

217 GRALIC-SUPERVISOR FAMILIES COMPLEX, 10 to 35 percent slopes

Map Unit Components	Gralic family (60 percent)	Supervisor family (25 percent)
Position, Slope, and Elevation	On sideslopes and convex areas of mountain uplands; 35 to 60 percent slopes; 7000 to 7800 feet.	On sideslopes of mountain uplands; 35 to 60 percent slopes; 7000 to 7800 feet.
Typical Vegetation and Precipitation (ppt)	Lodgepole pine, washoe pine, white fir, western white pine, prostrate manzanita, ceonothus, few forbes, Ross's sedge, few grasses; 25 to 30 inches ppt.	Lodgepole pine, washoe pine, white fir, western white pine, prostrate manzanita, ceonothus, few forbes, Ross's sedge, few grasses; 25 to 30 inches ppt.
Surface Layer	1 to 0 inches; lodgepole pine needles, over 0 to 17 inches, grayish brown to pale brown very gravelly fine sandy loam, granular structure, soft, pH 6.2.	1 to 0 inches; lodgepole pine needles, over 0 to 12 inches; dark grayish brown to brown gravelly fine sandy loam, granular and blocky structure, slightly hard, pH 6.0 to 6.2.
Substratum	17 to 60 inches; light yellowish brown to very pale brown very gravelly sandy loam to very gravelly loamy sand, single grain and massive, loose and soft, pH 6.2 to 6.4.	26 to 37 inches; weathering in place pale brown to reddish brown semi-soft tuff conglomerate.
Rooting Depth (in.) to Underlying Material	30 plus; andesite, obsidian.	20 to 40; andesite tuff, obsidian.
Erosion Factor (K)	.24	.20
Max. Erosion Hazard	High	High
Soil Permeability	Moderately rapid	Moderate
Drainage Class	Well drained	Well drained
Soil Manageability Class Group	3Ep III	3Ep
Forest Site Class	6-7 (5 to non-commercial)	6 (4-5)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	6 (Moderate)	6
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 1.8 inches	Low to Moderate 2.2 inches
Susceptibility to Burning Damage	High	Moderate to High
Slope Stability Hazard	Low	Low
Allowable Soil Loss	2-3 tons/acre/year	2 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Low to Moderate
Rating for Timber Site R-Value	Fair (8,12) 60+	Fair (7,8,12) 60+
Soil horizons in inches, USDA, Unified, AASHTO	0-17; Very gravelly fine sandy loam Unified: SM AASHTO: A-2-4 17-60; Very gravelly sandy loam, very gravelly loamy sand Unified: SM AASHTO: A-1-b	0-12; Gravelly fine sandy loam Unified: SM AASHTO: A-2-4, A-4 12-26; Very gravelly sandy loam Unified: SM AASHTO: A-1-b 26+; Weathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Wapal, Patio, Cheadle families and soils similar to the Supervisor family but deeper than 40 inches, Rock outcrop and Rubble land.	

218 PACKWOOD-BIEBER FAMILIES COMPLEX, 1 to 10 percent slopes

Map Unit Components	Packwood family (45 percent)	Bieber family (40 percent)
Position, Slope, and Elevation	On nearly level to undulating basalt plateaus; 1 to 10 percent slopes; 4700 to 5500 feet.	On nearly level to undulating basalt plateaus; 1 to 10 percent slopes; 4700 to 5500 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, low sagebrush, sandburg bluegrass, Idaho fescue, cheatgrass, other grasses; 14 to 16 inches ppt.	Western juniper, low sagebrush, black sagebrush, cheatgrass, sandburg bluegrass, other grasses; 14 to 16 inches ppt.
Surface Layer	0 to 5 inches; light yellowish brown very stony loam and platy and blocky structure, slightly hard to hard, pH 6.2 to 6.5	0 to 4 inches; brown very cobbly loam, blocky and granular structure, hard, pH 6.8.
Substratum	8 to 16 inches; weakly to strongly cemented yellow and brown silica duripan.	18 plus inches; strongly cemented silica duripan.
Rooting Depth (in.) to Underlying Material	7 to 15; silica duripan over basalt	8 to 20; silica duripan over basalt.
Erosion Factor (K)	.43	.37
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Slow	Very slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2edx	2edx
Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	8, 1	8, 1
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	6 (Moderate)	5
Hydrologic Soil Group	D	D
Available Water Capacity (AWC)	Very low to low	Very low to low
Upper 20 inches	1.1 to 2.3 inches	1.0 to 2.5 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	30-60	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-5; Very stony loam, loam Unified: CL-ML, CL AASHTO: A-4, A-6 5-8; Clay loam Unified: CL AASHTO: A-6 8-16; Silica duripan 16+; Unweathered bedrock	0-4; Very cobbly loam Unified: SC, CL AASHTO: A-6 4-18; Clay Unified: CH AASHTO: A-7 18+; Silica duripan
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Ditchcamp, Roval, Puls, Barnard, Deven and Pass Canyon families, Rock outcrop and Rubble land.	

219 PACKWOOD-DITCHCAMP FAMILIES-ROCK OUTCROP COMPLEX, 1 to 10 percent slopes

Map Unit Components	Packwood family (50 percent)	Ditchcamp family (20 percent)	Rock outcrop (15 percent)
Position, Slope, and Elevation	On intermountain areas between 10 to 30 foot diameter mounds on basalt plateaus; 1 to 5 percent slopes; 4500 to 5200 feet.	On 10 to 30 foot diameter mounds normally spaced within 100 feet of each other on basalt plateaus; 2 to 10 percent slopes; 4500 to 5200 feet.	On upper sideslopes and slightly convex areas on basalt plateaus; 2 to 10 percent slopes; 4500 to 5200 feet.
Typical Vegetation and Precipitation (ppt)	Low sagebrush, black sagebrush, Phlox spp., buckwheat, Idaho fescue, cheatgrass, other grasses; 12 to 14 inches ppt.	Big sagebrush, low sagebrush, western juniper, Idaho fescue, Poa spp., other grasses; 12 to 14 inches ppt.	
Surface Layer	0 to 5 inches; light yellowish brown very stony loam to loam, platy, and blocky structure, slightly hard to hard, pH 6.2 to 6.5.	0 to 15 inches; brown loam, platy and blocky structure, hard, pH 6.5	NOT APPLICABLE: Basalt or andesite bedrock with minor accumulations of aeolian soil deposition in some fractures.
Substratum	8 to 16 inches; weakly to strongly cemented yellow and brown silica duripan.	30 to 34 inches; strongly cemented reddish yellow silica duripan.	
Rooting Depth (in.) to Underlying Material	7 to 20; silica duripan over basalt bedrock	20 to 35; silica duripan over basalt bedrock	
Erosion Factor (K)	.43	.43	
Max. Erosion Hazard	Moderate	Moderate	
Soil Permeability	Slow	Slow	
Drainage Class	Well drained	Well drained	
Soil Manageability Class Group	2edx II	2e	
Forest Site Class	7 (non-commercial)	7 (non-commercial)	
Range Site	7, 1	12	
Water Runoff Potential	Slow	Slow	Rapid
Watershed Sensitivity	6 (Moderate)	7	4
Hydrologic Soil Group	D	C	
Available Water Capacity (AWC) Upper 20 inches	Very low to low 1.1 to 3.1 inches	Low to moderate 3.4 inches	
Susceptibility to Burning Damage	Low	Low	
Slope Stability Hazard	Low	Low	
Allowable Soil Loss	1 tons/acre/year	2 tons/acre/year	
Chance of Seedling Survival	Not Rated	Not Rated	
Rating for Timber Site R-Value	Not Rated 30-60	Not Rated 30-60	
Soil horizons in inches, USDA, Unified, AASHTO	0-5; Very stony loam, loam Unified: ML-CL AASHTO: A-4, A-6 5-8; Clay loam Unified: CL AASHTO: A-6 8-16; Silica duripan 16+; Unweathered bedrock	0-15; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 15-30; Clay loam Unified: CL, CH AASHTO: A-6, A-7 30-34; Silica Duripan 34+; Unweathered bedrock	
Included Areas:	Included with this unit in mapping and making up about 15 percent of the acreage are the Deven, Bieber, Roval, Puls and Aikman families and Lithic Xerorthents, mesic and rubble land.		

220 PACKWOOD-PULS FAMILIES COMPLEX, 1 to 5 percent slopes

Map Unit Components	Packwood family (50 percent)	Puls family (20 percent)
Position, Slope, and Elevation	On upper areas of undulating basalt plateaus; 2 to 5 percent slopes; 4400 to 5300 feet.	On nearly flat to concave areas of gently undulating basalt plateaus; 1 to 3 percent slopes; 4400 to 5300 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, low sagebrush, phlox spp., Idaho fescue, cheatgrass, sandburg bluegrass other grasses; 14 to 16 inches ppt.	Low sagebrush, black sage cheatgrass, few forbs; 14 to 16 inches ppt.
Surface Layer	0 to 5 inches; light yellowish brown very stony loam and platy and blocky structure, slightly hard to hard, pH 6.2 to 6.5	0 to 5 inches; pinkish gray very stony clay loam, granular structure, slightly hard, pH 6.3.
Substratum	8 to 16 inches; weakly to strongly cemented yellow and brown silica duripan.	19 to 28 plus inches; indurated cemented silica duripan.
Rooting Depth (in.) to Underlying Material	7 to 15; silica duripan over basalt	8 to 20; silica duripan over basalt.
Erosion Factor (K)	.43	.37
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Slow	Very slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2edx	3edx
Soil Manageability Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	8, 1	1
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	6 (Moderate)	5
Hydrologic Soil Group	D	D
Available Water Capacity (AWC)	Very low to low	Very low to low
Upper 20 inches	1.1 to 2.3 inches	1.0 to 2.5 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	30-60	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-5; Very stony loam, loam Unified: CL-ML, CL AASHTO: A-4, A-6 5-8; Clay loam Unified: CL AASHTO: A-6 8-16; Silica duripan 16+; Unweathered bedrock	0-5; Very stony clay loam Unified: GC, MH AASHTO: A-2-6, A-6 5-9; Clay loam Unified: CL, MH AASHTO: A-6 9-19; Clay Unified: CH AASHTO: A-7-5, A-7-65 19-28; Silica duripan
Included Areas:	Included with these soils in mapping and making up about 30 percent of the acreage are the Bieber, Ditchcamp, Roval, Barnard, Deven and Pass Canyon families, Rock outcrop and Rubble land.	

221 PASS CANYON-DISHNER-DEVEN FAMILIES ASSOCIATION, 1 to 20 percent slopes

Map Unit Components	Pass Canyon family (40 percent)	Dishner family (25 percent)	Deven family (15 percent)
Position, Slope, and Elevation	On upper sideslopes and ridges of basalt plateaus; 2 to 20 percent slopes; 4300 to 4800 feet.	On sideslopes and toeslopes of basalt plateaus; 1 to 15 percent slopes; 4300 to 4800 feet.	On sideslopes of basalt plateaus; 1 to 20 percent slopes; 4300 to 4800 feet.
Typical Vegetation and Precipitation (ppt)	Rabbitbrush, low sagebrush, big sagebrush, few western juniper, Phlox spp., Idaho fescue, sandberg bluegrass, cheatgrass; 10 to 14 inches ppt.	Low sagebrush, rabbitbrush, few western juniper, bottlebrush, cheatgrass; 10 to 14 inches ppt.	
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam granular and platy structure, slightly hard, pH 6.8 to 6.6.	0 to 5 inches; light brownish gray cobbly sandy clay loam, platy and granular structure, slightly hard, pH 6.8.	0 to 2 inches; brown cobbly loam, granular structure, soft, pH 6.3.
Rooting Depth (in.) to Underlying Material	8 to 15; basalt	10 to 20; basalt	10 to 20; basalt
Erosion Factor (K)	.32	.43	.37
Max. Erosion Hazard	Moderate	Moderate	Moderate
Soil Permeability	Moderately slow	Slow	Slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2ed II	2ed	2ed
Forest Site Class	7 (non-commercial)	7 (non-commercial)	7 (non-commercial)
Range Site	7, 1	7	7
Water Runoff Potential	Slow	Slow	Slow
Watershed Sensitivity	6 (Moderate)	5	5
Hydrologic Soil Group	D	D	D
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.0 to 2.0 inches	Very Low to Low 1.4 to 2.8 inches	Very Low to Low 1.4 to 2.8 inches
Susceptibility to Burning Damage	Low	Low	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated	Not Rated
R-Value	30-60	0-30	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7 12+; Unweathered bedrock	0-9; Cobbly sandy clay loam, silty clay loam Unified: CL AASHTO: A-6 9-16; Clay loam, cobbly clay Unified: CL, CH AASHTO: A-7 16+; Unweathered bedrock	0-2; Cobbly Loam Unified: ML-CL, CL AASHTO: A-4, A-6 2-7; Clay loam Unified: CL, MH, CH AASHTO: A-6, A-7 7-16; Clay Unified: CH AASHTO: A-7 16+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Gwin, Bakeoven, Stukel, Castlevale, Cowiche families, Lithic Xerorthents, mesic, and Rock outcrop.		

222 PASS CANYON-ELMORE FAMILIES-LAVA FLOW ASSOCIATION, 1 to 20 percent slopes

Map Unit Components	Pass Canyon family (40 percent)	Elmore family (30 percent)	Lava flow (15 percent)
Position, Slope, and Elevation	On nearly level to convex areas on or immediately adjacent to hummocky lava flow rock on undulating basalt plateaus; 1 to 10 percent slopes; 4300 to 5800 feet.	On isolated concave 0.1 to 2 acre pockets between broken and hummocky lava flow rock on undulating basalt plateaus; 1 to 5 percent slopes; 4300 to 5800 feet.	Hummocky, disaggregated lava flow rock with slope lengths of 5 to 30 feet on undulating basalt plateaus; 5 to 20 percent slopes; 4300 to 5800 feet.
Typical Vegetation and Precipitation (ppt)	Few ponderosa pine, western juniper, low sagebrush, big sagebrush, rabbitbrush, bitterbrush, sandberg bluegrass, Idaho fescue, cheatgrass; 16 to 18 inches ppt.	Ponderosa pine, Jeffrey pine, western juniper, big sagebrush, bitterbrush, bluebunch wheatgrass, bottlebrush, Ross's sedge, needlegrass; 16 to 18 inches ppt.	
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure, slightly hard, pH 6.8 to 6.6.	1 to 0 inches of ponderosa pine needles and twigs, over 0 to 8 inches; brown loam, platy and granular structure slightly hard, pH 6.0.	NOT APPLICABLE: Fractured vesicular basalt flow rock with minor accumulations of aeolian soil deposition in some fractures.
Rooting Depth (in.) to Underlying Material	10 to 20; basalt	20 to 40; basalt	
Erosion Factor (K)	.32	.37	
Max. Erosion Hazard	Moderate	Low	
Soil Permeability	Moderately slow	Moderately slow	
Drainage Class	Well drained	Well drained	
Soil Manageability Class Group	2ed II	2x	
Forest Site Class	7 (non-commercial)	5-6 (3-5)	
Range Site	8	Not placed in a range site.	
Water Runoff Potential	Moderate	Slow	Rapid
Watershed Sensitivity	6 (Moderate)	8	5
Hydrologic Soil Group	D	B	
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.3 to 2.6 inches	Low to Moderate 3.2 inches	
Susceptibility to Burning Damage	Low	Moderate	
Slope Stability Hazard	Low	Low	
Allowable Soil Loss	1 tons/acre/year	2 tons/acre/year	
Chance of Seedling Survival	Not Rated	Moderate	
Rating for Timber Site	Not Rated	FAIR (1,7,10)	
R-Value	30-60	30-60	

222 PASS CANYON-ELMORE FAMILIES-LAVA FLOW ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-2;	Very cobbly loam Unified: SM, SM-SC AASHTO: A-4	0-8;	Loam Unified: ML-CL, CL AASHTO: A-4, A-6
2-4;	Loam Unified: ML-CL, CL AASHTO: A-4, A-6	8-27;	Clay loam, gravelly clay loam Unified: CL, MH AASHTO: A-6, A-7
4-12;	Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7	27+;	Unweathered bedrock
12+;	Unweathered bedrock		

Included Areas:

Included with these soils in mapping and making up about 15 of the acreage is Lithic Xerorthents, mesic, Los Gatos, Keating, Germany, Gwin, Deven, Bieber, Lawyer, Stukel and Bakeoven families and Lava flow rock with steeper slopes.

223 PASS CANYON-ELMORE-PACKWOOD FAMILIES ASSOCIATION, 1 to 10 percent slopes

Map Unit Components	Pass Canyon family (40 percent)	Elmore family (25 percent)	Packwood family (20 percent)
Position, Slope, and Elevation	On lower sideslopes of undulating basalt plateaus 1 to 10 percent slopes, 4400 to 5800 feet.	On gentle knolls and ridges of undulating basalt plateaus; 1 to 10 percent slopes; 4400 to 5800 feet.	On nearly level to slightly concave areas of undulating basalt plateaus; 1 to 5 percent slopes; 4400 to 5800 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, big sagebrush, low sage- brush, bitterbrush, Idaho fescue, sand- burg bluegrass, other grasses; 16 to 18 inches ppt.	Ponderosa pine, Jeffrey pine, western juniper, big sagebrush, bitterbrush, mountain mahogany, squaw carpet, Ross's sedge, grasses; 16 to 18 inches ppt.	
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure, slightly hard, pH 6.8 to 6.6	1 to 0 inches of ponderosa pine needles and twigs, over 0 to 8 inches; brown loam, platy and granular structure, slightly hard, pH 6.0.	0 to 5 inches; light yellowish brown very stony loam to loam, platy and blocky structure, slightly hard to hard, pH 6.2 to 6.5.
Substratum			8 to 16 inches; weakly to strongly cemented yellow and brown silica duripan.
Rooting Depth (in.) to Underlying Material	10 to 20; basalt	20 to 40; basalt	7 to 20; silica duripan over basalt
Erosion Factor (K)	.32	.37	.43
Max. Erosion Hazard	Moderate	Low	Moderate
Soil Permeability	Moderately slow	Moderately slow	Slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2ed II	1	2edx
Forest Site Class	7 (non-commercial)	5-6 (3-5)	7 (non-commercial)
Range Site	8	Not placed in a range site.	8, 1
Water Runoff Potential	Moderate	Slow	Moderate
Watershed Sensitivity	6 (Moderate)	8	6
Hydrologic Soil Group	D	B	D
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.3 to 2.6 inches	Low to Moderate 3.2 inches	Very Low to Low 1.1 to 3.1 inches
Susceptibility to Burning Damage	Low	Moderate	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	1 tons/acre/year	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Moderate	Not Rated
Rating for Timber Site	Not Rated	Fair (1,7,10)	Not Rated
R-Value	30-60	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7 12+; Unweathered bedrock	0-8; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 8-27; Clay loam, gravelly clay loam Unified: CL, MH AASHTO: A-6, A-7 27+; Unweathered bedrock	0-5; Very stony loam, loam Unified: ML-CL, CL AASHTO: A-4, A-6 5-8; Clay loam Unified: CL AASHTO: A-6 8-16; Silica duripan 16+; Unweathered bedrock

Included Areas:

Included with these soils in mapping and making up about 15 percent of the acreage are the Deven, Gwin, Lawyer, Bieber and Barnard families and Rock outcrop.

224 PASS CANYON-FORDICE-GWIN FAMILIES ASSOCIATION, 1 to 20 percent slopes

Map Unit Components	Pass Canyon family (35 percent)	Fordice family (25 percent)	Gwin family (20 percent)
Position, Slope, and Elevation	Mainly on southeast to westerly aspects of sideslopes, ridges and knolls of undulating basalt plateaus and mountain uplands; 1 to 20 percent slopes; 4400 to 6000 feet.	Mainly on southeast to westerly aspects of concave areas of undulating basalt plateaus and mountain uplands; 1 to 20 percent slopes; 4400 to 6000 feet	Mainly on southeast to westerly aspects of sideslopes, ridges and knolls of undulating basalt plateaus and mountain uplands; 5 to 20 percent slopes; 4400 to 6000 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, few scattered ponderosa pine, low sagebrush, big sagebrush, mulesear, buckwheat, western yarrow, sandberg bluegrass, Idaho fescue, cheatgrass; 16 to 20 inches ppt.	Ponderosa pine, Jeffrey pine, western juniper, big sagebrush, bitterbrush, squaw carpet, lupine, bluebunch wheatgrass, Junegrass, Ross's sedge, other grasses; 16 to 20 inches ppt.	
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam, and loam, granular and platy structure, slightly hard, pH 6.6 to 6.8.	1 to 0 inches; of ponderosa pine and Jeffrey needles, over 0 to 9 inches; dark grayish brown and grayish brown very stony loam and extremely cobbly loam, granular and subangular blocky structure, friable, pH t.2 to 6.4.	0 to 11 inches; dark grayish brown very cobbly loam, granular and blocky structure, slightly hard, pH 6.8.
Rooting Depth (in.) to Underlying Material	10 to 20; basalt, andesite	20 to 40; basalt, andesite	10 to 20; basalt, andesite
Erosion Factor (K)	.32	.28	.37
Max. Erosion Hazard	Moderate	Low to Moderate	Moderate
Soil Permeability	Moderately slow	Moderately slow	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2edx II	2epx	2edx
Forest Site Class	7 (non-commercial)	6 (4-5)	7 (non-commercial)
Range Site	8	Not placed in a range site.	8
Water Runoff Potential	Moderate	Slow	Moderate
Watershed Sensitivity	6 (Moderate)	7	6
Hydrologic Soil Group	D	B	D
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.3 to 2.6 inches	Low to Moderate 2.0 inches	Very Low to Low 1.0 to 2.0 inches
Susceptibility to Burning Damage	Low	Moderate	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	1 tons/acre/year	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Very Low	Not Rated
Rating for Timber Site	Not Rated	Poor (1,4,7,11)	Not Rated
R-Value	30-60	30-60	30-60

224 PASS CANYON-FORDICE-GWIN FAMILIES ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4	0-9; Very stony loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-4, A-6	0-11; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4
2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6	9-28; Extremely cobbly clay loam Unified: GC, CL AASHTO: A-6	11-18; Extremely cobbly clay loam Unified: SC, CL AASHTO: A-6
4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7	28+; Unweathered bedrock	18+; Unweathered bedrock
12+; Unweathered bedrock		

Included Areas:

Included with these soils in mapping and making up about 20 percent of the acreage are the Deven, Stukel, Elmore and Lawyer families, Lithic Xerorthents, mesic and Rock outcrop.

225 PASS CANYON-FORDICE-GWIN FAMILIES ASSOCIATION, 20 to 40 percent slopes

Map Unit Components	Pass Canyon family (35 percent)	Fordice family (25 percent)	Gwin family (20 percent)
Position, Slope, and Elevation	Mainly on southeast to westerly aspects of sideslopes, ridges and knolls of mountain uplands; 20 to 40 percent slopes; 4400 to 6000 feet.	Mainly on southeast to westerly aspects of smooth sideslopes and concave areas of mountain uplands; 20 to 40 percent slopes; 4400 to 6000 feet.	Mainly on southeast to westerly aspects of upper sideslopes, ridges and knolls of mountain uplands; 20 to 40 percent slopes; 4400 to 6000 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, few scattered ponderosa pine, low sagebrush, big sagebrush, mulesear, buckwheat, western yarrow, sandberg blue- grass, Idaho fescue, cheatgrass; 16 to 20 inches ppt.	Ponderosa pine, Jeffrey pine, western juniper, big sagebrush, bitterbrush, squaw carpet, lupine, bluebunch wheatgrass, June- grass, Ross's sedge, other grasses; 16 to 20 inches ppt.	
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure slightly hard, pH 6.6 yo 6.8.	1 to 0 inches; ponderosa pine and juniper needles, over 0 to 9 inches; dark grayish brown and grayish brown very stony loam and extremely cobbly loam, granular structure, friable, pH 6.2 to 6.4.	0 to 11 inches; dark grayish brown very cobbly loam, granular and blocky structure, slightly hard, pH 6.8.
Rooting Depth (in.) to Underlying Material	10 to 20; basalt andesite	20 to 40; basalt andesite	10 to 20; basalt, andesite
Erosion Factor (K)	.32	.28	.37
Max. Erosion Hazard	Moderate to high	Moderate	Moderately to high
Soil Permeability	Moderately slow	Moderately slow	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	3Edx III	2Epx	3Edx
Forest Site Class	7 (non-commercial)	6 (4-5)	7 (non-commercial)
Range Site	8	Not placed in a range site.	8
Water Runoff Potential	Rapid	Slow	Rapid
Watershed Sensitivity	5 (Moderate)	7	5
Hydrologic Soil Group	D	B	D
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.3 to 2.6 inches	Low to Moderate 2.0 inches	Very Low to Low 1.0 to 2.0 inches
Susceptibility to Burning Damage	Moderate	Moderate to High	Moderate
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	1 tons/acre/year	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Very Low	Not Rated
Rating for Timber Site	Not Rated	Poor (1,4,7,11)	Not Rated
R-Value	30-60	30-60	30-60

225 PASS CANYON-FORDICE-GWIN FAMILIES ASSOCIATION (continued)

Soil horizons in inches, USDA, Unified, AASHTO

0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4	0-9; Very stony loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-4, A-6	0-11; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4
2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6	9-28; Extremely cobbly clay loam Unified: GC, CL AASHTO: A-6	11-18; Extremely cobbly clay loam Unified: SC, CL AASHTO: A-6
4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7	28+; Unweathered bedrock	18+; Unweathered bedrock
12+; Unweathered bedrock		

Included Areas:

Included with these soils in mapping and making up about 20 percent of the acreage are the Deven, Stukel, Bakeoven, Ruckles, Elmore and Lawyer families Lithic Xerorthents, mesic and Rock outcrop.

