5,000 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 114 has glacial till soil material and deeper soils. Landtype 142 has similar slopes but has shallower ash surface soil and mixed pine-fir vegetation. Landtype 159 has soils and aspect similar to Landtype 158 but has slopes over 30 percent.

Landtype 158 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly and cobbly loam subsoil derived from andesite, basalt, and soft interflow materials. Soil depth ranges from 24 to 48 inches. Gravel and cobble content ranges up to 50 percent by volume. This soil is nonsticky and nonplastic in the surface soil, and sticky and plastic in the subsoil when wet.

Bedrock is composed of hard andesite and basalt with soft to moderately hard interflow material composed of tuffaceous rhyolite material. Generally, these bedrock materials are competent.

Range of Profile Characteristics of Landtype 158

Litter:	Leaves, needles, and decomposing organic matter, 1 to 3 inches thick, covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 15 to 24 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam; moderate, fine to very fine, subangular and angular blocky structure; 35 to 50 percent gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 9 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 159

Mapping Unit 159 consists of 70 percent or more of Landtype 159 may have inclusions of Landtypes 114, 148, and 158.

Typically, Landtype 159 occurs on steep, northerly-facing sideslopes with gradients of 30 to 70 percent. It supports white fir, Douglas-fir, larch, and lodgepole pine with a ground cover of pinegrass, huckleberry, and Columbia brome.

Elevation ranges from 4,500 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 114 has glacial till soil material and deeper soils. Landtype 148 has similar slopes but has shallower ash surface soils which support mixed pine-fir vegetation. Landtype 158 has soils and aspect similar to Landtype 159 but has slopes less than 30 percent.

Landtype 159 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly and cobbly loam subsoil derived from andesite, basalt, and soft interflow materials. Soil depth ranges from 24 to 48 inches. Gravel and cobble content rangesup to 50 percent by volume. This soil has a nonsticky and nonplastic surface soil and a sticky and plastic subsoil when wet.

Bedrock is composed of hard andesite and basalt with soft to moderately hard interflow material composed of tuffaceous rhyolite materials. Generally, these bedrock materials are competent.

Range of Profile Characteristics of Landtype 159

Litter:	Leaves, needles, and decomposing organic matter, 1 to 3 inches thick, covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0 to 15 percent platy and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.6 to 6.5; 12 to 24 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam; moderate, fine to very fine, subangular and angular blocky structure; 35 to 50 percent platy and angular gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.6 to 6.5; 9 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 162

Mapping Unit 162 consists of 70 percent or more of Landtype 162 and may have inclusions of Landtypes 163, 164, and 168.

Typically, Landtype 162 occurs on steep sideslopes with gradients of 30 to 70 percent and variable aspect. It supports ponderosa pine, white fir, and Douglas-fir with a ground cover of elk sedge and pinegrass.

Elevation ranges from 5,000 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways. Landtype 163 has shallower soils with a south aspect and ponderosa pine vegetation. Landtype 164 has vegetation similar to Landtype 162 but has slopes less than 30 percent. Landtype 168 also has shallower soils which support juniper-mahogany vegetation.

Landtype 162 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly and cobbly loam to clay loam subsoil derived from gabbro. Soil depth ranges from 18 to 48 inches. Gravel and cobble content ranges up to 50 percent by volume. This soil has a nonsticky and nonplastic surface soil and a sticky and plastic subsoil when wet.

Bedrock is composed of hard to moderately hard, competent gabbro with minor amounts of peridotite and serpentine.

Range of Profile Characteristics of Landtype 162

Litter:	Leaves, needles, and decomposing organic matter, 1 to 2 inches thick, covering 70 to 90 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0 to 10 percent platy and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.0 to 6.0; 6 to 12 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam to clay loam; moderate to strong, fine to very fine angular blocky structure; 35 to 50 percent platy and angular gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.0 to 6.0; 12 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 163

Mapping Unit 163 consists of 70 percent or more of Landtype 163 and may have inclusions of Landtypes 162 and 168.

Typically, Landtype 163 occurs on steep, southerly-facing slopes with gradients of 30 to 70 percent. It supports ponderosa pine with a ground cover of fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 4,500 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 162 has deeper soils with an ash surface soil and mixed pine-fir vegetation. Landtype 168 has shallower soils with mahogany-juniper vegetation.

Landtype 163 has a well drained soil with moderate permeability. It has a gravelly loam to clay loam soil derived from gabbro. Soil depth ranges from 12 to 30 inches. Gravel and cobble content increases with depth and ranges from 35 to 50 percent by volume, This soil is sticky and plastic when wet.

Bedrock is composed of hard to moderately hard, competent gabbro with minor amounts of peridotite and serpentine.

Range of Profile Characteristics of Landtype 163

Litter:	Leaves, needles, and decomposing organic matter, 0 to 2 inches thick, covering 50 to 70 percent of the soil surface.
Surface Rock Fragments:	20 to 30 percent of the soil surface is angular and platy rock fragments.
Surface Layers:	Very dark grayish brown, brown to dark brown gravelly loam to gravelly loam, to gravelly clay loam; moderate to strong, fine to very fine, angular blocky structure; 35 to 50 percent platy and angular gravel and cobble; sticky and plastic when wet; pH ranges from 5.0 to 6.0; 12 to 30 inches thick.

See page 109 for general management discussion of loamy forested soils (more than 12 inches deep).

MAPPING UNIT 164

Mapping Unit 164 consists of 70 percent or more of Landtype 164 and may have inclusions of Landtypes 162 and 167.

Typically, Landtype 164 occurs on upland flats and sideslopes with gradients less than 30 percent and variable aspect. It supports ponderosa pine, white fir, and Douglas-fir, with a ground cover of elk sedge and pinegrass.

Elevation ranges from 5,000 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 162 has similar vegetation but has slope over 30 percent. Landtype 167 has deeper ash surface soils and a northerly aspect and associated species.

Landtype 164 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly and cobbly loam to clay loam subsoil derived from gabbro. Soil depth ranges from 18 to 48 inches. Gravel and cobble content ranges up to 50 percent by volume. This soil has a nonsticky and nonplastic surface soil and a sticky and plastic subsoil when wet.

Bedrock is composed of hard to moderately hard, competent gabbro with minor amounts of peridotite and serpentine.

Range of Profile Characteristics of Landtype 164

Litter:	Leaves, needles, and decomposing organic matter, 0 to 2 inches thick covering 70 to 90 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0 to 10 percent platy and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.0 to 6.0; 12 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam to clay loam; moderate to strong, fine to very fine, angular gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.0 to 6.0; 12 to 30 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 166

Mapping Unit 166 consists of 70 percent or more of Landtype 166 and may have inclusions of Landtypes 162 and 167.

Typically, Landtype 166 occurs on steep northerly-facing sideslopes with gradients of 30 to 70 percent. It supports white fir, Douglas-fir, larch and lodgepole pine with a ground cover of pinegrass, huckleberry, and Columbia brome.

Elevation ranges from 5,500 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 162 has similar landforms but has shallower ash surface soils and ponderosa pine-fir type vegetation. Landtype 167 has similar vegetation but has gradients less than 30 percent.

Landtype 166 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly and cobbly loam to clay loam subsoil derived from gabbro. Soil depth ranges from 24 to 60 inches. Gravel and cobble content ranges up to 50 percent by volume. This soil has a nonsticky and nonplastic surface soil and a sticky and plastic subsoil when wet.

Bedrock is composed of hard to moderately hard, competent gabbro with minor amounts of peridotite and serpentine.

Range of Profile Characteristics of Landtype 166

Litter:	Leaves, needles, and decomposing organic matter, 0 to 2 inches, covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0 to 10 percent platy and angular gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.0 to 6.0; 12 to 24 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam to clay loam; moderate to strong, fine to very fine, angular blocky structure; 35 to 50 percent platy and angular gravel and cobble by volume; sticky and plastic when wet; pH ranges from 5.0 to 6.0; 12 to 48 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 167

Mapping Unit 167 consists of 70 percent or more of Landtype 167 and may have inclusions of Landtypes 164 and 166.

Typically, Landtype 167 occurs on upland flats and northerly-facing sideslopes with gradients less than 30 percent. It supports white fir, larch, and lodgepole pine with a ground cover of pinegrass, huckleberry, and Columbia brome.

Elevation ranges from 5,500 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 164 has similar landform but has a shallower ash surface soil and mixed pine-fir vegetation. Landtype 166 has vegetation similar to Landtype 167 but has slopes over 30 percent.

Landtype 167 has a well drained soil with rapid permeability in the surface soil and moderate in the subsoil. It has a silt loam surface soil derived from gabbro. Soil depth ranges from 24 to 60 inches. Gravel and cobble content ranges up to 50 percent by volume. This soil has a nonsticky and nonplastic surface soil, and a sticky and plastic subsoil when wet.

Bedrock is composed of hard to moderately hard competent gabbro with minor amounts of serpentine and peridotite.

Range of Profile Characteristics of Landtype 167

Litter:	Leaves, needles, and decomposing organic matter, 0 to 2 inches thick, covering 90 to 100 percent of the soil surface.
Surface Rock Fragments:	None.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.0 to 6.0; 12 to 24 inches thick.
Subsoil Layers:	Brown to dark brown gravelly and cobbly loam to clay loam; moderate to strong, fine to very fine, angular blocky structure; 35 to 50 percent platy and angular gravel and cobble by volume; sticky and plastic when wet; 12 to 48 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 168

Mapping Unit 168 consists of 70 percent or more of Landtype 168 and may have inclusions of Landtypes 162 and 163.

Typically, Landtype 168 occurs on steep, exposed sideslopes with gradients of 30 to 70 percent. It supports mahogany, juniper, and scattered ponderosa pine with a ground cover of fescue, wheatgrass, and Sandberg bluegrass.

Elevation ranges from 4,500 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtypes 162 and 163 have similar landforms, but deeper soils. Landtype 162 supports pine-fir and Landtype 163, ponderosa pine.

Landtype 168 has an excessively drained soil with moderate permeability. It has a gravelly loam to clay loam soil derived from gabbro. Soil depth ranges from 6 to 18 inches. Gravel and cobble content ranges from 45 to 60 percent by volume. This soil is sticky and plastic when wet.

Bedrock is composed of hard to moderately hard, competent gabbro with minor amounts of serpentine and peridotite.

Range of Profile Characteristics of Landtype 168

Litter:	Leaves and decomposing organic matter, 0 to 1 inch thick, covering less than 30 percent of the soil surface.
Surface Rock Fragments:	50 to 70 percent of the soil surface is platy and angular rock fragments.
Surface Layers:	Very dark grayish brown to dark brown gravelly loam to gravelly clay loam; moderate to strong, fine to very fine, granular and angular blocky structure; 45 to 60 percent platy and angular gravel and cobble; sticky and plastic when wet; pH ranges from 5.0 to 6.0; 6 to 18 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 172

Mapping Unit 172 consists of 70 percent or more of Landtype 172 and may have inclusions of Landtypes 176.

Typically, Landtype 172 occurs on sideslopes with a slope range of 5 to 50 percent, and variable aspect. It supports ponderosa pine, Douglas-fir, white fir and lodgepole pine with a ground cover of pinegrass, elk sedge, and some huckleberry.

Elevation ranges from 4,500 to 6,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 176 has a deeper ash surface soil material and supports associated species.

Landtype 172 has an excessively drained soil with rapid permeability in the surface soil and very rapid in the subsoil. It has a silt loam surface soil derived from recent volcanic ash, and a gravelly to very gravelly loamy sand to sand subsoil derived from granodiorite. Soil depth ranges from 24 to 72 inches. Gravel content ranges from 40 to 70 percent by volume in the subsoil. This soil is nonsticky and nonplastic when wet.

Bedrock is composed of soft, highly weathered and hard unweathered granodiorite. It is massive to slightly fractured and competent to incompetent.

Range of Profile Characteristics of Landtype 172

Litter:	Leaves, needles, and decomposing organic matter; 0 to 2 inches, covering 80 to 90 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.8 to 6.8; 6 to 12 inches thick.
Subsoil Layers:	Brown to yellowish brown gravelly to very gravelly loamy sand to sand; single-grained; 40 to 70 percent angular gravel by volume; nonsticky and nonplastic when wet; pH ranges from 5.8 to 6.8; 18 to 60 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 176

Mapping Unit 176 consists of 70 percent or more of Landtype 176 and may have inclusions of Landtypes 114 and 172.

Typically, Landtype 176 occurs on upland flats and northerly-facing sideslopes with gradients up to 50 percent.

It supports white fir, lodgepole pine, larch, and Douglas-fir with a ground cover of pinegrass, elk sedge, and huckleberry.

Elevation ranges from 5,000 to 7,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 114 has loamy glacial till soil material. Landtype 172 has a shallower ash surface soil material and supports a mixed ponderosa pine-fir vegetation.

Landtype 176 has a well drained soil with rapid permeability in the surface soil and very rapid in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a gravelly to very gravelly loamy sand to sand subsoil derived from granodiorite. Soil depth ranges from 60 to 120 inches. Gravel content ranges from 40 to 70 percent by volume. This soil is nonsticky and nonplastic when wet.

Bedrock is composed of soft, highly weathered and hard unweathered granodiorite. It is massive to slightly fractured, and incompetent to competent.

Range of Profile Characteristics of Landtype 176

Litter:	Leaves, needles, and decomposing organic matter; 1 to 3 inches thick, covering 90 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.8 to 6.8; 15 to 24 inches thick.
Subsoil Layers:	Brown to yellowish brown gravelly to very gravelly loamy sand to sand; single grained; 40 to 70 percent angular gravel by volume; nonsticky and nonplastic when wet; pH ranges from 5.8 to 6.8; 30 to 100 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 181

Mapping Unit 181 consists of 70 percent or more of Landtype 181 and may have inclusions of Landtypes 182, 185, and 188.

Typically, Landtype 181 occurs on toeslopes and old landflow areas with gradients less than 30 percent and a southerly aspect. It supports ponderosa pine and a ground cover of mulesear wyethia and a variety of grasses and sedges.

Elevation ranges from 3,600 to 4,500 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 182 has an ash surface soil and supports a mixed ponderosa pine-fir vegetation. Landtype 185 is wetter and supports mainly a sedge and grass vegetation with a few ponderosa pine. Landtype 188 occurs on steep sideslopes with gradients over 30 percent.

Landtype 181 has a poorly drained soil with very slow permeability in the surface soil except when dry and cracked and very slow in the subsoil. It has a clay loam to clay surface soil and a clay subsoil. Soil material is derived from highly weathered tuffs and breccias. Soil depth ranges from 48 to 96 inches. Gravel and cobble content ranges up to 30 percent by volume. This soil is very sticky and very plastic when wet. It also has high shrink-swell characteristics when wet and dry.

Bedrock is composed of soft to moderately hard altered tuffs and mudflow breccias that are incompetent. They are massive to slightly fractured.

Range of Profile Characteristics of Landtype 181

Litter:	Leaves, needles, and decomposing organic matter, 0 to 1 inch thick, covering 70 to 90 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Black clay loam to clay; strong, fine, granular structure; 0 to 10 percent angular and rounded gravel and cobble by volume; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 8 to 12 inches thick.
Subsoil Layers:	Dark reddish gray to dark grayish brown clay; strong, fine, and very fine angular blocky structure; 10 to 30 percent angular and rounded gravel and cobble by volume; very sticky and very plastic; pH ranges from 5.5 to 6.5 when wet; 36 to 84 inches thick.

See page 110 for general management discussion of clayey forested soils.

MAPPING UNIT 182

Mapping Unit 182 consists of 70 percent or more of Landtype 182 and may have inclusions of Landtypes 181, 185, and 186.

Typically, Landtype 182 occurs on sideslopes and toeslopes with gradients less than 30 percent and variable aspect. It supports ponderosa pine, white fir, and Douglas-fir with a ground cover of pinegrass and elk sedge.

Elevation ranges from 3,600 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 181 has a southerly aspect and ponderosa pine vegetation. Landtype 185 is wetter and has a grass-sedge vegetation. Landtype 186 has similar soil and vegetation but has slopes over 30 percent.

Landtype 182 has a moderately well drained soil with rapid permeability in the surface soil and very slow in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a clay loam to clay subsoil derived from weathered tuffs and breccias. Soil depth ranges from 24 to 72 inches. Gravel and cobble content ranges up to 30 percent in the subsoil. This soil has a nonsticky and nonplastic surface soil, and a very sticky and very plastic subsoil when wet.

Bedrock is composed of soft to moderately hard mudflow breccias and conglomerates with minor amounts of hard basalts and andesites. The mudflow breccias and conglomerates are massive to slightly fractured and moderately competent. The basalts and andesites are moderately to highly fractured and moderately competent.

Range of Profile Characteristics of Landtype 182

Litter:	Leaves, needles, and decomposing organic matter, 0 to 2 inches thick, covering 70 to 90 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0-10 percent angular and rounded gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.5 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark reddish gray, reddish brown to dark grayish brown clay loam to clay; strong fine to very fine angular blocky structure; 10 to 30 percent angular and rounded gravel and cobble by volume; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 12 to 60 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 183

Mapping Unit 183 consists of 70 percent or more of Landtype 183 and may have inclusions of Landtypes 182 and 189.

Typically, Landtype 183 occurs on northerly-facing sideslopes and toeslopes with gradients less than 30 percent. It supports white fir, Douglas-fir, lodgepole pine and larch with a ground cover of pinegrass, huckleberry and Columbia brome.

Elevation ranges from 4,500 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 182 has similar landform but has a shallower ash surface soil and a mixed ponderosa pine-fir vegetation. Landtype 189 has similar soils but has slopes over 30 percent.

Landtype 183 has a moderately well drained soil with rapid permeability in the surface soil and very slow in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a clay loam to clay subsoil derived from weathered tuffs and breccias. Soil depth ranges from 36 to 72 inches. Gravel and cobble content ranges up to 30 percent in the subsoil. This soil has a nonsticky and nonplastic surface soil, and a very sticky and very plastic subsoil when wet.

Bedrock is composed of soft to moderately hard mudflow breccias and conglomerates with minor amounts of hard basalts and andesites. The mudflow breccias and conglomerates are massive to slightly fractured and moderately competent. The basalts and andesites are moderately to highly fractured and moderately competent.

Range of Profile Characteristics of Landtype 183

Litter:	Leaves, needles, and decomposing organic matter, 0 to 3 inches thick covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; nonsticky and nonplastic when wet; pH ranges from 5.5 to 6.5; 12 to 24 inches thick.
Subsoil Layers:	Dark reddish gray to reddish brown to dark grayish brown clay loam to clay; strong, fine to very fine, angular blocky structure; 10 to 30 percent angular and rounded gravel and cobble by volume; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 12 to 60 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 184

Mapping Unit 184 consists of 70 percent or more of Landtype 184 and may have inclusions of Landtypes 185 and 187.

Typically, Landtype 184 occurs on ridgetops and sideslopes with gradients less than 30 percent and variable aspect. It supports juniper, low sagebrush and a scattering of ponderosa pine with a ground cover of mulesear wyethia, fescue, Sandberg bluegrass, and wheatgrass.

Elevation ranges from 3,600 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 185 is a wetter soil and supports a grass-sedge type vegetation. Landtype 187 has soil and vegetation similar to to Landtype 184, but has slopes over 30 percent.

Landtype 184 has a somewhat poorly drained soil with very slow permeability except when dry and cracked. It has a gravelly and cobbly clay loam to clay soil derived from weathered tuffs and breccias. Soil depth ranges from 6 to 12 inches. Gravel and cobble content ranges from 30 to 45 by volume. It is very sticky and very plastic when wet.

Bedrock is composed of soft to moderately hard mudflow breccias and conglomerates with minor amounts of hard basalts and andesites. The mudflow breccias and conglomerates are massive to slightly fractured and moderately competent. The basalts and andesites are moderately to highly fractured and moderately competent.

Range of Profile Characteristics of Landtype 184

Litter:	Leaves and decomposing organic matter, 0 to 1 inch thick, covering less than 20 percent of the soil surface.
Surface Rock Fragments:	40 to 60 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark grayish brown gravelly and cobbly clay loam to clay; strong, fine to very fine, granular and angular blocky structure; 30 to 45 percent angular and rounded gravel and cobble; very sticky and very plastic when wet; pH ranges from 5.5 to to 6.5; 6 to 12 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 185

Mapping Unit 185 consists of 70 percent or more of Landtype 185 and may have inclusions of Landtypes 181, 182, and 184.

Typically, Landtype 185 occurs on seepy sideslopes and deep landflow areas with slopes less than 30 percent and variable aspect. It supports scattered ponderosa pine with a ground vegetation of mulesear wyethia and and various grasses and sedges.

Elevation ranges from 3,600 to 4,800 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 181, 182, and 184 are not as wet as Landtype 185. Landtype 181 has ponderosa pine vegetation. Landtype 182 has an ash surface soil and mixed ponderosa pine-fir vegetation. Landtype 184 has shallower soils with juniper and low sagebrush vegetation.

Landtype 185 has a poorly drained soil with very slow permeability except when dry and cracked. It has a clay loam to clay and gravelly clay loam to clay soil derived from weathered tuffs and breccias. Soil depth ranges from 12 to 24 inches. Gravel and cobble content ranges from 25 to 40 percent by volume. This soil is very sticky and very plastic when wet.

Bedrock is composed of soft to moderately hard mudflow breccias and conglomerates with minor amounts of hard basalts and andesites. The mudflow breccias and conglomerates are massive to slightly fractured and moderately competent. The basalts and andesites are moderately to highly fractured and moderately competent.

Range of Profile Characteristics of Landtype 185

Litter:	Leaves, needles, and decomposing organic matter; 0 to 2 inches thick covering 60 to 80 percent of the soil surface.
Surface Rock Fragments:	0 to 20 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Black to very dark gray clay loam to clay and gravelly clay loam to clay; strong, fine to very fine, granular and angular blocky structure; 25 to 40 percent angular and rounded gravel and cobble by volume; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 12 to 24 inches thick.

See page 110 for general management discussion of clayey forested soils.

MAPPING UNIT 186

Mapping Unit 186 consists of 70 percent or more of Landtype 186 and may have inclusions of Landtypes 185, 187, and 189.

Typically, Landtype 186 occurs on steep sideslopes with gradients of 30 to 70 percent and variable aspect. It supports ponderosa pine, white fir and Douglas-fir, with a ground cover of pinegrass and elk sedge.