226 PASS CANYON-GWIN-FORDICE FAMILIES ASSOCIATION, 40 to 70 percent slopes

Map Unit Components	Pass Canyon family (35 percent)	Gwin family (30 percent)	Fordice family (15 percent)
Position, Slope, and Elevation	Mainly on southeast to westerly aspects of sideslopes, ridges and knolls of mountain uplands; 40 to 70 percent slopes, 4400 to 6000 feet.	Mainly on southeast to westerly aspects of upper sideslopes, ridges and knolls of mountain uplands; 40 to 70 percent slopes; 4400 to 6000 feet.	Mainly on southeast to westerly aspects of smooth sideslopes and concave areas of mountain uplands; 40 to 60 percent slopes; 4400 to 6000 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, few scattered ponderosa pine, low sagebrush, big sagebrush, mulesear, buckwheat, western yarrow, sandberg blue- grass, Idaho fescue, cheatgrass; 16 to 20 inches ppt.	Western juniper, mountain mahogany, current spp., big sagebrush, low sagebrush, mulesear, Phlox spp., bottlebrush, Idaho fescue, cheat- grass; 16 to 20 inches ppt.	
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure slightly hard, pH 6.6 to 6.8.	0 to 11 inches; dark grayish brown very cobbly loam, granular and blocky structure, slightly hard, pH 6.8.	1 to 0 inches; of ponderosa pine and juniper needles, over 0 to 9 inches; inches; dark grayish brown and grayish brown very stony loam and extremely cobbly loam, granular and subgranular blocky structure, friable, pH 6.2 to 6.4.
Rooting Depth (in.) to Underlying Material	10 to 20; basalt andesite	10 to 20; basalt andesite	20 to 40; basalt, andesite
Erosion Factor (K)	.32	.37	.28
Max. Erosion Hazard	High to very high	High to very high	High
Soil Permeability	Moderately slow	Moderately slow	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	3Edx III	3Epx	3Edx
Forest Site Class	7 (non-commercial)	7 (non-commercial)	6 (4-5)
Range Site	8	8	Not placed in a range site.
Water Runoff Potential	Rapid	Very Rapid	Moderate
Watershed Sensitivity	4 (High)	3	6
Hydrologic Soil Group	D	D	B
Available Water Capacity (AWC)	Very low to Low	Very Low to Low	Low to Moderate
Upper 20 inches	1.3 to 2.6 inches	1.0 to 2.0 inches	2.0 inches
Susceptibility to Burning Damage	Moderate	Moderate	High
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year	2 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated	Very Low
Rating for Timber Site	Not Rated	Not Rated	Poor (1,4,7,8,11)
R-Value	30-60	30-60	30-60

226 PASS CANYON-GWIN-FORDICE FAMILIES ASSOCIATION (continued)

Soil horizons in inches, USDA, Unified, AASHTO

0-2;	Very cobbly loam Unified: SM, SM-SC AASHTO: A-4	0-11;	Very cobbly loam Unified: SM, SM-SC AASHTO: A-4	0-9;	Very stony loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-4, A-6
2-4;	Loam Unified: ML-CL, CL AASHTO: A-4, A-6	11-18;	Extremely cobbly clay loam Unified: SC, CL AASHTO: A-6	9-28;	Extremely cobbly clay loam Unified: GC, CL AASHTO: A-6
4-12;	Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7	18+;	Unweathered bedrock	28+;	Unweathered bedrock
12+;	Unweathered bedrock				

Included Areas:

Included with these soils in mapping and making up about 20 percent of the acreage are the Deven, Bakeoven, Ruckles, Elmore and Lawyer families Lithic Xerorthents, mesic and Rock outcrop.

227 PASS CANYON FAMILY-LITHIC XERORTHENTS, MESIC COMPLEX, 1 to 15 percent slopes

Map Unit Components	Pass Canyon family (45 percent)	Lithic Xerorthents, mesic (35 percent)
Position, Slope, and Elevation	On undulating basalt plateaus; 1 to 15 percent slopes; 4500 to 5700 feet.	On nearly level cobble pavement flats, knolls and ridges of undulating basalt plateaus; 1 to 15 percent slopes; 4500 to 5700 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, low sagebrush, few big sagebrush, Idaho fescue, sandberg blue- grass, cheatgrass; 14 to 18 inches ppt.	Low sagebrush, buckwheat, cheatgrass; 14 to 18 inches ppt.
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure, slightly hard, pH 6.8 to 6.6.	0 to 5 inches; brown and yellowish brown very cobbly loam and gravelly loam; platy and granular structure; slightly hard; pH 6.6 to 6.8.
Rooting Depth (in.) to Underlying Material	8 to 15; basalt	4 to 10; basalt andesite
Erosion Factor (K)	.32	Variable
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately slow	Moderate
Drainage Class	Well drained	Somewhat excessively drained
Soil Manageability Class	2ed	3eDx
Soil Manageability Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	8,1	1
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	6 (Moderate)	5
Hydrologic Soil Group	D	D
Available Water Capacity (AWC)	Very Low to Low	Very Low
Upper 20 inches	1.0 to 2.0 inches	0.6 to 1.5 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	30-60	Not Rated
Soil horizons in inches, USDA, Unified, AASHTO	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7 12+; Unweathered bedrock	0-5; Variable Unified: Not Rated AASHTO: Not Rated 5+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Deven, Indian Creek, Packwood, Keating families and Rock outcrop.	

228 PASS CANYON-LOS GATOS FAMILIES COMPLEX, 1 to 20 percent slopes

Map Unit Components	Pass Canyon family (45 percent)	Los Gatos family (35 percent)
Position, Slope, and Elevation	On undulating basalt plateaus and sideslopes of mountain uplands; 1 to 20 percent slopes; 4400 to 5500 feet.	On undulating basalt plateaus and lower sideslopes of mountain uplands; 1 to 15 percent slopes; 4400 to 5500 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, low sagebrush, big sagebrush, rabbitbrush, Idaho fescue, Poa spp., cheatgrass; 14 to 18 inches ppt.	Western juniper, few scattered ponderosa pine, big sagebrush, bitterbrush, rabbitbrush, Idaho fescue, Poa spp., other grasses; 14 to 18 inches ppt.
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure, slightly hard, pH 6.8 to 6.6.	0 to 19 inches; brown gravelly loam, granular and blocky structure, soft, pH 6.8 to 7.0
Rooting Depth (in.) to Underlying Material	10 to 20; hard fractured basalt, tuff	20 to 40; hard fractured basalt, tuff
Erosion Factor (K)	.32	.32
Max. Erosion Hazard	Moderate	Low
Soil Permeability	Moderately slow	Moderate
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ed	1
Soil Manageability Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	8,4	13
Water Runoff Potential	Moderate	Slow
Watershed Sensitivity	6 (Moderate)	8
Hydrologic Soil Group	D	B
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.3 to 2.6 inches	Low to Moderate 2.8 inches
Susceptibility to Burning Damage	Low	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	1 tons/acre/year	2 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7 12+; Unweathered bedrock	0-19; Gravelly loam Unified: ML, ML-CL AASHTO: A-4 19-38; Clay loam, gravelly clay loam Unified: CL, MH AASHTO: A-6, A-7 38+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Ridd, Stukel, Supan, Keating, Alicel, Cowiche, Elmore, Deven and Roval families and Rock outcrop, and unnamed soils similar to the Gwin family but over soft tuff.	

229 PASS CANYON-ROVAL FAMILIES COMPLEX, 1 to 15 percent slopes

	Pass Canyon family (60 percent)	Roval family (25 percent)
Map Unit Components		
Position, Slope, and Elevation	On undulating basalt plateaus and lower sideslopes of mountain uplands; 1 to 15 percent slopes; 4700 to 6000 feet.	On undulating basalt plateaus and lower sideslopes of mountain uplands; 1 to 15 percent slopes; 4700 to 6000 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, low sagebrush, rabbit- brush, Phlox spp., Idaho fescue, sandberg bluegrass, cheatgrass; 14 to 16 inches ppt.	Western juniper, low sagebrush, rabbit- brush, Phlox spp., Idaho fescue, sandberg bluegrass, cheatgrass; 14 to 16 inches ppt.
Surface Layer	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure, slightly hard, pH 6.8 to 6.6.	0 to 2 inches; brown very cobbly loam, platy and granular structure, slightly hard, pH 6.6.
Substratum		12 to 14 inches; strongly cemented silica duripan
Rooting Depth (in.) to Underlying Material	10 to 20; basalt	10 to 20; silica duripan over basalt.
Erosion Factor (K)	.32	.37
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately slow	Slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ed	2ed
Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	8	8
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	6 (Moderate)	6
Hydrologic Soil Group	D	D
Available Water Capacity (AWC)	Very Low to Low	Low
Upper 20 inches	1.3 to 2.6 inches	1.5 to 3.0 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7 12+; Unweathered bedrock	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-10; Clay loam Unified: CL, MH AASHTO: A-6, A-7 10-13; Clay Unified: CH AASHTO: A-7 13-14; Silica duripan 14+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Bieber, Deven, Stukel, Los Gatos and Fordice families, Lithic Xerothents, mesic, and Rock outcrop.	

230 PATIO deep-GLEASON-MERKEL FAMILIES COMPLEX, 10 to 40 percent slopes

Map Unit Components	Patio family, deep (35 percent)	Gleason family (30 percent)	Merkel family (25 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 15 to 40 percent slopes; 4800 to 6200 feet.	On sideslopes of mountain uplands; 10 to 40 percent slopes; 4800 to 6200 feet.	On toeslopes and sideslopes of mountain uplands; 10 to 35 percent slopes; 4800 to 6200 feet.
Typical Vegetation and Precipitation (ppt)	Ponderosa pine, few incense-cedar and white fir, rabbitbrush, ceonothus, snowberry, squaw carpet, Ross's sedge, few grasses; 16 to 25 inches ppt.	Ponderosa pine, few incense-cedar and white fir, rabbitbrush, ceonothus, snowberry, squaw carpet, Ross's sedge, few grasses; 16 to 25 inches ppt.	
Surface Layer	1 to 0 inches of white fir needles, over 0 to 18 inches; yellowish brown very gravelly loam, granular structure, slightly hard, pH 6.2 to 6.8.	1 to 0 inches; undecomposed ponderosa pine needles and twigs, over 0 to 22 inches; grayish brown gravelly sandy loam and sandy loam, granular and massive structure, soft, pH 6.0 to 6.5.	1 to 0 inches of white fir needles, over 0 to 11 inches pale brown very gravelly loam, granular and blocky structure, soft, pH 6.8.
Substratum		22 to 50 inches; light gray and very pale brown gravelly sandy loam to very gravelly coarse sand, massive, slightly hard to hard, pH 6.2.	
Rooting Depth (in.) to Underlying Material	40 plus; andesite, obsidian	40 plus; andesite obsidian or tuff	30 plus; tuff, andesite
Erosion Factor (K)	.28	.17	.32
Max. Erosion Hazard	Moderate	Low to Moderate	Moderate
Soil Permeability	Moderate	Moderately rapid	Moderate
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class	2ep	2e	2e
Group	II		
Forest Site Class	5 (3-4)	5 (3-4)	5 (3-4)
Range Site	Not placed in a range site.	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow	Slow
Watershed Sensitivity	7 (Moderate)	8	7
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC)	Moderate	Moderate	Moderate
Upper 20 inches	2.3 inches	2.5 inches	2.4 inches
Susceptibility to Burning Damage	Moderate	Moderate	Moderate
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year	2,3 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Moderate	Low to Moderate
Rating for Timber Site	Good (10)	Good (10)	Good (10)
R-Value	30-60	60+	30-60

230 PATIO deep-GLEASON-MERKEL FAMILIES COMPLEX (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-60; Very gravelly loam,
extremely gravelly
loam, extremely
cobble loam
Unified: SM, SM-SC
AASHTO: A-2-4, A-2-6

0-35; Gravelly sandy loam,
sandy loam
Unified: SM
AASHTO: A-2-4
35-50; Very gravelly coarse
sand
Unified: SW-SM, SM
AASHTO: A-1-b
50+; Weathered bedrock

0-32; Very gravelly loam,
extremely cobble loam
Unified: SM, SC
AASHTO: A-2-4,
A-2-6, A-4, A-6
32+; Unweathered bedrock

Included Areas:

Included with these soils in mapping and making up about 10 percent of the acreage are the Lamondi, Wapal, Smarts, DeMasters, Inville, Mascamp, Alicel, and Anatone families and areas with less slope.

231 PATIO deep-MERKEL FAMILIES COMPLEX, 15 to 35 percent slopes

Map Unit Components	Patio family, deep (60 percent)	Merkel family (20 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 15 to 35 percent slopes; 5500 to 7000 feet.	On sideslopes of mountain uplands; 15 to 35 percent slopes; 5500 to 7000 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, few lodgepole pine at higher elevations, plus snowberry, current spp., squaw carpet, Ross's sedge, few grasses; 20 to 30 inches, ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, few lodgepole pine at higher elevations, plus snowberry, current spp., squaw carpet, Ross's sedge, grasses; 20 to 30 inches ppt.
Surface Layer	1 to 0 inches of white fir needles, over 0 to 18 inches; yellowish brown very gravelly loam, granular structure, slightly hard, pH 6.2 to 6.8	1 to 0 inches of white fir needles, over 0 to 11 inches pale brown very gravelly loam, granular and blocky structure, soft, pH 6.8.
Rooting Depth (in.) to Underlying Material	40 plus; basalt, andesite	30 plus; tuff, andesite
Erosion Factor (K)	.28	.32
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate	Moderate
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ep	2e
Soil Manageability Group	II	
Forest Site Class	5 (3-4)	5 (3-4)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow
Watershed Sensitivity	7 (Moderate)	7
Hydrologic Soil Group	B	B
Available Water Capacity (AWC)	Moderate	Moderate
Upper 20 inches	2.3 inches	2.4 inches
Susceptibility to Burning Damage	Moderate	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	2,3 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Low to Moderate
Rating for Timber Site	Good	Good
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-60; Very gravelly loam, extremely gravelly loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-2-6	0-32; Very gravelly loam, extremely cobbly loam Unified: SM, SC AASHTO: A-2-4, A-2-6, A-4, A-6 32+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up 20 percent of the acreage are the Smarts, Lamondi, Wapal, Gleason, Anatone families, Lithic Xerorthents, frigid, and Rock outcrop.	

232 PATIO deep-MERKEL FAMILIES COMPLEX, 35 to 60 percent slopes

Map Unit Components	Patio family, deep (55 percent)	Merkel family (25 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 35 to 60 percent slopes; 5500 to 7000 feet.	On sideslopes of mountain uplands; 35 to 60 percent slopes; 5500 to 7000 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, few lodgepole pine at higher elevations, plus snowberry, current spp., squaw carpet, Ross's sedge, few grasses; 20 to 30 inches, ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, few lodgepole pine at higher elevations, plus snowberry, current spp., squaw carpet, Ross's sedge, grasses; 20 to 30 inches ppt.
Surface Layer	1 to 0 inches of white fir needles, over 0 to 18 inches; yellowish brown very gravelly loam, granular structure, slightly hard, pH 6.2 to 6.8	1 to 0 inches of white fir needles, over 0 to 11 inches pale brown very gravelly loam, granular and blocky structure, soft, pH 6.8.
Rooting Depth (in.) to Underlying Material	40 plus; basalt, andesite	30 plus; tuff, andesite
Erosion Factor (K)	.28	.32
Max. Erosion Hazard	High	High
Soil Permeability	Moderate	Moderate
Drainage Class	Well drained	Well drained
Soil Manageability Class	3Ep	3E
Soil Manageability Group	III	
Forest Site Class	5 (3-4)	5 (3-4)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	6 (Moderate)	5
Hydrologic Soil Group	B	B
Available Water Capacity (AWC)	Moderate	Moderate
Upper 20 inches	2.3 inches	2.4 inches
Susceptibility to Burning Damage	Moderate to High	Moderate to High
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	2,3 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Low to Moderate
Rating for Timber Site	Fair (8)	Fair (8)
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-60; Very gravelly loam, extremely gravelly loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-2-6	0-32; Very gravelly loam, extremely cobbly loam Unified: SM, SC AASHTO: A-2-4, A-2-6, A-4, A-6 32+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up 20 percent of the acreage are the Smarts, Lamondi, Wapal, Gleason, Anatone families, Rubble land, Rock outcrop and unnamed soils similar to the Inville family.	

233 PATIO-SMARTS-ANATONE FAMILIES ASSOCIATION, 15 to 35 percent slopes

Map Unit Components	Patio family (35 percent)	Smarts family (30 percent)	Anatone family (20 percent)
Position, Slope, and Elevation	On sideslopes and ridges of mountain uplands; 15 to 35 percent slopes; 5800 to 6700 feet.	On lower sideslopes and toeslopes of mountain uplands; 15 to 30 percent slopes; 5800 to 6700 feet.	On upper sideslopes, ridges and knolls of mountain uplands; 20 to 35 percent slopes; 5800 to 6700 feet.
Typical Vegetation and Precipitation (ppt)	Few ponderosa pine, white fir, western juniper, dense rabbitbrush, big sagebrush, some bitterbrush, paintbrush, mulesear, bottlebrush, Ross's sedge, other grasses; 20 to 30 inches ppt.	Few ponderosa pine, white fir, western juniper, dense rabbitbrush, big sagebrush, some bitterbrush, paintbrush, mulesear, bottlebrush, Ross's sedge, other grasses; 20 to 30 inches ppt.	
Surface Layer	0 to 19 inches; dark grayish brown to brown very gravelly loam, granular and blocky structure, soft, pH 6.8.	1/2 to 0 inches; ponderosa pine and white fir needles and twigs, over 0 to 20 inches; reddish brown stony loam and very cobbly loam, granular and blocky structure, slightly hard and hard, pH 6.6 to 6.8.	0 to 17 inches; brown cobbly loam to very cobbly loam, granular and subangular blocky structure, slightly hard, pH 7.0 to 6.8.
Rooting Depth (in.) to Underlying Material	20 to 40; andesite	20 to 40; basalt, andesite	10 to 20; andesite, basalt
Erosion Factor (K)	.28	.32	.37
Max. Erosion Hazard	Moderate	Moderate	Moderate to high
Soil Permeability	Moderate	Moderately slow	Moderate
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	3epX III	3epX	3EdX
Forest Site Class	6 (4-5)	5-6 (3-5)	7 (non-commercial)
Range Site	Not placed in a range site.	Not placed in a range site.	9
Water Runoff Potential	Slow	Slow	Rapid
Watershed Sensitivity	7 (Moderate)	7	4
Hydrologic Soil Group	B	B	D
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 2.3 inches	Low to Moderate 2.1 inches	Very Low to Low 1.2 to 2.5 inches
Susceptibility to Burning Damage	Moderate	Moderate	Moderate
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	2 tons/acre/year	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Low	Not Rated
Rating for Timber Site	Poor (1,4,7)	Poor (1,4,7)	Not Rated
R-Value	30-60	30-60	30-60

233 PATIO-SMARTS-ANATONE FAMILIES ASSOCIATION (continued)

Soil horizons in inches, USDA, Unified, AASHTO

0-28; Very gravelly loam Unified: SM, SM-SC AASHTO: A-2-4, A-2-6	0-20; Stony loam, very cobbly loam Unified: ML, ML-CL AASHTO: A-4	0-8; Cobbly loam Unified: ML, ML-CL AASHTO: A-4
28+; Unweathered bedrock	20-28; Very gravelly loam Unified: SM-SC, SC AASHTO: A-4, A-6	8-17; Very cobbly loam Unified: SM, SC AASHTO: A-4, A-6
	28-35; Extremely gravelly clay loam Unified: GC AASHTO: A-2-6, A-2-7	17+; Unweathered bedrock
	35+; Weathered bedrock	

Included Areas:

Included with these units in mapping and making up about 15 percent of the acreage are the Lamondi, Wapal, Mascamp families, Patio and Smarts families, deep, Lithic Xerorthents, frigid, and Rock outcrop.

235 PULS-PACKWOOD-DITCHCAMP FAMILIES COMPLEX 1 to 10 percent slopes

Map Unit Components	Puls family (40 percent)	Packwood family (30 percent)	Ditchcamp family (15 percent)
Position, Slope, and Elevation	On intermound areas between 10 to 30 foot diameter mounds on basalt plateaus; 1 to 2 percent slopes; 4400 to 5500 feet.	On intermound areas between 10 to 30 foot diameter mounds on basalt plateaus; 1 to 3 percent slopes; 4400 to 5500 feet.	On 10 to 30 foot diameter mounds normally from 100 to 150 feet of each other on basalt plateaus; 2 to 10 percent slopes; 4400 to 5500 feet.
Typical Vegetation and Precipitation (ppt)	Black sagebrush, low sagebrush, few western juniper, buckwheat, Idaho fescue, other grasses; 12 to 14 inches ppt.	Low sagebrush, few western juniper, bluebunch wheatgrass, cheatgrass, other grasses; 12 to 14 inches ppt.	
Surface Layer	0 to 5 inches; pinkish gray very stony clay loam, granular structure, slightly hard, pH 6.3.	0 to 5 inches; light yellowish brown very stony loam to loam, platy and blocky structure, slightly hard to hard, pH 6.2 to 6.5.	0 to 15 inches; brown loam, platy and blocky structure, hard, pH 6.5.
Substratum	19 to 28 inches; indurated silica cemented duripan.	8 to 16 inches; weakly to strongly cemented yellow and brown silica duripan.	30 to 34 inches; strongly cemented reddish yellow silica duripan.
Rooting Depth (in.) to Underlying Material	5 to 10; dense very hard clay over silica duripan at 10 to 20 inches	7 to 20; silica duripan over basalt	20 to 35; silica duripan over basalt
Erosion Factor (K)	.37	.43	.43
Max. Erosion Hazard	Moderate	Moderate	Moderate
Soil Permeability	Very slow	Slow	Slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	3eDx II	2edx	2e
Forest Site Class	7 (non-commercial)	7 (non-commercial)	7 (non-commercial)
Range Site	1	7,1	12
Water Runoff Potential	Moderate	Moderate	Slow
Watershed Sensitivity	5 (Moderate)	6	7
Hydrologic Soil Group	D	D	C
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.1 to 2.7 inches	Very Low to Low 1.3 to 3.1 inches	Low to Moderate 3.4 inches
Susceptibility to Burning Damage	Low	Low	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year	2 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated	Not Rated
R-Value	0-30	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-5; Very stony clay loam Unified: ML,CL AASHTO: A-6, A-7 5-19; Clay loam, clay Unified: CL, CH AASHTO: A-7 19-28; Silica duripan 28+; Unweathered bedrock	0-5; Very stony loam, loam Unified: ML-CL, CL AASHTO: A-4, A-6 5-8; Clay loam Unified: CL AASHTO: A-6 8-16; Silcia duripan 16+; Unweathered bedrock	0-15; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 15-30; Clay loam Unified: CL, CH AASHTO: A-6, A-7 30-34; Silica duripan 34+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Castlevale, Dishner, Aikman, Bieber and Roval families, Lithic Xerorthents, mesic, Rock outcrop, and unnamed soils similar to Ditchcamp family but are Mollisols.		

236 PULS-ROVAL-DISHNER FAMILIES COMPLEX, 0 to 5 percent slopes

Map Unit Components	Puls family (50 percent)	Roval family (20 percent)	Dishner family (15 percent)
Position, Slope, and Elevation	On shallow nearly level basins on undulating basalt plateaus; 0 to 2 percent slopes; 4500 to 5500 feet.	On upper areas of undulating basalt plateaus; 1 to 5 percent slopes; 4500 to 5500 feet.	On upper areas and gentle sideslopes of undulating basalt plateaus; 1 to 5 percent slopes; 4500 to 5500 feet.
Typical Vegetation and Precipitation (ppt)	Low sagebrush, black sagebrush, few forbes, cheatgrass; 14 to 16 inches ppt.	Western juniper, low sagebrush, few big sagebrush, Idaho fescue, sandberg bluegrass, bottlegrass, cheatgrass; 14 to 16 inches ppt.	
Surface Layer	0 to 5 inches; pinkish gray very stony clay loam, granular structure, slightly hard, pH 6.3.	0 to 2 inches; brown very cobbly loam, platy and granular structure, slightly hard, pH 6.6.	0 to 5 inches; light brownish gray cobbly sandy clay loam, platy and granular structure, slightly hard, pH 6.8.
Substratum	19 to 28 inches; indurated silica cemented duripan.	13 to 14 inches; strongly cemented silica duripan.	
Rooting Depth (in.) to Underlying Material	5 to 10; dense very hard clay over silica duripan below 10 to 20 inches.	10 to 20; silica duripan over basalt.	8 to 16; basalt
Erosion Factor (K)	.37	.37	.43
Max. Erosion Hazard	Moderate	Moderate	Moderate
Soil Permeability	Very Slow	Slow	Slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	3eDX III	2ed	2ed
Forest Site Class	7 (non-commercial)	7 (non-commercial)	7 (non-commercial)
Range Site	1	8	8,1
Water Runoff Potential	Moderate	Moderate	Moderate
Watershed Sensitivity	4 (Moderate)	6	5
Hydrologic Soil Group	D	D	D
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.1 to 2.7 inches	Low 1.5 to 3.0 inches	Very Low to Low 1.1 to 2.1 inches
Susceptibility to Burning Damage	Low	Low	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated	Not Rated
R-Value	0-30	30-60	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-5; Very stony clay loam Unified: ML, CL AASHTO: A-6, A-7 5-19; Clay loam, Unified: CL, CH AASHTO: A-7 19-28; Silica duripan 28+; Unweathered bedrock	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-10; Clay loam Unified: CL, MH AASHTO: A-6, A-7 10-13; Clay Unified: CH AASHTO: A-7 13-14; Silica duripan 14+; Unweathered bedrock	0-9; Cobbly sandy clay loam silty clay loam Unified: CL AASHTO: A-6 9-16; Clay loam, cobbly clay Unified: CL, CH AASHTO: A-7 16+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Aikman, Bierber, Castlevale, Packwood, Indian Creek, Barnard, Deven and Ditchcamp families, Lithic Xerorthents, mesic, and Rock outcrop.		

237 RIDD-LOS GATOS-GWIN FAMILIES ASSOCIATION, 5 to 35 percent slopes

Map Unit Components	Ridd family (40 percent)	Los Gatos family (25 percent)	Gwin family (20 percent)
Position, Slope, and Elevation	On sideslopes and convex areas of mountain uplands; 5 to 35 percent slopes; 4400 to 5800 feet.	On lower sideslopes and toeslopes of mountain uplands; 5 to 30 percent slopes; 4400 to 5800 feet.	On upper sideslopes ridges and convex areas of mountain uplands; 10 to 35 percent slopes; 4400 to 5800 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, few ponderosa pine, big sagebrush, rabbitbrush, bitterbrush, vetch, mulesear, Phlox spp., Idaho fescue, sandberg bluegrass, bluebunch wheatgrass; 14 to 18 inches ppt.	Western juniper, few ponderosa pine, big sagebrush, rabbitbrush, bitterbrush, vetch mulesear, Phlox spp., Idaho fescue, sandberg bluegrass, bluebunch wheatgrass; 14 to 18 inches ppt.	
Surface Layer	0 to 15 inches; dark grayish brown cobbly loam, granular structure, slightly hard, pH 6.0.	0 to 19 inches; brown gravelly loam, granular and blocky structure, soft, pH 6.8 to 7.0.	0 to 11 inches; dark grayish brown very cobbly loam, granular and blocky structure, slightly hard, pH 6.8.
Rooting Depth (in.) to Underlying Material	20 to 40; basalt	20 to 40; basalt	10 to 20; basalt
Erosion Factor (K)	.32	.32	.37
Max. Erosion Hazard	Low to moderate	Low to moderate	Moderate
Soil Permeability	Moderately slow	Moderate	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2e II	2e	2ed
Forest Site Class	7 (non-commercial)	7 (non-commercial)	7 (non-commercial)
Range Site	18	13	8
Water Runoff Potential	Slow	Slow	Rapid
Watershed Sensitivity	7 (Moderate)	7	5
Hydrologic Soil Group	B	B	D
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 2.4 inches	Low to Moderate 2.8 inches	Very Low to Low 1.0 to 2.0 inches
Susceptibility to Burning Damage	Moderate	Moderate	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	2 tons/acre/year	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated	Not Rated
R-Value	30-60	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-5; Cobbly loam Unified: ML, ML-CL AASHTO: A-4 5-37; Very cobbly clay loam Unified: CL AASHTO: A-6, A-7 37+; Unweathered bedrock	0-19; Gravelly loam Unified: ML, ML-CL AASHTO: A-4 19-38; Clay loam, gravelly clay loam Unified: CL, MH AASHTO: A-6, A-7 38+; Unweathered bedrock	0-11; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 11-18; Extremely cobbly clay loam Unified: SC, CL AASHTO: A-6 18+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Supan, Keating, Bakeoven and Pass Canyon families and Rock outcrop.		

238 RIDD-RUCKLES-KEATING FAMILIES COMPLEX, 1 to 20 percent slopes

Map Unit Components	Ridd family (35 percent)	Ruckles family (30 percent)	Keating family (20 percent)
Position, Slope, and Elevation	On smooth lower sideslopes and toeslopes of mountain uplands and alluvial fans; 1 to 20 percent slopes; 4400 to 5500 feet.	On knolls and ridges and upper sideslopes of mountain uplands and alluvial fans; 2 to 20 percent slopes; 4400 to 5500 feet.	On smooth lower sideslopes and toeslopes of mountain uplands and alluvial fans; 1 to 20 percent slopes; 4400 to 5500 feet.
Typical Vegetation and Precipitation (ppt)	Big sagebrush, rabbitbrush, bitterbrush, few western juniper, Idaho fescue, Poa spp., needlegrass; bottlebrush; 14 to 18 inches.	Western juniper, low sagebrush, big sagebrush, buckwheat, Phlox spp., Idaho fescue, cheatgrass; 14 to 18 inches ppt.	
Surface Layer	0 to 5 inches; dark grayish brown cobbly loam, granular structure, slightly hard, pH 6.0.	0 to 4 inches; brown very cobbly loam, granular structure, soft, pH 7.0.	0 to 2 inches; dark grayish brown cobbly clay loam, granular structure, hard, pH 6.8.
Rooting Depth (in.) to Underlying Material	20 to 40; basalt, tuff	10 to 20; basalt, tuff	20 to 40; basalt, tuff
Erosion Factor (K)	.32	.37	.32
Max. Erosion Hazard	Low to moderate	Moderate	Low to moderate
Soil Permeability	Moderately slow	Slow	Slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2e II	2ed	2e
Forest Site Class	7 (non-commercial)	7 (non-commercial)	7 (non-commercial)
Range Site	18	8	18
Water Runoff Potential	Slow	Moderate	Slow
Watershed Sensitivity	8 (moderate)	5	6
Hydrologic Soil Group	B	D	C
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 2.4 inches	Very Low to Low 1.0 to 2.0 inches	Low to Moderate 2.7 inches
Susceptibility to Burning Damage	Low	Low	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year	2 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated	Not Rated
R-Value	30-60	0-30	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-5; Cobbly loam Unified: ML, ML-CL AASHTO: A-4 5-37; Very cobbly clay loam Unified: CL AASHTO: A-6, A-7 37+; Unweathered bedrock	0-4; Very cobbly loam Unified: SM, SC AASHTO: A-4, A-6 4-14; Very gravelly clay Unified: GC, CH AASHTO: A-7 14+; Unweathered bedrock	0-6; Cobbly clay loam, clay loam Unified: CL, MH, CH AASHTO: A-6, A-7 6-32; Clay Unified: CH AASHTO: A-7 32+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Supan, Puls, Bieber, Deven, and Gwin families.		

239 ROCK OUTCROP-BAKEOVEN-WENATCHEE FAMILIES ASSOCIATION, 20 to 60 percent slopes

Map Unit Components	Rock outcrop (40 percent)	Bakeoven family (30 percent)	Wentchee family (15 percent)
Position, Slope, and Elevation	On upper slopes and ridges of mountain uplands and basalt plateau breaks; 30 to 60 percent slopes; 4200 to 5500 feet.	On sideslopes and convex areas of mountain uplands and plateau breaks; 20 to 50 percent slopes; 4200 to 5500 feet.	On lower sideslopes and toeslopes of mountain uplands and plateau breaks; 20 to 40 percent slopes; 4200 to 5500 feet.
Typical Vegetation and Precipitation (ppt)	Barren; 10 to 16 inches ppt.	Western juniper, rabbitbrush, big sage- brush, low sagebrush, Ribes spp., mules-ear, cheatgrass, sandberg bluegrass, needlegrass, Idaho fescue; 10 to 16 inches ppt.	
Surface Layer	NOT APPLICABLE: Basalt, bedrock with minor accumulations of aeolian soil deposition in some fractures.	A thin pumice overburden of up to 5 inches thick may be present, OVER 0 to 11 inches; dark grayish brown and grayish brown very cobbly fine sandy loam, subangular blocky structure; slightly hard, pH 6.6.	9 inches of pumice overburden consisting of brown gravelly coarse sandy loam over very pale brown extremely gravelly coarse loamy sand (pumice thickness in this map unit ranges from 0 to 5 inches) OVER 9 to 15 inches; pale brown fine sandy loam, subangular blocky sturcture, soft, pH 6.8.
Rooting Depth (in.) to Underlying Material		8 to 20; basalt	20 to 40; basalt
Erosion Factor (K)		.24	.20
Max. Erosion Hazard		Moderate to high	Moderate
Soil Permeability		Moderately rapid	Moderate
Drainage Class		Well drained	Well drained
Soil Manageability Class Group	Not rated III	3EPx	2e
Forest Site Class		7 (non-commercial)	7 (non-commercial)
Range Site		7,1	16
Water Runoff Potential	Very Rapid	Rapid	Slow
Watershed Sensitivity	2 (High)	5	7
Hydrologic Soil Group		D	B
Available Water Capacity (AWC) Upper 20 inches		Very Low to Low 0.8 to 1.9 inches	Low to Moderate 2.6 inches
Susceptibility to Burning Damage		Low	Moderate
Slope Stability Hazard		Low	Low
Allowable Soil Loss		1 tons/acre/year	2 tons/acre/year
Chance of Seedling Survival		Not Rated	Not Rated
Rating for Timber Site		Not Rated	Not Rated
R-Value		30-60	30-60

239 ROCK OUTCROP-BAKEOVEN-WENATCHEE FAMILIES ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-11;	Very cobbly fine sandy loam Unified: SM, SM-SC AASHTO: A-4	0-5;	Gravelly coarse sandy loam Unified: SM AASHTO: A-1-b
11+;	Unweathered bedrock	5-9;	Extremely gravelly loamy coarse sand Unified: SW-SM AASHTO: A-1-a
		9-27;	Fine sandy loam, loam Unified: ML, ML-CL, CL AASHTO: A-4, A-6
		27+;	Unweathered bedrock

Included Areas:

Included with this unit in mapping and making up about 15 percent of the acreage are the Searles, Fordice, Elmore, Cowiche and Stukel families.

240 ROCK OUTCROP-RUBBLE LAND-BAKEOVEN FAMILY ASSOCIATION, 40 to 90 percent slopes

Map Unit Components	Rock outcrop (35 percent)	Rubble land (30 percent)	Bakeoven family (20 percent)
Position, Slope, and Elevation	On ridge tops and scarp breaks of mountain uplands; 40 to 90 percent slopes; 4400 to 7000 feet.	On smooth concave mountain sideslopes; 50 to 90 percent slopes; 4400 to 7000 feet.	On smooth mountain sideslopes; 40 to 70 percent slopes; 4400 to 7000 feet.
Typical Vegetation and Precipitation (ppt)	Generally barren with few scattered trees, forbes, shrubs and grasses in some rock fractures; 14 to 20 inches ppt.	Barren; 14 to 20 inches ppt.	
Surface Layer	NOT APPLICABLE; Basalt, andesite or conglomerated tuff bedrock with minor accumulations of aeolian soil deposition in some fractures.	NOT APPLICABLE: Colluvial deposition of angular cobbles, stones and boulders of basalt or andesite rock material.	0 to 11 inches; dark grayish brown and grayish brown very cobbly fine sandy loam, subangular blocky structure; slightly hard, pH 6.6.
Rooting Depth (in.) to Underlying Material			7 to 20; basalt, andesite
Erosion Factor (K)			.24
Max. Erosion Hazard			High to Very High
Soil Permeability			Moderately rapid
Drainage Class			Well drained
Soil Manageability Class Group	Not Rated IV	4GdX	
Forest Site Class			7 (non-commercial)
Range Site			8,1
Water Runoff Potential	Very Rapid	Very Rapid	Rapid
Watershed Sensitivity	0 (Very High)	2	4
Hydrologic Soil Group			D
Available Water Capacity (AWC) Upper 20 inches			Very Low to Low
Susceptibility to Burning Damage			0.6 to 1.9 inches Moderate
Slope Stability Hazard			Low to Moderate
Allowable Soil Loss			1 tons/acre/year
Chance of Seedling Survival			Not Rated
Rating for Timber Site			Not Rated
R-Value			30-60
Soil horizons in inches, USDA, Unified, AASHTO			0-11; Very cobbly fine sandy loam Unified: SM, SM-SC AASHTO: A-4
Included Areas:	Included with this unit in mapping and making up about 15 percent of the acreage are the Fordice, Smarts, Keating, Gwin, Anatone families and Lithic Xerorthents.		

241 ROCK OUTCROP-RUBBLE LAND-CHEADLE FAMILY ASSOCIATION, 60 to 100 percent slopes

Map Unit Components	Rock outcrop (35 percent)	Rubble land (30 percent)	Cheadle family (25 percent)
Position, Slope, and Elevation	On ridges and scarp breaks of mountain uplands; 60 to 100 percent slopes; 7000 to 9900 feet.	On smooth sideslopes and strongly dissected drainages of mountain uplands; 60 to 100 percent slopes; 7000 to 9900 feet.	On sideslopes and ridges of mountain uplands; 60 to 90 percent slopes; 7000 to 9900 feet.
Typical Vegetation and Precipitation (ppt)	Barren; 25 to 35 inches ppt.	Barren; 25 to 35 inches ppt.	
Surface Layer	NOT APPLICABLE; Basalt, andesite or conglomerated tuff bedrock with minor accumulations of aeolian soil deposition in some fractures.	NOT APPLICABLE: Colluvial deposition of angular cobbles, stones and boulders of basalt or andesite rock material.	0 to 17 inches; dark grayish brown to brown very cobbly loam to very cobbly clay loam; granular and subangular blocky structure, slightly hard to hard, pH 6.6.
Rooting Depth (in.) to Underlying Material			8 to 20; andesite
Erosion Factor (K)			.37
Max. Erosion Hazard			Very High
Soil Permeability			Moderately rapid
Drainage Class			Well drained
Soil Manageability Class Group	Not Rated IV	4Gd	
Forest Site Class			7 (non-commercial)
Range Site			9,1
Water Runoff Potential	Very Rapid	Very Rapid	Very Rapid
Watershed Sensitivity	0 (Very High)	2	2
Hydrologic Soil Group			D
Available Water Capacity (AWC) Upper 20 inches			Very Low to Low 1.0 to 2.4 inches
Susceptibility to Burning Damage			Moderate
Slope Stability Hazard			Moderate
Allowable Soil Loss			1 tons/acre/year
Chance of Seedling Survival			Not Rated
Rating for Timber Site R-Value			Not Rated 30-60
Soil horizons in inches, USDA, Unified, AASHTO			0-12; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4, A-6 12-17; Very cobbly clay loam Unified: SC AASHTO: A-6, A-7 17+; Unweathered bedrock
Included Areas:	Included with this unit in mapping and making up about 10 percent of the acreage are the Behanin, Supervisor families and Lithic Cryochrepts.		

242 ROVAL-DEVEN FAMILIES ASSOCIATION, 1 to 10 percent slopes

Map Unit Components	Roval family (50 percent)	Deven family (35 percent)
Position, Slope, and Elevation	On upper sideslopes and slightly convex areas of undulating basalt plateaus; 2 to 10 percent slopes; 4700 to 5800 feet.	On nearly level to slight concave areas of undulating basalt plateaus; 1 to 10 percent slopes; 4700 to 5800 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, few ponderosa pine, mountain mahogany, low sagebrush, big sagebrush, sandberg bluegrass, cheatgrass; 14 to 16 inches ppt.	Western juniper, low sagebrush, Phlox spp., sandberg bluegrass, Idaho fescue, cheatgrass, bottlebrush; 14 to 16 inches ppt.
Surface Layer	0 to 2 inches; brown very cobbly loam, platy and granular structure, slightly hard, pH 6.6.	0 to 2 inches; brown cobbly loam, granular structure, soft, pH 6.3.
Substratum	13 to 14 inches; strongly cemented silica duripan.	
Rooting Depth (in.) to Underlying Material	10 to 20; silica duripan over basalt	10 to 20; basalt
Erosion Factor (K)	.37	.37
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Slow	Slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ed	2ed
Soil Manageability Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	8	8
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	6 (Moderate)	5
Hydrologic Soil Group	D	D
Available Water Capacity (AWC)	Low	Very Low to Low
Upper 20 inches	1.5 to 3.0 inches	1.4 to 2.8 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	30-60	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-10; Clay loam Unified: CL, MH AASHTO: A-6, A-7 10-13; Clay Unified: CH AASHTO: A-7 13-14; Silica duripan 14+; Unweathered bedrock	0-2; Cobbly loam Unified: ML-CL, CL AASHTO: A-4, A-6 2-7; Clay loam Unified: CL, MH, CH AASHTO: A-6, A-7 7-16; Clay Unified: CH AASHTO: A-7 16+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Bieber, Pass Canyon, Barnard families, Lithic Xerorthents, mesic, and Rock outcrop.	

243 ROVAL-PASS CANYON FAMILIES COMPLEX, 1 to 15 percent slopes

Map Unit Components	Roval family (45 percent)	Pass Canyon family (40 percent)
Position, Slope, and Elevation	On nearly level to undulating basalt plateaus; 1 to 15 percent slopes; 4500 to 5800 feet.	On nearly level to undulating basalt plateaus; 1 to 15 percent slopes; 4500 to 5800 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, low sagebrush, rabbitbrush, Phlox spp., Idaho fescue, sandberg bluegrass, bottlebrush, cheatgrass; 14 to 16 inches ppt.	Western juniper, low sagebrush, rabbitbrush, Phlox spp., Idaho fescue, sandberg bluegrass, bottlebrush, cheatgrass; 14 to 16 inches ppt.
Surface Layer	0 to 2 inches; brown very cobbly loam, platy and granular structure, slightly hard, pH 6.6	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure, slightly hard, pH 6.8 to 6.6.
Substratum	13 to 14 inches; strongly cemented silica duripan.	
Rooting Depth (in.) to Underlying Material	10 to 20; silica duripan over basalt.	10 to 20; basalt
Erosion Factor (K)	.37	.32
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Slow	Moderately slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ed	2ed
Soil Manageability Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	8	8
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	6 (Moderate)	6
Hydrologic Soil Group	D	D
Available Water Capacity (AWC)	Low	Very Low to Low
Upper 20 inches	1.5 to 3.0 inches	1.3 to 2.6 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-10; Clay loam Unified: CL, MH AASHTO: A-6, A-7 10-13; Clay Unified: CH AASHTO: A-7 13-14; Silica duripan 14+; Unweathered bedrock	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7 12+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Barnard, Bieber, Deven, Puls and Gwin families and Lithic Xerorthents, mesic.	

244 RUCKLES-BIEBER FAMILIES COMPLEX, 2 to 30 percent slopes

Map Unit Components	Ruckles family (45 percent)	Bieber family (35 percent)
Position, Slope, and Elevation	On sideslopes and toeslopes of mountain uplands; 5 to 30 percent slopes; 4800 to 5800 feet.	On toeslopes and alluvial fans of mountain uplands; 2 to 20 percent slopes; 4800 to 5800 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, low sagebrush, big sagebrush, rabbitbrush, Idaho fescue, bottlebrush, Poa spp.; 14 to 16 inches ppt.	Few western juniper, low sagebrush, Phlox spp., western yarrow, Idaho fescue, bottlebrush, Poa spp.; 14 to 16 inches ppt.
Surface Layer	0 to 4 inches; brown, very cobbly loam, granular structure, soft, pH 7.0.	0 to 4 inches; brown very cobbly loam, blocky and granular structure, hard, pH 6.8.
Substratum		18 plus inches; strongly cemented silica duripan
Rooting Depth (in.) to Underlying Material	10 to 20; basalt, tuff	10 to 20; silica duripan over basalt, tuff
Erosion Factor (K)	.37	.37
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Slow	Very slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2edx	2edx
Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	8	8
Water Runoff Potential	Rapid	Moderate
Watershed Sensitivity	4 (Moderate)	5
Hydrologic Soil Group	D	D
Available Water Capacity (AWC)	Very Low to Low	Very Low to low
Upper 20 inches	1.0 to 2.0 inches	1.2 to 2.5 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low to Moderate	Low
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	0-30	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-4; Very cobbly loam Unified: SM, SC AASHTO: A-4, A-6 4-14; Very gravelly clay Unified: GC, CH AASHTO: A-7 14+; Unweathered bedrock	0-4; Very cobbly loam Unified: SC, CL AASHTO: A-6 4-18; Clay Unified: CH AASHTO: A-7 18+; Silica duripan
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Deven, Aikman and Keating families and Lithic Xerorthents, mesic.	

245 RUCKLES-GWIN FAMILIES-ROCK OUTCROP ASSOCIATION, 20 to 40 percent slopes

Map Unit Components	Ruckles family (35 percent)	Gwin family (30 percent)	Rock outcrop (20 percent)
Position, Slope, and Elevation	Mostly on southerly aspects of sideslopes of mountain uplands; 20 to 40 percent slopes; 4600 to 6000 feet.	Mostly on southerly aspects of upper sideslopes and ridges of mountain uplands; 20 to 40 percent slopes; 4600 to 6000 feet.	On ridges, and knolls of mountain uplands; 20 to 40 percent slopes; 4600 to 6000 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, few ponderosa pine, mountain mahogany, bitterbrush, mulesear, low sagebrush, Idaho fescue, bottlebrush, sandberg bluegrass; 14 to 18 inches ppt.	Western juniper, mountain mahogany, low sagebrush, big sagebrush, Idaho fescue, sandberg bluegrass, cheatgrass; 14 to 18 inches ppt.	
Surface Layer	0 to 4 inches; brown very cobbly loam, granular structure, soft, pH 7.0.	0 to 11 inches; dark grayish brown very cobbly loam, granular and blocky structure, slightly hard, pH 6.8.	NOT APPLICABLE: Basalt, andesite or conglomerated tuff bedrock with minor accumulations of aeolian soil deposition in some fractures.
Rooting Depth (in.) to Underlying Material	10 to 20; basalt, tuff	8 to 20; basalt	
Erosion Factor (K)	.37	.37	
Max. Erosion Hazard	Moderate to high	Moderate to high	
Soil Permeability	Slow	Moderately slow	
Drainage Class	Well drained	Well drained	
Soil Manageability Class	3Ed	2Edx	
Group	III		
Forest Site Class	7 (non-commercial)	7 (non-commercial)	
Range Site	8	8, 1	
Water Runoff Potential	Rapid	Rapid	Very Rapid
Watershed Sensitivity	4 (High)	5	2
Hydrologic Soil Group	D	D	
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.0 to 2.0 inches	Very Low to Low 0.8 to 1.9 inches	
Susceptibility to Burning Damage	Moderate	Moderate	
Slope Stability Hazard	Low to Moderate	Low	
Allowable Soil Loss	1 tons/acre/year	1 tons/acre/year	
Chance of Seedling Survival	Not Rated	Not Rated	
Rating for Timber Site	Not Rated	Not Rated	
R-Value	0-30	30-60	
Soil horizons in inches, USDA, Unified, AASHTO	0-4; Very cobbly loam Unified: SM, SC AASHTO: A-4, A-6 4-14; Very gravelly clay Unified: GC, CH AASHTO: A-7 14+; Unweathered bedrock	0-11; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 11-18; Extremely cobbly clay loam Unified: SC, CL AASHTO: A-6 18+; Unweathered bedrock	
Included Areas:	Included with this unit in mapping and making up about 15 percent of the acreage are the Fordice, Lawyer, Pass Canyon, Deven families and Lithic Xerorthents, mesic.		