Elevation ranges from 3,600 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 185 occurs on slopes less than 30 percent with grass-sedge vegetation. Landtype 187 has shallower soils with juniper and low sagebrush vegetation. Landtype 189 has a deeper ash surface soil with associated species.

Landtype 186 has a moderately well drained soil with rapid permeability in the surface soil and very slow in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a clay loam to clay and gravelly clay loam to clay subsoil derived from weathered tuffs and breccias. Soil depth ranges from 24 to 48 inches. Gravel and cobble content ranges up to 40 percent in the subsoil. This soil is nonsticky and nonplastic in the surface soil, and very sticky and very plastic in the subsoil when wet.

Bedrock is composed of soft to moderately hard mudflow breccias and conglomerates with minor amounts of hard basalts and andesites. The mudflow breccias and conglomerates are massive to slightly fractured and moderately competent. The basalts and andesites are moderately to highly fractured and moderately competent.

Range of Profile Characteristics of Landtype 186

Litter:	Leaves, needles, and decomposing organic matter, 0 to 2 inches thick, covering 60 to 80 percent of the soil surface.
Surface Rock Fragments:	0 to 10 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0 to 10 percent angular and rounded gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.5 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark reddish gray to reddish brown to dark grayish brown clay loam to clay and gravelly clay loam to clay; strong, fine to very fine, angular blocky structure; 20 to 40 percent rounded and angular gravel and cobble by volume; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 18 to 42 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

MAPPING UNIT 187

Mapping Unit 187 consists of 70 percent or more of Landtype 187 and may have inclusions of Landtypes 185, 186, and 188.

Typically, Landtype 187 occurs on steep sideslopes with gradients of 30 to 70 percent and variable aspect. It supports juniper, low sagebrush and a scattering of ponderosa pine with a ground cover of mulesear wyethia, Sandberg bluegrass, wheatgrass, and fescue.

Elevation ranges from 3,600 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 185 has wetter soils and slopes less than 30 percent. Landtype 186 has deeper soils and an ash surface which supports a mixed ponderosa pine-fir vegetation. Landtype 188 also has deeper soil and ponderosa pine vegetation.

Landtype 187 has a moderately well drained soil with very slow permeability except when dry and cracked. It has a gravelly and cobbly clay loam to clay soil derived from weathered tuffs and breccias. Gravel and cobble content ranges from 30 to 45 percent by volume. This landtype is very sticky and very plastic when wet.

Bedrock is composed of soft to moderately hard mudflow breccias and conglomerates with minor amounts of hard basalts and andesites. The mudflow breccias and conglomerates are massive to slightly fractured and moderately competent. The basalts and andesites are moderately to highly fractured and moderately competent.

Range of Profile Characteristics of Landtype 187

Litter:	Leaves and decomposing organic matter; 0 to 1 inch thick covering less than 20 percent of the soil surface.
Surface Rock Fragments:	40 to 60 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark grayish brown gravelly and cobbly clay loam to clay; strong, fine to very fine, granular and angular blocky structure; 30 to 45 percent angular and rounded gravel and cobble; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 6 to 12 inches thick.

See page 109 for general management discussion of loamy and clayey nonforested soils (generally less than 15 inches deep).

MAPPING UNIT 188

Mapping Unit 188 consists of 70 percent or more of Landtype 188 and may have inclusions of Landtypes 185, 186, and 187.

Typically, Landtype 188 occurs on steep, southerly-facing sideslopes with gradients of 30 to 70 percent. It supports ponderosa pine and ground cover of mulesear wyethia and various grasses and sedges.

Elevation ranges from 3,600 to 6,000 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 185 has wetter soils, grass-sedge vegetation and slopes less than 30 percent. Landtype 186 has an ash surface soil and supports mixed ponderosa pine-fir vegetation. Landtype 187 has shallower soils which support juniper-low sagebrush vegetation.

Landtype 188 has a moderately well drained soil with very slow permeability in the surface soil except when dry and cracked and very slow in the subsoil. It has a clay loam surface soil and a clay loam to clay, and gravelly clay loam to clay subsoil. Soil material is derived from weathered tuffs and breccias. Soil depth ranges from 18 to 36 inches. Gravel and cobble content ranges from 10 to 40 percent by volume. This soil is very sticky and very plastic when wet.

Bedrock is composed of soft to moderately hard mudflow breccias and conglomerates with minor amounts of hard basalts and andesites. The mudflow breccias and conglomerates are massive to slightly fractured and moderately competent. The basalts and andesites are moderately to highly fractured and moderately competent.

Range of Profile Characteristics of Landtype 188

Litter:	Leaves, needles, and decomposing organic matter; 0 to 1 inch thick, covering 40 to 60 percent of the soil surface.
Surface Rock Fragments:	20 to 40 percent of the soil surface is angular and rounded rock fragments.
Surface Layers:	Very dark grayish brown to dark brown clay loam; strong, fine, granular structure; 10 to 20 percent angular and rounded gravel and cobble by volume; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 6 to 12 inches thick.
Subsoil Layers:	Dark reddish brown to reddish brown to dark grayish brown clay loam to clay, and gravelly clay loam and clay; strong, fine to very fine angular blocky structure; 20 to 40 percent angular and rounded gravel and cobble by volume; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 6 to 30 inches thick.

See page 110 for general management discussion of clayey forested soils.

MAPPING UNIT 189

Mapping Unit 189 consists of 70 percent or more of Landtype 189 and may have inclusions of Landtypes 183 and 186.

Typically, Landtype 189 occurs on steep, northerly-facing sideslopes with gradients of 30 to 70 percent. It supports white fir, Douglas-fir, larch, and lodgepole pine with a ground cover of pinegrass, huckleberry, and Columbia brome.

Elevation ranges from 4,500 to 6,200 feet.

The included landtypes in the mapping unit differ from the dominant landtype in the following ways: Landtype 183 has similar soil and vegetation but has slopes less than 30 percent. Landtype 186 has shallower soils, a more variable aspect and mixed ponderosa pine-fir vegetation.

Landtype 189 has a well drained soil with rapid permeability in the surface soil and very slow in the subsoil. It has a silt loam surface soil derived from recent volcanic ash and a clay loam to clay and gravelly clay loam to clay subsoil derived from weathered tuffs and breccias. Soil depth ranges from 24 to 60 inches. Gravel and cobble content ranges up to 40 percent by volume. This soil has a nonsticky and nonplastic surface soil and a very sticky and very plastic subsoil when wet.

Bedrock is composed of soft to moderately hard mudflow breccias and conglomerates with minor amounts of hard basalts and andesites. The mudflow breccias and conglomerates are massive to slightly fractured and moderately competent. The basalt and andesites are moderately to highly fractured and moderately competent.

Range of Profile Characteristics of Landtype 189

Litter:	Leaves, needles, and decomposing organic matter; 0 to 3 inches thick, covering 80 to 100 percent of the soil surface.
Surface Rock Fragments:	None
Surface Layers:	Very dark grayish brown to brown silt loam; massive; 0 to 10 percent angular and rounded gravel and cobble by volume; nonsticky and nonplastic when wet; pH ranges from 5.5 to 6.5; 12 to 24 inches thick.
Subsoil Layers:	Dark reddish gray to reddish brown to dark grayish brown clay loam to clay and gravelly clay loam to clay; strong, fine to very fine angular blocky structure; 10 to 40 percent angular and rounded gravel and cobble by volume; very sticky and very plastic when wet; pH ranges from 5.5 to 6.5; 12 to 48 inches thick.

See page 111 for general management discussion of soils with volcanic ash surface soils.

GENERAL MANAGEMENT GROUP DISCUSSIONS

This section contains general management discussions of groups of land-types that have similar management problems. Also, the different management groups can be considered as a broad overview of the survey area. The user can determine what broad areas have common management concerns.

Loamy and Clayey Soils - Nonforested
(Generally less than 15 inches deep)

Soils in this group are characterized as shallow, loamy and clayey soils with very limited plant-available water. The limited plant-available water supports only a discontinuous vegetative ground cover, leaving part of the soil surface vulnerable to erosion forces. Erosion pavements have developed where part of the finer soil materials have been eroded away, leaving the coarser rock fragments. Under natural conditions the ground cover and erosion pavement are generally protecting these soils from accelerated erosion. Any ground disturbance that removes the ground cover, the erosion pavement or channelized water can cause unacceptable accelerated erosion.

Soil moisture will generally begin to limit plant growth on these soils by June 1 due to evapotranspiration losses and limited stored soil moisture.

Grazing, range revegetation projects, and logging activities create the major impacts on these soils. Any of these activities can change either the ground cover or the erosion pavement. Range revegetation projects have the potential to disturb large areas of these soils and can create critical erosion situations. Therefore, range revegetation projects should have close coordination between the range and soil specialists to minimize soil losses and assure a successful reseeding the first time.

Loamy Forested Soils
(More than 12" deep)

The erosion hazard on slopes over 30 percent is the dominant management concern for this group of soils. Ideal conditions for accelerated sheet and rill erosion occur on these steep slopes when the protective vegetation and litter are removed. Also, if high intensity rainfall or runoff occurs, the moderate infiltration rates for these soils increases the amount of runoff water available for overland flow. As with most soils, particularly on steep slopes, unacceptable erosion can occur if water is allowed to concentrate or be discharged on bare soil. It is important that erosion control practices be kept current for each activity.

Loamy soils have moderate to high detrimental compaction hazards. The hazard level depends on the amount of rock fragments present, soil texture, and moisture content. When the rock fragment content is greater than 40 percent, there is a bridging effect between the rock fragments, which decreases the detrimental compaction hazard. In general, the moisture content should be below 20 percent by weight to prevent compaction damage from heavy equipment. Further onsite laboratory tests should be taken on planned activity areas.

Soils in this group generally have southerly aspects which can create excessively high surface soil temperatures if excess amounts of vegetation and litter are removed. This can create regeneration and revegetation problems. Special care is necessary when planning excessive vegetative removals so that enough shade or other protective material is present to protect young seedlings.

These soils, in general, have a moderate mixing and displacement hazard. The hazard increases when the soils become dry (below 10 percent moisture by weight).

Soils in this group generally have 2 to 3.5 inches of plant-available water storage in the soil profile. This will limit the fertilizer response potential for growing trees. Soil moisture will generally begin to limit vegetative growth on these soils by June 15 to July 1, due to evapotranspiration losses and limited stored moisture in the soil.

Forested Clayey Soils

Clayey soils have soil characteristics that create a high detrimental compaction hazard. Generally, clayey soils are easily compacted over a wide and variable soil moisture range. Clayey soils should be sampled for laboratory analysis to determine the optimum moisture range for compaction when intense activities such as logging are planned. This will determine the moisture range where detrimental compaction will be a problem.

Clayey soils puddle easily when excessively wet. This occurs when a soil has most of its pore spaces full of water and a compaction force such as vehicles or hoof is applied. Puddling destroys soils structure which results in reduced porosity, permeability, aeration, and lower productivity. The moisture content at which puddling occurs is above the optimum moisture range for compaction. Therefore, any significant traffic on the soil when the moisture content is above the optimum moisture range for compaction may cause puddling.

This group of clayey soils is generally quite resistant to erosion. They have good ground covers and the soil particles are highly resistant to detachment. Low infiltration and permeability rates increase the amount of surface water runoff. Excessive erosion can occur when runoff is allowed to concentrate into channels. Erosion control practices should be planned and kept current for each activity.

The high percentage of very fine soil particles in clayey soils are a good source of turbidity. The sediment in the runoff from these clayey soils has a high potential to create turbidity in downstream waters.

Soils with Volcanic Ash Surface Soils

Volcanic ash soils have several unique characteristics which affect their management. They have low bulk density; soil particles are easily detached; they have high water infiltration rates; high waterholding capacity; and are difficult to compact. Low bulk density affects the ease with which the soil material is moved about by outside forces such as logging traffic. Soil detachability affects the erodibility by water, and also affects the ease with which the soil material is moved about. High infiltration rates and high waterholding capacities decrease the erodibility by decreasing the amount of water available to erode the soil.

Under natural conditions the ash soils have good vegetative and litter cover which protects the soils from water and wind erosion. If the vegetative cover and litter are removed or broken up from activities such as logging traffic, livestock trailing, foot traffic or fire, a different situation exists. Then if water is allowed to concentrate into channels on these areas, particularly on steep slopes, excessive or unacceptable erosion can occur. It is imperative that erosion control practices be planned and kept current for each activity.

These soils are highly vulnerable to mixing, displacement and dustiness because of their low bulk density. Moisture content can increase or decrease this vulnerability. Ideal moisture range for activities such as logging, livestock trailing and vehicular traffic is between 10 and 35 percent moisture by weight. At moisture levels below 10 percent, excess mixing, displacement and dust are highly probable. Moisture contents above 35 percent are too wet to support these intensive activities.

Care should be taken to avoid displacement deeper than 6 inches as this may expose subsoil materials which are much less resistant to detrimental compaction.

The soils in this group which have ash deeper than 15 inches have the highest fertilizer response potential of the timbered soils in the survey area. This is due to the high plant-available waterholding capacity of this soil material. These soils should have first priority in fertilizer response trials.

High Surface Erosion + Potential for Turbidity

1, 3, (43), 48, 63, 65, 86, (87) (88), (97),
186, (187), (188), 189

Unstable + Potential for Turbidity 181

X = High water Yield

(X) = Poor Ground Veg.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF HYDROLOGIC INTERPRETATIONS

Land-type	Water Yield Class	Bedrock Hydrologic Characteristics	Hydrologic Group	Expected Sediment Size		Potential Source for Turbidity		WATER BALANCE DATA 1/					
				Surface	Subsoil	Surface Soil	Subsoil	Soil Depth	Root Zone	Plant Available Water	Field Capacity	Wilting Point	Maximum Waterholding Capacity
1	I	Not rated	D	Silt, clay	Clay, silt	Moderate to high	Moderate to high	48	18	3.1	5.4	2.3	25.3
3	I	Not rated	B-C	Sand, silt	Sand, silt	Moderate to high	Moderate to high	48	20	3.0	5.9	2.9	22.4
5	I	Not rated	A	Sand, silt	Sand, silt	Moderate	Moderate	48	20	3.0	5.9	2.9	27.6
7	III	Variable	D	Variable	Variable	Variable	Not rated	8	8	1.0	1.7	0.7	3.2
8	II-III	Variable	B	Variable	Variable	Variable	Variable	20	20	2.4	4.3	1.9	8.2
9	II	Variable	B	Sand & silt	Variable	Moderate	Variable	24	24	3.8	5.8	2.0	12.5
10	I	Variable	A	Sand & silt	Variable	Moderate	Variable	30	30	5.2	7.6	2.4	17.2
11	I	Not rated	B	Sand, silt	Silt, clay	Moderate	Moderate	30	30	4.8	9.5	4.7	18.2
12	I	Not rated	B	Sand, silt	Sand, silt	Moderate	Low to moderate	36	36	3.5	6.2	2.7	11.9
13	I	II	B	Sand, silt	Sand, silt	Moderate	Moderate	30	30	4.5	7.9	3.4	14.9
14	I	Not rated	B	Sand, silt	Sand, silt	Moderate	Moderate	36	36	5.3	8.3	3.0	17.7
15	I	Not rated	A	Sand	Sand	Low	Low	24	24	2.4	4.2	1.8	7.9
16	III	Variable	Not rated	Variable	Variable	Variable	Not rated	6	6	0.5	0.8	0.3	1.6
17	I	II	B	Sand, silt	Sand, silt	Moderate	Moderate	36	36	5.6	8.7	3.1	18.4
18	I-II	II	B	Sand, silt	Sand, silt	Moderate	Moderate	18	18	2.1	3.8	1.7	7.2
19	I	Not rated	A	Sand, silt	Sand, silt	Moderate	Moderate	36	36	6.0	8.9	2.9	19.7
31	II	II	B	Silt & sand	Sand & silt	Low to moderate	Low	18	18	2.3	4.1	1.8	7.7
32	I-II	II	B	Sand, silt	Sand & silt	Moderate	Low	20	20	3.2	4.7	1.6	10.7
33	II	II	B	Sand, silt	Sand, silt	Low to moderate	Low	18	18	2.2	3.8	1.6	7.2
34	III	II	D	Sand, silt	Sand, silt	Low	Not rated	8	8	1.0	1.7	0.7	3.2
35	III	II	D	Sand, silt	Not rated	Low	Not rated	6	6	0.6	1.1	0.5	1.7
36	I	II	A	Sand, silt	Sand, silt	Moderate	Low	30	30	5.4	7.8	2.4	17.6
37	III	II	D	Sand, silt	Not rated	Low	Not rated	8	8	0.9	1.5	0.6	2.4
41	I	I - II	B	Sand, silt	Silt, clay	Moderate	Moderate to high	18	18	2.4	4.8	2.4	9.1
42	I	I - II	B	Sand, silt	Silt, clay	Moderate	Moderate to high	24	24	3.7	6.5	2.8	14.0
43	II	II	B	Sand, silt	Silt, clay	Moderate	Moderate to high	18	18	2.3	4.5	2.2	8.6
44	III	II	D	Sand, silt	Silt, clay	Low to moderate	Not rated	12	12	1.4	2.5	1.1	4.8
45	III	II	D	Sand, silt	Not rated	Low to moderate	Not rated	8	8	0.9	1.6	0.7	3.0
46	III	I - II	D	Sand, silt	Silt, clay	Moderate	Not rated	12	12	1.4	2.5	1.1	4.8
47	III	II	D	Sand, silt	Not rated	Low to moderate	Not rated	8	8	0.9	1.6	0.7	3.0
48	I	II	B	Sand, silt	Silt, clay	Moderate	Moderate to high	24	24	3.7	6.5	2.8	14.0
58	I	I - II	A	Sand, silt	Silt, clay	Moderate	Moderate	30	30	6.9	11.3	4.4	25.1
59	I	II	A	Sand, silt	Silt, clay	Moderate	Moderate	30	30	5.1	8.2	3.1	18.3
62	I	I	A	Sand	Sand	Low	Low	24	24	1.9	3.6	1.7	8.4
63	I	II	A	Sand, silt	Sand, silt	Moderate	Moderate to high	36	36	6.4	9.3	2.9	21.1

1/ This data has been calculated for the average landtype soil depths except for landtypes 1, 3, 5, 11, 12, 14, 15 and 114, which are formed in deep glacial outwash or valley fill. General rooting depth was used for those landtypes. Percentage of coarse fragments has been taken into consideration.
Background information from: Broadfoot, W.M. and Burke, H.D. 1958. "Soil Moisture Constants and Their Variation." Occ. Paper 166. Southern Forest Experiment Station. U.S. Department of Agriculture. Forest Service.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF HYDROLOGIC INTERPRETATIONS

Land-type	Water Yield Class	Bedrock Hydrologic Characteristics	Hydrologic Group	Expected Sediment Size		Potential Source for Turbidity		WATER BALANCE DATA 1/					
				Surface	Subsoil	Surface Soil	Subsoil	Soil Depth	Root Zone	Plant Available Water	Field Capacity	Wilting Point	Maximum Waterholding Capacity
65	I	II	A	Sand, silt	Sand, silt	Moderate	Moderate to high	30	30	4.4	6.8	2.4	14.4
68	I	II	B	Sand, silt	Sand, silt	Moderate to high	Moderate to high	24	24	3.1	5.5	2.4	10.4
71	II	II	B	Sand, silt	Sand, silt	Moderate to high	Moderate to high	18	18	2.3	4.6	2.3	8.9
73	III	II	D	Sand, silt	Sand, silt	Moderate	Not rated	10	10	1.2	2.2	1.0	4.1
74	III	II	D	Sand, silt	Sand, silt	Moderate	Not rated	12	12	1.5	3.3	1.8	6.2
75	II	II	A	Sand, silt	Sand, silt	Moderate	Moderate to high	24	24	3.8	6.7	2.9	14.4
77	III	II	D	Sand, silt	Not rated	Moderate	Not rated	6	6	0.7	1.2	0.5	2.3
81	II	IV	D	Silt, clay	Silt, clay	High	High	36	24	3.4	7.4	4.0	20.3
82	I	IV	C	Sand, silt	Silt, clay	Moderate	High	36	36	6.3	11.7	5.4	19.8
83	I	IV	C	Sand, silt	Silt, clay	Moderate	High	42	42	7.9	13.6	5.7	25.0
85	II to III	IV	D	Silt, clay	Silt, clay	High	Not rated	15	15	1.8	3.9	2.1	7.5
86	II	IV	C	Sand, silt	Silt, clay	Moderate	High	30	30	5.1	9.7	4.6	16.2
87	III	IV	D	Silt, clay	Silt, clay	High	Not rated	12	12	1.4	3.1	1.7	6.0
88	II	IV	D	Silt, clay	Silt, clay	High	High	30	30	4.3	9.1	4.8	14.9
94	I	III	A	Sand, silt	Silt, clay	Moderate	Moderate to high	30	30	5.2	7.9	2.7	17.3
95	II	III	B	Sand, silt	Silt, clay	Moderate	Moderate to high	18	18	2.9	4.5	1.6	9.6
96	II-III	III	B-C	Sand, silt	Silt, clay	Moderate to high	Moderate to high	15	15	2.0	3.6	1.6	6.8
97	II	III	B	Sand, silt	Sand, silt	Moderate to high	Moderate to high	15	15	1.7	3.0	1.3	5.7
98		III	D	Sand, silt	Not rated	Moderate	Not rated	6	6	0.6	1.0	0.4	1.9
99	III	III	D	Sand, silt	Not rated	Moderate	Not rated	6	6	0.6	1.0	0.4	1.9
114	I	Not rated	A	Sand, silt	Sand, silt	Moderate	Moderate	36	36	6.1	9.1	3.0	20.1
121	II	II	B	Sand, silt	Sand, silt	Low to moderate	Low	18	18	2.3	4.1	1.8	7.7
122	I to II	II	B	Sand, silt	Sand, silt	Moderate	Low	24	24	1.9	2.4	0.5	6.0
123	II	II	B	Sand, silt	Sand, silt	Low to moderate	Low	18	18	2.2	3.9	1.7	7.5
124	I	II	B	Sand, silt	Sand, silt	Moderate	Low	24	24	4.0	6.0	2.0	13.1
125	III	II	D	Sand, silt	Sand, silt	Low	Not rated	9	9	1.1	1.9	0.8	3.6
126	I	II	A	Sand, silt	Sand, silt	Moderate	Low	30	30	5.4	7.8	2.4	17.6
127	I	II	A	Sand, silt	Sand, silt	Moderate	Low	30	30	5.4	7.8	2.4	17.6
128	III	II	D	Sand, silt	Sand, silt	Low	Not rated	9	9	1.1	1.9	0.8	3.6
132	II	III	B	Sand, silt	Sand, silt	Moderate	Low	20	20	3.3	4.9	1.6	10.7
133	II	III	B	Sand, silt	Sand, silt	Low to moderate	Low	18	18	2.2	3.8	1.6	7.2
134	III	III	D	Sand, silt	Sand, silt	Low	Not rated	8	8	1.0	1.7	0.7	3.2
141	I	II & III	B	Sand, silt	Sand, silt	Low to moderate	Low to moderate	18	18	2.2	3.9	1.7	7.4
142	I	II & III	B	Sand, silt	Sand, silt	Moderate	Low to moderate	24	24	3.9	5.9	2.0	12.7
143	II	II & III	B	Sand, silt	Sand, silt	Low to moderate	Low to moderate	18	18	2.2	3.9	1.7	7.4
148	I to II	II & III	B	Sand, silt	Sand, silt	Moderate	Low to moderate	24	24	3.9	5.9	2.0	12.7