246 MENZEL-HOLLAND FAMILIES, 4 to 15 inch pumice overburden-ROCK OUTCROP ASSOCIATION, 15 to 40 percent slopes

Map Unit Components	Menzel family (35 percent)	Holland family (25 percent)	Rock outcrop (25 percent)
Position, Slope, and Elevation	On basalt plateau scarp breaks; 15 to 40 percent slopes; 4300 to 4700 feet.	On basalt plateau scarp breaks; 15 to 40 percent slopes; 4300 to 4700 feet.	On ridges and upper sideslopes of basalt plateau scarp breaks; 20 to 40 percent slopes; 4300 to 4700 feet.
Typical Vegetation and Precipitation (ppt)	Ponderosa pine, bitterbrush, big sagebrush, rabbitbrush, greenleaf manzanita, Ross's sedge, few grasses; 16 to 20 inches ppt.	Ponderosa pine, western juniper, big sagebrush, bitterbrush, rabbitbrush, Ribes spp., needlegrass, Idaho fescue, Ross's sedge, other grasses; 16 to 20 inches ppt.	
Surface Layer	1/2 to 0 inches of ponderosa pine needles and pumice gravel pavement, over 14 inches of pumice overburden consisting of grayish brown gravelly coarse sand grading to very pale brown extremely gravelly coarse sand (pumice thickness ranges from 4 to 15 inches) OVER 14 to 18 inches; yellowish brown gravelly sandy loam, granular and blocky structure, soft, pH 6.8.	1 to 0 inches ponderosa pine needles and twigs, over 12 inches of pumice overburden consisting of 0 to 5 inches grayish brown gravelly coarse sand; 5 to 12 inches; very pale brown extremely gravelly coarse sand (thickness ranges from 4 to 15 inches) OVER 12 to 21 inches; brown loam, subangular blocky structure, hard, pH 6.6.	NOT APPLICABLE: Basalt bedrock with minor accumulations of aeolian soil deposition in some fractures.
Rooting Depth (in.) to Underlying Material	40 plus; basalt, colluvium	20 to 40; basalt	
Erosion Factor (K)	.15	.20	
Max. Erosion Hazard	Moderate	Moderate	
Soil Permeability	Rapid in the pumice overburden to moderately rapid below.	Rapid in the pumice overburden to moderately slow below.	
Drainage Class	Well drained	Well drained	
Soil Manageability Class Group	2ep II	2ep	
Forest Site Class	5 (3-4)	6 (4-5)	
Range Site	Not placed in a range site.	Not placed in a range site.	
Water Runoff Potential	Very Slow	Slow	Very Rapid
Watershed Sensitivity	9 (Moderate)	8	2
Hydrologic Soil Group	A	B	
Available Water Capacity (AWC) Upper 20 inches	Moderate to High 2.4 inches	Low to Moderate 2.6 inches	
Susceptibility to Burning Damage	Moderate to High	Moderate to High	
Slope Stability Hazard	Low	Low	
Allowable Soil Loss	3 tons/acre/year	2 tons/acre/year	
Chance of Seedling Survival	Moderate	Moderate	
Rating for Timber Site R-Value	Fair (5, 10) 60+	Fair (5, 7, 10) 30-60	

246 MENZEL-HOLLAND FAMILIES, 4 to 15 inch pumice overburden-ROCK OUTCROP ASSOCIATION

(continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-4; Gravelly coarse sand Unified: SM AASHTO: A-1-b	0-5; Gravelly coarse sand Unified: SW-SM, SM AASHTO: A-1-b
4-14; Extremely gravelly coarse sand Unified: GW-GM AASHTO: A-1-a	5-12; Extremely gravelly coarse sand Unified: GW-GM AASHTO: A-1-a
14-60; Gravelly sandy loam, very gravelly sandy loam Unified: SM AASHTO: A-1-b, A-2-4	12-21; Loam Unified: CL AASHTO: A-6
	21-37; Clay loam Unified: CL, MH AASHTO: A-6, A-7
	37+; Unweathered bedrock

Included Areas:

Included with this unit in mapping and making up about 15 percent of the acreage are the Alcot, Skalan families and Lithic Xerorthents, mesic, areas of steeper slopes, and soils similar to the Menzel and Holland families but with a deeper pumice overburden.

247 SEARLES-GWIN FAMILIES-LAVA FLOW COMPLEX, 1 to 10 percent slopes

Map Unit Components	Searles family (40 percent)	Gwin family (25 percent)	Lava flow (20 percent)
Position, Slope, and Elevation	On knolls and depressions of undulating basalt plateaus; 1 to 10 percent slopes; 4200 to 5000 feet.	On knolls and depressions of undulating basalt plateaus; 1 to 10 percent slopes; 4200 to 5000 feet.	On ridges and moundlike protrusions of fractured and disaggregated lava flow rock on undulating basalt plateaus; 2 to 10 percent slopes 4200 to 5000 feet.
Typical Vegetation and Precipitation (ppt)	Bitterbrush, big sagebrush, mountain mahogany, Idaho fescue, stipa, bluebunch wheatgrass, Bromus spp., other grasses, 10 to 14 inches ppt.	Bitterbrush, big sagebrush, Idaho fescue, bluebunch wheatgrass, Bromus spp., Agropiran spp., Stipa, other grasses, western juniper and mountain mahogany, 10 to 14 inches ppt.	
Surface Layer	0 to 7 inches; brown gravelly sandy loam, granular structure, soft, pH 7.0.	0 to 11 inches; dark grayish brown very cobbly loam, subangular blocky and granular structure, slightly hard, pH 6.8.	NOT APPLICABLE: Fractured vesicular basalt flow rock with minor accumulations of aeolian soil deposition in some fractures.
Rooting Depth (in.) to Underlying Material	20 to 40; basalt	10 to 20; basalt	
Erosion Factor (K)	.24	.37	
Max. Erosion Hazard	Low	Moderate	
Soil Permeability	Moderately slow	Moderately slow	
Drainage Class	Well drained	Well drained	
Soil Manageability Class	2x	2edx	
Soil Manageability Group	II		
Forest Site Class	7 (non-commercial)	7 (non-commercial)	
Range Site	17, 16	7	
Water Runoff Potential	Very Slow	Slow	Rapid
Watershed Sensitivity	8 (Moderate)	6	5
Hydrologic Soil Group	B	D	
Available Water Capacity (AWC)	Low to Moderate	Very Low to Low	
Upper 20 inches	2.3 inches	1.0 to 2.0 inches	
Susceptibility to Burning Damage	Low	Low	
Slope Stability Hazard	Low	Low	
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year	
Chance of Seedling Survival	Not Rated	Not Rated	
Rating for Timber Site	Not Rated	Not Rated	
R-Value	30-60	30-60	

247 SEARLES-GWIN FAMILIES-LAVA FLOW COMPLEX (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-7; Gravelly sandy loam Unified: SM, SM-SC AASHTO: A-4	0-11; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4
7-14; Cobbly loam Unified: ML-CL, CL AASHTO: A-4, A-6	11-18; Extremely cobbly clay loam Unified: SC, CL AASHTO: A-6
14-34; Extremely cobbly loam Unified: SC AASHTO: A-6	18+; Unweathered bedrock
34+; Unweathered bedrock	

Included Areas:

Included with this unit in mapping and making up about 15 percent of the acreage are the Lithic Xerorthents, mesic, Pass Canyon, Bakeoven, Stukel, Fordice, and Neer families and lava flow rock with steeper slopes.

249 SHELD-AHART FAMILIES ASSOCIATION, 2 to 20 percent slopes

Map Unit Components	Sheld family (50 percent)	Ahart family (30 percent)
Position, Slope, and Elevation	On sideslopes of volcanic mountain uplands; 5 to 20 percent slopes; 5600 to 6200 feet.	On toeslopes and alluvial draws of volcanic mountain uplands; 2 to 15 percent slopes; 5600 to 6200 feet.
Typical Vegetation and Precipitation (ppt)	Mixed conifer forest of white fir, ponderosa pine, incense cedar, plus greenleaf manzanita, snowberry ceonothus, currant spp., Ross's sedge, grasses; 30 to 40 inches ppt.	Mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus greenleaf manzanita, snowberry, coenothus, currant spp., Ross's sedge, grasses; 30 to 40 ppt.
Surface Layer	2 to 0 inches of white fir and ponderosa pine needles and twigs, over 0 to 25 inches; dark grayish brown and brown gravelly fine sandy loam and very cobbly loam, granular and subangular blocky structure; soft, pH 5.8 to 6.2.	1/2 to 0 inches mostly undecomposed white fir needles and grass over 0 to 12 inches; brown gravelly fine sandy loam; granular structure; soft; pH 6.2.
Substratum	44 to 50 inches; light yellowish brown extremely cobbly loam, massive, soft, pH 6.2.	28 to 60 inches; light yellowish brown very gravelly fine sandy loam; massive; soft; pH 6.0.
Rooting Depth (in.) to Underlying Material	40 plus inches; hard basalt.	40 plus inches; hard basalt, alluvium
Erosion Factor (K)	.20	.20
Max. Erosion Hazard	Low to moderate	Low
Soil Permeability	Moderate	Moderate
Drainage Class	Well drained	Well drained
Soil Manageability Class	2e	1
Group	II	
Forest Site Class	4 (2-3)	4 (2-3)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Very slow
Watershed Sensitivity	9 (Low)	9
Hydrologic Soil Group	B	B
Available Water Capacity (AWC)	Moderate to High	Moderate to High
Upper 20 inches	3.1 inches	3.0 inches
Susceptibility to Burning Damage	Moderate	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	High	High
Rating for Timber Site	Good	Good
R-Value	60+	60+
Soil horizons in inches, USDA, Unified, AASHTO	0-12; Gravelly fine sandy loam Unified: SM AASHTO: A-4 12-50; Very cobbly loam, very gravelly loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-4 50+; Unweathered bedrock	0-60; Gravelly fine sandy loam Unified: SM AASHTO: A-2-4, A-4
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Lithic Xerumbrepts, Stonewell and Yallani families and Rock outcrop.	

250 SIMPSON FAMILY, 1 to 10 percent slopes

Map Unit Components	Simpson family (75 percent)
Position, Slope, and Elevation	On lower sideslopes, toeslopes and alluvial basins of basalt plateaus; 1 to 10 percent slopes; 4300 to 4700 feet.
Typical Vegetation and Precipitation (ppt)	Rabbitbrush, big sagebrush, few western juniper, sandberg bluegrass, wheatgrass; 10 to 14 inches ppt.
Surface Layer	0 to 3 inches; brown loam, granular structure, slightly hard, pH 7.2.
Substratum	28 to 30 inches; yellowish brown semi-consolidated ashy tuff which rubs to a clay loam, massive, very hard, pH 7.6.
Rooting Depth (in.) to Underlying Material	20 to 40; basalt
Erosion Factor (K)	.43
Max. Erosion Hazard	Low
Soil Permeability	Slow
Drainage Class	Well drained
Soil Manageability Class	1
Group	I
Forest Site Class	7 (non-commercial)
Range Site	12
Water Runoff Potential	Slow
Watershed Sensitivity	6 (Moderate)
Hydrologic Soil Group	C
Available Water Capacity (AWC)	Low to Moderate
Upper 20 inches	2.7 inches
Susceptibility to Burning Damage	Low
Slope Stability Hazard	Low
Allowable Soil Loss	2 tons/acre/year
Chance of Seedling Survival	Not Rated
Rating for Timber Site	Not Rated
R-Value	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-3; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 3-8; Silty clay loam Unified: CL, MH, CH AASHTO: A-6, A-7 8-28; Silty clay Unified: CH AASHTO: A-7 28-30; Clay loam Unified: CL, MH, CH AASHTO: A-6, A-7 30+; Unweathered bedrock
Included Areas:	Included with this soil in mapping and making up about 25 percent of the acreage are the Deven, Dishner, Pass Canyon families and Lithic Xerorthents, mesic.

251 SIMPSON-DEVEN FAMILIES ASSOCIATION, 1 to 20 percent slopes

Map Unit Components	Simpson family (55 percent)	Deven family (25 percent)
Position, Slope, and Elevation	On lower sideslopes, toeslopes and alluvial fans of basalt plateaus; 1 to 15 percent slopes; 4300 to 4800 feet.	On upper sideslopes, ridges and knolls of basalt plateaus; 2 to 20 percent slopes; 4300 to 4800 feet.
Typical Vegetation and Precipitation (ppt)	Big sagebrush, rabbitbrush, Phlox spp., Idaho fescue, sandberg bluegrass; 10 to 14 inches ppt.	Western juniper, low sagebrush, rabbitbrush, Phlox spp., Idaho fescue, sandberg bluegrass cheatgrass; 10 to 14 inches ppt.
Surface Layer	0 to 3 inches; brown loam, granular structure, slightly hard, pH 7.2.	0 to 2 inches; brown cobbly loam, granular structure, soft, pH 6.3.
Substratum	28 to 30 inches; yellowish brown semi-consolidated ashy tuff which rubs to a clay loam, massive, very hard, pH 7.6.	
Rooting Depth (in.) to Underlying Material	20 to 40; hard basalt	10 to 20; hard basalt
Erosion Factor (K)	.43	.37
Max. Erosion Hazard	Low to moderate	Moderate
Soil Permeability	Slow	Slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2e	2ed
Soil Manageability Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	12, 17	7
Water Runoff Potential	Slow	Moderate
Watershed Sensitivity	6 (Moderate)	5
Hydrologic Soil Group	C	D
Available Water Capacity (AWC)	Low to Moderate	Very Low to Low
Upper 20 inches	2.7 inches	1.4 to 2.8 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low	Low
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	0-30	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-3; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 3-8; Silty clay loam Unified: CL, MH, CH AASHTO: A-6, A-7 8-28; Silty clay Unified: CH AASHTO: A-7 28-30; Clay loam Unified: CL, MH, CH AASHTO: A-6, A-7	0-2; Cobbly loam Unified: ML-CL, CL AASHTO: A-4, A-6 2-7; Clay loam Unified: CL, MH, CH AASHTO: A-6, A-7 7-16; Clay Unified: CH AASHTO: A-7 16+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Dishner, Castlevale, Barnard, Jackknife, Bieber, Pass Canyon Families, Lithic Xerorthents, mesic, and rock outcrop.	

252 SMARTS deep-SMARTS FAMILY COMPLEX, 2 to 20 percent slopes

Map Unit Components	Smarts family, deep (50 percent)	Smarts family (30 percent)
Position, Slope, and Elevation	On sideslopes and toeslopes of mountain uplands; 2 to 20 percent slopes; 5300 to 7500 feet.	On upper sideslopes, knolls and incised drainages of mountain uplands; 2 to 20 percent slopes; 5300 to 7500 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus green leaf manzanita, snowberry, serviceberry, Ross's sedge, few grasses, (Note - in the northeastern part of the survey area stands of ponderosa pine/ jeffrey pine are found); 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus few western juniper, few lodgepole pine at higher elevations, greenleaf manzanita, serviceberry, Ross's sedge, few grasses, (Note- in the northeastern part of the survey area stands of ponderosa pine/jeffrey pine are found); 20 to 30 inches ppt.
Surface Layer	2 to 0 inches of decomposed and undecomposed white for needles and twigs, over 0 to 18 inches; brown stony loam, granular structure, soft, pH 6.2.	1/2 to 0 inches of ponderosa pine and white fir needles and twigs, over 0 to 20 inches reddish brown stony loam and very cobbly loam, granular and blocky structure, slightly hard and hard, pH 6.6 to 6.8.
Rooting Depth (in.) to Underlying Material	40 plus; basalt, tuff	20 to 40; basalt, tuff
Erosion Factor (K)	.32	.32
Max. Erosion Hazard	Low to moderate	Low to moderate
Soil Permeability	Moderately slow	Moderately slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ep	2epx
Soil Manageability Group	II	
Forest Site Class	4 (2-3)	5 (3-4)
Range Site	Not placed in a range site.	Not placed in a range site
Water Runoff Potential	Very Slow	Slow
Watershed Sensitivity	8 (Low)	7
Hydrologic Soil Group	B	B
Available Water Capacity (AWC)	Moderate	Low to Moderate
Upper 20 inches	2.6 inches	2.1 inches
Susceptibility to Burning Damage	Low to Moderate	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	2 tons/acre/year
Chance of Seedling Survival	Moderate	Low
Rating for Timber Site	Fair (1)	Fair (1,3,7)
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-18; Stony loam Unified: ML-CL, CL AASHTO: A-4 18-50; Extremely gravelly clay loam, extremely gravelly loam Unified: SC AASHTO: A-2-6, A-6 50+; Weathered bedrock	1-20; Stony loam, very cobbly loam Unified: ML-CL, ML AASHTO: A-4 20-28; Very gravelly loam Unified: SM-SC, SC AASHTO: A-4, A-6 28-35; Extremely gravelly clay loam Unified: GC AASHTO: A-2-6, A-2-7 35+; Weathered bedrock
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Mascamp, Lamondi, DeMasters and Merlin families.	

253 SMARTS deep-SMARTS FAMILY COMPLEX, 20 to 40 percent slopes

Map Unit Components	Smarts family, deep (45 percent)	Smarts family (35 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 20 to 35 percent slopes; 5500 to 7500 feet.	On upper sideslopes, ridges and incised drainages of mountain uplands; 20 to 40 percent slopes; 5500 to 7500 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus greenleaf manzanita, snowberry, serviceberry, Ross's sedge, few grasses; 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus few western juniper, few lodgepole pine at higher elevations; greenleaf manzanita, mulesear, serviceberry, Ross's sedge, few grasses; 20 to 30 inches ppt.
Surface Layer	2 to 0 inches of decomposed and undecomposed white fir needles and twigs over 0 to 18 inches; brown stony loam, granular structure, soft, pH 6.2.	1/2 to 0 inches; ponderosa pine and white fir needles and twigs, over 0 to 20 inches; reddish brown stony loam and very cobbly loam, granular and blocky structure, slightly hard and hard, pH 6.6 to 6.8.
Rooting Depth (in.) to Underlying Material	40 plus; basalt	20 to 40; basalt
Erosion Factor (K)	.32	.32
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately slow	Moderately slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ep	2epx
Soil Manageability Group	II	
Forest Site Class	4 (2-3)	5 (3-4)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow
Watershed Sensitivity	7 (Moderate)	7
Hydrologic Soil Group	B	B
Available Water Capacity (AWC)	Moderate	Low to Moderate
Upper 20 inches	2.6 inches	2.1 inches
Susceptibility to Burning Damage	Low to Moderate	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	2 tons/acre/year
Chance of Seedling Survival	Moderate	Low
Rating for Timber Site	Fair (1)	Fair (1,3,7)
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-18; Stony loam Unified: ML-CL, CL AASHTO: A-4 18-50; Extremely gravelly clay loam, extremely gravelly loam Unified: SC AASHTO: A-2-6, A-6 50+; Weathered bedrock	0-20; Stony loam, very cobbly loam Unified: ML-CL, ML AASHTO: A-4 20-28; Very gravelly loam Unified: SM-SC, SC AASHTO: A-4, A-6 28-35; Extremely gravelly clay loam Unified: GC AASHTO: A-2-6, A-2-7 35+; Weathered bedrock
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the DeMasters, Lamondi, Mascamp, Anatone families, Lithic Xerorthents, frigid, and rock outcrop.	

254 SMARTS-BERTAG-DEMASTERS FAMILIES, deep ASSOCIATION, 10 to 35 percent slopes

Map Unit Components	Smarts family, deep (35 percent)	Bertag family, deep (25 percent)	DeMasters family, deep (20 percent)
Position, Slope, and Elevation	On upper sideslopes and ridges of mountain uplands;; 10 to 35 percent slopes; 5500 to 7500 feet.	On middle to lower sideslopes and draws of mountain uplands; 10 to 35 percent slopes; 5500 to 7500 feet.	On lower sideslopes, toeslopes and alluvial fans of mountain uplands; 10 to 35 percent slopes; 5500 to 7500 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, plus mountain mahogany, big sagebrush, ceonothus, mulesear, snowberry, Ross's sedge, few grasses; 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, plus few quaking aspen, snowberry, serviceberry, current spp., Ross's sedge, few grasses; 20 to 30 inches ppt.	
Surface Layer	2 to 0 inches of decomposed and undecomposed white fir needles and twigs, over 0 to 18 inches; brown stony loam, granular structure, soft, pH 6.2.	1-1/2 to 0 inches of ponderosa pine and white fir needles and twigs, over 0 to 13 inches; dark brown loam, granular and blocky structure, slightly hard, pH 6.4.	1-1/2 to 0 inches of ponderosa pine and white fir needles and twigs, over 0 to 14 inches; brown loam, granular and blocky structure, soft, pH 5.6 to 6.4.
Rooting Depth (in.) to Underlying Material	40 plus; basalt tuff	40 plus; tuff	40 plus; basalt, tuff, alluvium
Erosion Factor (K)	.32	.43	.32
Max. Erosion Hazard	Low to moderate	Moderate	Low to moderate
Soil Permeability	Moderately slow	Slow	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2ep II	2s	2e
Forest Site Class	4 (2-3)	4 (2-3)	4 (2-3)
Range Site	No placed in a range site.	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Moderate	Slow
Watershed Sensitivity	7 (Moderate)	5	7
Hydrologic Soil Group	B	C	B
Available Water Capacity (AWC) Upper 20 inches	Moderate 2.6 inches	Moderate to High 2.9 inches	Moderate to High 3.4 inches
Susceptibility to Burning Damage	Low to Moderate	Low to Moderate	Low to Moderate
Slope Stability Hazard	Low	Low to Moderate	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Moderate	Moderate to High	High
Rating for Timber Site	Fair (1)	Good	Good
R-Value	30-60	0-30	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-18; Stony loam Unified: ML-CL, CL AASHTO: A-4 18-50; Extremely gravelly clay loam, extremely gravelly loam Unified: SC AASHTO: A-2-6, A-6 50+; Weathered bedrock	0-13; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 13-20; Cobbly clay loam Unified: CL, CH AASHTO: A-6, A-7 20-60; Gravelly clay Unified: CH AASHTO: A-7	0-14; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 14-37; Gravelly clay loam Unified: CL AASHTO: A-6 37-60; Extremely cobbly clay loam Unified: SC, CL AASHTO: A-6, A-7

254 SMARTS-BERTAG-DEMASTERS FAMILIES, deep ASSOCIATION (continued)

Included Areas:

Included with these soils in mapping and making up about 20 percent of acreage are the Cavanaugh, Mascamp, Merlin, Manila, Lamondi and Vipont families, and moderately deep Smarts and DeMasters families.

255 SMARTS deep-CAVANAUGH FAMILIES COMPLEX, 10 to 35 percent slopes

Map Unit Components	Smarts family, deep (50 percent)	Cavanaugh Family (30 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 10 to 35 percent slopes; 5500 to 6600 feet.	On sideslopes and toeslopes of mountain uplands; 10 to 35 percent slopes; 5500 to 6600 feet.
Typical Vegetation and Precipitation (ppt)	White fire forest, or mixed conifer forest of ponderosa pine, white fir, plus squaw carpet mulesear, snowberry, bitterbrush, Ross's sedge, grasses; 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of ponderosa pine, white fir, plus western juniper, mountain mahogany, squaw carpet, big sagebrush, bitterbrush, mulesear, Ross's sedge, grasses; 20 to 30 inches ppt.
Surface Layer	2 to 0 inches of decomposed and undecomposed white fir needles and twigs, over 0 to 18 inches; stony loam, granular structure, soft, pH 6.2.	1 to 0 inches of white fir and ponderosa pine needles, over 0 to 13 inches; dark brown and brown cobbly loam to very cobbly loam, granular and blocky structure, slightly hard, pH 6.4.
Substratum	32 to 50 inches; pale brown extremely gravelly loam, massive, soft, pH 6.0.	
Rooting Depth (in.) to Underlying Material	40 plus; basalt, tuff	30 plus; tuff basalt
Erosion Factor (K)	.32	.37
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately slow	Slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ep	2s
Group	II	
Forest Site Class	4 (2-3)	4-5 (3-4)
Range Site	Not palced in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Moderate
Watershed Sensitivity	7 (Moderate)	5
Hydrologic Soil Group	B	C
Available Water Capacity (AWC)	Moderate	Low to Moderate
Upper 20 inches	2.6 inches	2.5 inches
Susceptibility to Burning Damage	Low to Moderate	Moderate
Slope Stability Hazard	Low	Low to Moderate
Allowable Soil Loss	3 tons/acre/year	2, 3 tons/acre/year
Chance of Seedling Survival	Moderate	Low to Moderate
Rating for Timber Site	Fair (1)	Fair (3)
R-Value	30-60	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-18; Stony loam Unified: ML-CL, CL AASHTO: A-4 18-50; Extremely gravelly clay loam, extremely gravelly loam Unified: SC AASHTO: A-2-6, A-6 50+; Weathered bedrock	0-7; Cobbly loam Unified: ML-CL, CL AASHTO: A-4, A-6 7-13; Very cobbly loam Unified: SM-SC, SC AASHTO: A-4, A-6 13-18; Very cobbly clay loam Unified: CL AASHTO: A-6 18-60; Very gravelly clay, extremely gravelly clay loam Unified: GC AASHTO: A-2-7, A-7
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the DeMasters, Manila, Bertag and Anatone families, Rock outcrop and Smarts family, moderately deep.	

256 SMARTS deep-CAVANAUGH FAMILIES COMPLEX, 35 to 60 percent slopes

Map Unit Components	Smarts family, deep (55 percent)	Cavanaugh Family (25 percent)
Position, Slope, and Elevation	On sideslopes of basalt plateau breaks and mountain uplands; 35 to 60 percent slopes; 5500 to 6600 feet.	On sideslopes of basalt plateau breaks and mountain uplands; 35 to 60 percent slopes; 5500 to 6600 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of ponderosa pine, white fir, plus squaw carpet mulesear, snowberry, bitterbrush, Ross's sedge, grasses; 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of ponderosa pine, white fir, plus western juniper, mountain mahogany, squaw carpet, big sagebrush, bitterbrush, mulesear, Ross's sedge, grasses; 20 to 30 inches ppt.
Surface Layer	2 to 0 inches of decomposed and undecomposed white fir needles and twigs, over 0 to 18 inches; stony loam, granular structure, soft, pH 6.2.	1 to 0 inches of white fir and ponderosa pine needles, over 0 to 13 inches; dark brown and brown cobbly loam to very cobbly loam, granular and blocky structure, slightly hard, pH 6.4.
Substratum	32 to 50 inches; pale brown extremely gravelly loam, massive, soft, pH 6.0.	
Rooting Depth (in.) to Underlying Material	40 plus; basalt, tuff	30 plus; tuff basalt
Erosion Factor (K)	.32	.37
Max. Erosion Hazard	High	High
Soil Permeability	Moderately slow	Slow
Drainage Class	Well drained	Well drained
Soil Manageability Class	3ep	3s
Soil Manageability Group	III	
Forest Site Class	4 (2-3)	4-5 (3-4)
Range Site	Not palced in a range site.	Not placed in a range site.
Water Runoff Potential	Moderate	Rapid
Watershed Sensitivity	6 (Moderate)	4
Hydrologic Soil Group	B	C
Available Water Capacity (AWC) Upper 20 inches	Moderate 2.6 inches	Low to Moderate 2.5 inches
Susceptibility to Burning Damage	Moderate	Moderate
Slope Stability Hazard	Low	High
Allowable Soil Loss	3 tons/acre/year	2, 3 tons/acre/year
Chance of Seedling Survival	Moderate	Low to Moderate
Rating for Timber Site	Fair (1,8)	Fair (3,8)
R-Value	30-60	0-30
Soil horizons in inches, USDA, Unified, AASHTO	0-18; Stony loam Unified: ML-CL, CL AASHTO: A-4 18-50; Extremely gravelly clay loam, extremely gravelly loam Unified: SC AASHTO: A-2-6, A-6 50+; Weathered bedrock	0-7; Cobbly loam Unified: ML-CL, CL AASHTO: A-4, A-6 7-13; Very cobbly loam Unified: SM-SC, SC AASHTO: A-4, A-6 13-18; Very cobbly clay loam Unified: CL AASHTO: A-6 18-60; Very gravelly clay, extremely gravelly clay loam Unified: GC AASHTO: A-2-7, A-7
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the DeMasters, Manila, Anatone and Merlin families, Rock outcrop and Smarts family, moderately deep.	

257 SMARTS-MASCAMP FAMILIES ASSOCIATION, 40 to 60 percent slopes

Map Unit Components	Smarts family (50 percent)	Mascamp family (30 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 40 to 60 percent slopes; 5500 to 7500 feet.	On upper sideslopes, ridges and knolls of mountain uplands; 40 to 60 percent slopes; 5500 to 7500 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus squaw carpet, snowbrush, serviceberry, manzanita, viola, mulesear, Ross's sedge, few grasses; 20 to 30 inches ppt.	Western juniper, low sagebrush, big sagebrush, rabbitbrush, mountain mahogany, Idaho fescue, cheatgrass, other grasses; 20 to 30 inches ppt.
Surface Layer	1/2 to 0 inches; ponderosa pine and white fir needles and twigs, over 0 to 20 inches; reddish brown stony loam and very cobbly loam, granular and blocky structure, slightly hard and hard, pH 6.6 to 6.8.	0 to 6 inches; dark grayish brown very cobbly loam, granular structure, slightly hard, pH 6.8.
Rooting Depth (in.) to Underlying Material	20 to 40; basalt, tuff	10 to 20; basalt, tuff
Erosion Factor (K)	.32	.37
Max. Erosion Hazard	High	High to very high
Soil Permeability	Moderately slow	Moderate
Drainage Class	Well drained	Well drained
Soil Manageability Class	3Ep	3Ed
Group	III	
Forest Site Class	5 (3-4)	7 (non-commercial)
Range Site	Not placed in a range site	9
Water Runoff Potential	Moderate	Rapid
Watershed Sensitivity	6 (Moderate)	4
Hydrologic Soil Group	B	D
Available Water Capacity (AWC)	Low to Moderate	Very Low to Low
Upper 20 inches	2.1 inches	1.2 to 2.5 inches
Susceptibility to Burning Damage	Moderate to High	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Not Rated
Rating for Timber Site	Fair (1,3,7,8)	Not Rated
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-20; Stony loam, very cobbly loam Unified: ML, ML-CL AASHTO: A-4 20-28; Very gravelly loam Unified: SM-SC, SC AASHTO: A-4, A-6 28-35; Extremely gravelly clay loam Unified: GC AASHTO: A-2-6, A-2-7 35+; Weathered bedrock	0-12; Very cobbly loam, very gravelly loam Unified: SM-SC, SC AASHTO: A-4 12-19; Very gravelly clay loam Unified: SC AASHTO: A-2-6, A-6 19+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Anatone, Bearskin, DeMasters, Lamondi, Bertag, Cavanaugh, Hades and Vipont families, Rock outcrop, Rubble land and unnamed soils similar to DeMasters family but not Pachic.	

258 SMARTS-MASCAMP-DEMASTERS deep FAMILIES ASSOCIATION, 2 to 20 percent slopes

Map Unit Components	Smarts family (40 percent)	Mascamp family (25 percent)	DeMasters family, deep (20 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 2 to 20 percent slopes; 5500 to 7500 feet.	On upper sideslopes, ridges and knolls of mountain uplands; 5 to 20 percent slopes; 5500 to 7500 feet.	On lower sideslopes and alluvial draws of mountain uplands; 2 to 20 percent slopes; 5500 to 7500 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus squaw carpet, snowbrush, serviceberry, manzanita, viola, mulesear, Ross's sedge, few grasses; 20 to 30 inches ppt.	Western juniper, low sagebrush, big sagebrush, rabbitbrush, mountain mahogany, Idaho fescue, cheatgrass, other grasses; 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus few quaking aspen, snowbrush, service- berry, forbes, Ross's sedge, few grasses; 20 to 30 inches ppt.
Surface Layer	1/2 to 0 inches; ponderosa pine and white fir needles and twigs, over 0 to 20 inches; reddish brown stony loam and very cobbly loam, granular and blocky structure, stlightly hard and hard, pH 6.6 to 6.8.	0 to 6 inches; dark grayish brown very cobbly loam, granular structure, slightly hard, pH 6.8.	1-1/2 to 0 inches of ponderosa pine and white fir needles and twigs, over 0 to 14 inches; brown loam, granular and blocky structure, soft, pH 5.6 to 6.4.
Rooting Depth (in.) to Underlying Material	20 to 40; basalt, tuff	10 to 20; basalt, tuff	40 plus; basalt, tuff, alluvium
Erosion Factor (K)	.32	.37	.32
Max. Erosion Hazard	Low to Moderate	Moderate	Low to Moderate
Soil Permeability	Moderately slow	Moderate	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2ep II	2ed	2e
Forest Site Class	5 (3-4)	7 (non-commercial)	4 (2-3)
Range Site	Not placed in a range site	9	Not placed in a range site
Water Runoff Potential	Slow	Moderate	Very Slow
Watershed Sensitivity	7 (Moderate)	6	8
Hydrologic Soil Group	B	D	B
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 2.1 inches	Very Low to Low 1.2 to 2.5 inches	Moderate to High 3.4 inches
Susceptibility to Burning Damage	Low to Moderate	Low	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Not Rated	High
Rating for Timber Site	Fair (1,3,7)	Not Rated	Good
R-Value	30-60	30-60	30-60

258 SMARTS-MASCAMP-DEMASTERS deep FAMILIES ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-20; Stony loam, very cobbly loam Unified: ML, ML-CL AASHTO: A-4	0-12; Very cobbly loam, very gravelly loam Unified: SM-SC, SC AASHTO: A-4	0-14; Loam Unified: ML-CL, CL AASHTO: A-4, A-6
20-28; Very gravelly loam Unified: SM-SC, SC AASHTO: A-4, A-6	12-19; Very gravelly clay loam Unified: SC AASHTO: A-2-6, A-6	14-37; Gravelly clay loam Unified: CL AASHTO: A-6
28-35; Extremely gravelly clay loam Unified: GC AASHTO: A-2-6, A-2-7	19+; Unweathered bedrock	37-60; Extremely cobbly clay laom Unified: SC, CL AASHTO: A-6, A-7
35+; Weathered bedrock		

Included Areas:

Included with these soils in mapping and making up about 15 percent of the acreage are the Anatone, Bearskin, Lamondi, Bertag, Cavanaugh, Hades and Vipont families, and Rock outcrop.

259 SMARTS-MASCAMP-DEMASTERS deep FAMILIES ASSOCIATION, 20 to 40 percent slopes

Map Unit Components	Smarts family (40 percent)	Mascamp family (30 percent)	DeMasters family, deep (15 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 20 to 40 percent slopes; 5500 to 7500 feet.	On upper sideslopes, ridges and knolls of mountain uplands; 20 to 40 percent slopes; 5500 to 7500 feet.	On lower sideslopes and alluvial draws of mountain uplands; 20 to 35 percent slopes; 5500 to 7500 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus squaw carpet, snowbrush, serviceberry, manzanita, viola, mulesear, Ross's sedge, few grasses; 20 to 30 inches ppt.	Western juniper, low sagebrush, big sagebrush, rabbitbrush, mountain mahogany, Idaho fescue, cheatgrass, other grasses; 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus few quaking aspen, snowbrush, service- berry, forbes, Ross's sedge, few grasses; 20 to 30 inches ppt.
Surface Layer	1/2 to 0 inches; ponderosa pine and white fir needles and twigs, over 0 to 20 inches; reddish brown stony loam and very cobbly loam, granular and blocky structure, slightly hard and hard, pH 6.6 to 6.8.	0 to 6 inches; dark grayish brown very cobbly loam, granular structure, slightly hard, pH 6.8.	1-1/2 to 0 inches of ponderosa pine and white fir needles and twigs, over 0 to 14 inches; brown loam, granular and blocky structure, soft, pH 5.6 to 6.4.
Rooting Depth (in.) to Underlying Material	20 to 40; basalt, tuff	10 to 20; basalt, tuff	40 plus; basalt, tuff, alluvium
Erosion Factor (K)	.32	.37	.32
Max. Erosion Hazard	Moderate	Moderate to High	Moderate
Soil Permeability	Moderately slow	Moderate	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2ep II	3Ed	2e
Forest Site Class	5 (3-4)	7 (non-commercial)	4 (2-3)
Range Site	Not placed in a range site	9	Not placed in a range site
Water Runoff Potential	Slow	Rapid	Slow
Watershed Sensitivity	7 (Moderate)	5	7
Hydrologic Soil Group	B	D	B
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 2.1 inches	Very Low to Low 1.2 to 2.5 inches	Moderate to High 3.4 inches
Susceptibility to Burning Damage	Moderate	Moderate	Low to Moderate
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Not Rated	High
Rating for Timber Site	Fair (1,3,7)	Not Rated	Good
R-Value	30-60	30-60	30-60

259 SMARTS-MASCAMP-DEMASTERS deep FAMILIES ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-20; Stony loam, very cobbly loam Unified: ML, ML-CL AASHTO: A-4	0-12; Very cobbly loam, very gravelly loam Unified: SM-SC, SC AASHTO: A-4	0-14; Loam Unified: ML-CL, CL AASHTO: A-4, A-6
20-28; Very gravelly loam Unified: SM-SC, SC AASHTO: A-4, A-6	12-19; Very gravelly clay loam Unified: SC AASHTO: A-2-6, A-6	14-37; Gravelly clay loam Unified: CL AASHTO: A-6
28-35; Extremely gravelly clay loam Unified: GC AASHTO: A-2-6, A-2-7	19+; Unweathered bedrock	37-60; Extremely cobbly clay loam Unified: SC, CL AASHTO: A-6, A-7
35+; Weathered bedrock		

Included Areas:

Included with these soils in mapping and making up about 15 percent of the acreage are the Anatone, Bearskin, Lamondi, Bertag, Cavanaugh, Hades and Vipont families, Rock outcrop and unnamed soils similar to DeMasters and Smarts families but no Pachic.

260 STONEWELL FAMILY, 40 to 60 inch pumice, 15 to 40 percent slopes

Map Unit Components	Stonewell family, pumice (75 percent)
Position, Slope, and Elevation	On sideslopes and toeslopes of volcanic mountain uplands with a deep deposit of recent pyroclastic pumice; 15 to 40 percent slopes; 5400 to 6400 feet.
Typical Vegetation and Precipitation (ppt)	Open mixed conifer stands of ponderosa pine, sugar pine, white fir and incense-cedar, and more dense stands of lodgepole pine above 5700 feet in some areas, plus greenleaf manzanita, bitterbrush, ceonothus, Ross's sedge, bunchgrasses; 25 to 40 inches ppt.
Surface Layer	1 to 0 inches; scattered ponderosa pine needles mixed with pumice gravels over, 0 to 4 inches; dark grayish brown very gravelly loamy sand (pumice) single grain structure, loose, pH 6.2.
Substratum	4 to 50 inches; light gray extremely gravelly coarse sand (pumice) grading to gravelly coarse sand at 44 to 50 inches over extremely cobbly sandy loam from 50 to 60 plus inches, single grain structure, loose, pH 6.2. to 6.8.
Rooting Depth (in.) to Underlying Material	40 plus; pumice, cinders, basalt
Erosion Factor (K)	.15
Max. Erosion Hazard	Moderate
Soil Permeability	Rapid
Drainage Class	Somewhat excessively drained
Soil Manageability Class	3eP
Group	III
Forest Site Class	6-7 (4 to non-commercial)
Range Site	Not placed in a range site.
Water Runoff Potential	Very Slow
Watershed Sensitivity	8 (Low)
Hydrologic Soil Group	A
Available Water Capacity (AWC)	Moderate to High
Upper 20 inches	2.4 inches
Susceptibility to Burning Damage	High
Slope Stability Hazard	Low
Allowable Soil Loss	3 tons/acre/year
Chance of Seedling Survival	Low to Moderate
Rating for Timber Site	Fair (6)
R-Value	60+
Soil horizons in inches, USDA, Unified, AASHTO	0-4; Very gravelly loamy sand Unified: SW-SM, SM AASHTO: A-1-a 4-44; Extremely gravelly coarse sand Unified: GP AASHTO: A-1-a 44-50; Gravelly coarse sand Unified: SM AASHTO: A-1-a, A-1-b 50-60; Extremely cobbly sandy loam Unified: SM AASHTO: A-1-b, A-2-4
Included Areas:	Included with this soil in mapping and making up about 25 percent of the acreage are unnamed Cindery over Medial, and Cindery over Medial-Skeletal, frigid soils, Lithic Xerorthents frigid, Rock outcrop, areas of deeper pumice and steeper slopes.

**261 STONEWELL-YALLANI FAMILIES ASSOCIATION, 6 to 20 inch pumice overburden,
5 to 30 percent slopes**

Map Unit Components	Stonewell family, pumice overburden phase (50 percent)	Yallani family, pumice overburden phase (30 percent)
Position, Slope, and Elevation	On toeslopes and lower sideslopes of volcanic mountain uplands; 5 to 25 percent slopes; 5300 to 6300 feet.	On sideslopes and knolls of volcanic mountain uplands; 10 to 30 percent slopes; 5300 to 6300 feet.
Typical Vegetation and Precipitation (ppt)	Mixed conifer forest of ponderosa pine, white fir, sugar pine, incense-cedar, plus greenleaf manzanita, bitterbrush, Ross's sedge, bunchgrasses; 25 to 40 inches ppt.	Mixed conifer forest of ponderosa pine, white fir, sugar pine, incense-cedar, plus greenleaf manzanita, bitterbrush, Ross's sedge, bunchgrasses; 25 to 40 inches ppt.
Surface Layer	1 to 0 inches white fir needles and twigs; over 9 inches of pumice overburden consisting of light gray and yellowish brown gravelly and very gravelly loamy coarse sand; granular structure, soft, pH 6.6 (Thickness ranges from 6 to 20 inches) OVER 9 to 27 inches; brown gravelly and very gravelly sandy loam; granular and sub- angular blocky structure; soft; pH 6.4. *SUBSTRATUM: 27 to 60 inches; reddish yellow and brownish yellow very gravelly loamy coarse sand; massive; soft; pH 6.2.	1 to 0 inches; ponderosa pine and white fir needles and twigs, over 17 inches of pumice overburden consisting of 0 to 2 inches; gray extremely gravelly loamy coarse sand; 2 to 17 inches; white extremely gravelly coarse sand. (Thickness ranges from 6 to 20 inches) OVER 17 to 23 inches; yellowish brown gravelly coarse sandy loam, granular structure, soft, pH 6.2. *SUBSOIL: 23 to 60 inches; yellowish brown to dark yellowish brown extremely cobbly and stony coarse sandy loam, granular and blocky structure, soft, pH 6.8.
Rooting Depth (in.) to Underlying Material	40 plus; cinders, basalt	40 plus; basalt, andesite
Erosion Factor (K)	.15	.15
Max. Erosion Hazard	Low to Moderate	Low to Moderate
Soil Permeability	Rapid in the pumice overburden to moderately rapid below.	Rapid in the pumice overburden to moderately rapid below.
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability Class	2ep	2ep
Soil Manageability Group	II	
Forest Site Class	4 (2-3)	4-5 (2-4)
Range Site	Not placed in a range site.	Not placed in a range site
Water Runoff Potential	Very Slow	Slow
Watershed Sensitivity	9 (Low)	8
Hydrologic Soil Group	A	B
Available Water Capacity (AWC)	Moderate to High	Moderate
Upper 20 inches	2.6 inches	2.3 inches
Susceptibility to Burning Damage	High	High
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Moderate	Moderate
Rating for Timber Site	Fair (5)	Fair (3,5)
R-Value	60+	60+

261 STONEWELL-YALLANI FAMILIES ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-9; Gravelly loamy coarse sand,
very gravelly loamy coarse sand
Unified: SW-SM, SM
AASHTO: A-1-a, A-1-b
9-27; Gravelly sandy loam, very gravelly
sandy loam
Unified: SM
AASHTO: A-1-b
27-60; Very gravelly loamy coarse sand
Unified: SW-SM, SM
AASHTO: A-1-a, A-1-b

0-2; Extremely gravelly loamy coarse
sand
Unified: SW-SM
AASHTO: A-1-a
2-17; Extremely gravelly coarse sand
Unified: GW-GM
AASHTO: A-1-a
17-60; Gravelly coarse sandy loam,
extremely stony coarse sandy loam,
extremely cobbly coarse sandy loam
Unified: SM
AASHTO: A-1-b, A-2-4

Included Areas:

Included with these soils in mapping and making up about 20 percent of the acreage are the Zynbar and Inville families, unnamed Cindery over Medial, and Cindery over Medial-Skeletal, frigid soils and Rock outcrop.

262 STONEWELL-YALLANI FAMILIES ASSOCIATION, 35 to 70 percent slopes

Map Unit Components	Stonewell family, (50 percent)	Yallani family, (25 percent)
Position, Slope, and Elevation	On smooth to concave sideslopes of volcanic cinder cones; 35 to 70 percent slopes; 4600 to 6000 feet.	On lower sideslopes of volcanic cinder cones; 35 to 60 percent slopes; 4600 to 6000 feet.
Typical Vegetation and Precipitation (ppt)	Mixed conifer forest of ponderosa pine, white fir, incense-cedar, plus greenleaf manzanita, bitterbrush, Ross's sedge, squaw carpet; 25 to 40 inches ppt.	Mixed conifer forest of ponderosa pine, white fir, incense-cedar, plus greenleaf manzanita, bitterbrush, Ross's sedge, squaw carpet; 25 to 40 inches ppt.
Surface Layer	1 to 0 inches white fir and ponderosa pine needles and twigs, over 0 to 4 inches; dark grayish brown gravelly sandy loam, granular structure, soft, pH 6.4.	3 to 0 inches of mostly decomposed white fir twigs and needles over: 0 to 4 inches; brown gravelly sandy loam; granular and subangular blocky structure; soft; pH 6.4.
Rooting Depth (in.) to Underlying Material	30 plus inches, cinders, ash, vesicular basalt.	40 plus inches; basalt
Erosion Factor (K)	.20	.20
Max. Erosion Hazard	Moderate to high	Moderate to high
Soil Permeability	Moderately rapid	Moderately rapid
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability Class Group	3E III	3Ex
Forest Site Class	5-6 (3-5)	4-5 (2-4)
Range Site	Not placed in a range site.	Not placed in a range site
Water Runoff Potential	Moderate	Moderate
Watershed Sensitivity	7 (Moderate)	7
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Upper 20 inches	Moderate 2.6 inches	Moderate to high 2.4 inches
Susceptibility to Burning Damage	Moderate to High	Moderate to High
Slope Stability Hazard	Low	Low
Allowable Soil Loss	2,3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Moderate	Low to Moderate
Rating for Timber Site	Fair (8)	Fair (3,8)
R-Value	60+	60+
Soil horizons in inches, USDA, Unified, AASHTO	0-24; Gravelly sandy loam, very gravelly sandy loam Unified: SM AASHTO: A-1-b 24-42; Extremely gravelly loamy sand, extremely gravelly coarse sand Unified: GP AASHTO: A-1-a 42-51; Very fine sandy loam, silt loam, very gravelly coarse sand Unified: SM, ML AASHTO: A-1-a, A-4 51-60; Extremely gravelly coarse sand Unified: GP AASHTO: A-1-a	0-18; Gravelly sandy loam, extremely cobbly fine sandy loam Unified: SM, SM-SC AASHTO: A-2-4 18-60; Extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-4
Included Areas:	Included with these soils in mapping and making up about 25 percent of the acreage are the Lithic Xerorthents, frigid, Zynbar family, Rock outcrop, Stonewell family pumice and pumice overburden phases, and unnamed Medial over Cindery, frigid soils.	

**263 STONEWELL-YALLANI FAMILIES-LITHIC XERORTHENTS, FRIGID ASSOCIATION,
30 to 55 percent slopes**

Map Unit Components	Stonewell family (40 percent)	Yallani family (30 percent)	Lithic Xerorthents, frigid (15 percent)
Position, Slope, and Elevation	On smooth sideslopes of volcanic mountain uplands; 30 to 50 percent slopes; 5600 to 6900 feet.	On sideslopes of volcanic mountain uplands; 30 to 55 percent slopes; 5600 to 6900 feet.	On upper sideslopes and ridges of volcanic mountain uplands; 35 to 55 percent slopes; 5600 to 6900 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest or mixed conifer forest of white fir, red fir, ponderosa pine plus snowbrush, greenleaf manzanita, Ross's sedge, mint., few grasses; 30 to 40 inches ppt.	White fir forest or mixed conifer forest of white fir, red fir, ponderosa pine plus snowbrush, greenleaf manzanita, Ross's sedge, mint., few grasses; 30 to 40 inches ppt.	
Surface Layer	1 to 0 inches; white fir and ponderosa pine needles and twigs, over 0 to 4 inches; dark grayish brown gravelly sandy loam, granular structure, soft, pH 6.4.	3 to 0 inches of mostly decomposed white fir twigs and needles over: 0 to 4 inches; brown gravelly sandy loam; granular and subangular blocky structure; soft; pH 6.4.	0 to 2 inches; yellowish brown very gravelly sandy loam; platy and granular structure; slightly hard, pH 6.6
Rooting Depth (in.) to Underlying Material	30 plus inches; cinders, basalt	40 plus inches; basalt	6 to 20; basalt
Erosion Factor (K)	.20	.20	Variable
Max. Erosion Hazard	Moderate to High	Moderate to High	High
Soil Permeability	Moderately rapid	Moderately rapid	Moderately rapid
Drainage Class	Somewhat excessively drained	Well drained	Somewhat excessively drained
Soil Manageability Class Group	3E III	3Ex	3Edx
Forest Site Class	5 (3-4)	4-5 (2-4)	7 (non-commercial)
Range Site	Not placed in a range site.	Not placed in a range site	9
Water Runoff Potential	Moderate	Moderate	Rapid
Watershed Sensitivity	7 (Moderate)	7	5
Hydrologic Soil Group	B	B	D
Available Water Capacity (AWC)	Moderate	Moderate to High	Very Low to Low
Upper 20 inches	2.6 inches	2.4 inches	0.6 to 2.5 inches
Susceptibility to Burning Damage	Moderate to High	High	High
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	2,3 tons/acre/year	3 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Moderate	Low to Moderate	Not Rated
Rating for Timber Site	Fair (8)	Fair (3,7,8)	Not Rated
R-Value	60+	60+	Not Rated

263 STONEWELL-YALLANI FAMILIES-LITHIC XERORTHENTS, FRIGID ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-24; Gravelly sandy loam, very gravelly sandy loam Unified: SM AASHTO: A-1-b	0-18; Gravelly sandy loam, extremely cobbly fine sandy loam Unified: SM, SM-SC AASHTO: A-1-b, A-2-4	0-6; Variable Unified: Not Rated AASHTO: Not Rated 6+; Unweathered bedrock
24-42; Extremely gravelly loamy sand, extremely gravelly coarse sand Unified: GP AASHTO: A-1-a	18-60; Extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-4	
42-51; Very fine sandy loam, silt loam, very gravelly coarse sand Unified: SM, ML AASHTO: A-1-a, A-4		
51-60; Extremely gravelly coarse sand Unified: GP AASHTO: A-1-a		

Included Areas:

Included with these soils in mapping and making up about 15 percent of the acreage are Zynbar and Kinzel families, Rock outcrop, and Yallani soils that are moderately deep.