1/ This data has been calculated for the average landtype soil depths, except for Landtypes 1, 3, 5, 11, 12, 14, 15 and 114, which are formed in deep glacial outwash or valley fill. General rooting depth was used for those landtypes. Percentage of coarse fragments has been taken into consideration.
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SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF HYDROLOGIC INTERPRETATIONS

Land-type	Water Yield Class	Bedrock Hydrologic Characteristics	Hydrologic Group	Expected Sediment Size		Potential Source for Turbidity		WATER BALANCE DATA 1/					
				Surface	Subsoil	Surface Soil	Subsoil	Soil Depth	Root Zone	Plant Available Water	Field Capacity	Wilting Point	Maximum Waterholding Capacity
158	I	II & III	A	Sand, silt	Sand, silt	Moderate	Low to moderate	30	30	5.7	8.0	2.3	18.6
159	I	II & III	A	Sand, silt	Sand, silt	Moderate	Low to moderate	30	30	5.4	7.8	2.4	17.6
162	II	II	B	Silt, sand	Sand, silt	Moderate	Low to moderate	24	24	3.9	6.7	2.9	14.4
163	II	II	B	Sand, silt	Sand, silt	Low to moderate	Low to moderate	18	18	2.2	4.9	2.6	9.4
164	I	II	B	Silt, sand	Sand, silt	Moderate	Low to moderate	24	24	3.9	6.7	2.9	14.4
166	I	II	A	Silt, sand	Sand, silt	Moderate	Low to moderate	30	30	5.3	8.5	3.2	19.1
167	I	II	A	Silt, sand	Sand, silt	Moderate	Low to moderate	30	30	5.3	8.5	3.2	19.1
168	III	II	D	Sand, silt	Not rated	Low to moderate	Not rated	12	12	1.4	2.4	1.0	4.6
172	I	III	A	Silt, sand	Sand	Moderate	Low	30	30	3.3	4.5	1.2	12.4
176	I	III	A	Silt, sand	Sand	Moderate	Low	36	36	5.0	6.7	1.7	17.9
181	I	IV	D	Clay	Clay	High	High	30+	30	5.4	11.5	6.1	18.7
182	I	IV	D	Sand, silt	Clay	Moderate	High	30	30	5.8	10.9	5.2	18.3
183	I	IV	C	Silt, sand	Clay, silt	Moderate	High	36	36	7.3	12.5	5.2	23.4
184	III	IV	D	Clay, silt	Clay, silt	High	Not rated	10	10	1.3	2.8	1.5	5.4
185	I	IV	D	Clay, silt	Clay, silt	High	High	15	15	2.4	5.1	2.6	7.6
186	II	IV	C	Silt, sand	Clay	Moderate	High	30	30	5.6	10.1	4.6	17.7
187	III	IV	D	Silt, clay	Silt, clay	High	Not rated	9	9	1.2	2.6	1.4	4.9
188	II	IV	D	Clay	Clay	High	High	24	24	4.0	8.5	4.5	13.9
189	I	IV	C	Silt, sand	Silt, clay	Moderate	High	36	36	7.0	11.9	4.8	22.4

1/ This data has been calculated for the average landtype soil depths, except for Landtypes 1, 3, 5, 11, 12, 14, 15 and 114, which are formed in deep glacial outwash or valley fill. General rooting depth was used for those landtypes. Percentage of coarse fragments has been taken into consideration.
Background information from: Broadfoot, W.M. and Burke, H.D. 1958. "Soil Moisture Constants and Their Variation." Occ. Paper 166. Southern Forest Experiment Station. U.S. Department of Agriculture. Forest Service

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF BEDROCK CHARACTERISTICS OF LANDTYPES

Land-type	Composition		Color (fresh surface)	Hardness	Degree of Fracture	Fracture System	Fracture Surface	Competency
1/ 1,3,5,7, 8,9,10, 11,12,13, 14,15,16, 17,18,19								
31	Interbedded Graywacke Shale,	100	Gray, black, brown	Soft to moderately hard	Highly fractured	Blocky & platy	Regular	Competent
32								
33	Mudstone, and							
34	Siltstone							
35								
36								
37								
41	Basalt & andesite	80	Gray, black	Hard	Moderately to highly fractured	Blocky & platy	Regular	Competent
42	Tuffaceous interflow material	20	Red, brown	Soft to moderately hard	Massive	Random	Irregular	
46								
47								
48								
59								
62	Pyroclastics	100	White to purple	Soft	Massive	None	None	Incompetent
63	Tuffaceous sediments	60	Pink, white, to purple	Soft to moderately hard	Massive to slightly fractured	Random	Irregular	Incompetent to competent
65	Rhyolitic ejecta							
68	Rhyolite	40	Pink to purple	Hard to moderately hard	Massive to moderately fractured	Platy & blocky	Regular	
	Rhyolite	100	Light purple to whitish	Moderately hard to hard	Massive to moderately fractured	Platy & blocky	Regular	Competent
73								
74								
75								
77								
81	Altered tuffs & breccias	100	Red, brown, gray	Soft to moderately hard	Massive to slightly fractured	Random	Irregular	Incompetent
82								
83								
85								
86								
87								
88								
94	Serpentine	50	Green to black, gray	Moderately hard to hard	Moderately to highly fractured	Blocky & platy random	Regular	Moderately competent to competent
95	Peridotite	40						
96	Metavolcanics	10						
97								
98								
99								

1/ Bedrock of these units was not rated. Depth and composition are highly variable.

SOIL RESOURCE INVENTORY
PALOUSE NATIONAL FOREST

TABLE OF BEDROCK CHARACTERISTICS OF LANDTYPES

Land-type	Composition	%	Color (fresh surface)	Hardness	Degree of Fracture	Fracture System	Fracture Surface	Competency
114	Variable	0	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
121	Argillite	75	Gray, black	Moderately hard to hard	Highly fractured	Blocky and platy	Regular	Competent
122 123 124 125 126 127 128	Other miscellaneous unidentified older metasedimentary rock	25						
132 133 134	Chert conglomerate	100	Gray, black, brown	Hard	Slightly fractured	Random to block and platy	Irregular	Competent
141	Andesite and basalt	75	Gray, black	Hard	Moderately to highly fractured	Blocky and platy	Regular	Competent
142 158	Soft tuffaceous rhyolitic material (interflow)	25	Red, brown	Soft to moderately hard	Massive to slightly fractured	Random	Irregular	
143	Andesite and basalt	70	Gray, black	Hard	Moderately to highly fractured	Blocky and platy	Regular	Competent
148 159	Soft tuffaceous rhyolitic material (interflow)	30	Red to brown	Soft to moderately hard	Massive to slightly fractured	Random	Irregular	
162	Gabbro	80	Gray and black	Hard to moderately hard	Moderately to highly fractured	Random to blocky & platy	Irregular	Moderately competent to competent
163	Peridotite	10						
164 166 167 168	Serpentine	10						
172 176	Granodiorite	100	White and gray	Soft to hard	Massive to slightly fractured	Random	Irregular	Incompetent to competent
181	Altered tuffs & mudflow breccia (landflow position	100	Gray, black, yellow, red	Soft to moderately hard	Massive to slightly fractured	Random	Irregular	Incompetent
182	Mudflow breccia	80	Gray, black	Soft to moderately hard	Massive to slightly fractured	Random	Irregular	Moderately competent
183	and conglomerates							
184	Basalt and andesite	20	Gray, black	Hard	Moderately to highly fractured	Blocky and platy	Regular	Moderately competent
185 186 187 188 189								

SOIL RESOURCE INVENTORY
HALFHEUR NATIONAL FOREST

LANDTYPE VEGETATIVE CHARACTERISTICS

Land-type	Major Plant Community Types 1/	Total Vegetative Cover %	Overstory		Understory		Ground Cover		Annual Production Potential	
			Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Pounds of Herbage	Cubic Feet of Wood
1	MM	90-100	None	N/A	None	N/A	Nebraska Sedge Ovalhead Sedge	90-100	2000- 2500	Not rated
3	MD, MM	75-100	None	N/A	None	N/A	Kentucky bluegrass Tufted hairgrass	75-100	800 - 1500	Not rated
5	CL-G2-11 CL-S5-11	80-100	Lodgepole pine	40 - 60	Lodgepole pine Big huckleberry	20 - 40	Grouse huckleberry Pinegrass	60- 80	200 - 300	30 - 50
7	GU-49-11 SD-29-11 CP-G1-11 CJ-2S-11	30- 60	Juniper Ponderosa pine	0 - 40	Big sagebrush Juniper Low sagebrush Mountain mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20- 50	300 - 500	5 - 10
8	CP-G1-12 CD-G1-11	60- 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Sandberg bluegrass Elk sedge	30- 60	300 - 400	15 - 35
9	CW-G1-11 CW-G1-12	80- 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50- 80	300 - 400	40 - 60
10	CW-F3-11 CW-S2-11 CW-S8-11	90-100	White fir Douglas-fir Western larch	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60- 90	200 - 350	50 -130
11	CP-G1-12 CD-G1-11	60- 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Sandberg bluegrass Elk sedge	30- 60	300 - 400	15 - 35
12	CP-G1-12 CD-G1-11	60- 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Elk sedge Sandberg bluegrass Wheatgrass	30- 60	300 - 400	15 - 35
13	SD-29-11	30- 60	Juniper	0 - 20	Big sagebrush Juniper Bitterbrush	20 - 40	Fescue	20- 50	300 - 600	Not rated
14	[illegible]-G1-11 [illegible]1-12	80- 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50- 80	300 - 400	40 - 60
15	[illegible]s-49-11 SD-19-11	30- 50	None	Not rated	Low sagebrush	0 - 30	Fescue Wheatgrass Sandberg bluegrass	30- 50	200 - 400	Not rated
16	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
17	CA-G1	70- 90	Whitebark pine Subalpine fir	20 - 40	Alpine sagebrush Whitebark pine Subalpine fir	20 - 40	Elk sedge Fleece flower	40- 80	200 - 400	Not rated
18	SS-49-11 GS-39-11 GS-12-11	50- 75	None	Not rated	Alpine sagebrush	10 - 30	Elk sedge Yarrow Alpine fescue	40- 60	200 - 450	Not rated
19	CA-G1-11 CE-S4-11 CL-S4-11	60-100	Subalpine fir Whitebark pine Lodgepole pine	40 - 80	Alpine sagebrush Subalpine fir Lodgepole pine	40 - 80	Elk sedge Grouse huckleberry Pokewood fleece flower	40- 80	100 - 400	0 - 40
31	CP-G1-12 CD-G1-11	60- 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Elk sedge Sandberg bluegrass	30- 60	300 - 400	15 - 35
32	CW-G1-11 CW-G1-12	80- 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50- 80	300 - 400	40 - 60
33	CP-G1-12 CD-G1-11	60- 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Elk sedge Sandberg bluegrass	30- 60	300 - 400	15 - 35
[illegible]	CP-G1-11 SD-29-11 CJ-2S-11	30- 60	Juniper Ponderosa pine	0 - 40	Big sagebrush Mahogany	40 - 60	Fescue Wheatgrass Sandberg bluegrass	20- 50	300 - 500	5 - 10

1/ Plant communities of the Blue Mountains in Eastern Oregon and Southeastern Washington. USDA - Forest Service, Pacific Northwest, Region 6-8200-1.

LANDTYPE VEGETATIVE CHARACTERISTICS

Land-type	Major Plant Community Types 1/	Total Vegetative Cover %	Overstory		Understory		Ground Cover		Annual Production Potential	
			Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Pounds of Herbage	Cubic Feet of Wood
35	GR-49-13 SD-29-11 SD-19-11	20- 50	None	N/A	Big sagebrush Rabbitbrush	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	200 - 400	N/A
36	CW-S2-11 CW-S8-11 CW-F3-11	90-100	Whitefir Douglas-fir Western larch	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50-130
37	GR-91-11 SD-29-11 SD-19-11	20 -50	None	N/A	Big sagebrush Rabbitbrush	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	200 - 400	N/A
41	CP-G1-12 CD-G1-11	60- 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Elk sedge Sandberg bluegrass	30 - 60	300 - 400	15- 35
42	CW-G1-11 CW-G1-12	80- 90	Ponderosa pine Douglas-fir White fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf Arnica	50 - 80	300 - 400	40 - 60
43	CP-G1-12 CD-G1-11	60- 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue,Elk sedge Wheatgrass Sandberg bluegrass	30 - 60	300 - 400	15 - 35
44	CP-G1-11 SD-29-11 CJ-2S-11 SD-49	30- 60	Juniper Ponderosa pine	0 - 40	Juniper Big sagebrush Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	300 - 500	5 - 10
45	SD-19-11 GR-49-13	20- 50	None	N/A	Low sagebrush Big sagebrush	10 - 40	Wheatgrass Fescue Sandberg bluegrass	20 - 50	200 - 400	N/A
46	CP-G1-11 SD-29-11 CJ-2S-11	30- 60	Juniper Ponderosa pine	0 - 40	Juniper Big sagebrush Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	300 - 500	5 - 10
47	SD-91-11 SD-19-11 GR-91-11	20- 50	None	N/A	Low sagebrush Stiff sagebrush	10 - 30	Wheatgrass Sandberg bluegrass	10 - 30	200 - 400	N/A
48	CW-G1-11 CW-G1-12	80- 90	White fir Douglas-fir Ponderosa pine	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
58	CW-S2-11 CW-S8-11 CW-F3-11	90-100	White fir Douglas-fir Lodgepole pine Western larch	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -130
59	CW-S2-11 CW-F3-11 CW-S8-11	90-100	White fir Douglas-fir Lodgepole pine Western larch	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -130
62	CP-G1-12	40- 60	Ponderosa pine	20 - 40	Ponderosa pine	0 - 10	Wheatgrass Fescue	0 - 10	100 - 200	10 - 20
63	CW-S2-11 CW-S8-11 CW-F3-11	90-100	White fir Douglas-fir Lodgepole pine Western larch	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -130
65	CW-G1-11 CW-G1-12	80- 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
68	CD-G1-11 CP-G1-12	60- 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Sandberg bluegrass Elk sedge	30 - 60	300 - 400	15 - 35
71	CP-S2-21 CD-G1-11 CP-G1-12	50- 70	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 40	Rosa sedge Fescue Wheatgrass Elk sedge	30 - 60	200 - 400	15 - 35
73	CP-G1-11 CJ-S1-11 SD-29-11	30- 60	Juniper Ponderosa pine	0 - 40	Big sage, bitter-brush, mahogany, juniper	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	300 - 500	5 - 10

1/ Plant communities of the Blue Mountains in Eastern Oregon and Southeastern Washington. USDA - Forest Service, Pacific Northwest, Region 6-8200-1.

LANDTYPE VEGETATIVE CHARACTERISTICS

Landtype	Plant Community Types 1/	Total Vegetative Cover %	Overstory		Understory		Ground Cover		Annual Production Potential	
			Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Pounds of Herbage	Cubic Feet of Wood
[illegible]	CP-G1-11 CJ-S1-11 CJ-2S-11 SD-29-11	30 - 60	Juniper Ponderosa pine	0 - 40	Big sagebrush Juniper, bitterbrush Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	300 - 500	5 - 10
[illegible]	CW-G1-11 CW-G1-12	80 - 90	Ponderosa Pine Douglas-fir White fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
77	SD-91-11 SD-19-11	20 - 50	None	N/A	Stiff sagebrush Low sagebrush	10 - 30	Wheatgrass Sandberg bluegrass	10 - 30	200 - 400	N/A
81	CP-G1-12 CD-G1-11	70 - 90	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Ceanothus	10 - 40	Fescue Elk sedge Pinegrass	40 - 70	300 - 500	20 - 40
82	CW-G1-11 CW-G1-12	80 - 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	20 - 40	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 500	40 - 60
83	CW-S2-11 CW-S8-11 CW-F3-11	90 -100	White fir, larch Douglas-fir Lodgepole pine	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -130
85	CP-G1-11 SD-29-11 CJ-2S-11	30 - 60	Juniper Ponderosa pine	0 - 40	Big sagebrush Juniper Low sagebrush Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	30 - 50	300 - 500	5 - 10
86	CW-G1-11 CW-G1-12	80 - 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
[illegible]	CP-G1-11 SD-29-11 SD-19-11 CJ-2S-11	30 - 60	Juniper Ponderosa pine	0 - 40	Big sagebrush Low sagebrush Juniper Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	30 - 50	300 - 500	5 - 10
88	CD-G1-11 CP-G1-12	60 - 80	Ponderosa pine	20 - 60	Ponderosa pine Ceanothus	10 - 40	Fescue Elk sedge	30 - 60	300 - 400	15 - 35
94	CW-S2-11 CW-S8-11 CW-FS-11	90 -100	White fir Douglas-fir Lodgepole pine Western larch	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -120
95	[illegible]1-11 J1-12	80 - 90	Ponderosa pine White fir Douglas-fir	30 - 60	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	40 - 70	250 - 300	30 - 50
96	CP-G1-12 CD-G1-11 CP-G1-11	50 - 70	Ponderosa pine	10 - 50	Ponderosa pine Juniper Mahogany	10 - 30	Wheatgrass Fescue Sandberg bluegrass Elk sedge	20 - 50	200 - 350	10 - 30
97	CD-G1-11 CW-G1-11 CW-G1-12	60 - 80	Ponderosa pine Douglas-fir White fir	20 - 60	Ponderosa pine White fir Douglas-fir Mahogany	10 - 30	Pinegrass Elk sedge Fescue	30 - 60	250 - 300	20 - 40
98	CJ-2S-11 CP-G1-11 SD-49 CJ-S1-11	30 - 60	Juniper	0 - 30	Mahogany Big sagebrush	0 - 30	Wild onion Wheatgrass Sandberg bluegrass	10 - 40	100 - 200	N/A
99	CJ-2S-11 CP-G1-11 SD-49 CJ-S1-11	30 - 60	Juniper	0 - 30	Mahogany Big sagebrush	0 - 30	Wild onion Wheatgrass Sandberg bluegrass	10 - 40	100 - 200	N/A
114	CW-S2-11 CL-S8-11 CL-S4-11 CE-S4-11	90 -100	White fir Douglas-fir Lodgepole pine Spruce	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	40 -130
[illegible]	CP-G1-12 CD-G1-11	60 - 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Elk sedge Sandberg bluegrass	30 - 60	300 - 400	15 - 35
[illegible]2	CW-G1-11 CW-G1-12	80 - 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60

1/ Plant communities of the Blue Mountains in Eastern Oregon and Southeastern Washington. USDA - Forest Service, Pacific Northwest, Region 6-8200-1.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

LANDTYPE VEGETATIVE CHARACTERISTICS

Land type	Major Plant Community Types 1/	Total Vegetative Cover %	Overstory		Understory		Ground Cover		Annual Production Potential	
			Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Pounds of Herbage	Cubic Feet of Wood
123	CP-G1-12 CD-G1-11	60 - 80	Ponderosa pine	20 - 50	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue,elk sedge Wheatgrass Sandberg bluegrass	30 - 60	300 - 400	15 - 30
124	CW-G1-11 CW-G1-12	80 - 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
125	CP-G1-11 SD-29-11 CJ-2S-11	30 - 60	Juniper Ponderosa pine	0 - 40	Big sagebrush Juniper Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	300 - 500	5 - 10
126	CW-F3-11 CW-S2-11 CW-S8-11	90 -100	White fir Douglas-fir Lodgepole pine Western larch	60 - 90	Pinegrass Grouse huckleberry Columbia brome Forbs	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -130
127	CW-F3-11 CW-S2-11 CW-S8-11	90 -100	White fir Douglas-fir Lodgepole pine Western larch	60 - 90	Pinegrass Grouse huckleberry Columbia brome Forbs	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -130
128	CP-G1-11 SD-29-11 CJ-2S-11	30 - 60	Juniper Ponderosa pine	0 - 30	Big sagebrush Juniper Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	300 - 500	5 - 10
132	CW-G1-11 CW-G1-12	80 - 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod White fir Douglas-fir	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
133	CP-G1-12 CD-G1-11	60 - 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Sandberg bluegrass Elk sedge	30 - 60	300 - 400	15 - 35
138	CP-G1-11 SD-29-11 CJ-2S-11	30 - 60	Juniper Ponderosa pine	0 - 40	Big sagebrush Juniper Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	300 - 500	5 - 10
141	CP-G1-12 CD-G1-11	60 - 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue,wheatgrass Sandberg bluegrass Elk sedge	30 - 60	300 - 400	15 - 35
142	CW-G1-11 CW-G1-12	80 - 90	Ponderosa pine Douglas-fir White fir	40 - 70	Reprod Spirea Douglas-fir	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
143	CP-G1-12 CD-G1-11	60 - 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Sandberg bluegrass Elk sedge	30 - 60	300 - 400	15 - 35
148	CW-G1-11 CW-G1-12	80 - 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
158	CW-F3-11 CW-S2-11 CW-S8-11	90 -100	Douglas-fir White fir Western larch Lodgepole pine	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -130
159	CW-F3-11 CW-S2-11 CW-S8-11	90 -100	Douglas-fir White fir Western larch Lodgepole pine	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 -130
162	CW-G1-11 CW-G1-12	80 - 90	Douglas-fir Ponderosa pine White fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60
163	CP-G1-12 CD-G1-11	60 - 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Mahogany	10 - 30	Fescue Wheatgrass Elk sedge Sandberg bluegrass	30 - 60	300 - 400	15 - 35
164	CW-G1-11 CW-G1-12	80 - 90	Douglas-fir Ponderosa pine White fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	300 - 400	40 - 60

1/ Plant communities of the Blue Mountains in Eastern Oregon and Southeastern Washington, USDA - Forest Service, Pacific Northwest, Region 6-8200-1.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

LANDTYPE VEGETATIVE CHARACTERISTICS

Land-type	Major Plant Community Types 1/	Total Vegetative Cover %	Overstory		Understory		Ground Cover		Annual Production Potential	
			Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Major Species	Vegetative Cover %	Pounds of Herbage	Cubic Feet of Wood
166	CW-F3-11 CW-S2-11 CW-S8-11	90 - 100	White fir Douglas-fir Lodgepole pine Western larch	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 - 130
167	CW-F3-11 CW-S2-11 CW-S8-11	90 - 100	White fir Douglas-fir Lodgepole pine Western larch	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 - 130
168	CP-G1-11 SD-29-11 CJ-2S-11	30 - 60	Juniper Ponderosa pine	0 - 40	Big sagebrush Juniper Mahogany	10 - 40	Fescue Wheatgrass Sandberg bluegrass	20 - 50	300 - 500	5 - 10
172	CW-G1-11 CW-G1-12 CL-G2-11	70 - 90	Ponderosa pine White fir Douglas-fir	30 - 60	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf arnica	50 - 80	250 - 400	35 - 60
176	CW-F3-11 CW-S2-11 CW-S8-11 CL-S4-11	90 -100	White fir Douglas-fir Larch, spruce Lodgepole pine	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 - 130
181	Unidentified pine site	80 -100	Ponderosa pine	40 - 70	Ponderosa pine	0 - 30	Hulesears Wyethia Grass Sedges	60 - 90	500 -1000	20 - 40
182	CW-G1-12 CW-G1-12	80 -100	Ponderosa pine Douglas-fir White fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge	60 - 90	400 - 800	40 - 60
183	CW-S2-11 CW-S8-11 CW-F3-11	90 -100	White fir Douglas-fir Western larch Lodgepole pine	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 - 130
184	CJ-S1-11 CP-G1-11 SD-29-11	30 - 60	Juniper Ponderosa pine	0 - 40	Low sagebrush Big sagebrush Juniper	10 - 40	Fescue Sandberg bluegrass Wheatgrass	20 - 50	300 - 500	5 - 10
	Unidentified pine site	70 - 90	Ponderosa pine	0 - 30	Ponderosa pine	0 - 20	Hulesears Wyethia Grasses Sedges	60 - 90	600 -1000	5 - 15
186	CW-G1-11 CW-G1-12	80 - 90	Ponderosa pine White fir Douglas-fir	40 - 70	Reprod Spirea Snowberry	10 - 30	Pinegrass Elk sedge Heartleaf Arnica	50 - 80	300 - 400	40 - 60
187	CP-G1-11 SD-29-11 CJ-S1-11	30 - 60	Juniper Ponderosa pine	0 - 40	Low sagebrush Big sagebrush Juniper	10 - 40	Sandberg bluegrass Wheatgrass Fescue	20 - 50	300 - 500	5 - 10
188	CP-G1-12 CD-G1-11	60 - 80	Ponderosa pine	20 - 60	Ponderosa pine Bitterbrush Snowberry	10 - 30	Elk sedge Wheatgrass Hulesears Wyethia	30 - 60	300 - 500	15 - 35
189	CW-F3-11 CW-S2-11 CW-S8-11	90 -100	White fir Douglas-fir Western larch Lodgepole pine	60 - 90	Reprod Big huckleberry	10 - 50	Pinegrass Grouse huckleberry Columbia brome Forbs	60 - 90	200 - 350	50 - 130

1/ Plant communities of the Blue Mountains in Eastern Oregon and Southeastern Washington. USDA - Forest Service, Pacific Northwest, Region 6-8200-1.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL CHARACTERISTICS OF MODAL SITE

1/ Land-type	Depth of Soil to Bedrock (inches)	Litter (inches)	Surface Rock-% Ground Cover	Soil Layer and Thickness (inches)	Color 3/	Texture	Rock Fragments Size	Rock Fragments Shape	Rock Fragments %	Rock Fragment Class
11	120+	½	N/A	1. 0-12	Very dark grayish brown	Loam	Gravel	Rounded	5	N/A
				2. 12-30	Brown to dark brown	Clay loam	Gravel	Rounded	10	N/A
12	96+	1	25	1. 0-12	Very dark grayish brown	Cobbly loam	Cobble	Rounded	40	Cobbly
				2. 12-36	Brown to dark brown	Very cobbly loam	Cobble	Rounded	55	Very cobbly
13	30	½	25	1. 0-12	Very dark gray	Loam	Gravel & cobble	Platy	10	N/A
				2. 12-30	Brown to dark brown	Loam	Cobble	Platy	30	N/A
14	120+	1½	N/A	1. 0-10	Dark brown	Silt loam 2/	Cobble	Rounded	5	N/A
				2. 10-36	Brown to dark brown	Cobbly loam	Cobble	Rounded	40	Cobbly
15	120+	N/A	60	1. 0- 8	Very dark grayish brown	Cobbly loam	Cobble & gravel	Rounded	45	Cobbly
				2. 8-24	Brown to dark brown	Very cobbly loam	Cobble & gravel	Rounded	75	Very cobbly
16 1/		-	-	-	-	-	-	-	-	-
17	36	2	5	1. 0-10	Dark brown	Silt loam 2/	-	-	-	N/A
				2. 10-36	Brown to dark brown	Gravelly clay loam	Gravel & cobble	Flat to angular	40	Gravelly
18	18	½	35	1. 0-18	Dark brown	Gravelly loam	Cobble	Flat to angular	45	Gravelly
19	96+	2	N/A	1. 0-15	Dark brown	Silt loam 2/	-	-	-	-
				2. 15-36	Brown to dark brown	Cobbly loam	Cobble	Flat to angular	45	Cobbly
31	19	½	25	1. 0- 9	Very dark gray	Gravelly loam	Gravel	Angular, platy	35	Gravelly
				2. 9-19	Dark brown	Gravelly loam	Gravel & cobble	Angular, platy	45	Gravelly
32	21	1	-	1. 0- 8	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 8-13	Dark brown	Gravelly loam	Gravel & cobble	Angular, platy	45	Gravelly
33	18	½	30	1. 0- 9	Very dark gray	Gravelly loam	Gravel	Angular, platy	35	Gravelly
				2. 9-18	Dark brown	Gravelly loam	Gravel & cobble	Angular, platy	45	Gravelly
34	8	-	40	1. 0- 8	Very dark grayish brown	Very gravelly loam	Gravel & cobble	Angular, platy	55	Very gravelly
35	6	-	50	1. 0- 6	Very dark grayish brown	Very gravelly loam	Gravel & cobble	Angular, platy	60	Very gravelly
36	30	½	-	1. 0-14	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 14-30	Dark brown	Gravelly loam	Gravel & cobble	Angular, platy	45	Gravelly
37	8	-	50	1. 0- 8	Very dark grayish brown	Very gravelly loam	Gravel & cobble	Angular, platy	60	Very gravelly
41	18	½	20	1. 0- 8	Very dark grayish brown	Gravelly loam	Gravel & cobble	Platy, angular	35	Gravelly
				2. 8-18	Dark brown to brown	Cobbly clay loam	Gravel & cobble	Platy, angular	50	Cobbly
42	25	1	5	1. 0- 8	Very dark grayish brown	Silt loam 2/	Gravel & cobble	Platy, angular	10	-
				2. 8-25	Dark brown to brown	Cobbly clay loam	Gravel & cobble	Platy, angular	45	Cobbly
43	18	½	25	1. 0- 9	Very dark grayish brown	Gravelly loam	Gravel & cobble	Platy, angular	40	Gravelly
				2. 9-18	Dark brown to brown	Cobbly clay loam	Gravel & cobble	Platy, angular	45	Cobbly
44	12	-	40	1. 0-12	Dark brown	Gravelly loam	Gravel & cobble	Platy, angular	45	Gravelly
45	8	-	50	1. 0- 8	Dark brown	Very gravelly loam	Gravel & cobble	Platy, angular	55	Very gravelly
46	11	-	40	1. 0-11	Dark brown	Gravelly loam	Gravel & cobble	Platy, angular	45	Gravelly
47	8	-	50	1. 0- 8	Dark brown	Cobbly loam	Cobble & gravel	Platy, angular	60	Cobbly
48	26	1	5	1. 0- 9	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 9-26	Dark brown to brown	Cobbly clay loam	Cobble & gravel	Platy, angular	40	Cobbly
58	30	1½	N/A	1. 0-14	Dark brown	Silt loam 2/	-	-	-	-
				2. 14-30	Dark brown to brown	Gravelly & cobbly clay loam	Cobble & gravel	Platy, angular	40	Gravelly & cobbly

1/ Soil characteristics for Soils 1 thru 10, and Soil 16 are not rated due to their wide variability.

2/ Volcanic ash.

3/ Moist colors.

TABLE OF SOIL CHARACTERISTICS OF MODAL SITE

Land-type	Depth of Soil to Bedrock (inches)	Litter (inches)	Surface Rock-% Ground Cover	Soil Layer and Thickness (inches)	Color 3/	Texture	Rock Fragments Size	Rock Fragments Shape	Rock Fragments %	Rock Fragment Class
59	32	2	-	1. 0-15	Dark brown	Silt loam 2/	-	-	-	-
				2. 15-32	Dark brown to brown	Cobbly clay loam	Cobble & gravel	Platy, angular	40	Cobbly
62	24	-	-	1. 0-24	Dark brown to brown	Loamy sand	None	None	None	None
63	36	1-3/4	-	1. 0-18	Dark brown	Silt loam 2/	None	None	None	None
				2. 18-36	Brown to dark brown	Gravelly loam	None	None	None	None
65	30	1½	5	1. 0-10	Dark grayish brown	Silt loam 2/	None	None	None	None
				2. 10-30	Brown to dark brown	Gravelly loam	Gravel & cobble	Angular, platy	40	Gravelly
68	24	1	20	1. 0- 8	Dark grayish brown	Gravelly loam	Gravel	Angular, platy	35	Gravelly
				2. 8-24	Brown to dark brown	Gravelly loam	Gravel, cobble	Angular, platy	45	Gravelly
71	18	1	40	1. 0- 8	Dark brown	Gravelly loam	Gravel & cobble	Platy	35	Gravelly
				2. 8-18	Brown to dark brown	Gravelly clay loam	Gravel & cobble	Platy	45	Gravelly
73	10	-	50	1. 0-10	Dark brown	Gravelly loam	Gravel & cobble	Platy	45	Gravelly
74	12	-	45	1. 0-12	Dark brown	Gravelly loam	Gravel & cobble	Platy	45	Gravelly
75	24	1½	5	1. 0- 8	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 8-24	Brown to dark brown	Gravelly clay loam	Gravel & cobble	Platy	40	Gravelly
77	6	-	70	1. 0- 6	Dark brown	Very gravelly loam	Gravel & cobble	Platy	55	Very gravelly
81	34	1	10	1. 0-12	Very dark grayish brown	Clay loam	Gravel & cobble	Subangular platy	15	-
				2. 12-34	Dark grayish brown	Gravelly clay	Gravel & cobble	Subangular platy	40	Gravelly
82	36	1½	5	1. 0- 8	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 8-36	Dark reddish gray	Gravelly clay	Gravel & cobble	Subangular platy	35	Gravelly
83	42	1-3/4	-	1. 0-15	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 15-42	Dark reddish gray	Gravelly clay	Gravel & cobble	Subangular platy	35	Gravelly
	15	½	35	1. 0-15	Dark reddish brown	Gravelly clay loam	Gravel & cobble	Subangular platy	40	Gravelly
86	32	1	10	1. 0- 6	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 6-32	Dark reddish gray	Cobbly clay	Gravel & cobble	Subangular platy	40	Cobbly
87	12	None	35	1. 0-12	Dark reddish brown	Gravelly clay loam	Gravel & cobble	Subangular platy	45	Gravelly
88	30	½	15	1. 0-10	Very dark grayish brown	Clay loam	Gravel & cobble	Subangular platy	15	-
				2. 10-30	Dark grayish brown	Cobbly clay	Gravel & cobble	Subangular platy	40	Cobbly
94	28	2	None	1. 0-12	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 12-28	Dark brown	Gravelly loam	Gravel & cobble	Angular platy	35	Gravelly
95	18	1	5	1. 0- 6	Dark brown	Silt loam 2/	-	-	-	-
				2. 6-18	Brown to dark brown	Gravelly clay loam	Gravel & cobble	Angular platy	35	Gravelly
96	15	½	35	1. 0-15	Dark brown	Gravelly loam	Gravel & cobble	Angular platy	35	Gravelly
97	14	½	45	1. 0-14	Dark brown	Gravelly loam	Gravel & cobble	Angular platy	45	Gravelly
98	6	None	50	1. 0- 6	Dark brown	Very gravelly loam	Gravel & cobble	Angular platy	60	Very gravelly
99	6	None	60	1. 0- 6	Dark brown	Very gravelly loam	Gravel & cobble	Angular platy	65	Very gravelly
114	120+	2	None	1. 0-15	Dark brown	Silt loam 2/	-	-	-	-
				2. 15-36	Brown to dark brown	Cobbly loam	Cobble	Angular to rounded	45	Cobbly
121	19	1	30	1. 0- 9	Very dark grayish brown	Gravelly loam	Gravel & cobble	Platy angular	40	Gravelly
				2. 9-19	Brown to dark brown	Gravelly loam	Gravel & cobble	Platy angular	45	Gravelly
122	25	1½	15	1. 0- 8	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 8-25	Brown to dark brown	Gravelly loam	Gravel & cobble	Platy angular	40	Gravelly

2/ Volcanic ash.

3/ Moist colors.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL CHARACTERISTICS OF MODAL SITE

Land-type	Depth of Soil to Bedrock (inches)	Litter (inches)	Surface Rock--% Ground Cover	Soil Layer and Thickness (inches)	Color 3/	Texture	Rock Fragments: Size	Rock Fragments: Shape	Rock Fragments: %	Rock Fragment Class
123	18	3/4	40	1. 0- 8	Very dark grayish brown	Gravelly loam	Gravel & cobble	Platy angular	35	Gravelly
				2. 8-18	Brown to dark brown	Gravelly loam	Gravel & cobble	Platy angular	45	Gravelly
124	24	1½	10	1. 0- 9	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 9-24	Brown to dark brown	Gravelly loam	Gravel & cobble	Platy angular	40	Gravelly
125	9	½	60	1. 0- 9	Very dark grayish brown	Gravelly loam	Gravel & cobble	Platy angular	45	Gravelly
126	32	2	None	1. 0-15	Dark brown	Silt loam 2/	-	-	-	-
				2. 15-32	Brown to dark brown	Gravelly loam	Gravel & cobble	Platy angular	40	Gravelly
127	30	2½	None	1. 0-15	Dark brown	Silt loam 2/	-	-	-	-
				2. 15-30	Brown to dark brown	Gravelly loam	Gravel & cobble	Platy angular	40	Gravelly
128	9	None	60	1. 0- 9	Dark brown	Gravelly loam	Gravel & cobble	Platy angular	40	Gravelly
132	20	1	10	1. 0- 8	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 8-20	Dark brown	Gravelly loam	Gravel & cobble	Angular & rounded	40	Gravelly
133	18	3/4	30	1. 0- 9	Very dark grayish brown	Gravelly loam	Gravel & cobble	Angular & rounded	35	Gravelly
				2. 9-18	Dark brown	Gravelly loam	Gravel & cobble	Angular & rounded	45	Gravelly
134	8	None	40	1. 0- 8	Very dark grayish brown	Very gravelly loam	Gravel & cobbles	Angular & rounded	55	Gravelly
141	19	3/4	15	1. 0- 9	Very dark grayish brown	Gravelly loam	Gravel & cobble	Platy, angular	40	-
				2. 9-19	Brown to dark brown	Cobbly loam	Gravel & cobble	Platy, angular	40	Cobbly
142	25	1½	None	1. 0- 8	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 8-25	Brown to dark brown	Cobbly loam	Gravel & cobble	Platy, angular	45	Cobbly
143	17	3/4	20	1. 0- 8	Very dark to grayish brown	Gravelly loam	Gravel & cobble	Platy, angular	40	Gravelly
				2. 8-17	Brown to dark brown	Cobbly loam	Gravel & cobble	Platy, angular	45	Cobbly
148	26	1	5	1. 0- 8	Dark brown	Silt loam 2/	-	-	-	-
				2. 8-26	Brown to dark brown	Cobbly loam	Gravel & cobble	Platy, angular	45	Cobbly
158	32	2½	None	1. 0-16	Dark brown	Silt loam 2/	-	-	-	-
				2. 16-32	Brown to dark brown	Cobbly loam	Gravel & cobble	Platy, angular	40	Cobbly
159	30	2	None	1. 0-15	Dark brown	Silt loam 2/	-	-	-	-
				2. 15-30	Brown to dark brown	Cobbly loam	Gravel & cobble	Platy, angular	45	Cobbly
162	24	1	10	1. 0- 8	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 8-24	Brown to dark brown	Gravelly loam	Gravel & cobble	Angular, platy	40	Gravelly
163	19	1	25	1. 0-18	Brown to dark brown	Gravelly loam	Gravel & cobble	Angular, platy	45	Gravelly
164	25	1½	10	1. 0- 9	Very dark grayish brown	Silt loam 2/	-	-	-	-
				2. 9-25	Brown to dark brown	Gravelly clay loam	Gravel & cobble	Angular, platy	40	Gravelly
166	32	2	None	1. 0-16	Dark brown	Silt loam 2/	-	-	-	-
				2. 16-32	Brown to dark brown	Gravelly loam	Gravel & cobble	Angular, platy	40	Gravelly
167	30	2	None	1. 0-15	Dark brown	Silt loam 2/	-	-	-	-
				2. 15-30	Brown to dark brown	Gravelly clay loam	Gravel & cobble	Angular, platy	40	Gravelly
168	12	½	60	1. 0-12	Brown to dark brown	Gravelly loam	Gravel & cobble	Angular, platy	45	Gravelly
172	32	1½	None	1. 0-10	Dark brown	Silt loam 2/	-	-	-	-
				2. 10-32	Brown to dark brown	Gravelly loamy sand	Gravel	Angular	55	Gravelly
176	36	2	None	1. 0-18	Dark brown	Silt loam 2/	-	-	-	-
				2. 18-36	Brown to dark brown	Gravelly loamy sand	Gravel	Angular	55	Gravelly

2/ Volcanic ash.
3/ Moist colors.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL CHARACTERISTICS OF MODAL SITE

Land-type	Depth of Soil to Bedrock (inches)	Litter (inches)	Surface Rock -% Ground Cover	Soil Layer and Thickness (inches)	Color [3]	Texture	Rock Fragments Size	Rock Fragments Shape	Rock Fragments %	Rock Fragment Class
181	72	1	None	1. 0-10	Black	Clay	Gravel & cobble	Rounded	5	-
				2. 10-30+	Dark grayish brown	Clay	Gravel & cobble	Rounded	20	-
182	30	1½	5	1. 0- 8	Dark brown	Silt loam [2]	-	-	-	-
				2. 6-30	Dark grayish brown	Clay	Gravel & cobble	Rounded	25	-
183	36	2	None	1. 0-15	Dark brown	Silt loam [2]	-	-	-	-
				2. 15-36	Dark grayish brown	Clay	Gravel & cobble	Rounded	25	-
184	10	None	50	1. 0-10	Very dark grayish brown	Gravelly clay loam	Gravel & cobble	Rounded	35	Gravelly
185	18	1	5	1. 0- 9	Black	Clay	Gravel & cobble	Rounded	30	-
				2. 9-18	Dark grayish brown	Clay	Cobble	Rounded	30	-
186	30	2	10	1. 0- 8	Dark brown	Silt loam [2]	-	-	-	-
				2. 8-30	Dark grayish brown	Gravelly clay loam	Gravel & cobble	Rounded	35	Gravelly
187	9	None	50	1. 0- 9	Very dark grayish brown	Gravelly clay loam	Gravel & cobble	Rounded	40	Gravelly
188	20	1	30	1. 0-10	Very dark grayish brown	Clay loam	Gravel & cobble	Rounded	5	-
				2. 10-20	Brown to dark brown	Gravelly clay loam	Gravel & cobble	Rounded	35	Gravelly
189	36	2½	None	1. 0-15	Dark brown	Silt loam [2]	-	-	-	-
				2. 15-36	Brown to dark brown	Gravelly clay loam	Gravel & cobble	Rounded	35	Gravelly

2/ Volcanic ash.
3/ Hoist colors.