264 STONEWELL-YALLANI-ZYNBAR FAMILIES ASSOCIATION, 2 to 20 percent slopes

Map Unit Components	Stonewell family (40 percent)	Yallani family (25 percent)	Zynbar family (20 percent)
Position, Slope, and Elevation	On sideslopes of cinder cones and volcanic mountain uplands; 2 to 15 percent slopes; 5500 to 6400 feet.	On upper sideslopes, ridges and knolls of volcanic mountain uplands and cinder cones; 5 to 20 percent slopes; 5500 to 6400 feet.	On sideslopes and toeslopes of cinder cones and volcanic mountain uplands; 2 to 15 percent slopes; 5500 to 6400 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar. plus Ribes spp., rabbitbrush, mint., Ross's sedge, Stipa spp.; 30 to 40 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar. plus Ribes spp., rabbitbrush, mint., Ross's sedge, Stipa spp.; 30 to 40 inches ppt.	
Surface Layer	1 to 0 inches; white fir and ponderosa pine needles and twigs, over 0 to 4 inches; dark grayish brown gravelly sandy loam, granular structure, soft, pH 6.4	3 to 0 inches of mostly decomposed white fir twigs and needles over: 0 to 4 inches; brown gravelly sandy loam granular and subangular blocky structure; soft; pH 6.4.	0 to 11 inches; brown and dark yellowish brown gravelly coarse sandy loam, granular structure, soft, pH 6.6 to 7.0.
Rooting Depth (in.) to Underlying Material	40 plus; cinders, basalt	40 plus; basalt, andesite	30 plus; basalt, cinders, andesite
Erosion Factor (K)	.20	.20	.20
Max. Erosion Hazard	Low	Low to moderate	Low
Soil Permeability	Moderately rapid	Moderately rapid	Moderately rapid
Drainage Class	Somewhat excessively drained	Well drained	Well drained
Soil Manageability Class	1	2e	1
Soil Manageability Group	I		
Forest Site Class	4 (2-3)	4-5 (2-4)	4 (1-3)
Range Site	Not placed in a range site.	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Very slow	Very slow	Very slow
Watershed Sensitivity	9 (Low)	9	9
Hydrologic Soil Group	B	B	B
Available Water Capacity (AWC)	Moderate	Moderate to High	Moderate to High
Upper 20 inches	2.6 inches	2.4 inches	3.0 inches
Susceptibility to Burning Damage	Moderate	Moderate	Moderate
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year	2,3 tons/acre/year
Chance of Seedling Survival	Moderate	Low to Moderate	Moderate to High
Rating for Timber Site	Good	Fair (3)	Good
R-Value	60+	60+	60+

264 STONEWELL-YALLANI-ZYNBAR FAMILIES ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-24; Gravelly sandy loam, very gravelly sandy loam Unified: SM AASHTO: A-1-b	0-18; Gravelly sandy loam, extremely cobbly fine sandy loam Unified: SM, SM-SC	0-34; Gravelly coarse sandy loam Unified: SM AASHTO: A-2-4
24-42; Extremely gravelly loamy sand, extremely gravelly coarse sand Unified: GP AASHTO: A-1-a	18-60; Extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-4	34+; Unweathered bedrock
42-51; Very fine sandy loam, silt loam, very gravelly coarse sand Unified: SM, ML AASHTO: A-1-a, A-4		
51-60; Extremely gravelly coarse sand Unified: GP AASHTO: A-1-a		

Included Areas:

Included with these soils in mapping and making up about 15 percent of the acreage are the Lithic Xerorthents, frigid, Sheld and Ahart families and Rock outcrop.

265 STONEWELL-ZYNBAR FAMILIES ASSOCIATION, 15 to 35 percent slopes

Map Unit Components	Stonewell family (45 percent)	Zynbar family (35 percent)
Position, Slope, and Elevation	Upper sideslopes of volcanic cinder cones; 20 to 35 percent slopes; 5800 to 6600 feet.	Lower sideslopes of volcanic cinder cones; 15 to 35 percent slopes; 5800 to 6600 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, plus snowbrush, greenleaf manzanita, chinquapine, Ross's sedge, grasses; 30 to 40 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, plus snowbrush, Greenleaf manzanita, chinquapine, Ross's sedge, grasses; 30 to 40 inches ppt.
Surface Layer	1 to 0 inches; white fir and ponderosa pine needles and twigs, over 0 to 4 inches; dark grayish brown gravelly sandy loam, granular structure, soft, pH 6.4.	0 to 11 inches; brown and dark yellowish brown gravelly coarse sandy loam, granular structure, soft, pH 6.6 to 7.0.
Rooting Depth (in.) to Underlying Material	40 plus; cinders, basalt	30 plus; basalt, cinders, andesite
Erosion Factor (K)	.20	.20
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately rapid	Moderately rapid
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability Class	2e	2e
Soil Manageability Group	II	
Forest Site Class	4 (2-3)	3 (1-3)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow
Watershed Sensitivity	9 (Low)	8
Hydrologic Soil Group	B	B
Available Water Capacity (AWC)	Moderate	Moderate to High
Upper 20 inches	2.6 inches	3.0 inches
Susceptibility to Burning Damage	Moderate	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	2, 3 tons/acre/year
Chance of Seedling Survival	Moderate	Moderate to High
Rating for Timber Site	Good	Good
R-Value	60+	60+
Soil horizons in inches, USDA, Unified, AASHTO	0-24; Gravelly sandy loam, very gravelly sandy loam Unified: SM AASHTO: A-1-b 24-42; Extremely gravelly loamy sand, extremely gravelly coarse sand Unified: GP AASHTO: A-1-a 42-51; Very fine sandy loam, silt loam, very gravelly coarse sand Unified: SM, ML AASHTO: A-1-a, A-4 51-60; Extremely gravelly coarse sand Unified: GP AASHTO: A-1-a	0-34; Gravelly coarse sandy loam Unified: SM AASHTO: A-2-4 34+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Yallani, Sheld and Ahart families, Lithic Xerorthents, frigid and Rock outcrop.	

266 STUKEL FAMILY-LAVA FLOW ASSOCIATION, 1 to 20 percent slopes

Map Unit Components	Stukel family (55 percent)	Lava flow (20 percent)
Position, Slope, and Elevation	On nearly level to undulating basalt plateaus; 1 to 10 percent; 4200 to 4500 feet.	Hummocky disaggregated lava flow rock and collapsed lava tubes with slope lengths of 10 to 40 feet on undulating basalt plateaus; 5 to 20 percent slopes; 4200 to 4500 feet.
Typical Vegetation and Precipitation (ppt)	Few western juniper, rabbitbrush, big sagebrush, low sagebrush, cheatgrass, Idaho fescue, bottlebrush; 10 to 14 inch ppt.	Barren; 10 to 14 inch ppt.
Surface Layer	0 to 11 inches; grayish brown to brown very cobbly loam to loam, granular and blocky structure, soft to slightly hard, pH 6.2 to 7.2.	NOT APPLICABLE: Fractured vesicular basalt flow rock with minor accumulations of aeolian soil deposition in some fractures.
Rooting Depth (in.) to Underlying Material	8 to 15; basalt	
Erosion Factor (K)	.37	
Max. Erosion Hazard	Moderate	
Soil Permeability	Moderate	
Drainage Class	Well drained	
Soil Manageability Class	2ed	
Group	II	
Forest Site Class	7 (non-commercial)	
Range Site	7, 1	
Water Runoff Potential	Slow	Moderate
Watershed Sensitivity	6 (Moderate)	6
Hydrologic Soil Group	D	
Available Water Capacity (AWC) Upper 20 inches	Very Low to Low 1.1 to 2.1 inches	
Susceptibility to Burning Damage	Low	
Slope Stability Hazard	Low	
Allowable Soil Loss	1 tons/acre/year	
Chance of Seedling Survival	Not Rated	
Rating for Timber Site	Not Rated	
R-Value	30-60	
Soil horizons in inches, USDA, Unified, AASHTO	0-3; Very cobbly loam Unified: SM, SM-SC, ML, ML-CL AASHTO: A-2-4, A-4 3-11; Loam Unified: ML, ML-CL AASHTO: A-4 11+; Unweathered bedrock	
Included Areas:	Included with this unit in mapping and making up about 25 percent of the acreage are the Bakeoven, Searles, Gwin, Pass Canyon, Cowiche families and Lithic Xerorthents, mesic and lava flow rock with steeper slopes.	

267 STUKEL-LOS GATOS-PASS CANYON FAMILIES COMPLEX, 1 to 10 percent slopes

Map Unit Components	Stukel family (35 percent)	Los Gatos family (30 percent)	Pass Canyon family (20 percent)
Position, Slope, and Elevation	On nearly level to undulating basalt plateaus; 1 to 10 percent slopes; 4400 to 5200 feet.	On nearly level to undulating basalt plateaus; 1 to 10 percent slopes; 4400 to 5200 feet.	On nearly level to undulating basalt plateaus; 1 to 10 percent slopes; 4400 to 5200 feet.
Typical Vegetation and Precipitation (ppt)	Western juniper, low sagebrush, rabbitbrush, big sagebrush, cheatgrass, bottlebrush, Idaho fescue; 14 to 16 inches ppt.	Western juniper, big sagebrush, bitterbrush, Phlox spp., mustard, western yarrow, sandberg bluegrass, Idaho fescue, bottlebrush; 14 to 16 inches ppt.	
Surface Layer	0 to 11 inches; grayish brown to brown very cobbly loam to loam, granular and blocky structure, soft, pH 6.2 to 7.2.	0 to 19 inches; brown gravelly loam, granular and blocky structure, soft, pH 6.8 to 7.0.	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure, slightly hard, pH 6.8 to 6.6.
Rooting Depth (in.) to Underlying Material	10 to 20; basalt, tuff	20 to 40; basalt, tuff	14 to 20; basalt, tuff
Erosion Factor (K)	.37	.32	.32
Max. Erosion Hazard	Moderate	Low	Moderate
Soil Permeability	Moderate	Moderately Slow	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2ed II	1	2ed
Forest Site Class	7 (non-commercial)	7 (non-commercial)	7 (non-commercial)
Range Site	4, 8	13	8, 4
Water Runoff Potential	Slow	Very Slow	Moderate
Watershed Sensitivity	6 (Moderate)	8	6
Hydrologic Soil Group	D	B	D
Available Water Capacity (AWC)	Low	Low to Moderate	Low
Upper 20 inches	1.5 to 2.8 inches	2.8 inches	1.8 to 2.6 inches
Susceptibility to Burning Damage	Low	Moderate	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	1 tons/acre/year	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated	Not Rated
R-Value	30-60	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-3; Very cobbly loam Unified: SM, SM-SC, ML, ML-CL AASHTO: A-2-4, A-4 3-11; Loam Unified: ML, ML-CL AASHTO: A-4 11+; Unweathered bedrock	0-19; Gravelly loam Unified: ML, ML-CL AASHTO: A-4 19-38; Clay loam, gravelly clay loam Unified: CL, MH AASHTO: A-6, A-7 38+; Unweathered bedrock	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-4; Loam Unified: ML-CL, CL ASHTO: A-4, A-6 4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7 12+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Bakeoven, Roval, Deven, Supan, Elmore and Lawyer families.		

268 SUPAN-SUPAN deep-PASS CANYON FAMILIES ASSOCIATION, 1 to 20 percent slopes

Map Unit Components	Supan family (40 percent)	Supan family, deep (25 percent)	Pass Canyon family (20 percent)
Position, Slope, and Elevation	On sideslopes of undulating basalt plateaus and mountain uplands; 1 to 20 percent slopes; 4300 to 6000 feet.	On lower sideslopes and depressions of undulating basalt plateaus and mountain uplands; 1 to 15 percent slopes; 4300 to 6000 feet.	On sideslopes ridges and knolls of undulating basalt plateaus and mountain uplands; 1 to 20 percent slopes; 4300 to 6000 feet.
Typical Vegetation and Precipitation (ppt)	May have dense western juniper and big sagebrush, with mountain mahogany, bitterbrush, rabbitbrush, Idaho fescue, wheatgrass, Ross's sedge, other grasses; 14 to 16 inches ppt.	May have dense western juniper and big sagebrush, with bitterbrush, rabbitbrush, mountain mahogany, Idaho fescue, wheatgrass, bluegrass, Ross's sedge, other grasses; 14 to 16 inches ppt.	
Surface Layer	0 to 11 inches; brown loam, granular and blocky structure, slightly hard, pH 6.8.	0 to 23 inches; brown loam, granular and blocky structure, soft to slightly hard, pH 6.8 to 7.0.	0 to 4 inches; very dark grayish brown to dark brown very cobbly loam and loam, granular and platy structure, slightly hard, pH 6.6 to 6.8.
Rooting Depth (in.) to Underlying Material	20 to 40; soft to hard basalt, tuff	40 plus; soft to hard basalt, tuff	10 to 20; basalt, tuff
Erosion Factor (K)	.32	.32	.32
Max. Erosion Hazard	Low to moderate	Low	Moderate
Soil Permeability	Moderately slow	Moderately slow	Moderately slow
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class	2e	1	2ed
Group	II		
Forest Site Class	7 (non-commercial)	7 (non-commercial)	7 (non-commercial)
Range Site	13	13	8, 4
Water Runoff Potential	Very Slow	Very Slow	Moderate
Watershed Sensitivity	8 (Low)	8	6
Hydrologic Soil Group	B	B	D
Available Water Capacity (AWC)	Moderate	Moderate to High	Very Low to Low
Upper 20 inches	3.3 inches	3.4 inches	1.3 to 2.6 inches
Susceptibility to Burning Damage	Low to Moderate	Low	Low
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	2 tons/acre/year	3 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated	Not Rated
R-Value	30-60	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-11; Loam Unified: ML, ML-CL AASHTO: A-4 11-31; Cobbly clay loam Unified: CL, CH AASHTO: A-6, A-7 31+; Weathered bedrock	0-23; Loam Unified: ML, ML-CL AASHTO: A-4 23-60; Gravelly clay loam Very gravelly clay loam, extremely cobbly clay loam Unified: CL, CH AASHTO: A-6, A-7	0-2; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4 2-4; Loam Unified: ML-CL, CL AASHTO: A-4, A-6 4-12; Clay loam, cobbly clay loam Unified: CL, MH AASHTO: A-6, A-7 12+; Unweathered bedrock

Included Areas:

Included with these soils in mapping and making up about 15 percent of the acreage are the Deven, Roval, Barnard, Ridd, Gwin, Alicel, Wrentham, Sutkel, Bieber, Los Gatos, Elmore and Fordice families, Rock outcrop and unnamed soils similar to Wrentham family but not Pachic, and soils similar to the Skalan family.

269 SUPERVISOR-CHEADLE FAMILIES-ROCK OUTCROP ASSOCIATION, 15 to 35 percent slopes

Map Unit Components	Supervisor family (45 percent)	Cheadle family (20 percent)	Rock outcrop (20 percent)
Position, Slope, and Elevation	On sideslopes and toeslopes of mountain uplands; 15 to 35 percent slopes; 7000 to 9700 feet.	On upper sideslopes and ridges of mountain uplands; 20 to 35 percent slopes; 7000 to 9700 feet.	On ridges and sideslopes of deeply incised drainages of mountain uplands; 20 to 35 percent slopes; 7000 to 9700 feet.
Typical Vegetation and Precipitation (ppt)	White bark pine, few lodgepole pine, mulesear, lupine, penstamin, Ross's sedge, few grasses; 30 to 35 inches ppt.	Big sagebrush, low sagebrush, mulesear, lupine, phlox spp., buckwheat, Idaho fescue, other grasses; 30 to 35 inches ppt.	
Surface Layer	1 to 0 inches; lodgepole pine needles, over 0 to 12 inches; dark grayish brown to brown gravelly fine sandy loam, granular and blocky structure, slightly hard, pH 6.0 to 6.2.	0 to 17 inches; dark grayish brown to brown very cobbly loam to very cobbly clay loam; granular and subangular blocky structure, slightly hard to hard, pH 6.6.	NOT APPLICABLE: Basalt, andesite or conglomerated tuff bedrock with minor accumulations of aeolian soil deposition in some fractures.
Substratum	26 to 37 inches; weathering in place pale brown to reddish brown semi-soft tuff conglomerate.		
Rooting Depth (in.) to Underlying Material	20 to 40; andesite, tuff	10 to 20; andesite	
Erosion Factor (K)	.20	.37	
Max. Erosion Hazard	Moderate	Moderate to high	
Soil Permeability	Moderate	Moderate	
Drainage Class	Well drained	Well drained	
Soil Manageability Class	2ep	2ed	
Soil Manageability Group	II		
Forest Site Class	6-7 (4-5 at 7000 to 8000 feet elevation, and non-commercial above 8000 feet elevation)	7 (non-commercial)	
Range Site	Not placed in a range site.	9	
Water Runoff Potential	Slow	Rapid	Very Rapid
Watershed Sensitivity	7 (Moderate)	4	2
Hydrologic Soil Group	B	D	
Available Water Capacity (AWC)	Low to Moderate	Very Low to Low	
Upper 20 inches	2.2 inches	1.2 to 2.4 inches	
Susceptibility to Burning Damage	Moderate	Low	
Slope Stability Hazard	Low	Low	
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year	
Chance of Seedling Survival	Low to Moderate (Not Rated above 8,000 feet elevation)	Not Rated	
Rating for Timber Site	Fair to Poor (7,12,13)	Not Rated	
R-Value	60+	30-60	

269 SUPERVISOR-CHEADLE FAMILIES-ROCK OUTCROP ASSOCIATION (continued)

Soil horizons in
inches, USDA,
Unified, AASHTO

0-12; Gravelly fine sandy loam	0-12; Very cobbly loam
Unified: SM	Unified: SM, SM-SC
AASHTO: A-2-4, A-4	AASHTO: A-4, A-6
12-26; Very gravelly sandy loam	12-17; Very cobbly clay loam
Unified: SM	Unified: SC
AASHTO: A-1-b	AASHTO: A-6, A-7
26+; Weathered bedrock	17+; Unweathered bedrock

Included Areas:

Included with this unit in mapping and making up about 15 percent of the acreage are the Duncom, Gralic and Behanin families, Lithic Cryochrepts, and Rubble land.

270 SUPERVISOR-CHEADLE FAMILIES-ROCK OUTCROP ASSOCIATION, 35 to 60 percent slopes

Map Unit Components	Supervisor family (40 percent)	Cheadle family (25 percent)	Rock outcrop (20 percent)
Position, Slope, and Elevation	On sideslopes and toeslopes of mountain uplands; 35 to 60 percent slopes; 8000 to 9000 feet.	On upper sideslopes and ridges of mountain uplands; 35 to 60 percent slopes; 8000 to 9900 feet.	On ridges and sideslopes of deeply incised drainages of mountain uplands; 35 to 60 percent slopes; 8000 to 9900 feet.
Typical Vegetation and Precipitation (ppt)	Semi-dense and stunted white bark pine forest with few lodgepole pine, plus mules-ear, lupine, penstamin, Ross's sedge, few grasses; 30 to 35 inches ppt.	Big sagebrush, low sagebrush, mulesear, lupine, Phlox spp., buckwheat, Idaho fescue, other grasses; 30 to 35 inches ppt.	
Surface Layer	1 to 0 inches; lodgepole pine needles over 0 to 12 inches; dark grayish brown to brown gravelly fine sandy loam, granular and blocky structure, slightly hard, pH 6.0 to 6.2.	0 to 17 inches; dark grayish brown to brown very cobbly loam to very cobbly clay loam; granular and subangular blocky structure, slightly hard to hard, pH 6.6.	NOT APPLICABLE: Basalt, andesite or conglomerated tuff bedrock with minor accumulations of aeolian soil deposition in some fractures.
Substratum	26 to 37 inches; weathering in place pale brown to reddish brown semi-soft tuff conglomerate.		
Rooting Depth (in.) to Underlying Material	20 to 40; andesite, tuff	10 to 20; andesite	
Erosion Factor (K)	.20	.37	
Max. Erosion Hazard	High	High to very high	
Soil Permeability	Moderate	Moderate	
Drainage Class	Well drained	Well drained	
Soil Manageability Class Group	3Ep III	3Ed	
Forest Site Class	7 (non-commercial)	7 (non-commercial)	
Range Site	Not placed in a range site.	9	
Water Runoff Potential	Moderate	Very Rapid	Very Rapid
Watershed Sensitivity	6 (High)	3	0
Hydrologic Soil Group	B	D	
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 2.2 inches	Very Low to Low 1.2 to 2.4 inches	
Susceptibility to Burning Damage	Moderate to High	Moderate	
Slope Stability Hazard	Low	Low	
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year	
Chance of Seedling Survival	Not Rated	Not Rated	
Rating for Timber Site	Poor (7, 8, 13)	Not Rated	
R-Value	60+	30-60	
Soil horizons in inches, USDA, Unified, AASHTO	0-12; Gravelly fine sandy loam Unified: SM AASHTO: A-2-4, A-4 12-26; Very gravelly sandy loam Unified: SM AASHTO: A-1-b 26+; Weathered bedrock	0-12; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4, A-6 12-17; Very cobbly clay loam Unified: SC AASHTO: A-6, A-7 17+; Unweatheed bedrock	
Included Areas:	Included with this unit in mapping and making up about 15 percent of the acreage are the Duncom family, Lithic Cryochrepts, and Rubble land.		

271 SUPERVISOR-CHEADLE FAMILIES-ROCK OUTCROP ASSOCIATION, 60 to 90 percent slopes

Map Unit Components	Supervisor family (30 percent)	Cheadle family (30 percent)	Rock outcrop (25 percent)
Position, Slope, and Elevation	On sideslopes of mountain uplands; 60 to 80 percent slopes; 8000 to 9700 feet.	On upper sideslopes and ridges of mountain uplands; 60 to 90 percent slopes; 8000 to 9700 feet.	On ridges and sideslopes of deeply incised drainages; 60 to 90 percent slopes; 8000 to 9700 feet.
Typical Vegetation and Precipitation (ppt)	Semi-dense and stunted white bark pine forest with few lodgepole pine, plus mules-ear, lupine, penstamin, Ross's sedge, few grasses; 30 to 35 inches ppt.	Big sagebrush, low sagebrush, mulesear, lupine, Phlox spp., buckwheat, Idaho fescue, other grasses; 30 to 35 inches ppt.	
Surface Layer	1 to 0 inches; lodgepole pine needles, over 0 to 12 inches; dark grayish brown to brown gravelly fine sandy loam, granular and blocky structure, slightly hard, pH 6.0 to 6.2.	0 to 17 inches; dark grayish brown to brown very cobbly loam to very cobbly clay loam; granular and subangular blocky structure, slightly hard to hard, pH 6.6.	NOT APPLICABLE: Basalt, andesite or conglomerated tuff bedrock with minor accumulations of aeolian soil deposition in some fractures.
Substratum	26 to 37 inches; weathering in place pale brown to reddish brown semi-soft tuff conglomerate.		
Rooting Depth (in.) to Underlying Material	20 to 40; andesite,	10 to 20; andesite	
Erosion Factor (K)	.20	.37	
Max. Erosion Hazard	Very high	Very high	
Soil Permeability	Moderate	Moderate	
Drainage Class	Well drained	Well drained	
Soil Manageability Class Group	4Gp IV	4Gd	
Forest Site Class	7 (non-commercial)	7 (non-commercial)	
Range Site	Not placed in a range site.	9	
Water Runoff Potential	Rapid	Very Rapid	Very Rapid
Watershed Sensitivity	4 (Very High)	2	0
Hydrologic Soil Group	B	D	
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 2.2 inches	Very Low to Low 1.2 to 2.4 inches	
Susceptibility to Burning Damage	High	Moderate	
Slope Stability Hazard	Moderate	Moderate	
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year	
Chance of Seedling Survival	Not Rated	Not Rated	
Rating for Timber Site R-Value	Poor (7, 9, 13) 60+	Not Rated 30-60	
Soil horizons in inches, USDA, Unified, AASHTO	0-12; Gravelly fine sandy loam Unified: SM AASHTO: A-2-4, A-4 12-26; Very gravelly sandy loam Unified: SM AASHTO: A-1-b 26+; Weathered bedrock	0-12; Very cobbly loam Unified: SM, SM-SC AASHTO: A-4, A-6 12-17; Very cobbly clay loam Unified: SC AASHTO: A-6, A-7 17+; Unweathered bedrock	
Included Areas:	Included with this unit in mapping and making up about 15 percent of the acreage are the Duncom family, Lithic Cryochrepts, and Rubble land.		