TABLE OF SOIL CHARACTERISTICS OF MODAL SITE

Land-type	1/ Soil Structure			Consistence				pH	Location of Modal Site	Estimated Soil Taxonomic Classification
	Grade	Size	Type	Dry	Moist	Wet Stickiness	Wet Plasticity			
11.	1. Weak	Very fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	5.8	NE¼SE¼, Sec. 20, T. 16 S., R. 30	Typic Xerochrepts; fine-loamy, mixed, frigid family.
	2. Moderate	Very fine	Angular blocky	Hard	Firm	Sticky	Plastic	6.2		
12.	1. Weak	Very fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.0	SW¼SE¼, Sec. 17, T. 16 S., R. 33 E.	Typic Xerochrepts; loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2		
13.	1. Weak	Very fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.1	NW¼SE¼, Sec. 12, T. 18 S., R. 33 E.	Typic Argixerolls; fine-loamy, mixed, frigid family.
	2. Moderate	Very fine	Subangular blocky	Slightly hard	Friable	Sticky	Plastic	5.8		
14.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.0	NE¼NE¼, Sec. 10, T. 16 S., R. 33½E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2		
15.	1. Weak	Very fine	Crumb	Loose	Very friable	Nonsticky	Nonplastic	6.0	NW¼SW¼, Sec. 15, T. 16 S., R. 33½E.	Typic Haploxerolls; sandy skeletal, frigid family.
	2. Single-grained	-	-	Slightly hard	Very friable	Nonsticky	Nonplastic	6.5		
16. 1/	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.5	NE¼SW¼, Sec. 10, T. 15 S., R. 33 E.	Entic Cryandepts; ashy over loamy-skeletal, mixed family.
	2. Moderate	Very fine	Angular blocky	Slightly hard	Friable	Sticky	Plastic	6.5		
18.	1. Weak	Very fine	Granular	Slightly hard	Friable	Sticky	Slightly plastic	5.8	SE¼NW¼, Sec. 13, T. 15 S., R. 33 E.	Typic Cryoborolls; fine-loamy, mixed family.
19.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.6	SE¼SW¼, Sec. 1, T. 15 S., R. 33 E.	Entic Cryandepts; ashy over loamy-skeletal, mixed family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	5.8		
31.	1. Weak	Very fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.3	NE¼SW¼, Sec. 26 T. 15 S., R. 31 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.8		
32.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.2	SW¼NW¼, Sec. 5, T. 16 S., R. 32 E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.8		
33.	1. Weak	Very fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.4	SE¼NE¼, Sec. 26, T. 15 S., R. 29 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.5		
34.	1. Weak	Very fine	Granular	Slightly hard	Friable	Nonsticky	Nonplastic	6.5	NE¼NE¼, Sec. 21, T. 15 S., R. 31 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
35.	1. Weak	Very fine	Granular	Slightly hard	Friable	Nonsticky	Nonplastic	6.6	NE¼NE¼, Sec. 15, T.15 S., R. 31 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
36.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.3	NE¼SE¼, Sec. 10, T. 15 S., R. 31 E.	Typic Vitrandepts; ashy over loamy, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.6		
37.	1. Weak	Very fine	Granular	Slightly hard	Friable	Nonsticky	Nonplastic	6.7	SW¼NE¼, Sec. 10, T. 19 S., R. 29 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
41.	1. Weak	Fine	Granular	Slightly hard	Friable	Sticky	Slightly plastic	5.8	SW¼NE¼, Sec. 24, T. 10 S., R. 28 E.	Lithic Argixerolls; loamy-skeletal, mixed, frigid family.
	2. Moderate	Very fine	Angular blocky	Hard	Firm	Sticky	Plastic	6.2		
42.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.0	SW¼SW¼, Sec. 25, T. 17 S., R. 29 E.	Andic Xerochrepts; medial over clayey, mixed, frigid family.
	2. Moderate	Very fine	Angular blocky	Hard	Firm	Sticky	Plastic	5.8		
43.	1. Weak	Fine	Granular	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2	NW¼NE¼, Sec. 15, T. 12 S., R. 29 E.	Lithic Argixerolls; loamy-skeletal, mixed, frigid family.
	2. Moderate	Very fine	Angular blocky	Hard	Firm	Sticky	Plastic	6.0		
44.	1. Weak	Fine	Granular	Slightly hard	Friable	Sticky	Plastic	6.0	SE¼NE¼, Sec. 14, T. 12 S., R. 29 E.	Lithic Haploxerolls; loamy-skeletal, mixed, frigid family.
45.	1. Weak	Fine	Granular	Slightly hard	Friable	Slightly sticky	Slightly plastic	5.8	NE¼NE¼, Sec. 18, T. 17 S., R. 29 E.	Lithic Haploxerolls; loamy-skeletal,mixed,frigid family.
46.	1. Weak	Fine	Granular	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2	NW¼NW¼, Sec. 35, T. 17 S., R. 29 E.	Lithic Argixerolls; loamy-skeletal,mixed, frigid family.
47.	1. Weak	Fine	Granular	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2	SE¼NE¼, Sec. 27, T. 15 S., R. 27 E.	Lithic Haploxerolls; loamy-skeletal, mixed, frigid family.
48.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.0	NE¼SW¼, Sec. 34, T. 14 S., R. 28 E.	Andic Xerochrepts; medial over clayey, mixed, frigid family.
	2. Moderate	Very fine	Angular blocky	Hard	Firm	Sticky	Plastic	6.2		
49.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.1	SE¼SW¼, Sec. 21, T. 14 S., R. 28 E.	Entic Cryandepts; ashy over loamy-skeletal; mixed family.
	2. Moderate	Very fine	Angular blocky	Hard	Firm	Sticky	Plastic	5.8		
50.	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.0	NE¼SW¼, Sec. 18, T. 14 S., R. 28 E.	Entic Cryandepts; ashy over loamy-skeletal, mixed family.
	2. Moderate	Very fine	Angular blocky	Hard	Firm	Sticky	Plastic	5.8		

1/ Soil characteristics for Soils 1 thru 10, and Soil 16 are not rated due to their wide variability.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL CHARACTERISTICS OF MODAL SITE

Land-type	Soil Structure: Grade	Size	Type	Consistence: Dry	Moist	Wet: Stickiness	Wet: Plasticity	pH	Location of Modal Site	Estimated Soil Taxonomic Classification
62	1. Single-grained	-	-	Loose	Loose	Nonsticky	Nonplastic	6.0	SW¼SE¼, Sec. 23 T. 17 S., R. 33 E.	Typic Xerepsamments; ashy, frigid family.
63	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.0	SE¼SW¼, Sec. 12, T. 17 S., R. 32 E.	Entic Cryandepts; ashy over loamy-skeletal, mixed family.
	2. Weak	Fine	Subangular blocky	Slightly hard	Very friable	Slightly sticky	Slightly plastic	5.8		
65	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.8	SW¼SW¼, Sec. 33, T. 16 S., R. 33 E.	Xeric Eutrandepts; medial, frigid family.
	2. Weak	Fine	Subangular blocky	Slightly hard	Very friable	Slightly sticky	Slightly plastic	5.8		
68	1. Weak	Fine	Crumb	Slightly hard	Very friable	Slightly sticky	Slightly plastic	6.0	SE¼SE¼, Sec. 2, T. 17 S., R. 32 E.	Typic Haploxerolls; coarse-loamy, mixed, frigid family.
	2. Weak	Fine	Subangular blocky	Slightly hard	Very friable	Slightly sticky	Slightly plastic	5.8		
71	1. Weak	Fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2	SW¼SE¼, Sec. 9, T. 15 S., R. 28 E.	Lithic Argixerolls; loamy-skeletal, mixed, frigid family.
	2. Moderate	Very fine	Subangular blocky	Slightly hard	Friable	Sticky	Plastic	6.2		
73	1. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.4	NE¼SE¼, Sec. 20, T. 20 S., R. 31 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
74	1. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly p astic	6.4	NW¼NW¼, Sec. 9, T. 20 S., R. 28 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
75	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.2	SW¼NE¼, Sec. 5, T. 20 S., R. 28 E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Moderate	Very fine	Subangular blocky	Slightly hard	Friable	Sticky	Plastic	6.4		
77	1. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.3	SW¼NW¼, Sec. 5, T. 20 S., R. 31 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
81	1. Moderate	Very fine to fine	Granular	Hard	Firm	Sticky	Plastic	6.1	NW¼NE¼, Sec. 29, T. 15 S., R. 28 E.	Vertic Argiaquolls; fine montmorillonitic, frigid family.
	2. Strong	Fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.3		
82	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.3	NW¼NE¼, Sec. 31, T. 15 S., R. 28 E.	Andic Xerochrepts; medial over fine montmorillonitic, frigid family.
	2. Strong	Fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.0		
83	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.3	NW¼NW¼, Sec. 6, T. 12 S., R. 32 E.	Entic Cryandepts; ashy over clayey family.
	ng	Fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.0		
85	ag	Very fine to fine	Granular & angular blocky	Hard	Firm	Sticky	Very plastic	6.4	SE¼NW¼, Sec. 33, T. 19 S., R. 29 E.	Lithic Argixerolls; clayey-skeletal, montmorillonitic, frigid family.
86	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.4	NW¼SE¼, Sec. 27, T. 17 S., R. 29 E.	Andic Xerochrepts; medial over fine montmorillonitic, frigid family.
	2. Strong	Fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.0		
87	1. Moderate	Fine	Granular & angular blocky	Hard	Firm	Sticky	Very plastic	6.4	NW¼SE¼, Sec. 27, T. 17 S., R. 32 E.	Lithic Argixerolls, clayey-skeletal, montmorillonitic, frigid family.
88	1. Moderate	Very fine	Granular	Hard	Firm	Sticky	Plastic	6.5	SE¼SW¼, Sec. 4, T. 17 S., R. 29 E.	Vertic Argixerolls; fine, montmorillonitic, frigid family.
	2. Strong	Fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.0		
94	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.5	SE¼SW¼, Sec. 1, T. 12 S., R. 34 E.	Entic Cryandepts; ashy over loamy family.
	2. Moderate	Fine & very fine	Angular blocky	Hard	Firm	Sticky	Plastic	6.2		
95	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.6	SE¼SW¼, Sec. 17, T. 12 S., R. 33 E.	Andic Xerochrepts; medial over loamy-skeletal, frigid family.
	2. Moderate	Fine & very fine	Angular blocky	Hard	Firm	Sticky	Plastic	6.3		
96	1. Moderate	Very fine	Granular & angular blocky	Hard	Firm	Sticky	Plastic	6.5	SE¼NW¼, Sec. 16, T. 14 S., R. 33 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
97	1. Moderate	Very fine	Granular & angular blocky	Hard	Firm	Sticky	Plastic	6.5	NW¼NW¼, Sec. 18, T. 14 S., R. 33 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
98	1. Weak	Very fine	Granular & angular blocky	Slightly hard	Friable	Sticky	Slightly plastic	6.7	NE¼SE¼, Sec. 7, T. 16 S., R. 31 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
99	1. Weak	Very fine	Granular & angular blocky	Slightly hard	Friable	Sticky	Slightly plastic	6.7	NE¼NE¼, Sec. 28, T. 15 S., R. 28 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.

TABLE OF SOIL CHARACTERISTICS OF MODAL SITE

Land-type	Soil Structure			Consistence				pH	Location of Modal Site	Estimated Soil Taxonomic Classification
	Grade	Size	Type	Dry	Moist	Wet: Stickiness	Wet: Plasticity			
114	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.8	SW¼NE¼, Sec. 27, T. 15 S., R. 34 E.	Entic Cryandepts; ashy over loamy skeletal; mixed family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.0		
121	1. Weak	Very fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.0	SE¼SE¼, Sec. 1, T. 10 S., R. 32 E.	Lithic Haploxerolls; loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2		
122	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.2	SW¼SE¼, Sec. 1, T. 10 S., R. 32 E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.3		
124	1. Weak	Very fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.0	NW¼SW¼, Sec. 31, T. 9 S., R. 33 E.	Lithic Haploxerolls; loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.3		
125	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.4	SW¼NE¼, Sec. 6, T. 10 S., R. 33 E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2		
125	1. Weak	Very fine & fine	Granular	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.5	SW¼SW¼, Sec. 36, T. 9 S., R. 32 E.	Lithic Haploxerolls; loamy-skeletal, mixed, frigid family.
126	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.5	NE¼NW¼, Sec. 6, T. 10 S., R. 33 E.	Entic Cryandepts; ashy over loamy-skeletal, mixed family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.1		
127	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.4	SE¼SW¼, Sec. 30, T. 9 S., R. 33 E.	Entic Cryandepts; ashy over loamy-skeletal, mixed family.
	2. Weak	Very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.1		
128	1. Weak	Very fine & fine	Granular	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.5	SE¼NE¼, Sec. 2, T. 10 S., R. 32 E.	Lithic Haploxerolls; loamy-skeletal, mixed, frigid family.
132	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.4	NW¼SE¼, Sec. 7, T. 16 S., R. 28 E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Weak	Fine to very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.6		
133	1. Weak	Very fine	Crumb	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.5	NW¼SW¼, Sec. 10, T. 16 S., R. 28 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
	2. Weak	Fine to very fine	Subangular blocky	Slightly hard	Friable	Slightly sticky	Slightly plastic	6.2		
134	1. Weak	Fine to very fine	Granular	Slightly hard	Friable	Slightly sticky	Nonplastic	6.4	NE¼NE¼, Sec. 13, T. 16 S., R. 27 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family
141	1. Weak	Very fine to fine	Crumb	Slightly hard	Friable	Sticky	Slightly plastic	6.3	SW¼NE¼, Sec. 28, T. 16 S., R. 35 E.	Lithic Haploxerolls; loamy-skeletal, mixed, frigid family.
	2. Moderate	Fine	Subangular blocky	Hard	Friable	Sticky	Plastic	6.5		
142	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.3	NE¼SE¼, Sec. 19, T. 16 S., R. 35 E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Moderate	Fine	Subangular blocky	Hard	Friable	Sticky	Plastic	6.5		
143	1. Weak	Very fine to fine	Crumb	Slightly hard	Friable	Sticky	Slightly plastic	6.6	SE¼NE¼, Sec. 4, T. 16 S., R. 35 E.	Lithic Haploxerolls; loamy-skeletal, mixed, frigid family.
	2. Moderate	Fine	Subangular blocky	Hard	Friable	Sticky	Plastic	6.4		
148	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.5	SE¼NE¼, Sec. 2, T. 16 S., R. 34 E.	Andic Xerochrepts; medial over loamy skeletal, mixed, frigid family.
	2. Moderate	Fine	Subangular blocky	Hard	Friable	Sticky	Plastic	6.2		
156	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.4	NE¼SE¼, Sec. 31, T. 15 S., R. 35 E.	Entic Cryandepts; ashy, over loamy-skeletal, mixed family.
	2. Moderate	Fine	Subangular blocky	Hard	Friable	Sticky	Plastic	6.4		
159	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.5	SE¼SE¼, Sec. 11, T. 14 S., R. 35 E.	Entic Cryandepts; ashy over loamy-skeletal, mixed family.
	2. Moderate	Fine	Subangular blocky	Hard	Friable	Sticky	Plastic	6.2		
162	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.7	SE¼NE¼, Sec. 8, T. 12 S., R. 34 E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Moderate	Fine & very fine	Angular blocky	Hard to very hard	Firm	Sticky	Plastic	5.7		
164	1. Moderate	Fine & very fine	Granular & angular blocky	Hard	Firm	Sticky	Plastic	5.8	NW¼SE¼, Sec. 9, T. 12 S., R. 34 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
165	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.8	SW¼SW¼, Sec. 34, T. 11 S., R. 34 E.	Andic Xerochrepts; medial over loamy-skeletal, mixed, frigid family.
	2. Moderate	Fine & very fine	Angular blocky	Hard to very hard	Firm	Sticky	Plastic	5.8		

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF SOIL CHARACTERISTICS OF MODAL SITE

Land type	Soil Structure			Consistence				pH	Location of Modal Site	Estimated Soil Taxonomic Classification
	Grade	Size	Type	Dry	Moist	Wet Stickiness	Wet Plasticity			
166	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.8	SE¼SW¼, Sec. 33, T. 11 S., R. 34 E.	Entic Cryandepts; medial over loamy-skeletal, mixed family.
	2. Moderate	Fine & very fine	Angular blocky	Hard to very hard	Firm	Sticky	Plastic	5.6		
167	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.7	NE¼NE¼, Sec. 3, T. 12 S., R. 34 E.	Entic Cryandepts; medial over loamy-skeletal, mixed family.
	2. Moderate	Fine	Angular blocky	Hard to very hard	Firm	Sticky	Plastic	5.7		
168	1. Moderate	Fine & very fine	Granular & angular blocky	Hard	Firm	Sticky	Plastic	5.8	SE¼SW¼, Sec. 31, T. 11 S., R. 34 E.	Lithic Xerochrepts; loamy-skeletal, mixed, frigid family.
172	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.5	SE¼NW¼, Sec. 29, T. 9 S., R. 33 E.	Andic Xerochrepts; medial over sandy, frigid family.
	2. Single-grain	-	-	Loose	Very friable	Nonsticky	Nonplastic	6.5		
176	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.2	NE¼NE¼, Sec. 30, T. 9 S., R. 33 E.	Entic Cryandepts; ashy over sandy family.
	2. Single-grain	-	-	Loose	Very friable	Nonsticky	Nonplastic	6.4		
181	1. Strong	Fine	Granular	Hard	Firm	Sticky	Plastic	6.2	NE¼NW¼, Sec. 25, T. 10 S., R. 33 E.	Typic Pelloxererts; fine montmorillonitic, frigid family.
	2. Strong	Fine to very fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.0		
182	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.8	NE¼NE¼, Sec. 33, T. 10 S., R. 33 E.	Andic Xerochrepts; medial over fine montmorillonitic, frigid family.
	2. Strong	Fine to very fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.2		
183	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.2	SE¼NE¼, Sec. 23, T. 11 S., R. 31 E.	Entic Cryandepts; ashy over clayey family.
	2. Strong	Fine to very fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.0		
184	1. Moderate to strong	Fine to very fine	Granular & angular blocky	Hard	Firm	Sticky	Plastic	6.0	NE¼NE¼, Sec. 26, T. 10 S., R. 33 E.	Lithic Argixerolls; clayey-skeletal, montmorillonitic, frigid family.
185	1. Strong	Fine to very fine	Granular & angular blocky	Very hard	Firm	Very sticky	Very plastic	6.0	SW¼SW¼, Sec. 8, T. 10 S., R. 33 E.	Typic Pelloxererts; fine, montmorillonitic, frigid family.
	Strong	Fine	Angular	Very hard	Firm	Very sticky	Very plastic	6.0		
	assive	-	-	Soft	Very friable	Nonsticky	Nonplastic	6.2	SE¼NE¼, Sec. 35, T. 10 S., R. 33 E.	Andic Xerochrepts; medial over fine montmorillonitic, frigid family.
	.. Strong	Fine to very fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.2		
187	1. Moderate to strong	Fine to very fine	Angular blocky	Hard	Firm	Sticky	Plastic	6.0	SE¼NW¼, Sec. 11, T. 12 S., R. 31 E.	Lithic Argixerolls; clayey-skeletal, montmorillonitic, frigid family.
188.	1. Strong	Fine	Granular	Hard	Fine	Sticky	Plastic	6.0	NW¼SE¼, Sec. 16, T. 10 S., R. 33 E.	Vertic Argixerolls; fine montmorillonitic, frigid family.
	2. Strong	Fine to very fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	5.8		
189	1. Massive	-	-	Soft	Very friable	Nonsticky	Nonplastic	5.8	SW¼SW¼, Sec. 28, T. 11 S., R. 32 E.	Entic Cryandepts; ashy over clayey family.
	2. Strong	Fine to very fine	Angular blocky	Very hard	Very firm	Very sticky	Very plastic	6.0		

APPENDIX I

GENERALIZED GEOLOGY OF THE MALHEUR NATIONAL FOREST [1/]

The survey area lies within the Blue Mountain Physiographic Division of Oregon, and extends from the north edge of Harney Basin to the Greenhorn Mountains. Elevation ranges from 3,500 to 9,000 feet. Most of the survey areas range from 4,000 to 6,500 feet. Three major drainage systems (John Day, Malheur, and Silvies) have all or part of their headwaters within the survey area.

All of the Malheur National Forest has received volcanic ash in recent geologic history. Probable source is Mt. Mazama.[2/] Natural geologic erosion has removed most of the ash on the lower south aspects. Upper elevations and north aspects still have 18 to 24 inches of this ash. East and west aspects have 8 to 12 inches of ash remaining. Color of the ash varies from brown to white, depending on organic matter and weathering.

Glaciation has had a minor effect in the survey area. However, in localized high-elevation areas it has been significant. Glaciated valleys and other glacial features occur in and around some of the higher peaks in the mapping area. General areas are Strawberry Mountain, Canyon Mountain, Glacier Mountain, Indian Rock, Summit Rock, Table Mountain, and little Baldy Mountain.

The bedrock of the survey area is composed of the following major bedrock types: sedimentary and metasedimentary; basalt and andesite; rhyolite; pyroclastic; serpentine and peridotite; and diorite and gabbro.

1/ The reader is encouraged to consult the following publications for detailed geologic information:

Baldwin, E.M., 1964, "Geology of Oregon," University of Oregon.

Green, Walker & Corcoran. Geologic Map of the Burns Quadrangle, Oregon: U.S. Geologic Survey, Map I-680, Scale 1:250,000.

Brown, C.E., and Thayer, T.P., 1966a, Geologic Map of the Canyon City Quadrangle, Northeastern Oregon: U.S. Geol. Survey, Map I-447. Scale 1:250,000.

Thayer, and Brown, 1966a, Geologic Map of the Aldrich Mtn. Quadrangle, Grant County, Oregon: U.S. Geol. Survey Map GQ-438. Scale 1:62,500.

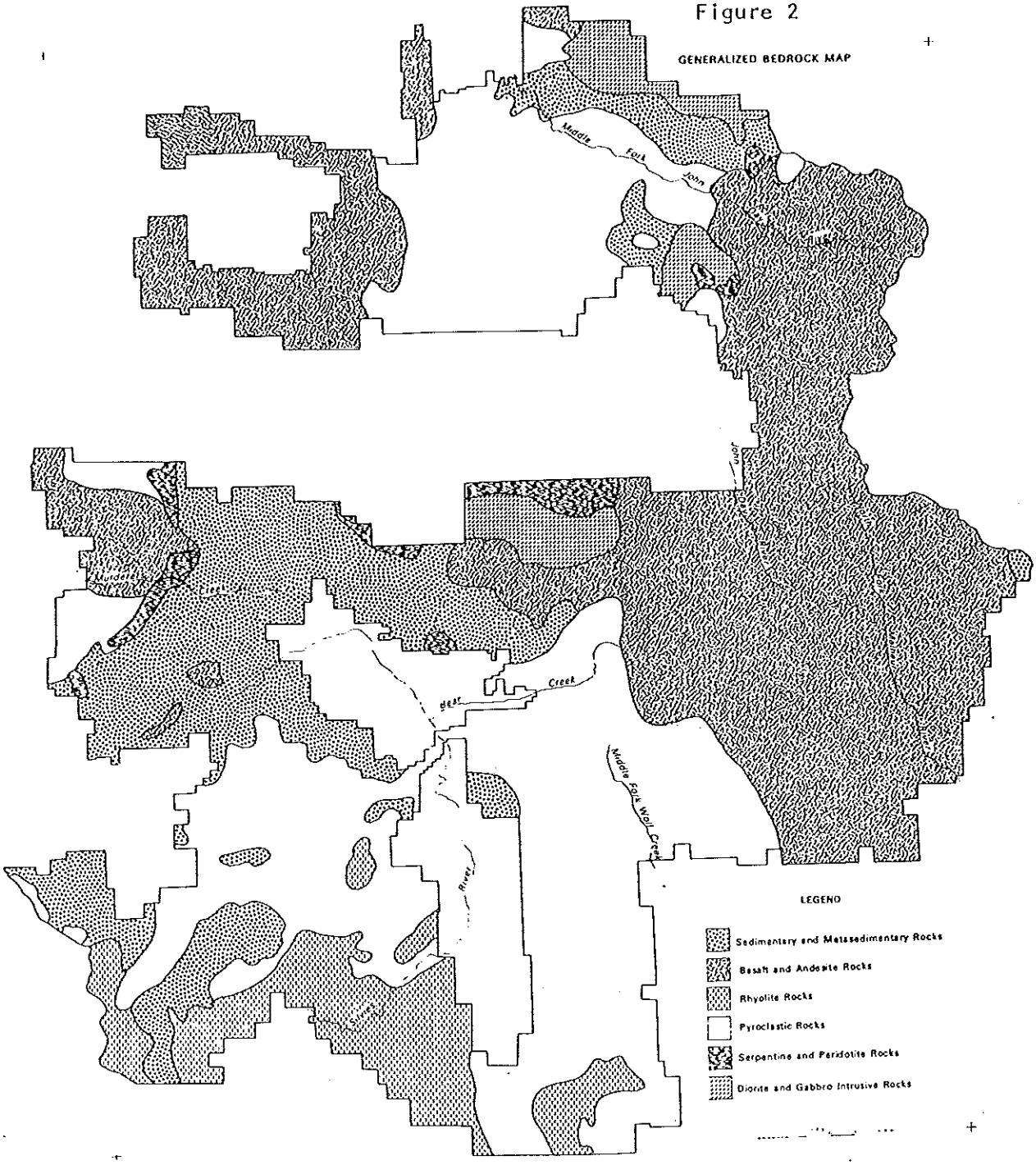
Thayer, T.P., 1956, Preliminary Geologic Map of the John Day Quadrangle, Oregon: U.S. Geol. Survey Map MF-51. Scale 1:62,500.

Brown and Thayer, 1966b, Geologic Map of the Mt. Vernon Quadrangle, Grant County, Oregon: U.S. Geol. Survey, Map GQ-548. Scale 1:62,500.

Vigrass, L.W., 1959, Geology of the Suplee Area, Crook, Grant, and Harney Counties, Oregon: Stanford Univ. doctoral dissert., unpub.

2/ Powers, H.A. and Wilcox, R.E. - Science 114, 1334 (1964)

Figure 2


GENERALIZED BEDROCK MAP
Middle Fork John
Creek
Middle Fork Wolf Creek
LEGEND
Sedimentary and Metasedimentary Rocks
Basalt and Andesite Rocks
Rhyolite Rocks
Pyroclastic Rocks
Serpentine and Peridotite Rocks
Diorite and Gabbro Intrusive Rocks

Sedimentary and Metasedimentary Rocks - These rocks are soft to hard and highly fractured with a blocky and platy fracture system. Colors range from gray to brown to black. Typically, these rock types are steeply folded and faulted. There has been varying degrees of metamorphism in this rock group. The argillite are more highly metamorphosed.

Landtypes which have these bedrock materials include 31, 32, 33, 34, 35, 36, 37, 121, 122, 123, 124, 125, 126, 127, 128, 132, 133, and 134.

Basalt and Andesite Rocks - These rocks are fine-grained, generally hard and competent, and moderately to highly fractured. Platy and blocky fracturing is most common, with an occasional area of columnar fracturing. Colors range from black to gray. These rocks are among the most resistant in the area and often form cap ridges and plateaus that are underlain by the less resistant pyroclastic rocks. However, in some areas they predominate from ridgetop to valley bottom, and also occur in some areas intermixed with pyroclastics.

Landtypes which have these bedrock materials include 41, 42, 43, 44, 45, 46, 47, 48, 58, 59, 141, 142, 143, 148, 158, and 159.

Rhyolite Rocks - These rocks are fine-grained, moderately hard to hard and competent. They are massive to moderately fractured in plates and blocks. Color ranges from white to light purple. These rocks are among the more resistant on the Forest and often form cap ridges and plateaus that are underlain by the less resistant pyroclastic rocks.

Landtypes which have these bedrock materials include 71, 73, 74, 75, and 77.

Pyroclastic Rocks - This is a broad class of rocks whose primary fragments originated as airborne material that was explosively ejected from volcanoes. After settling to earth, this material was subjected to one of several possible processes, depending upon where and how the ejecta fell. Some of the ejecta fell on ancient lakes and streams, settled to the bottom, and later became consolidated into rocks. These rocks may exhibit various degrees of stratification, depending upon the relative water velocity at the time. Other volcanic ejecta may have become involved in mudflow activity that incorporated the ejecta with pre-existing soil and rocks. This mass then later solidified and hardened to form breccia rocks. Other processes also occurred. Because of the various ways the pyroclastics can form, there is wide variation in their appearance and properties. Often incorporated within the pyroclastic rocks are andesite and basalt fragments.

In general, the pyroclastic rocks have little resistance to weathering and are often associated with unstable soils. As a group they are moderately competent to incompetent, although a minor amount does occur that is hard and competent. In some areas the pyroclastics are so highly weathered they are hardly recognizable as rock. This occurs most commonly in Mapping Units 81 and 181.

Landtypes which have these bedrock materials include 62, 63, 65, 68, 81, 82, 83, 85, 86, 87, 88, 181, 182, 183, 184, 185, 186, 187, 188, and 189.

Serpentine and Peridotite Rocks - This is a minor bedrock area but has some important road location and soil fertility problems. Therefore, it was separated out as a separate rock type area. These rock types are moderately hard to hard, and moderately to highly fractured. Fracture system is blocky and platy to random. Color ranges from black to green.

Landtypes which have these bedrock materials are 94, 95, 96, 97, 98 and 99.

Diorite and Gabbro Intrusive Rocks - These rocks are coarse-textured and are soft to hard, depending on the depth of past weathering. Colors range from gray to white.

Landtypes which have these bedrock materials are 161, 162, 163, 164, 166, 167, 168, 172 and 176.

APPENDIX II

CLIMATE

The climate of the survey area is characterized by low to moderate annual precipitation, and high summer temperatures. Torrential rainstorms occur occasionally in the spring and summer, often causing severe soil erosion and flood damage, and adding little to the soil moisture. Strong winds, generally from the west and southwest, may occur at any time of the year and cause drifting snow in winter and soil movement and excessive evaporation in other seasons.

Precipitation

Most National Forest land is situated in a 20- to 40-inch annual precipitation zone. Only a small portion of the area receives precipitation below 15 or above 40 inches. Most of the annual precipitation occurs from October through May. An Isohyetal Map of the normal annual precipitation is

Temperature

Average annual temperature ranges between 27 and 50 degrees Fahrenheit, with no months averaging above 70 degrees. Recorded extremes have varied from -56 degrees at Austin, to +108 degrees at Long Creek. The frost-free season is very short and freezing conditions can occur in every month.

Although yearly temperature ranges are moderate, diurnal fluctuations are pronounced. Thinner atmosphere at higher elevations permits rapid exchanges of heat by radiation. Besides large daily variations, pronounced temperature differences occur between north and south slopes, and between sunlit and shaded ground. Forest temperatures can be expected to be as much as 10 degrees cooler in the day as compared to adjacent nonforest lands.

Tables of Mean Temperature and Precipitation Data

These tables include data from U.S. Weather Bureau Stations on and adjacent to the Malheur National Forest. Austin, Bates-Dixie Pass, and Seneca are within the survey area boundaries. John Day and Burns are located outside the survey area boundaries.

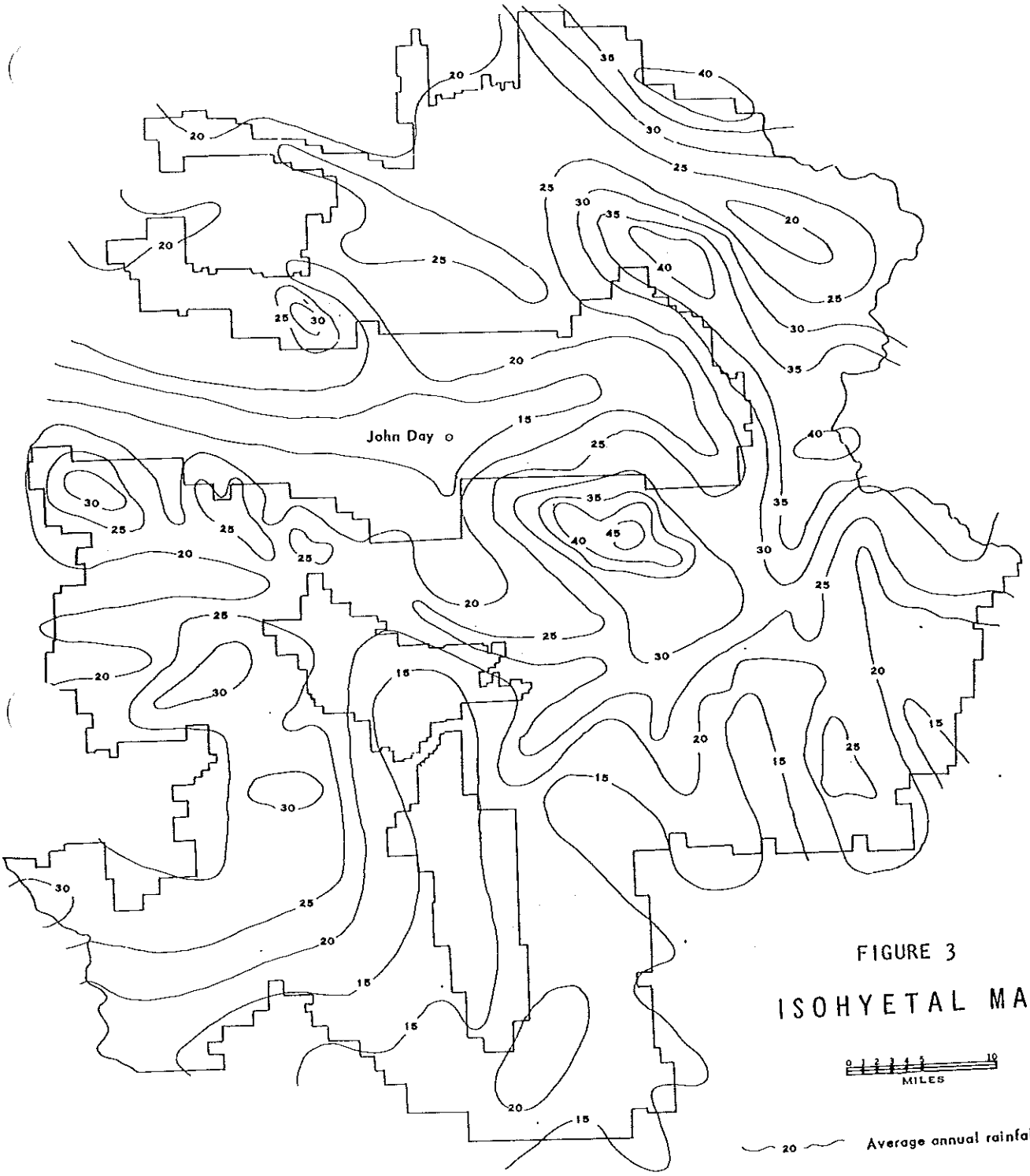


FIGURE 3

ISOHYETAL MAP

Location: John Day

Elevation: 3063
Period: 1912 - 1966

Month	Mean Temperature (°F)	Precipitation (Inches)
January	30.7	1.66
February	35.8	1.23
March	41.1	1.31
April	49.1	1.48
May	55.4	1.54
June	60.6	1.38
July	69.8	.45
August	68.2	.59
September	61.7	.83
October	51.6	1.14
November	40.6	1.45
December	34.7	1.53
Annual	49.9	14.65

Location: Burns

Elevation: 4148
Period: 1951 - 1960

Month	Mean Temperature (°F)	Precipitation (Inches)
January	24.8	1.62
February	29.7	1.27
March	37.4	.97
April	46.0	.75
May	53.4	.89
June	59.8	.88
July	69.5	.34
August	67.2	.29
September	58.8	.50
October	48.4	.86
November	36.1	1.16
December	29.1	1.43
Annual	46.7	10.96

Location: Austin

Elevation: 4213
Period: 1912 - 1966

Month	Mean Temperature (°F)	Precipitation (Inches)
January	20.4	2.76
February	25.5	2.14
March	32.7	1.88
April	41.5	1.33
May	48.1	1.47
June	54.6	1.47
July	61.8	.56
August	59.4	.55
September	52.4	.82
October	43.3	1.50
November	31.7	2.13
December	24.6	2.78
Annual	41.3	19.45

Location: Seneca

Elevation: 466
Period: 1938 - 1960

Month	Mean Temperature (°F)	Precipitation (Inches)
January	23.6	1.75
February	24.1	1.17
March	31.0	1.19
April	40.5	.97
May	46.8	1.19
June	53.5	.94
July	60.4	.32
August	56.9	.33
September	49.9	.64
October	42.2	.89
November	31.5	1.02
December	25.6	1.54
Annual	40.5	11.95

Location: Bates - Dixie Pass

Elevation: 5250
Period: 1948 - 1965

Month	Mean Temperature (°F)	Precipitation (Inches)
January	-	4.68
February	-	4.30
March	-	4.07
April	-	2.87
May	-	3.63
June	-	2.60
July	-	.89
August	-	1.13
September	-	1.57
October	-	3.21
November	-	3.96
December	-	4.62
Annual	-	36.99

APPENDIX III

This Appendix contains the landtype data input necessary to quantify erosion losses, using Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Soil Erosion. By David A. Anderson, USDA, Forest Service, Southwest Region, Soil Note 13.

See this report for use of this information.

H = 1.0
M = 0.8
L = 0.4

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

LANDTYPE DATA INPUT FOR QUANTIFIED SOIL EROSION COMPUTATIONS [1/]

Land-type	Surface Rock (%)	Basic Erosion Rate	Erodibility Coefficient [2/]	Two-year 30-minute Precipitation	Number of Slopes	Percent Slopes	Number of Vegetative Cover Densities	% Ground Cover Condition Class
1	0	.35	Moderate (2)	.30	1	5	7	40 50 60 70 80 90 100 2 2 3 3 3 3 3
3	5	.35	Moderate (2)	.30	2	5, 10	7	40 50 60 70 80 90 100 2 2 2 3 3 3 3
5	0	.32	Moderate (2)	.30	2	5, 10	7	30 40 50 60 70 80 90 1 2 2 2 2 2 3
7	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not Rated
8	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not Rated
9	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not Rated
10	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not Rated
11	0	.41	Moderate (2)	.35	2	10, 20	6	30 40 50 60 70 80 1 2 2 2 2 3
12	25	.20	Low (3)	.35	2	10, 20	6	30 40 50 60 70 80 1 2 2 2 2 2
13	25	.41	Moderate (2)	.30	2	10, 20	6	20 30 40 50 60 70 1 1 2 2 2 2
14	0	.32	Moderate (2)	.35	4	5, 10, 20, 30	6	40 50 60 70 80 90 1 2 2 2 2 3
15	60	.12	Low (3)	.35	1	5	6	10 20 30 40 50 60 1 1 1 1 2 2
16	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not Rated
17	5	.32	Moderate (2)	.50	5	5, 10, 15, 20, 25	6	50 60 70 80 90 100 2 2 2 3 3 3
18	35	.41	Moderate (2)	.50	5	5, 10, 15, 20, 25	6	40 50 60 70 80 90 1 2 2 2 2 3
19	0	.32	Moderate (2)	.50	5	10, 15, 20, 25, 30	6	50 60 70 80 90 100 2 2 2 3 3 3
31	25	.41	Moderate (2)	.35	4	5, 10, 15, 20	6	30 40 50 60 70 80 1 1 2 2 2 3
32	0	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	6	40 50 60 70 80 90 1 2 2 2 2 3
33	30	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	6	30 40 50 60 70 80 1 1 2 2 2 3
34	40	.41	Moderate (2)	.35	7	10, 20, 30, 40, 50, 60, 70	6	10 20 30 40 50 60 1 1 1 2 2 2
35	50	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	6	10 20 30 40 50 60 1 1 1 2 2 2
36	0	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	30 40 50 60 70 80 90 1 2 2 2 2 3 3
37	50	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	6	10 20 30 40 50 60 1 1 1 2 2 2
41	20	.45	Moderate (2)	.35	5	5, 10, 15, 20, 25	6	20 30 40 50 60 70 1 1 1 2 2 2
42	5	.32	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	30 40 50 60 70 80 90 1 1 2 2 2 2 3
43	25	.45	Moderate (2)	.35	5	30, 40, 50, 60, 70	6	20 30 40 50 60 70 1 1 1 2 2 2
44	40	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	6	10 20 30 40 50 60 1 1 1 2 2 2
45	50	.41	High (1)	.35	5	30, 40, 50, 60, 70	6	10 20 30 40 50 60 1 1 1 1 2 2
46	40	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	6	10 20 30 40 50 60 1 1 1 2 2 2

1/ Anderson, David A. 1969. Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Erosion, USDA Forest Service, R-3. Soil Note 13.
2/ Anderson, David A. 1969. Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Erosion, USDA Forest Service, R-3. Soil Note 13, Table 4.

EH = BER x ER x P x S

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

LANDTYPE DATA INPUT FOR QUANTIFIED SOIL EROSION COMPUTATIONS [1/]

Land-type	Surface Rock (%)	Basic Erosion Rate	Erodibility Coefficient [2/]	Two-year 30-minute Precipitation	Number of Slopes	Percent Slope	Number of Vegetative Cover Densities	% Ground Cover Condition Class						
47	50	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	6	10 / 1	20 / 1	30 / 1	40 / 1	50 / 2	60 / 2	
48	5	.32	Moderate (2)	.35	5	30, 40,50, 60, 70	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
58	0	.32	Moderate (2)	.40	5	5, 10, 15, 20, 25	7	40 / 1	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
59	0	.32	Moderate (2)	.40	5	30, 40,50, 60, 70	7	40 / 1	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
62	0	.12	Low (3)	.35	5	30, 40,50, 60, 70	5	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2		
63	0	.32	Moderate (2)	.40	5	10, 20,30, 40, 50	7	40 / 1	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
65	5	.32	Moderate (2)	.35	5	10, 20,30, 40, 50	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
68	20	.32	Moderate (2)	.35	5	10, 20,30, 40, 50	7	10 / 1	20 / 1	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2
71	40	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	10 / 1	20 / 1	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2
73	50	.41	Moderate (2)	.35	5	30, 40,50, 60, 70	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
74	45	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
75	5	.32	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
77	70	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	5	10 / 1	20 / 1	30 / 1	40 / 1	50 / 2		
81	10	.65	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3
82	5	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3
83	0	.32	Moderate (2)	.40	5	5, 10, 15, 20, 25	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
85	35	.60	Moderate (2)	.35	5	5, 10, 15, 20, 25	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
86	10	.41	Moderate (2)	.35	5	30, 40,50, 60, 70	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3
87	35	.60	Moderate (2)	.35	5	30, 40,50, 60, 70	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
88	15	.60	Moderate (2)	.35	5	30, 40,50, 60, 70	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3
94	0	.32	Moderate (2)	.40	5	30, 40, 50, 60, 70	7	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3	100 / 3
95	5	.32	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
96	35	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	20 / 1	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2
97	45	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
98	50	.41	High (1)	.35	5	5, 10, 15, 20, 25	6	10 / 1	20 / 1	30 / 1	40 / 1	50 / 2	60 / 2	
99	60	.41	High (1)	.35	5	30, 40, 50, 60, 70	6	10 / 1	20 / 1	30 / 1	40 / 1	50 / 2	60 / 2	
114	0	.32	Moderate (2)	.40	5	5, 10, 15, 20, 25	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
121	30	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3

1/ Anderson, David A. 1969. Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Erosion, USDA Forest Service, R-3, Soil Note 13.
2/ Anderson, David A. 1969. Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Erosion, USDA Forest Service, R-3, Soil Note 13, Table 4.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

LANDTYPE DATA INPUT FOR QUANTIFIED SOIL EROSION COMPUTATIONS [1/]

Land-type	Surface Rock (1)	Basic Erosion Rate	Erodibility [2/] Coefficient	Two-year 30-Min. Precipitation	Number of Slopes	Percent Slope	Number of Vegetative Cover Densities	% Ground Cover / Condition Class						
122	15	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
123	40	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3
124	10	.32	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
125	60	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
126	0	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
127	0	.32	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
128	60	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
132	10	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
133	30	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3
134	40	.41	Moderate (2)	.35	7	10, 20, 30, 40, 50, 60, 70	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
141	15	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	20 / 1	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 3
142	0	.32	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
143	20	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	20 / 1	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 3
148	5	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
158	0	.32	Moderate (2)	.40	5	5, 10, 15, 20, 25	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
159	0	.32	Moderate (2)	.40	5	30, 40, 50, 60, 70	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
162	10	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
163	25	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3
164	10	.32	Moderate (2)	.34	5	5, 10, 15, 20, 25	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
166	0	.32	Moderate (2)	.40	5	30, 40, 50, 60, 70	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
167	0	.32	Moderate (2)	.40	5	5, 10, 15, 20, 25	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
168	60	.41	Moderate (2)	.35	5	30, 40, 50, 60, 70	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
172	0	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	30 / 1	40 / 1	50 / 2	60 / 2	70 / 2	80 / 2	90 / 3
176	0	.32	Moderate (2)	.40	5	10, 20, 30, 40, 50	7	40 / 1	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
181	0	.65	Moderate (2)	.30	5	5, 10, 15, 20, 25	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 3	80 / 3	90 / 3
182	5	.41	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3
183	0	.32	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
184	50	.60	Moderate (2)	.35	5	5, 10, 15, 20, 25	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
185	5	.65	Moderate (2)	.35	5	5, 10, 15, 20, 25	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3
186	10	.41	Moderate (2)	.30	5	30, 40, 50, 60, 70	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3
187	50	.60	Moderate (2)	.35	5	30, 40, 50, 60, 70	6	10 / 1	20 / 1	30 / 1	40 / 2	50 / 2	60 / 2	
188	30	.60	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	30 / 1	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3
189	0	.32	Moderate (2)	.35	5	30, 40, 50, 60, 70	7	40 / 2	50 / 2	60 / 2	70 / 2	80 / 3	90 / 3	100 / 3

1/Anderson, David A. 1969. Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Erosion, USDA Forest Service, R-3. Soil Note 13.
2/Anderson, David A. 1969. Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Erosion, USDA Forest Service, R-3. Soil Note 13, Table 4.