272 ROCK OUTCROP, tuff-LITHIC XERORTHENTS, FRIGID COMPLEX, 60 to 100 percent slopes

Map Unit Components	Rock outcrop, tuff (45 percent)	Lithic Xerorthents, frigid (40 percent)
Position, Slope, and Elevation	On ridges, knolls and deeply incised drainages of mountain uplands; 60 to 100 percent slopes; 5000 to 8000 feet.	On sideslopes and ridges of mountain uplands; 60 to 100 percent slopes; 5000 to 8000 feet.
Typical Vegetation and Precipitation (ppt)	Barren; 16 to 30 inches ppt.	Very sparse vegetation consisting of Buckwheat, Phlox spp., low sagebrush, Idaho fescue, trace of western juniper; 16 to 30 inches ppt.
Surface Layer	NOT APPLICABLE: Platy and massive paralithic volcanic tuff which rubs to a sandy loam, loam, or clay loam texture.	0 to 2 inches; yellowish brown very gravelly sandy loam; platy and granular structure; slightly hard, pH 6.6.
Rooting Depth (in.) to Underlying Material		4 to 10; andesite, conglomerated tuff, sandstone
Erosion Factor (K)		Variable
Max. Erosion Hazard		Very high
Soil Permeability		Moderate
Drainage Class		Somewhat excessively drained
Soil Manageability Class	Not rated	4GD
Soil Manageability Group	IV	
Forest Site Class		7 (non-commercial)
Range Site		1
Water Runoff Potential	Very Rapid	Very Rapid
Watershed Sensitivity	0 (Very High)	0
Hydrologic Soil Group		D
Available Water Capacity (AWC) Upper 20 inches		Very low
Susceptibility to Burning Damage		0.6 to 1.5 inches
Slope Stability Hazard		Low
Allowable Soil Loss		Moderate
Chance of Seedling Survival		1 tons/acre/year
Rating for Timber Site		Not Rated
R-Value		Not Rated
Soil horizons in inches, USDA, Unified, AASHTO		0-6; Variable Unified: Not Rated AASHTO: Not Rated
Included Areas:	6+; Weathered bedrock	
	Included with this unit in mapping and making up about 15 percent of the acreage are the Cheadle, Anatone, Patio and Smarts families, Lithic Cryochrepts, Rubble land, and areas of lesser and greater slopes.	

273 VIPONT-GINSER-ANATONE FAMILIES ASSOCIATION, 15 to 40 percent slopes

Map Unit Components Position, Slope, and Elevation	Vipont family (40 percent)	Ginsler family (25 percent)	Anatone family (20 percent)
Typical Vegetation and Precipitation (ppt)	Few ponderosa pine, white fir, western juniper, big sagebrush, mountain mahogany, bitterbrush, ceonothus, greenleaf manzanita, Carex spp., wheatgrass, Ross's sedge, Idaho fescue; 20 to 22 inches ppt.	Few ponderosa pine, white fir, western juniper big sagebrush, mountain mahogany, bitterbrush, ceonothus, greenleaf manzanita, Carex spp., wheatgrass, Idaho fescue; Ross's sedge, 20 to 22 inches ppt.	On southeast to westerly aspects of upper sideslopes, ridges, and knolls of mountain uplands; 20 to 40 percent slopes; 5500 to 7000 feet.
Surface Layer	0 to 16 inches; brown very gravelly loam, granular and blocky structure, slightly hard, pH 6.8.	0 to 24 inches; dark brown to to dark yellowish brown cobbly loam, very cobbly loam and extremely cobbly loam, granular and blocky structure, slightly hard to hard, pH 6.4 to 6.8.	0 to 17 inches; brown cobbly loam to very cobbly loam, granular and blocky structure, slightly hard, pH 6.8 to 7.0.
Rooting Depth (in.) to Underlying Material	20 to 40; basalt	20 to 40; andesite, basalt	10 to 20; andesite, basalt
Erosion Factor (K)	.28	.32	.37
Max. Erosion Hazard	Moderate	Moderate	Moderate to high
Soil Permeability	Moderately slow	Moderate	Moderate
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Class Group	2e II	2ep	3Ed
Forest Site Class	5-6 (4-5)	6 (4-5)	7 (non-commercial)
Range Site	Not placed in a range site.	Not placed in a range site.	9
Water Runoff Potential	Slow	Slow	Rapid
Watershed Sensitivity	7 (Moderate)	7	4
Hydrologic Soil Group	B	B	D
Available Water Capacity (AWC) Upper 20 inches	Low to Moderate 2.8 inches	Low to Moderate 2.3 inches	Very Low to Low 1.2 to 2.5 inches
Susceptibility to Burning Damage	Moderate	Moderate	Moderate
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	2 tons/acre/year	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Moderate	Low	Not Rated
Rating for Timber Site R-Value	Poor (1,7,11) 30-60	Poor (1,7,11) 30-60	Not Rated 30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-16; Very gravelly loam Unified: SM, SM-SC AASHTO: A-4 16-32; Very gravelly clay loam, very cobbly clay loam, extremely cobbly clay loam Unified: SC, CL AASHTO: A-6, A-7 32+; Weathered bedrock	0-24; Cobbly loam, very cobbly loam, extremely cobbly loam Unified: SM, SC, ML, CL AASHTO: A-4, A-6 24+; Weathered bedrock	0-8; Cobbly loam Unified: ML, ML-CL AASHTO: A-4 8-17; Very cobbly loam Unified: SM, SC AASHTO: A-4, A-6 17+; Unweathered bedrock

273 VIPONT-GINSER-ANATONE FAMILIES ASSOCIATION (continued)

Included Areas:

Included with these soils in mapping and making up about 15 percent of the acreage are the Hades, Mascamp, Lamondi and Smarts families, and Rock outcrop.

Map Unit Components	Aquolls (70 percent)
Position, Slope, and Elevation	On nearly level slightly concave alluvial basins and drainages; (subject to spring flooding); 0 to 5 percent slopes; 4800 to 6400 feet.
Typical Vegetation and Precipitation (ppt)	Kentucky bluegrass, other <i>Poa</i> spp., timothy, willows, forbes, sedges, other grasses; 14 to 25 inches ppt.
Surface Layer	0 to 4 inches very dark gray silty clay loam; platy and granular structure; hard; pH 7.4.
Substratum	27 to 60 inches; light gray and gray with yellowish brown and yellowish red mottles; silty clay loam and clay loam; massive and blocky structure; slightly hard and very hard; pH 6.4.
Rooting Depth (in.) to Underlying Material	40 plus; alluvium
Erosion Factor (K)	Variable
Max. Erosion Hazard	Moderate
Soil Permeability	Variable
Drainage Class	Poorly drained
Soil Manageability Class	3W
Group	III
Forest Site Class	7 (non-commercial)
Range Site	25
Water Runoff Potential	Very Slow
Watershed Sensitivity	7 (Moderate)
Hydrologic Soil Group	D
Available Water Capacity (AWC)	Moderate to High
Upper 20 inches	3.3 inches
Susceptibility to Burning Damage	Low
Slope Stability Hazard	Low
Allowable Soil Loss	5 tons/acre/year
Chance of Seedling Survival	Not Rated
Rating for Timber Site	Not Rated
R-Value	Not Rated
Soil horizons in inches, USDA, Unified, AASHTO	0-60; Variable Unified: Not Rated AASHTO: Not Rated
Included Areas:	Included with this soil in mapping and making up about 30 percent of the acreage are the Jackknife, Aikman, Smarts and Los Gatos families and unnamed Fluvents, Saprists, and Fluvaquents.

275 WOODHURST-BEHANIN deep FAMILIES COMPLEX, 10 to 35 percent slopes

Map Unit Components	Woodhurst family (45 percent)	Behanin family, deep (35 percent)
Position, Slope, and Elevation	On sideslopes and toeslopes of mountain uplands; 10 to 30 percent slopes; 7000 to 8000 feet.	On sideslopes and ridges of mountain uplands; 10 to 35 percent slopes; 7000 to 8000 feet.
Typical Vegetation and Precipitation (ppt)	White fir, lodgepole pine, few quaking aspen, snowberry, forbes, Ross's sedge, few grasses; 25 to 35 inches ppt.	White fir, lodgepole pine, western white pine, few quaking aspen, snowberry, forbes, Ross's sedge, few grasses; 25 to 35 inches ppt.
Surface Layer	3 to 0 inches; white fir and lodgepole pine needles and twigs, over 0 to 25 inches; brown to yellowish brown cobbly fine sandy loam, very stony loam and extremely stony loam, granular and blocky structure, slightly hard, pH 6.4 to 6.8.	1-1/2 to 0 inches of white fir needles and twigs, over 0 to 60 inches; very dark grayish brown to brown very gravelly loam, very stony loam and extremely gravelly loam, granular to subangular blocky structure, slightly hard, pH 6.0 to 6.4.
Rooting Depth (in.) to Underlying Material	40 plus; basalt	40 plus; basalt, andesite
Erosion Factor (K)	.20	.28
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderate	Moderate
Drainage Class	Well drained	Well drained
Soil Manageability Class	2ep	2e
Group	II	
Forest Site Class	5 (3-4)	5 (3-4)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow
Watershed Sensitivity	7 (Moderate)	7
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Upper 20 inches	Moderate 2.5 inches	Moderate 2.4 inches
Susceptibility to Burning Damage	Low to Moderate	Low to Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Moderate	Moderate
Rating for Timber Site	Fair (1,3,12)	Fair (1,12)
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-34; Cobbly fine sandy loam, very stony loam, extremely stony loam Unified: SM, SM-SC AASHTO: A-4 34-60; Very cobbly loam Unified: ML, CL AASHTO: A-4, A-6	0-34; Very gravelly loam, very stony loam Unified: SM, ML, ML-CL AASHTO: A-4 34-60; Extremely gravelly loam Unified: GM, GM-GC AASHTO: A-2-4, A-2-6
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Supervisor, Gallatin, Duncom and Cheadle families and Lithic Cryochrepts.	

276 WRENTHAM-BAKEOVEN FAMILIES ASSOCIATION, 10 to 40 percent slopes

Map Unit Components	Wrenthan family (65 percent)	Bakeoven family (20 percent)
Position, Slope, and Elevation	Mainly on sideslopes and toeslopes of mountain uplands; 10 to 35 percent slopes; 4600 to 5600 feet.	Mainly on upper sideslopes and ridges of Mountain uplands; 15 to 40 percent slopes; 4600 to 5600 feet.
Typical Vegetation and Precipitation (ppt)	Big sagebrush, rabbitbrush, bitterbrush, Ribes spp., lupine, arrowleaf balsam root, western yarrow, crested wheatgrass, bluebunch wheatgrass, sandberg bluegrass, thurbers needlegrass, Idaho fescue; 12 to 14 inches ppt.	Low sagebrush, big sagebrush, rabbitbrush, Phlox spp., Idaho fescue, sandberg bluegrass, cheatgrass; 12 to 14 inches ppt.
Surface Layer	0 to 23 inches; dark grayish brown, grayish brown and brown very gravelly loam, granular structure, slightly hard, pH 6.6 to 6.8.	0 to 11 inches; dark grayish brown and grayish brown very cobbly fine sandy loam, subangular blocky structure; slightly hard, pH 6.6.
Substratum	23 to 33 inches; pale brown very gravelly loam, massivé, slightly hard, pH 6.4.	
Rooting Depth (in.) to Underlying Material	20 to 40; andesite	8 to 20; andesite, basalt
Erosion Factor (K)	.28	.24
Max. Erosion Hazard	Moderate	Moderate to high
Soil Permeability	Moderate	Moderately rapid
Drainage Class	Well drained	Well drained
Soil Manageability Class	2e	3Edx
Soil Manageability Group	II	
Forest Site Class	7 (non-commercial)	7 (non-commercial)
Range Site	12	7, 1
Water Runoff Potential	Slow	Rapid
Watershed Sensitivity	7 (Moderate)	5
Hydrologic Soil Group	B	D
Available Water Capacity (AWC)	Low to Moderate	Very Low to Low
Upper 20 inches	2.5 inches	0.8 to 1.9 inches
Susceptibility to Burning Damage	Low	Low
Slope Stability Hazard	Low	Low
Allowable Soil Loss	2 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Not Rated	Not Rated
Rating for Timber Site	Not Rated	Not Rated
R-Value	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-33; Very gravelly loam Unified: GM, GM-GC, SM, SM-SC AASHTO: A-2-4, A-4 33+; Unweathered bedrock	0-11; Very cobbly fine sandy loam Unified: SM, SM-SC AASHTO: A-4 11+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Searles, Supan, Simpson, Pass Canyon and Alicel families, Rock outcrop, soils similar to Wrenthan family but not Pachic, and areas of greater slope.	

277 YALLANI-SHELD FAMILIES COMPLEX, 5 to 30 percent slopes

Map Unit Components	Yallani family (60 percent)	Sheld family (25 percent)
Position, Slope, and Elevation	On sideslopes, toeslopes and alluvial fans of volcanic mountain uplands; 5 to 30 percent slopes; 5800 to 7000 feet.	On sideslopes, toeslopes and alluvial fans of volcanic mountain uplands; 5 to 30 percent slopes; 5800 to 7000 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, some red fir, ponderosa pine, and lodgepole pine above 6500 feet, plus current spp., snowberry, Ross's sedge, bunchgrasses; 35 to 45 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, some red fir and lodgepole pine above 6500 feet, current spp., snowberry, Ross's sedge, bunchgrasses: 35 to 45 inches ppt.
Surface Layer	3 to 0 inches of mostly decomposed white fir twigs and needles over: 0 to 4 inches; brown gravelly sandy loam; granular and subangular blocky structure; soft; pH 6.4.	2 to 0 inches of white fir and ponderosa pine needles and twigs, over 0 to 25 inches; dark grayish brown and brown gravelly fine sandy loam and very cobbly loam, granular and subangular blocky structure, soft, pH 5.8 to 6.2.
Rooting Depth (in.) to Underlying Material	40 plus; basalt, andesite	40 plus inches, hard basalt
Erosion Factor (K)	.20	.20
Max. Erosion Hazard	Low to moderate	Low to moderate
Soil Permeability	Moderately rapid	Moderate
Drainage Class	Well drained	Well drained
Soil Manageability Class	2e	2e
Soil Manageability Group	II	
Forest Site Class	4 (2-3)	4 (2-3)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow
Watershed Sensitivity	8(Low)	8
Hydrologic Soil Group	B	B
Available Water Capacity (AWC)	Moderate to High	Moderate to High
Upper 20 inches	2.4 inches	3.1 inches
Susceptibility to Burning Damage	Moderate	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Low to Moderate	High
Rating for Timber Site	Fair (3)	Good
R-Value	60+;	60+
Soil horizons in inches, USDA, Unified, AASHTO	0-18; Gravelly sandy loam, extremely cobbly fine sandy loam Unified: SM, SM-SC AASHTO: A-2-4, A-1-b 18-60; Extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-4	0-12; Gravelly fine sandy loam Unified: SM AASHTO: A-4 12-50; Very cobbly loam, Very gravelly loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-4 50+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Lithic Xerumbrepts, Ahart, Stonewell, Kinzel and Divers families, rock outcrop, and soils similar to the Germany family but medial-skeletal.	

278 YALLANI-INVILLE FAMILIES COMPLEX, 8 to 20 inch pumice overburden, 5 to 30 percent slopes

Map Unit Components	Yallani family, pumice overburden phase (60 percent)	Inville family (20 percent)
Position, Slope, and Elevation	On sideslopes of volcanic mountain uplands; 5 to 30 percent slopes; 5400 to 6500 feet.	On sideslopes of volcanic mountain uplands; 5 to 30 percent slopes; 5400 to 6500 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of ponderosa pine, white fir, red fir, plus greenleaf manzanita, bitterbrush, rabbit- brush, Ross's sedge, grasses; 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, red fir, plus greenleaf manzanita, bitterbrush, rabbitbrush, Ross's sedge, grasses; 20 to 30 inches ppt.
Surface Layer	1 to 0 inches; ponderosa pine and white fir needles and twigs, over 17 inches of pumice overburden consisting of 0 to 2 inches; gray extremely gravelly loamy coarse sand; 2 to 17 inches; white extremely gravelly coarse sand. (Thickness ranges from 8 to 20 inches) OVER 17 to 23 inches; yellowish brown gravelly coarse sandy loam, granular structure, soft, pH 6.2.	2 to 0 inches of undecomposed and decomposed ponderosa pine needles, over 12 inches of pumice consisting of 0 to 2 inches; pale brown and grayish brown gravelly loamy coarse sand and gravelly loamy fine sand. (Thickness ranges from 8 to 20 inches) OVER 12 to 15 inches; yellowish brown very gravelly sandy loam, granular structure, soft, pH 6.4
Rooting Depth (in.) to Underlying Material	40 plus; basalt, andesite	40 plus; basalt
Erosion Factor (K)	.15	.17
Max. Erosion Hazard	Low to moderate	Low to moderate
Soil Permeability	Rapid in the pumice overburden to moderately rapid below.	Rapid in the pumice overburden to moderate below.
Drainage Class	Well drained	Well drained
Soil Manageability Class Group	2ep II	2ep
Forest Site Class	5 (3-4)	4-5 (2-4)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow
Watershed Sensitivity	8 (Low)	8
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Upper 20 inches	Moderate 2.3 inches	Moderate to high 2.3 inches
Susceptibility to Burning Damage	High	High
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Moderate	Moderate
Rating for Timber Site	Fair (3,5)	Fair (5)
R-Value	60+	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-2; Extremely gravelly loamy coarse sand Unified: SW-SM AASHTO: A-1-a 2-17; Extremely gravelly coarse sand Unified: GW-GM AASHTO: A-1-a 17-60; Gravelly coarse sandy loam, extremely stony coarse sandy loam, extremely cobbly coarse sandy loam Unified: SM AASHTO: A-1-b, A-2-4	0-6; Very gravelly loamy coarse sand Unified: SW-SM, SM AASHTO: A-1-a 6-12; Very gravelly loamy fine sand Unified: SM AASHTO: A-2-4 12-21; Very gravelly sandy loam Unified: SM AASHTO: A-1-b 21-60; Very gravelly loam Unified: SM, SM-SC AASHTO: A-2-4, A-2-6

278 YALLANI-INVILLE FAMILIES COMPLEX (continued)

Included Areas:

Included with these soils in mapping and making up about 20 percent of the acreage are the Stonewell family pumice phase, Kinzel family, unnamed cindery over medial-skeletal, frigid soils, and Rock outcrop.

279 YALLANI-STONEWELL FAMILIES ASSOCIATION, 15 to 35 percent slopes

Map Unit Components	Yallani family (50 percent)	Stonewell family (30 percent)
Position, Slope, and Elevation	On knolls, ridges and sideslopes of volcanic mountain uplands; 20 to 35 percent slopes; 5600 to 6800 feet.	On smooth sideslopes of volcanic mountain uplands; 15 to 30 percent slopes; 5600 to 6800 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, some red fir and incense-cedar, plus greenleaf manzanita, snowbrush, Ross's sedge, few grasses; 30 to 40 inches ppt.	White fir forest, or mixed conifer forest of white fir, some red fir, ponderosa pine, and incense-cedar, plus greenleaf manzanita, snowbrush, Ross's sedge, few grasses; 30 to 40 inches ppt.
Surface Layer	3 to 0 inches of mostly decomposed white fir twigs and needles over: 0 to 4 inches; brown gravelly sandy loam; granular and subangular blocky structure; soft, pH 6.4.	1 to 0 inches; white fir and ponderosa pine needles and twigs, over 0 to 4 inches; dark grayish brown gravelly sandy loam, granular structure, soft, pH 6.4.
Rooting Depth (in.) to Underlying Material	40 plus; basalt, andesite	40 plus; cinders, basalt
Erosion Factor (K)	.20	.20
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately Rapid	Moderately rapid
Drainage Class	Well drained	Somewhat excessively drained
Soil Manageability Class Group	2e II	2e
Forest Site Class	4 (2-3)	4 (2-3)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow
Watershed Sensitivity	8 (Low)	9
Hydrologic Soil Group	B	B
Available Water Capacity (AWC) Upper 20 inches	Moderate to High 2.4 inches	Moderate 2.6 inches
Susceptibility to Burning Damage	Moderate	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Low to Moderate	Moderate
Rating for Timber Site	Fair (3)	Good
R-Value	60+	60+
Soil horizons in inches, USDA, Unified, AASHTO	0-18; Gravelly sandy loam, extremely cobbly fine sandy loam Unified: SM, SM-SC AASHTO: A-2-4, A-1-b 18-60; Extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-4	0-24; Gravelly sandy loam, very gravelly sandy loam Unified: SM AASHTO: A-1-b 24-42; Extremely gravelly loamy sand, extremely gravelly coarse sand Unified: GP AASHTO: A-1-a 42-51; Very fine sandy loam, silt loam, very gravelly coarse sand Unified: SM, ML AASHTO: A-4, A-1-a 51-60; Extremely gravelly coarse sand Unified: GP AASHTO: A-1-a
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Zynbar, Sheld and Ahart families, Lithic Xerorthents, frigid, and rock outcrop.	

280 WAPAL-ANATONE-PATIO deep FAMILIES ASSOCIATION, 60 to 90 percent slopes

Map Unit Components	Wapal family (40 percent)	Anatone family (25 percent)	Patio family, deep (20 percent)
Position, Slope, and Elevation	On sideslopes and deeply incised drainages of mountain uplands; 60 to 90 percent slopes; 5500 to 7000 feet.	On ridges, knolls and upper sideslopes of mountain uplands; 60 to 90 percent slopes; 5500 to 7000 feet.	On sideslopes and lower slopes of mountain uplands; 60 to 80 percent slopes; 5500 to 7000 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus few western juniper, big sagebrush, ceonothus, rabbitbrush, Ross's sedge, few grasses; 20 to 30 inches ppt.	Western juniper, few ponderosa pine, mountain mahogany, low sagebrush, big sagebrush, bottlebrush, Idaho fescue, other grasses; 20 to 30 inches ppt.	
Surface Layer	1/2 to 0 inches; ponderosa pine needles and twigs, over 0 to 6 inches; gray to light yellowish brown gravelly fine sandy loam, granular structure, loose, pH 6.6.	0 to 17 inches; brown cobbly loam to very cobbly loam, granular and blocky structure, slightly hard, pH 6.8 to 7.0.	1 to 0 inches of white fir needles, over 0 to 18 inches; yellowish brown very gravelly loam, granular structure, slightly hard, pH 6.2 to 6.8.
Rooting Depth (in.) to Underlying Material	40 plus; andesite tuff, obsidian	10 to 20; andesite, tuff, obsidian	40 plus; andesite, tuff, obsidian
Erosion Factor (K)	.20	.37	.28
Max. Erosion Hazard	High to very high	Very high	High to very high
Soil Permeability	Moderately rapid	Moderate	Moderate
Drainage Class	Somewhat excessively drained	Well drained	Well drained
Soil Manageability Class Group	4Gp IV	4Gd	4Gp
Forest Site Class	6 (4-5)	7 (Non-commercial)	5 (3-4)
Range Site	Not placed in a range site.	9	Not placed in a range site.
Water Runoff Potential	Rapid	Very Rapid	Rapid
Watershed Sensitivity	5 (High)	2	5
Hydrologic Soil Group	A	D	B
Available Water Capacity (AWC)	Low	Very Low to Low	Moderate
Upper 20 inches	1.5 inches	1.2 to 2.5 inches	2.3 inches
Susceptibility to Burning Damage	High	Moderate	High
Slope Stability Hazard	Moderate	Moderate	Moderate
Allowable Soil Loss	3 tons/acre/year	1 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Low to Very Low	Not Rated	Low to Moderate
Rating for Timber Site	Poor (9)	Not Rated	Poor (9)
R-Value	60+	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-6; Gravelly fine sandy loam Unified: SM AASHTO: A-4 6-60; Very gravelly loamy fine sand, very gravelly loamy sand Unified: SM AASHTO: A-1-b, A-2-4	0-8; Cobbly loam Unified: ML, ML-CL AASHTO: A-4 8-17; Very cobbly loam Unified: SM, SC AASHTO: A-4, A-6 17+; Unweathered bedrock	0-60; Very gravelly loam, extremely gravelly loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-2-6
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Mascamp family, Lithic Xerorthents, frigid, rock outcrop and Rubble land.		

281 WAPAL-PATIO deep FAMILIES ASSOCIATION, 15 to 35 percent slopes

Map Unit Components	Wapal family (55 percent)	Patio family, deep (25 percent)
Position, Slope, and Elevation	On upper sideslopes, ridges and knolls of mountain uplands; 20 to 35 percent slopes; 5500 to 7000 feet.	On lower sideslopes and toeslopes of mountain uplands; 15 to 35 percent slopes; 5500 to 7000 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, washoe pine, plus few western juniper, mountain mahogany, big sagebrush, ceonothus, rabbitbrush, Ross's sedge, few grasses 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, washoe pine plus big sagebrush, ceonothus, rabbitbrush, Ross's sedge, few grasses; 20 to 30 inches ppt.
Surface Layer	1/2 to 0 inches; ponderosa pine needles and twigs, over 0 to 6 inches; gray to light yellowish brown gravelly fine sandy loam, granular structure, loose, pH 6.6.	1 to 0 inches of white fir needles, over 0 to 18 inches; yellowish brown very gravelly loam, granular structure, slightly hard, pH 6.2 to 6.8.
Rooting Depth (in.) to Underlying Material	40 plus; andesite, tuff, obsidian	40 plus; andesite, tuff, obsidian
Erosion Factor (K)	.20	.28
Max. Erosion Hazard	Moderate	Moderate
Soil Permeability	Moderately rapid	Moderate
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability Class	2ep	2ep
Soil Manageability Group	II	
Forest Site Class	6 (4-5)	5 (3-4)
Range Site	Not placed in a range site.	Not placed in a range site.
Water Runoff Potential	Slow	Slow
Watershed Sensitivity	8 (Low)	7
Hydrologic Soil Group	A	B
Available Water Capacity (AWC)	Low	Moderate
Upper 20 inches	1.5 inches	2.3 inches
Susceptibility to Burning Damage	Moderate	Moderate
Slope Stability Hazard	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year
Chance of Seedling Survival	Low to Very Low	Low to Moderate
Rating for Timber Site	Good	Good
R-Value	60+	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-6: Gravelly fine sandy loam Unified: SM AASHTO: A-4 6-60: Very gravelly loamy fine sand, very gravelly loamy sand Unified: SM AASHTO: A-1-b, A-2-4	0-60; Very gravelly loam, extremely gravelly loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-2-6
Included Areas:	Included with these soils in mapping and making up about 20 percent of the acreage are the Anatone, Smarts, Gleason, Merkel, and Lamondi families, Rock outcrop, and unnamed soils similar to the Inville family.	