SOIL RESOURCE INVENTORY
MALHEUR NATIONAL FOREST

TABLE OF ERODIBILITY COEFFICIENTS 2/

Land-type	Detachability	Infiltration of Surface Horizon	Permeability of Lower Horizon	Depth at Which Permeability Reduction Begins	Percent Coarse Fragments on Surface (Average)	Miscellaneous Factors	Assigned Value	Erodibility Coefficient
1	5	5	4	2	3	5	24	Moderate
3	5	5	4	2	3	5	24	Moderate
5	8	3	2	2	3	3	21	Moderate
7	Not rated (variable)	-	-	-	-	-	-	-
8	Not rated (variable)	-	-	-	-	-	-	-
9	Not rated (variable)	-	-	-	-	-	-	-
10	Not rated (variable)	-	-	-	-	-	-	-
11	4	5	4	2	3	1	19	Moderate
12	5	3	2	1	3	1	15	Low
13	5	5	3	2	3	3	21	Moderate
14	8	3	2	2	3	2	20	Moderate
15	8	1	1	1	2	1	14	Low
16	Not rated	-	-	-	-	-	-	-
17	9	2	4	2	3	3	23	Moderate
18	5	5	4	3	2	4	23	Moderate
19	9	2	3	2	3	4	23	Moderate
31	4	4	3	3	3	1	18	Moderate
32	8	3	3	3	3	2	22	Moderate
33	4	4	3	3	2	2	18	Moderate
34	7	4	5	5	2	3	26	Moderate
35	8	4	5	6	2	3	28	Moderate
36	8	2	3	2	3	4	22	Moderate
37	8	4	5	6	2	3	28	Moderate
41	5	5	4	4	3	1	22	Moderate
42	8	3	4	3	3	2	23	Moderate
43	4	5	4	4	3	2	22	Moderate
44	7	5	5	5	2	3	27	Moderate
45	8	5	6	6	2	3	30	High
46	7	5	5	5	2	3	27	Moderate
47	7	5	6	6	2	3	29	Moderate
48	8	3	4	3	3	3	24	Moderate
58	9	2	4	2	3	4	24	Moderate
59	9	2	4	2	3	4	24	Moderate
62	9	1	1	1	3	0	15	Low
63	9	2	3	1	3	4	22	Moderate
65	8	2	3	2	3	3	21	Moderate
68	7	3	3	3	3	2	21	Moderate
71	7	4	3	4	2	1	21	Moderate
73	7	4	5	5	2	3	26	Moderate
74	7	4	5	5	2	2	25	Moderate
75	8	2	3	3	3	2	21	Moderate
77	7	4	6	6	1	3	27	Moderate

2/ Anderson, David A. 1969. Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Erosion, USDA Forest Service, R-3. Soil Note 13, Table 4.

SOIL RESOURCE INVENTORY
BALDIEUR NATIONAL FOREST

TABLE OF ERODIBILITY COEFFICIENTS [2/]

Land type	Detachability	Infiltration of Surface Horizon	Permeability of Lower Horizon	Depth at Which Permeability Reduction Begins	Percent Coarse Fragments on Surface (Average)	Miscellaneous Factors	Assigned Value	Erodibility Coefficient
81	2	9	6	2	3	2	24	Moderate
82	8	3	6	3	3	2	25	Moderate
84	9	2	6	2	3	3	25	Moderate
85	2	8	6	5	2	3	26	Moderate
86	8	3	6	3	3	3	26	Moderate
87	2	8	6	5	2	3	26	Moderate
88	2	8	6	4	3	3	26	Moderate
94	9	2	4	2	3	4	24	Moderate
95	8	3	4	3	3	4	25	Moderate
96	4	5	4	4	2	5	24	Moderate
97	4	5	4	4	2	5	24	Moderate
98	7	4	6	6	2	5	30	High
99	7	4	6	6	1	6	30	High
119	9	2	3	2	3	4	23	Moderate
121	4	4	3	3	3	1	18	Moderate
122	8	3	3	3	3	2	22	Moderate
123	4	4	3	3	2	2	18	Moderate
124	8	3	3	3	3	3	23	Moderate
125	7	4	5	5	2	3	26	Moderate
126	9	2	3	2	3	4	23	Moderate
127	9	2	3	2	3	4	23	Moderate
128	7	4	5	5	2	3	26	Moderate
132	8	3	3	3	3	2	22	Moderate
133	4	4	3	3	3	2	19	Moderate
134	7	4	5	5	2	3	26	Moderate
141	5	4	3	3	3	1	19	Moderate
142	8	3	3	3	3	2	22	Moderate
143	5	4	3	3	3	2	20	Moderate
148	8	3	3	3	3	3	23	Moderate
158	9	2	3	2	3	4	23	Moderate
159	9	2	3	2	3	4	23	Moderate
162	8	3	3	2	3	3	22	Moderate
163	6	4	3	3	3	2	21	Moderate
164	8	3	3	2	3	3	22	Moderate
166	9	2	3	2	3	4	23	Moderate
167	9	2	3	2	3	4	23	Moderate
168	7	4	5	5	2	3	26	Moderate
172	9	2	1	1	3	5	21	Moderate
176	9	2	1	1	3	5	21	Moderate
181	1	9	6	4	3	3	26	Moderate
182	8	3	6	3	3	2	25	Moderate
183	9	2	6	2	3	3	25	Moderate
184	4	8	6	5	2	3	28	Moderate
185	2	8	6	4	3	3	26	Moderate
186	8	3	6	3	3	3	26	Moderate
187	4	8	6	5	2	3	28	Moderate
188	2	8	6	4	3	3	26	Moderate
189	9	2	6	2	3	4	26	Moderate

2/ Anderson, David A. 1969. Guidelines for Computing Quantified Soil Erosion Hazard and Onsite Erosion, USDA Forest Service, R-3. Soil Note 13, Table 4.

APPENDIX IV

DEFINITIONS OF SOIL AND HYDROLOGIC INTERPRETATIONS

Erosion

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, hydrophobic characteristics and bedrock materials of each landtype unit are considered in making ratings.

Low - 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 occur. Sheet erosion is indicated by some soil pedestals and observable accumulation of soil materials along the upslope edge of rocks and debris. This is accompanied by a probable fertility loss.

High - 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 fertility loss.

Very high - Large loss of surface soil material can be expected in the form of large losses from sheet erosion, numerous small gullies and rills or large gullies. 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.

Subsoil Erosion Potential

This interpretation predicts the potential for subsoil erosion by water for each unit. It includes erosion which takes place after the surface soil has been removed (about 8 inches in depth) such as in skid trails and firebreaks. Factors considered in making ratings are texture and structure of subsoil materials, slope, permeability, compaction, climate and landform.

Low - Factors indicate that little or no erosion may occur.
Moderate - Factors indicate considerable erosion is likely to occur.
High - Factors indicate severe erosion is likely to occur.

Dry Ravel Potential on Natural Slope

This is a prediction of the dry ravel potential on natural slopes of a soil that is subjected to vehicular, hoof, and/or foot traffic during the period of the year when the soils are dry. Factors taken into consideration are: vegetative cover (amount and kind); soil depth; amount, size, and shape of gravel and cobble; soil structural strength; and soil texture.

Low - Factors indicate that dry ravel will not be a problem.

Moderate - Factors indicate that a moderate amount of dry ravel will take place under moderate use such as livestock grazing.

High - Factors indicate that an excessive amount of dry ravel will take place under moderate use such as livestock grazing.

Cutslope Erosion Potential

This interpretation predicts the potential of soils exposed in a road cut to erode without erosion control measures. Most soil material in a road cut is highly vulnerable to erosion due to its steepness, exposed subsoil, and inadequate protective cover. This is a relative rating among the different landtypes as to the erodibility of the soil material. Factors considered were soil depth, soil characteristics, landform above the cutslope, aspect, type of bedrock, and a minimum cutslope height of six feet. Soils less than eight inches deep were not rated, as there would be very little soil material in the cutslope.

Low - Factors indicate that little erosion is likely to occur.

Moderate - Factors indicate that a moderate amount of erosion can be expected.

High - Factors indicate that a large amount of erosion can be expected.

Fillslope Erosion Potential

This interpretation predicts the potential of soil material on a fillslope to erode without erosion control measures. Most soil material in a road fill is highly vulnerable to erosion due to its steepness, type of soil material, and lack of protective cover. Factors considered are the expected relative ratio of coarse rock fragments to soil material, erodibility of the soil material, aspect, and a minimum fill height of six feet.

Low - Factors indicate that little erosion is likely to occur.

Moderate - Factors indicate that a moderate amount of erosion can be expected.

High - Factors indicate that a large amount of erosion can be expected.

Dry Ravel Potential on Road Cuts and Fills

This is a prediction of the dry ravel potential on road cuts and fills not subjected to livestock or vehicle traffic. Cut and fill slopes are generally steeper than the surrounding landtypes. This can create areas of high potential for dry ravel. This rating is based on cuts and fills greater than six feet in height. Factors considered were bedrock characteristics, soil depth, soil characteristics and aspect.

Low - Factors indicate that dry ravel will not be a problem.

Moderate - Factors indicate that a moderate amount of dry ravel will take place with some detrimental effects downhill and some ditch cleanout necessary.

High - Factors indicate that an expressive amount of dry ravel will take place. There will be detrimental effects below fillslopes and much ditch cleanout necessary below cutslopes.

Erosion Potential on Road Running Surface

This interpretation is a prediction of the erosion potential on unsurfaced roads with grades less than 10 percent. Factors considered in this prediction are the expected relative ratios of coarse rock fragments, soil material, soil texture, and bedrock type.

Low - Factors indicate that little erosion will occur. Much of the road running surface is coarse rock fragments.

Moderate - Factors indicate that a moderate amount of erosion can be expected.

High - Factors indicate that a large amount of erosion can be expected. Most of the running surface is highly erodible soil material.

SOIL INTERPRETATION

Stability Hazard

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 by slumps, slides, and all kinds of deep-seated failures. Surface erosion is not included. Mapping units with an "X" behind the mapping unit number (i.e., 41X, 82X) on the soil maps, would be classed as IV or V. These areas show evidence of past failures. This rating applies throughout Region 6.

I. Very stable - no evidence of failure.

II. Stable - Occasional failures are observed.

III. Moderately stable - Several failures are observed.

IV. Unstable - Many failures are observed.

V. Very unstable - Entire area shows evidence of recent and past failures.

Expected Stability Changes from Roadbuilding

This rating evaluates each landtype for its susceptibility to stability changes when roads are built. Minimum road cut and fill heights are six feet. Mapping units with an "X" behind the mapping unit number (i.e., 41X, 82X) on the soil maps, cannot be evaluated without further on-the-ground investigation.

Other Soil Interpretations

Detrimental Compaction Hazard - This is a relative prediction of soil behavior under the physical influence of foot, hoof, vehicular, or log traffic. It is a combined rating of the length of time a soil is at optimum moisture for compaction and the comparative force necessary to get compaction. Factors considered are soil texture, amount of coarse fragments, soil mineralogy, soil structure, soil drainage, evidence of seasonal saturation, soil aggregate strength, pore size, and distribution and soil consistence. Soils with more than 60 percent coarse fragments or a narrow optimum moisture range for compaction are rated low. Soils high in clay which have a wide moisture range over which they can be compacted are rated high.

Low - Factors indicate that detrimental compaction will be a minor problem.

Moderate - Factors indicate that compaction will be a problem in the spring and early summer.

High - Factors indicate that compaction will be a problem for a large part of the spring and summer.

Mixing and Displacement Hazard - This interpretation rates the landtypes as to the ease with which its soil material can be loosened and moved after its vegetation and litter are removed. Mixing and displacement can be done by hoof, foot, vehicular, or log traffic. Factors considered are soil texture, soil structural strength, bulk density, organic matter, coarse fragments, and root size and distribution.

Low - Factors indicate that these soils are not easy to loosen and/or displace.

Moderate - Factors indicate that these soils are moderately easy to loosen and/or displace.

High - Factors indicate that these soils are easy to loosen and/or displace.

Dustiness Hazard - This interpretation is a relative prediction of soil behavior, assuming that the soils will be subjected to vehicular, hoof, foot, or logging traffic during the dry season. Factors considered are soil texture, soil structure, amount of coarse fragments, and individual soil particle characteristics.

Low - Factors indicate dust will be a minor problem.

Moderate - Factors indicate that under normal conditions dust will be a minor problem, but under heavy use and extremely dry conditions, dust will be a problem.

High - Factors indicate that dust will be a major problem. Dust abatement measures will be necessary for some uses under normal conditions.

Muddiness Hazard - This is a relative prediction of surface soil behavior when subjected to vehicular, hoof, and/or foot traffic during periods of time when the soil moisture is at or above field capacity. Factors considered are soil texture, percent of coarse rock material, clay content, and soil parent material.

Low - Factors indicate that muddiness is not likely to be a problem.

Moderate - Factors indicate that muddiness will occasionally be a problem for intensive use. Special restrictions or surfacing may occasionally be necessary for intensive use.

High - Factors indicate that muddiness will be a problem for intensive use, with restrictions and surfacing necessary.

Potential for High Surface Soil Temperatures - This is a relative prediction of the effect on the surface soil temperatures when vegetative cover and litter are removed. This will have an effect on the survival of seedlings. Factors considered are general aspect of the landtype, climatic zone, soil texture, soil color, water-holding capacity, and insulating effect of the soil material.

Low - Factors indicate that excessively high surface soil temperatures will not occur.

Moderate - Factors indicate that excessively high surface soil temperatures will occasionally occur which will result in some mortality.

High - Factors indicate that high surface soil temperatures will occur with definite mortality.

Frost Heave Potential as It Affects Seedling Mortality - This is a prediction of the frost heave potential in the surface soil of a landtype. Excess amounts of water are necessary in the surface soil for frost heave to occur. The surface soil then must be subjected to an abundance of freeze-thaw cycles such as cold nights and warm days. Also, ground vegetation and litter must be sparse so that there is very little insulating effect.

We have two conditions on the Forest that meet the above criteria. Volcanic ash soils hold an extra amount of water, but generally have good ground cover. If this ground cover is removed, conditions exist for frost heave. The other condition is very shallow (less than 12 inches), gravelly or cobbly soils over bedrock that drains slowly so that the soils are saturated for a period of time when the freeze-thaw cycles occur.

In this interpretation, ash surface soil landtypes are rated without vegetative cover and litter. Other landtypes are rated in their natural condition.

Low - Frost heave is generally not a problem. When extreme frost heave conditions exist, some frost heave damage can occur.

Moderate - Frost heave will occasionally be a problem and some damage to seedlings will occur.

High - Frost heave will commonly occur, with damage to young seedlings.

Potential Fertilizer Response - This is a relative prediction of the expected response of the landtypes to balanced fertilizer applications. Factors considered for the expected response are: plant available moisture, plant community, aspect, and mineralogy of soil material.

High - Factors indicate a good response to fertilizer.

Moderate - Factors indicate a moderate response to fertilizer.

Low - Factors indicate a low response to fertilizer.

HYDROLOGIC INTERPRETATIONS

Water Yield Class

This interpretation is an indication of the rate and amount of water yield expected from each soil. It is based on factors such as soil characteristics, infiltration rates, permeability, slope, climate, vegetation, and drainage patterns.

Class I - These soils have a high water detention storage capacity and a low rate of runoff. Little water is yielded to peak flows until detention storage capacity is exceeded, or unless the soils are initially saturated or frozen. They are important in sustaining high base flow, due to a relatively large volume of water held in detention storage.

Class II - These soils have a moderate water detention storage capacity and a moderate rate of runoff. Water contributes to both peak flows and base flow.

Class III - These soils have a low water detention storage capacity and a high rate of runoff. The storage capacity is low and easily exceeded with most of the water contributing to peak flow. Little water is yielded to sustain base flow.

Bedrock Hydrologic Characteristics

This interpretation indicates the relative capacity of bedrock to store and transmit water. The rating is based on bedrock composition, texture, type, and extent of fracturing, frequency of jointing, bedding characteristics, and degree of weathering.

Class I - This indicates that the bedrock has a relatively high capacity to store water. The water transmission rate is low unless the storage capacity is exceeded. Rocks in this class include sandstones because of their texture, fracture, and bedding characteristics; and basalts where water occurs in large tubes and other cavities, or in the interflow zone between successive lava flows.

Class II - This indicates that the bedrock has a moderate capacity to store water. The rate of water transmission is moderate. Rocks in this class are generally hard to moderately hard, moderately fine pyroclastics, argillite, and schist.

Class III - This indicates that the bedrock has a relatively low capacity to store water. The rate of water transmission is rapid. Rocks generally in this class are fractured, coarse, crystalline (i.e., granite, gabbro and gneiss), and other hard-fractured rocks such as conglomerate.

Class IV - This indicates that the bedrock has both low-storage capacity and low rate of water transmission. Rocks in this class are generally highly weathered, fine textured, and lack open fracture channels.

Hydrologic Group

This interpretation is a grouping of soils into four classes, indicating the general infiltration and water movement ability of the soil and bedrock materials. This method of rating has been developed by the Soil Conservation Service. The four groups are the standard SCS groupings and definitions.

Group A - Soils having high infiltration rates, even when thoroughly wetted, consisting chiefly of deep, well to excessively drained sands and/or gravel. These soils have a high rate of water transmission and would result in a low runoff potential.

Group B - Soils having moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C - Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water, or (2) soils with moderately fine to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission.

Group D - Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of (1) clay soils with high swelling potential, (2) soils with a high permanent water table, (3) soils with claypan or clay layer at or near the surface, and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission.

Sedimentation Yield Potential

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

Expected Sediment Size

This interpretation indicates the expected sediment size reaching the streams resulting from erosion of each unit. This interpretation is a statement of the two dominate separates expected (gravel, sand, silt, or clay) from each soil unit. The ratings are presented in two columns. The first column indicates the separates expected from the surface soils, and the second indicates separates expected from the subsoils.

Potential Source for Turbidity

This rating relates to the level of turbidity and longevity of the turbidity that can be expected from landtype soils material that enters a streamcourse or a body of water from erosion or other activities. It can be used to designate those landtype soil materials which have characteristics that are responsible for turbid or suspended sediment conditions. Factors considered in making this interpretation are soil texture, soil structural strength, parent rock material, and lab testing.

Low - Factors indicate that this landtype soil material will have a low potential for causing turbidity.

Moderate - Factors indicate that this landtype soil material will have a moderate potential for causing turbidity.

High - Factors indicate that this landtype soil material will have a high potential for causing turbidity.

Water Balance Data

Soil Depth - Average landtype soil depth was used except for Landtypes 11, 12, 14, 15, 114, and Mapping Units 1, 3, and 5 which are formed in deep glacial outwash or valley fill. General rooting depth was used for those soils.

Root Zone - Depth to which 80 to 90 percent of the root activity (all species) takes place. Same as effective rooting depth.

Plant Available Water - Soil water that is available for plant growth. Difference between field capacity and wilting point.

Field Capacity (Field Moisture Capacity) - The amount of soil water remaining in a soil after the free water has been allowed to drain away for a day or two if the root zone has been previously saturated. It is the greatest amount of water that the soil will hold under conditions of free drainage, usually expressed as a percentage of the oven-dry weight of soil or other convenient unit.

Wilting Point (or permanent wilting point) - The water content of soil on an oven-dry basis at which plants (specifically sunflower plants) wilt and fail to recover their turgidity when placed in a dark, humid atmosphere. The percentage of water at the wilting point approximates the minimum water contents in soils under plants in the field at depths below the effects of surface evaporation. It is approximated by the moisture content at 15-bar tension.

Maximum Water-Holding Capacity - That amount of water in a soil when all the pores are full of water.

APPENDIX V

TERMS AND DEFINITIONS OF LANDTYPE CRITERIA [1/]

Following is a list of terms and definitions used in Soil Resource Inventories. These terms and definitions are used in compiling information for the Table of Soil Characteristics of Modal Sites, Table of Landtype Features and Qualities, Table of Bedrock Characteristics of Landtypes, and the Landtype Descriptions.

1/ Unless otherwise noted, the following definitions were developed for use in Soil Resource Inventories, R-6

SOIL CHARACTERISTICS

These terms are found in the Table of Soil Characteristics of Modal Sites. They describe morphological properties of the soil.

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

Depth of Soil to Bedrock - Depth from soil surface to consolidated bedrock. Depth is in inches.

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

Surface Rock (Percent Ground Cover) - Percent on an area basis of the soil surface that is rock fragments.

Soil Layer - Each soil layer is a homogeneous layer of soil material. Soil layers are described when soil characteristics change significantly and have definite effects on management. Each layer may result from stratification or soil formation processes.

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

Color - Stated in narrative Munsel notations for each soil layer. Colors are of moist crushed soil.

Texture - Relative proportions of sand (2.0 mm. - .05 mm.), silt (.05 mm.-.02 mm.), and clay (less than .002 mm.). Standard USDA textural classes are used for each soil layer.

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

Coarse-textured soils - Sands, loamy sands.

Moderately coarse-textured soils - Sandy loam, fine sandy loam.

Medium-textured soils - Very fine sandy loam, loam, silt loam, silt.

Moderately fine-textured soils - Clay loam, sandy clay loam, silty clay loam.

Fine-textured soils - Sandy clay, silty clay, clay.

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

* Standard USDA Handbook 18 Definitions.

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

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

Massive - The soil material is coherent.

Single-grain - The soil material is incoherent.

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

Dry: -

Loose - Noncoherent.

Soft - crushes easily to powder or single grain.

Slightly hard - easily broken between thumb and forefinger.

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

Very hard - can be broken in hands without difficulty.

Extremely hard - cannot be broken in hands.

Moist:

Loose - noncoherent.

Very friable - crushes under gentle pressure between thumb and forefinger.

Very firm - crushes under strong pressure; barely crushable between thumb and forefinger.

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

Wet:

Stickiness - is measured by pressing wet soil between fingers.

Nonsticky - practically no adherence when pressure is released.

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

* Standard USDA Handbook 18 Definitions.

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

Shape Classes - Round, thin, flat, subangular, subround, angular, blocky, etc.

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

0 - 35% - not noted

35 - 50% - gravelly, cobbly or stony

50 - 80% - very gravelly, very cobbly, or very stony

80%+ - extremely gravelly, extremely cobbly or extremely stony.

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

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

Weak - Indistinct peds, barely observable in place.

Moderate - Distinct peds, moderately durable and evident.

Strong - Distinct peds in place, durable.

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

Very fine - less than 5 mm.

Fine - 5 mm. to 10 mm.

Medium - 10 mm. to 20 mm.

Coarse - 20 mm. to 50 mm.

Very coarse - greater than 50 mm.

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

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

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

Block-like - Soil particles arranged around a point and bounded by flat or rounded surfaces (angular blocky, subangular blocky).

* Standard USDA Handbook 18 Definitions.

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

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

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

Nonplastic - no wire is formable.

Slightly plastic - wire forms, but soil mass easily deformed.

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

Very plastic - wire forms, much pressure required to deform soil mass.

Soil pH [1/] - intensity of soil acidity or alkalinity expressed on a scale from 1 to 14:

	pH		pH
Extremely acid	- below 4.5	Neutral Neutral	6.5 - 7.3
Strongly acid	- 4.6 - 5.5	Slightly alkaline	7.4 - 8.4
Slightly acid	- 5.6 - 6.4	Strongly alkaline	8.5 - 9.0
		Very strongly alkaline	Above 9.0

Classification - estimated Soil Taxonomy Classification at family level.

1/ All pH values were taken by the Hellige-Truog.

LANDTYPE FEATURES AND QUALITIES

These terms are found in the Table of Landtype, Features and Qualities. They describe properties of the mapping unit that result from soil characteristics, bedrock characteristics, topography, and site.

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

General Aspect - refers to the general direction of slope exposure.

Percent Slope Range - range of slope of the landtype.

Bedrock Composition - General bedrock types that occur beneath the landtype.

Depth of Soil to Bedrock - This is the average soil depth to bedrock of the landtype.

Effective Rooting Depth - Depth to which 80 to 90 percent of the root activity (includes all species) takes place. It is influenced by the depth of the bedrock, lack of aeration, water table, root penetration, and type of vegetation.

Texture - Relative proportions of sand (2.0 mm. - .05 mm.), silt (.05 mm. - .02 mm.), and clay (less than .002 mm.). Standard USDA textural classes are used for each soil layer.

Estimated Soil Bulk Density - The mass of dry soil per unit bulk volume. The bulk volume is determined before drying to constant weight at 105° centigrade. A unit of measure, usually grains per cubic centimeter or pounds per square foot.

Permeability - Water or air movement in and through the soil material. The classes are based on soil texture, rock fragment content, porosity, and bulk density.

Class:

Very slow - very little, if any, water transmission. Generally fine-textured soils - clay. Less than .05 inch/hr.

Slow - little water transmission. Generally moderately fine-textured soils - clay loams and silty clay loams. .05 inch/hr. to 1 inch/hr.

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

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

Very rapid - excessive water transmission; soil never becomes saturated. Very porous soils. Generally coarse-textured soils - sands and gravels. Greater than 10 inches/hr.

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

Infiltration Rate Classes

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

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

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

Drainage Classes [2/] The rapidity and extent of removal of water from the soil, based on soil permeability, infiltration, internal drainage, and topographic position:

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

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

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

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

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

2/ Very poorly drained and somewhat excessively drained classes are not used.

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

Intensity Classes:

Few - 0 to 1 drainage miles per square mile.

Common - 1 to 3 drainage miles per square mile.

Many - 3 to 5 drainage miles per square mile.

Abundant - Greater than 5 drainage miles per square mile.

Patterns:

Dendritic - Drainages branch in random directions.

Parallel - Drainages are relatively parallel.

Angulate - Drainage equally developed in two directions meeting at acute and obtuse angles.

Engineering Classification (Unified System) - Each soil is classified as to its Unified Soil Classification. Those soils with significant layers of different soil materials will have a classification for each layer designated. The classification will be made for some representative soils by laboratory testing. Those soils not tested will be classified by comparing their properties to those tested, or interpreted from soil textures.

Elevation - Altitude above mean sea level expressed in feet.

BEDROCK CHARACTERISTICS

These terms are found in the Table of Bedrock Characteristics of Landtypes.

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

Composition - Bedrock components and percentage. (Example: Sandstone (20), conglomerates (70), Mudstone (10).

Color - Color is in narrative terms for fresh unweathered surfaces.

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

Hard - Rock can readily be broken with hammer, but not by hand.

Soft - Rock can be broken by hand.

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

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

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

Slightly Fractured - Only occasional fractures noted.

Massive - No fractures or very few fractures noted.

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

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

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

Irregular - Rough, irregular, fragmented fracture surfaces.

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

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

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

Incompetent - Failures are common to rock unit. Rocks of the unit are soft, deeply weathered, and have high potential for mass movement.

APPENDIX VI

SOIL MATERIALS TESTING RESULTS

This appendix contains Engineering soil materials testing results for some representative soil materials. The testing was done by the Malheur National Forest Soil Materials Testing Lab.

The laboratory test data presented in this appendix is intended to be used as a guide and indicator for planning purposes only.

LANDTYPE NO. 33

Location: SE¼NE¼, Sec. 26, T. 15 S., R. 29 E.
Depth: 6 to 12 inches Unified: GMu ASSHO: A-1-6(0)
Liquid Limit: 49.2 Plasticity Index: Nonplastic
Plastic Limit: Nonplastic

Hydrometer Analysis:	Diameter MM	% Passing
	.0331	14.18
	.0216	11.00
	.0128	8.45
	.0092	7.29
	.0066	6.20
	.0033	4.26
	.0014	2.51

Mechanical Analysis	
Sieve Size	% Passing
3	100.00
1	78.00
1/2	65.19
3/8	61.66
#4	52.40
#10	42.01
#20	34.46
#40	28.80
#60	24.98
#100	21.53
#200	18.07

LANDTYPE NO. 41

Location: SW¼NE¼, Sec. 24, T. 10 S., R. 28 E.
Depth: 6 to 12 inches Unified: GMu ASSHO: A-7-5(2)
Liquid Limit: 45.7 Plasticity Index: 11.0
Plastic Limit: 34.5

Hydrometer Analysis:	Diameter MM	% Passing
	.0305	34.16
	.0197	31.50
	.0119	25.14
	.0085	21.96
	.0061	18.86
	.0031	14.09
	.0013	10.38

Mechanical Analysis	
Sieve Size	% Passing
3	100.00
1	70.59
3/4	68.92
1/2	64.47
3/8	62.96
#4	58.91
#10	54.79
#20	51.11
#40	48.64
#60	46.75
#100	44.76
#200	41.83

LANDTYPE NO. 71

Location: SE¼SW¼, Sec. 8, T. 20 S., R. 28 E.
Depth: 6 to 12 inches Unified SMd ASSHO: A-4-(0)
Liquid Limit: 27.0 Plasticity Index: Nonplastic
Plastic Limit -

Hydrometer Analysis:	Diameter MM	% Passing
	.0311	35.56
	.0205	29.92
	.0127	23.33
	.0091	19.53
	.0065	16.28
	.0033	10.29
	.0013	5.93

Mechanical Analysis	
Sieve Size	% Passing
3	100.00
1	90.50
3/4	88.39
1/2	84.48
3/8	82.29
#4	75.52
#10	69.87
#20	66.53
#40	62.66
#60	58.17
#100	52.92
#200	45.51

SOIL MATERIALS TESTING RESULTS

LANDTYPE NO. 96

Location: SE¼NW¼, Sec. 16, T. 14 S., R. 33 E.
Depth: 4 to 10 inches Unified: GMu
Liquid Limit: 41 Plasticity Index: 5
Plastic Limit:35.6

Hydrometer Analysis:	Diameter MM	% Passing
	.0272	18.80
	.0185	16.00
	.0115	12.65
	.0084	10.71
	.0060	9.03
	.0030	6.14
	.0012	3.86

Mechanical Analysis	
Sieve Size	% Passing
3	100.00
1	79.26
1/2	69.70
3/8	66.00
#4	49.22
#10	36.33
#20	32.26
#40	29.97
#60	28.35
#100	26.48
#200	23.53

LANDTYPE NO. 123

Location: NW¼SW¼, Sec. 31, T. 9 S., R. 33 E.
Depth: 6 to 12 inches Unified: SMu ASSHO: A-2-7
Liquid Limit:42.0 Plasticity Index: Nonplastic
Plastic Limit: -

Hydrometer Analysis:	Diameter MM	% Passing
	.0302	25.81
	.0202	19.41
	.0121	15.58
	.0088	13.02
	.0063	10.22
	.0032	6.95
	.0013	3.55

Mechanical Analysis	
Sieve Size	% Passing
3	100.00
1	98.42
3/4	95.04
1/2	90.93
3/8	88.58
#4	79.10
#10	66.37
#20	54.12
#40	46.07
#60	41.60
#100	37.83
#200	33.50

LANDTYPE NO. 141

Location: SE¼SW¼, Sec. 15, T. 16 S., R. 35 E., R. 33 E.
Depth: 6 to 12 inches Unified SMu ASSHO:A-4(0)
Liquid Limit: 34.3 Plasticity Index: 6
Plastic:Limit 28.2

Hydrometer Analysis:	Diameter MM	% Passing
	.0290	28.84
	.0194	24.09
	.0119	18.73
	.0081	15.04
	.0063	12.12
	.0033	6.91
	.0013	4.68

Mechanical Analysis	
Sieve Size	% Passing
3	100.00
1	97.26
3/4	95.84
1/2	91.94
3/8	86.66
#4	72.88
#10	61.65
#20	55.62
#40	51.15
#60	47.11
#100	42.63
#200	36.50

LANDTYPE NO. 172

Location: SE¼NW¼, Sec. 29, T. 9 S., R. 33 E.
Depth: 12 - 20 inches Unified: SW-SMd ASSHO: A-1-b(1)
Liquid Limit: 0 Plasticity Index: Nonplastic
Plastic Limit: Nonplastic

Hydrometer Analysis:	Diameter MM	% Passing
	.0357	6.96
	.0226	6.45
	.0133	5.29
	.0094	4.35
	.0066	3.15
	.0033	2.21
	.0013	2.34

Mechanical Analysis

Sieve Size	% Passing
3	100.00
1	100.00
1/2	100.00
3/8	100.00
#4	98.02
#10	70.70
#20	48.06
#40	32.81
#60	23.43
#100	16.16
#200	9.76

LANDTYPE NO. 182

Location: NE¼NE¼, Sec. 33, T. 10 S., R. 33 E.
Depth: 12 to 18 inches Unified: SMu ASSHO: A-7-5
Liquid Limit: 50.6 Plasticity Index: 17
Plastic Limit: 33.5

Hydrometer Analysis:	Diameter MM	% Passing
	.0274	40.39
	.0181	35.97
	.0110	30.67
	.0079	28.31
	.0057	24.83
	.0029	20.52
	.0012	16.47

Mechanical Analysis

Sieve Size	% Passing
3	100.00
1	90.02
3/4	87.38
1/2	85.39
3/8	83.98
#4	79.02
#19	70.98
#20	61.22
#40	56.86
#60	54.10
#100	50.71
#200	45.85

LANDTYPE NO. 159 Ash Surface Soil

Location: SW¼SE¼, Sec. 11, T. 14 S., R. 35 E.
Depth: 1 to 8 inches Unified: ML ASSHO: A-4(0)
Liquid Limit: 0 Plasticity Index: Nonplastic
Plastic Limit Nonplastic

Hydrometer Analysis:	Diameter MM	% Passing
	.0332	59.96
	.0222	45.61
	.0137	26.30
	.0099	18.65
	.0071	12.11
	.0035	5.33
	.0015	3.41

Mechanical Analysis

Sieve Size	% Passing
3	100.00
1	100.00
3/4	100.00
1/2	100.00
3/8	100.00
#4	100.00
#10	100.00
#20	97.49
#40	94.24
#60	90.18
#100	83.25
#200	72.20

APPENDIX VII

GLOSSARY

Accelerated Erosion - See "Erosion"

Alluvium - Material laid down in recent times in river beds, flood plains, and lakes and fans at the foot of mountains.

Andesite - A dark gray to black, dense, fine-grained extrusive igneous rock. Very similar to basalt.

Argillite - A rock type derived either from siltstone, claystone or shale, that has undergone a somewhat higher degree of induration or hardening than is present in those rocks.

Ash (Recent Volcanic Ash) - Silt and very fine sand-size volcanic ejecta as used in this report. The volcanic ash that is the surface soil material of some of the landtypes is considered to have been laid down in recent geologic times.

Associated Species - As used in this report includes white fir, Douglas-fir, western larch, and lodgepole pine.

Basalt - A dark gray to black, dense, fine-grained extrusive igneous rock. Very similar to andesite.

Base Flow - Sustained or fair weather runoff. It is composed of ground-water runoff and delayed subsurface runoff.

Bedding - A collective term signifying existence of beds or layers.

Bedrock - The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Breccia - Rock composed of angular fragments in the finer ground mass.

Cirque Basin - A half-amphitheater formed by alpine glaciation with three steep sides. Usually found at upper ends of valleys and along ridges.

Clay - A soil separate less than .002 mm. in diameter. As a soil textural class, soil material that is 40 percent or more clay; less than 45 percent sand, and less than 40 percent silt.

Cobble- A soil separate between 3 and 10 inches in diameter.

Colluvium - Soil material or rock fragments moved downslope by gravitational force in the form of soil creep, slides, and local wash.

Compaction - The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

Complex - An association in which two or three mapping units or miscellaneous mapping units are so intricately mixed that it is not practical to show them separately at the scale of mapping used.

Conglomerate - A cemented clastic rock containing rounded fragments in a finer groundmass.

Critical Soil - The term "critical soil" is frequently used by laymen, but it is a meaningless term unless it is related to a specific function. Many soils may be critical for one reason or another but different soils may not be critical for the same reasons. For example, a deep, wet, plastic and unstable soil will be critical in relation to road location and stability. This soil is not critical in relation to regeneration and droughtiness problems. Another soil may be very shallow over hard bedrock. This soil is not critical from the standpoint of road stability, but may be critical as to regeneration problems resulting from droughtiness and low fertility. It may also be critical in relation to surface erosion. From these two examples, it becomes obvious that the term "critical soil" must be defined by the user in relation to its intended purpose.

Debris Slide - A rapidly moving slide composed of soil, bedrock, or both.

Erosion - (1) The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep; (2) detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of water erosion:

Accelerated Erosion - Erosion much more rapid than normal, natural, or geologic erosion primarily as a result of the influence of the activities of man, or, in some cases, of other animals or natural catastrophies that expose base surfaces; for example, fires.

Geological Erosion - The normal or natural erosion caused by geological processes acting over long geologic periods and resulting in the wearing away of mountains, the building up of flood plains, coastal plains, etc. Syn., natural erosion.

Gully Erosion - The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 4 inches to as much as 75 to 100 feet.

Natural Erosion: Wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation etc., undisturbed by man. Syn. geol. erosion.

Normal Erosion: The gradual erosion of land used by man which does not greatly exceed natural erosion. See natural erosion.

Rill Erosion: An erosion process in which numerous small channels less than 4 feet deep and 6 inches wide are formed.

Sheet Erosion - The removal of a fairly uniform layer of soil from the land surface by runoff water.

Splash Erosion - The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles may or may not be subsequently removed by surface runoff.

Erosion Pavement - Rock fragments left on the soil surface after part of the finer soil materials have been eroded away by water or wind.

Evapotranspiration - Water transpired by vegetation plus that evaporated from the soil.

Extrusive Bedrock - This applies to those igneous rocks derived from volcanic lavas that cooled on the surface of the earth. This lava cools rapidly and forms fine-textured rocks such as basalt and andesite.

Faulted - Movement which has produced relative displacement of adjacent rock masses along a fracture.

Fold - A bend in a strata or any plane or structure.

Gabbro - A coarse-grained, basic, intrusive rock.

Geologic Erosion - See "Erosion."

Geomorphology - The study of landforms as they relate to geologic composition and history.

Glacier - A mass of ice with definite lateral limits, with motion in a definite direction, and originating from the compacting of snow by pressure.

Glacial Outwash - Glacial material swept out, sorted, and deposited by water that originated from the melting of glacial ice.

Glacial Soils - Soils derived from materials transported or influenced by glaciers.

Glacial Till - Nonsorted, nonstratified sediment carried or deposited by a glacier.

Glaciated Valley & Trough - U-shaped valley formerly cut out and occupied by a glacier.

Granodiorite - A coarse-grained, acidic, intrusive rock.

Gravel - A soil separate between 2.0 millimeters and 3 inches in diameter.

Graywacke - A loose and general term for sandstone containing significant quantities of silt and clay materials.

Gully Erosion - See "Erosion."

Hydrophobic - Lacking a strong affinity for water, water repellant.

Inclusion - Landtype found within a mapping unit that is not extensive enough to be mapped separately or as part of a complex.

Intrusive Bedrock - This term is applied to those rocks derived from magmas that have been injected into older rocks at depth without reaching the surface. These magmas are slow-cooling and form coarse-textured rocks, such as granite, granodiorite or gabbro.

Isohyetal Map - A map with lines along which all points receive the same amount of precipitation.

Jointing - Fracturing in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.

Landform - Structural configuration of the topography as a result of past and present geological activity.

Mapping Units & Landtypes - Mapping units are shown on the soil maps as numbers. Mapping units contain a dominant landtype which accounts for at least 70 percent of the mapping unit 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 - Commonly, two or three numbers (46/47, 41/46/85) occur in a mapping delineation. This is called a Mapping Unit Complex. The mapping units within these delineations are present in an arrangement too complex or too small to separate at the one-inch-per-mile scale. Where a 2-mapping unit complex occurs, each mapping unit makes up 40 to 60 percent of the complex, and for a 3-mapping unit complex, each mapping unit makes up 30 to 40 percent of the complex. Refer to each mapping unit for information desired.

Massive - Soil structure or bedrock condition in which there is no observable aggregation or no definite orderly arrangement of natural lines of weakness.

Mass Movement - All movement of soil and bedrock materials occurring below the soil surface such as landslips, landflows, rock slides, slumps, etc.

Metasedimentary - Sedimentary rocks partially altered by heat and pressure.

Metavolcanic - Volcanic rocks partially altered by heat and pressure.

Miscellaneous Mapping Units - Mapping Units 1, 3, 5, 7, 8, 9, 10 and 16 are considered miscellaneous mapping units that are too variable to be described by a profile description. They are described by a short narrative description. Soil materials are too variable to make all of the interpretations. More detailed mapping is necessary if additional information is needed.

Mixed Species - As used in this report includes ponderosa pine, white fir, and Douglas-fir.

Natural Erosion - See "Erosion."

Normal Erosion - See "Erosion."

Peak Flow (Peak Runoff)- The greatest water discharge for any single runoff period.

Peridotite - A coarse-grained, ultra basic, intrusive rock.

Physiographic Divisions - Broad groupings based on the physical features of the landscape.

Plastic Soil - A soil capable of being molded or deformed continuously and permanently, by relatively moderate pressure, into various shapes.

Puddling and Puddled - The act of destroying soil structure by manipulating a soil when it is in a wet and plastic condition. Puddling reduces porosity and permeability.

Pyroclastic - A general term applied to rocks formed from volcanic material that has been explosively or aerially ejected from a volcanic vent.

Rhyolite - A light-colored, fine-grained, acidic, extrusive rock.

Rill Erosion - See "Erosion."

Runoff - That part of the precipitation which appears in surface streams of either perennial or intermittent form.

Sand - A soil separate between .05 and 2.0 millimeters in diameter.

Sandstone - A rock composed primarily of cemented sand-size grains.

Sedimentary Rock - A rock formed by deposition of soil and rock particles by water, ice, or wind that later solidifies through cementation, ionic exchange or compression.

Serpentine - A rock consisting almost wholly of serpentine minerals derived from the alteration of previously existing olive and pyroxene.

Shale - Fine-grained rock, softer than slate, consisting of clay minerals and silt, which typically splits readily along closely spaced planes, parallel to stratification.

Sheet Erosion - See "Erosion."

Silt - A soil separate consisting of particles between 0.002 and 0.05 millimeters in diameter.

Siltstone - A sedimentary rock consisting primarily of silt-size particles.

Slump - A deep-seated, slow-moving rotational failure occurring in plastic materials, resulting in vertical and lateral displacement.

Soil - Any and all loose, incoherent, unconsolidated weathered material on the earth's surface resting on solid, consolidated, unweathered bedrock, no matter how formed, or origin, or method of weathering or deposition. Generally includes any material that may be moved or broken by hand tools or heavy equipment without the need of blasting except soft, unweathered bedrock. In soil horizon designation, soil materials included "A", "B", and "C" horizons.

Soil Creep - Slow mass movement of soil materials down slopes primarily under the influence of gravity, but facilitated by saturation with water and/or by alternating freezing and thawing.

Splash Erosion - See "Erosion."

Spot Symbols - Symbols used on soil maps to represent a landscape factor too small to delineate.

Stone - A soil separate greater than 10 inches in diameter.

Toeslope - That portion of a slope that is transitional between the valley floor and the upper slope.

Topography - The relief features or surface configuration of an area.

U-shaped Valley - Descriptive phrase of the cross profile of a valley which has been carved out by glacial movement.

Volcanic Ejecta - Any and all material forcibly blown out of volcanic cones, fissures, and vents.

V-shaped Valley - A descriptive phrase of the cross profile of a valley which has been cut by stream action.

Welded Tuff - A tuff that has been indurated by the combined action of the heat retained by the particles and the enveloping hot gases.