282 WAPAL-PATIO deep-ANATONE FAMILIES ASSOCIATION, 35 to 60 percent slopes

Map Unit Components	Wapal family (40 percent)	Patio family, deep (25 percent)	Anatone family (20 percent)
Position, Slope, and Elevation	On sideslopes and deeply incised drainages of mountain uplands; 35 to 60 percent slopes; 5500 to 7000 feet.	On sideslopes and lower slopes of mountain uplands; 35 to 60 percent slopes; 5500 to 7000 feet.	On ridges, knolls and upper sideslopes of mountain uplands; 40 to 60 percent slopes; 5500 to 7000 feet.
Typical Vegetation and Precipitation (ppt)	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, plus washoe pine, few western juniper, big-sage- brush ceonothus, rabbitbrush, Ross's sedge, few grasses; 20 to 30 inches ppt.	White fir forest, or mixed conifer forest of white fir, ponderosa pine, incense-cedar, washoe pine, plus few western juniper, big sagebrush, ceonothus, rabbitbrush, Ross's sedge, few grasses; 20 to 30 inches ppt.	
Surface Layer	1/2 to 0 inches; ponderosa pine needles and twigs, over 0 to 6 inches; gray to light yellowish brown gravelly fine sandy loam, granular structure, loose, pH 6.6.	1 to 0 inches of white fir needles, over 0 to 18 inches; yellowish brown very gravelly loam, granular structure, slightly hard, pH 5.8 to 6.0.	0 to 17 inches; brown cobbly loam to very cobbly loam, granular and blocky structure, slightly hard, pH 6.8 to 7.0.
Rooting Depth (in.) to Underlying Material	40 plus; andesite, tuff, obsidian	40 plus; andesite, tuff, obsidian	10 to 20; andesite, tuff, obsidian
Erosion Factor (K)	.20	.28	.37
Max. Erosion Hazard	High	High	High to very high
Soil Permeability	Moderately rapid	Moderate	Moderate
Drainage Class	Somewhat excessively drained	Well drained	Well drained
Soil Manageability Class Group	3Ep III	3Ep	3Ed
Forest Site Class	6 (4-5)	5 (3-4)	7 (non-commercial)
Range Site	Not placed in a range site.	Not placed in a range site.	9
Water Runoff Potential	Moderate	Moderate	Rapid
Watershed Sensitivity	7 (Moderate)	6	3
Hydrologic Soil Group	A	B	D
Available Water Capacity (AWC)	Low	Moderate	Very Low to Low
Upper 20 inches	1.5 inches	2.3 inches	1.2 to 2.5 inches
Susceptibility to Burning Damage	High	Moderate to High	Moderate
Slope Stability Hazard	Low	Low	Low
Allowable Soil Loss	3 tons/acre/year	3 tons/acre/year	1 tons/acre/year
Chance of Seedling Survival	Low to Very Low	Low to Moderate	Not Rated
Rating for Timber Site	Fair (8)	(Fair 8)	Not Rated
R-Value	60+	30-60	30-60
Soil horizons in inches, USDA, Unified, AASHTO	0-6; Gravelly fine sandy loam Unified: SM AASHTO: A-4 6-60; Very gravelly loamy fine sand, very gravelly loamy sand Unified: SM AASHTO: A-1-b, A-2-4	0-60; Very gravelly loam, extremely gravelly loam, extremely cobbly loam Unified: SM, SM-SC AASHTO: A-2-4, A-2-6	0-8; Cobbly loam Unified: ML, ML-CL AASHTO: A-4 8-17; Very cobbly loam Unified: SM, SC AASHTO: A-4, A-6 17+; Unweathered bedrock
Included Areas:	Included with these soils in mapping and making up about 15 percent of the acreage are the Mascamp, Gleason, Merkel, Smarts families, Lithic Xerorthents, frigid, Rock outcrop, Rubble land and unnamed soils similar to the Inville family.		

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land use allocations to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in the land use.

Information in this section can provide a basis for assigning management priorities to land areas that have few or less severe limitations and for determining areas where more detailed or site-specific soil information is needed. Additional information about each soil and its use and management is given under "Detailed Soil Map Unit Descriptions." In that section, individual soils are evaluated for their productivity, their manageability limitations, and their potential for production of forage and timber.

Watershed

Water is used on the Forest for livestock, dust abatement on roads during timber hauling, human consumption, maintenance of instream flows, and wildlife needs, including wetland habitat. Outside Forest boundaries, water is used primarily for agricultural irrigation, hydroelectric power generation, livestock, recreation and wildlife. Tremendous amount of fracturing occurs throughout the rock mass. Therefore, the capacity for reception and temporary storage of water in the rock mass is considerable. The fracturing and the associated deep weathering in the underlying rock mantles are important factors in determining the hydrologic response of these watersheds.

Twenty watersheds on the Forest produce a cumulative annual yield of 565,800 acre-feet of water per year, not including water yield on private lands within the Forest Boundary. Most of this water percolates through the thin soil mantle and enters the ground-water system. At the beginning of the rainy season when the shallow soils are dry and undisturbed, they normally have a high infiltration rate. Because of the degree of fracturing and deep weathering in the underlying bedrock, these soils have a more permeable substratum than other shallow soils. For watershed planning purposes, these soils were assigned a hydrologic soil group rating of moderately high runoff rather than high runoff potential.

Soils in the forest are managed for watershed protection by preventing soil erosion and maintaining productivity. Overland flow or runoff on shallow forest soils can increase tremendously when wildfires induce the formation of water-repellent soil layers. Prevention of large wildfires through more intensive vegetative management is an important objective of soil management. The use of

prescribed burning to develop age-class mosaics, along with fuelbreak construction, is an important tool for reducing soil erosion and sedimentation.

Timber production is of major importance in this survey area. About 29 percent or about 510,000 acres of the survey area is capable of supporting commercial timber at 20 cubic feet or more per acre per year at culmination of mean annual increment. Most of this acreage (about 85 to 90 percent) is on the Modoc National Forest. The rest is privately owned.

The largest areas of woodland are in map units 1, 2, 10, 11, 12, 13, 14, 15, 16, 18, and 19 described in the section "General soil map units". In the past ten years the Modoc National Forest has harvested about 60 million board feet of commercial timber per year. The most common commercial trees in the survey area are ponderosa pine and white fir. Other commercial timber present in less amounts are incense-cedar, sugar pine, Jeffrey pine, red fir, lodgepole pine and western white pine. The survey area has large areas of somewhat open pine stands which are typical of the eastside ponderosa pine climax community.

Most of the timber producing land in the survey area is limited in productivity due to one or more of the following factors: (a) marginal precipitation, (b) short growing season, (c) warm, dry southerly exposures, (d) low available soil water holding capacity, (e) low available nutrient supply. Recent nutrient analysis have shown nitrogen, phosphorus and/or sulfur to be deficient on many of the timber stands tested on the Modoc National Forest.

The major concerns with managing the soil resource to maintain or improve timber productivity are: accelerated soil erosion, soil compaction, areas of low regeneration potential, cumulative watershed impacts, low soil fertility, and soils with a high potential for slope failure. Timber management based on soil survey information and other timber inventory information is the basis for maintaining or improving timber production.

About 64 percent or about 1,130,000 acres of the survey area is rangeland. Modoc County has more resident beef cows than any other County in the state (Summary of Agricultural Commissioner's Reports in California 1981 and 1982). Eighty-eight grazing allotments are administered on the Modoc National Forest and vary in size from 100 acres to over 84,000 acres. The Modoc National Forest is by far, the leading Forest in the Region in total permitted domestic grazing with over 128,000 Animal Unit Months (AUM's) per year. These range allotments are normally utilized by livestock during the late spring, summer and early fall months.

The livestock normally remain off the allotments for the rest of the year. This helps maintain plant vigor and allows the plants to grow and set seed in the spring. It also helps alleviate compaction caused by trampling during this period when the soils are normally wet. Range has other land uses including watershed, wildlife habitat and recreation.

Over the past 60 years or so, western juniper and brush have become more prominent on some of our rangelands causing those areas to produce less grass. This is due to a combination of things such as better wildfire control, and overgrazing by either domestic or wild animals. In addition, improper or excessive road developments and/or overgrazing have resulted in excessive soil erosion in some areas.

Wildlife ¹

A diversity of wildlife and fish species habit the survey area. Those which contribute to recreational hunting and fishing are the most popular, such as mule deer, pronghorn antelope, trout, largemouth bass, channel catfish, and various waterfowl species like Canada geese, mallards, pintails, and gadwalls. Threatened, endangered, and sensitive species also use various habitats on the Forest. They include the bald eagle, Modoc sucker, California bighorn sheep, goshawk, and redband trout. In total, there are over 350 fish and wildlife species that rely in part, or totally, on the variety of habitats found within the Forest.

Soil directly affects the kind and amount of habitat that is available to fish and wildlife by their influence on the vegetation to provide food and cover. For example, on forested lands soils are important for determining the site's potential to produce large diameter trees and dense canopied stands for habitat used by dependent species such as goshawks and marten. Soils help to differentiate between those lands capable of providing these conditions and those lands which are not capable. Soils information is also important in determining the suitability of habitat improvement projects. Prescribe burning, seedings, and mechanical manipulation all require knowledge of soils to ensure meeting management objectives.

The soil survey can be used to help determine areas of potential habitat for various kinds of wildlife and their suitability for habitat improvement. Refer to the

soil maps, the detailed map unit descriptions, and the applicable range site descriptions for this information.

Recreation

The Modoc National Forest is best known for its remote location and uncrowded recreation opportunities. In 1981, total recreation use on the Forest was 377,400 recreation visitor days (RVDs) and wildlife and fish user days (WFUDs). Most visitors enjoy hunting, fishing, and camping, while others delight in touring, hiking, horseback riding, swimming, picnicking, and gathering firewood. These activities are enhanced by the abundance of wildlife variety of landscape settings, and uncrowded conditions.

Increased use of the forest by recreational off-highway vehicles (trail bikes, 4-wheel jeeps, etc.) can cause major impact on soil resources. Overuse and heavy foot traffic can cause such severe soil compaction and reduced infiltration that it becomes necessary to close campgrounds for restoration.

Soils in the survey area are not rated in the map unit descriptions for their manageability. The rating system considers soil properties useful in recreation planning. For site-specific planning, more detailed soil investigation and interpretations may be required. The following is a general discussion of soil characteristics important for some kinds of recreational sites.

Camp areas require site preparation such as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Steeper slopes and the presence of stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes, stones, or boulders that increase the cost of shaping sites or building access roads and parking areas.

¹ This section prepared by Karen Shimamoto, Forest Ecologist, Modoc National Forest.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Classification of the Soils

The system of soil classification used by the National Co-operative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In Table 2, the soils of the survey area are listed alphabetically and are classified according to the system. In Table 3, the soils are listed by the categories. The categories are defined in the following paragraphs.

ORDER. Ten (prior to 1992) soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in "sols". An example is Alfisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeralfs "Xer", meaning dry, plus "alfs", from Alfisols.

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name or a suborder and by a prefix that indicates a property of the soil. For example, Haploxeralfs ("Haplo", meaning minimal horizonation, plus "xeralfs", the suborder of the Alfisols that have a xeric moisture regime).

SUBGROUP. Each great group has a typical subgroup. Other subgroups are intergrades or extragrades. The typical is the central concept; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective "Lithic" identifies the subgroup that has hard parent rock within 20 inches of the surface. An example is Lithic Haploxeralfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the

properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy, mixed, mesic Lithic Haploxeralfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer and the substratum can differ to some extent within a series.

In this survey soil series names were not used. Instead common family names were used. A common family name is a short name which can be substituted for the family which is explained in the family paragraph above. In other words instead of writing out "loamy, mixed, mesic Lithic Haploxerolls" we can simply call it the "Stukel family". There were several reasons for going only to the family level and common family name instead of to the series level and using the series name. These include:

- A soil inventory designed for forestwide planning and reconnaissance level project purposes does not warrant mapping to the series level of specificity.
- If this survey had been mapped at the series level this would have necessitated the development of about 30 to 40 new state soil series. This is due to significant differences in existing series already established. This would have taken a lot of additional soil scientist time to do this adequately. The relative short time period that was left to finish this inventory combined with the limited amount of soil scientist availability did not allow for this to be done.
- This also implies that perhaps 40 to 50 of the soils recognized in this survey may already fit established series or they could fit if minor changes were made to the established series and these changes approved through the SCS. This is true. However, to avoid confusion with using both series names and common family names together in this survey, it was decided that only common family names would be used.
- Using only the common family name instead of a series name helps to eliminate the bias that can be associated with attempting to "bend" the range in characteristics, etc., to fit an established series.

Table 2 - Classification by Soil Name

Soil Name	Family or Higher Taxonomic Class
Ahart family	Medial, frigid, Andic Xerumbrepts
Aikman family	Fine, montmorillonitic, mesic, Typic Chromoxererts
Alcot family	Cindery, mesic, Typic Xerorthents
Alicel family	Fine-loamy, mixed, mesic, Pachic Haploxerolls
Anatone family	Loamy-skeletal, mixed, frigid, Lithic Haploxerolls
Aquolls	Aquolls
Bakeoven family	Loamy-skeletal, mixed, mesic, Lithic Haploxerolls
Barnard family	Fine, montmorillonitic, mesic, Aridic Durixerolls
Bearskin family	Loamy, mixed, frigid, Lithic Argixerolls
Behanin family	Loamy-skeletal, mixed, Pachic Cryoborolls
Bertag family	Fine, montmorillonitic, frigid, Pachic Ultic Argixerolls
Bieber family	Clayey, montmorillonitic, mesic, shallow, Aridic Durixerolls
Cardon family	Fine, montmorillonitic, mesic, Chromic Pelloxererts
Castlevale family	Loamy, mixed, mesic, Lithic Xerollic Haplargids
Casuse family	Loamy, mixed, mesic, shallow, Xeralfic Haplargids
Cavanaugh family	Clayey-skeletal, montmorillonitic, frigid, Ultic Argixerolls
Cheadle family	Loamy-skeletal, mixed, Lithic Cryoborolls
Cowiche family	Fine-loamy, mixed, mesic, Aridic Argixerolls
Cryoborolls, wet	Cryoborolls, wet
DeMasters family	Fine-loamy, mixed, frigid, Pachic Ultic Argixerolls
Deven family	Clayey, montmorillonitic, mesic, Lithic Argixerolls
Dishner family	Clayey, montmorillonitic, mesic, Lithic Xerollic Haplargids

Soil Name	Family or Higher Taxonomic Class
Ditchcamp family	Fine-loamy, mixed, mesic, Xerollic Durargids
Divers family	Medial-skeletal, Andic Cryochrepts
Duncom family	Loamy, mixed, Lithic Cryoborolls
Elmore family	Fine-loamy, mixed, mesic, Pachic Ultic Argixerolls
Fordice family	Loamy-skeletal, mixed, mesic, Ultic Argixerolls
Friana family	Fine, montmorillonitic, Argic Pachic Cryoborolls
Gallatin family	Fine-loamy, mixed, Pachic Cryoborolls
Germany family	Medial, mesic, Andic Xerumbrepts
Ginser family	Loamy-skeletal, mixed, frigid, Pachic Haploxerolls
Gleason family	Coarse-loamy, mixed, mesic, Entic Haploxerolls
Gralic family	Loamy-skeletal, mixed, non-acid, Typic Cryorthents
Gwin family	Loamy-skeletal, mixed, mesic, Lithic Argixerolls
Hades family	Fine-loamy, mixed, frigid, Pachic Argixerolls
Hiibner family	Clayey-skeletal, montmorillonitic, mesic, Typic Argixerolls
Holland family	Fine-loamy, mixed, mesic, Ultic Haploxerafals
Indian Creek family	Clayey, montmorillonitic, mesic, shallow, Xerollic Durargids
Inville family	Loamy-skeletal, mixed, frigid, Ultic Haploxerafals
Jacket family	Fine, montmorillonitic, mesic, Pachic Ultic Argixerolls
Jacknife family	Fine, montmorillonitic, mesic, Pachic Argixerolls
Keating family	Fine, montmorillonitic, mesic, Typic Argixerolls
Kinzel family	Medial-skeletal, Andic Cryumbrepts
Lamondi family	Loamy-skeletal, mixed, frigid, Pachic Ultic Haploxerolls
Lapine family	Cindery, Typic Cryorthents
Lawyer family	Loamy-skeletal, mixed, mesic, Pachic Ultic Argixerolls
Lithic Cryochrepts	Lithic Cryochrepts

Soil Name	Family or Higher Taxonomic Class
Lithic Xerorthents	Lithic Xerorthents
Lithic Xerumbrepts	Lithic Xerumbrepts
Loberg family	Clayey-skeletal, mixed, Typic Cryoboralfs
Los Gatos family	Fine-loamy, mixed, mesic, Typic Argixerolls
Manila family	Fine, montmorillonitic, frigid, Typic Argixerolls
Mascamp family	Loamy-skeletal, mixed, frigid, Lithic Argixerolls
Menzel family	Coarse-loamy, mixed, mesic, Andic Xerochrepts
Merkel family	Loamy-skeletal, mixed, frigid, Typic Xerochrepts
Merlin family	Clayey, montmorillonitic, frigid, Lithic Argixerolls
Neer family	Medial-skeletal, mesic, Andic Xerochrepts
Packwood family	Loamy, mixed, mesic, shallow, Xerollic Durargids
Pass Canyon family	Loamy, mixed, mesic, Lithic Argixerolls
Patio family	Loamy-skeletal, mixed, frigid, Ultic Haploxerolls
Puls family	Clayey, montmorillonitic, mesic, shallow, Abruptic Xerollic Durargids
Ridd family	Loamy-skeletal, mixed, mesic, Typic Argixerolls
Roval family	Loamy, mixed, mesic, shallow, Aridic Durixerolls
Ruckles family	Clayey-skeletal, montmorillonitic, mesic, Lithic Argixerolls
Sadie family	Medial, mesic, Andic Xerochrepts
Saprists	Saprists
Searles family	Loamy-skeletal, mixed, mesic, Aridic Argixerolls
Sheld family	Medial-skeletal, frigid, Andic Xerumbrepts
Simpson family	Fine, montmorillonitic, mesic, Aridic Argixerolls
Skalan family	Loamy-skeletal, mixed, mesic, Ultic Haploxeralfs
Smarts family	Loamy-skeletal, mixed, frigid, Pachic Ultic Argixerolls
Stonewell family	Cindery, frigid, Dystric Xerorthents
Stukel family	Loamy, mixed, mesic, Lithic Haploxerolls

Soil Name	Family or Higher Taxonomic Class
Supan family	Fine-loamy, mixed, mesic, Pachic Argixerolls
Supervisor family	Loamy-skeletal, mixed, Typic Cryoborolls
Vipont family	Loamy-skeletal, mixed, frigid, Pachic Argixerolls
Wapal family	Sandy-skeletal, mixed, frigid, Typic Xerorthents
Wenatchee family	Fine-loamy, mixed, mesic, Xerollic Haplargids
Woodhurst family	Loamy-skeletal, mixed, Argic Pachic Cryoborolls
Wretham family	Loamy-skeletal, mixed, mesic, Pachic Haploxerolls
Wuksi family	Ashy-skeletal, Typic Cryorthents
Xerofluvents	Xerofluvents
Yallani family	Medial-skeletal, frigid, Andic Xerochrepts
Zynbar family	Medial, frigid, Entic Dystrandeps

Seven soil orders are represented in the Modoc survey area: Alfisols, Aridisols, Entisols, Histosols, Inceptisol, Mollisols, and Vertisols.

The soils in the survey area have a xeric moisture regime. The xeric moisture regime is typical in Mediterranean climates, where winters are moist and cool and summers are warm and dry. Therefore, unless the soil is irrigated, its moisture control section is dry in all parts for 45 consecutive days or more from July until October in 6 out of 10 years. The moisture control section is moist in all parts for 45 consecutive days or more from December until May.

The soils have a mesic, cryic or frigid temperature regime. In a mesic temperature regime, the soil temperature at a depth of 20 inches ranges from 47 to 59 degrees F. In a frigid temperature regime, which occurs at the highest elevations, particularly on north-facing aspects, the soil temperature at a depth of 20 inches ranges from 32 to 47 degrees F. Soils in a cryic temperature regime have a mean annual temperature higher than 32 degrees F but lower than 47 degrees F. A soil with a cryic regime is colder in summer than a soil with a frigid regime.

Alfisols are soils that can have a massive and hard A horizon and an argillic B horizon. They have high base saturation, and water is held at less than 15 bar tension during at least 3 months of each year when the soil is warm enough for plants to grow. Alfisols in this area have been placed in the Xeralf suborder. They have a xeric moisture regime; winters are moist and cool, and summers are warm and dry.

Aridisols are the soils that have formed in aridic moisture regime. The Aridisols in the survey area are in the Argids suborder and Durargids great group. They have a silica hard pan.

Entisols are soils that have little or no evidence of development of pedogenic horizons.

The Entisols in this area are in the Orthent and Psamment suborders. The soils do not have a B horizon and generally have less than 1 percent organic matter.

Orthents have a particle-size class that is loamy or finer in texture in some horizon below the Ap horizon and have slope of more than 25 percent or have an organic carbon content that decreases regularly with increasing depth. The organic carbon reaches a level of 0.2 percent

or less within a depth of 1.25 meters. Psamments are loamy fine sand or coarser in the textural control section. These soils are on alluvial fans and are deep to very deep. The Orthents and Psamments have been placed in the Xerorthent and Xeropsamment great groups since they have a xeric moisture regime.

Inceptisols are soils in which altered horizons have lost bases of iron and aluminum but have retained some weatherable minerals. These soils do not have an illuvial horizon enriched either with silicate clay that contains aluminum or with an amorphous mixture of aluminum and organic carbon.

The Inceptisols in the survey area are in the Ochrept suborder. They have an ochric epipedon and a cambic horizon. They do not have a mollic epipedon because either the dark color, organic matter, or structure is lacking. The cambic horizon increases in clay content by 1 or 2 percent and has structure. The texture is coarse sandy loam or finer. These soils have a xeric moisture regime and thus have been placed in the Xerochrept great group.

Mollisols typically have a dark colored surface layer which is more than 25 cm thick, is more than 1 percent organic matter, and is not both hard and massive. Base saturation of this layer is more than 50 percent.

In this survey area, the Mollisols are in the Xeroll suborder. These soils formed in a warm, subhumid climate or in a semiarid climate where a natural, supplemental source of water extends the growing season. Winters are cool and moist, and summers are hot and dry. Unless irrigated, these soils are dry throughout the root zone for more than 60 consecutive days during the 3-month period following the summer solstice.

Xerolls are divided into two great groups: Argixerolls and Haploxerolls. Soils that do not have clay-enriched B horizon or layers strong in calcium carbonates are classified in the Hapolxeroll great group. Soils that have a clay-enriched B horizon and a clear to gradual boundary between the A and B horizons and do not have strongly calcareous layers have been placed in the Argixeroll great group.

Vertisols are the soils that have clay fraction of greater than 30 percent. These are easily recognized from cracks that open and close periodically and from slickensides.

Table 3 - Classification by Taxonomic Category

(An asterisk in the columns below indicate the soil was not classified to that level.)

ORDER	SUBORDER	GREAT GROUP	SUBGROUP	FAMILY	SOIL NAME	
Alfisols	Boralfs Xeralfs	Cryoboralfs Haploxeralfs	Typic Cryoboralfs	Clayey-skeletal, mixed	Loberg family	
			Ultic Haploxeralfs	Loamy-skeletal, mixed, frigid	Inville family	
				Loamy-skeletal, mixed, mesic	Skalan family	
				Fine-Loamy, mixed, mesic	Holland family	
Aridisols	Argids	Durargids	Abruptic Xerollic Durargids	Clayey, montmorillonitic, mesic, shallow	Puls family	
			Xerollic Durargids	Clayey, montmorillonitic, mesic, shallow	Indian Creek family	
				Fine-loamy, mixed, mesic	Ditchcamp family	
			Loamy, mixed, mesic, shallow	Packwood family		
			Haplargids	Lithic Xerollic Haplargids	Clayey, montmorillonitic, mesic	Dishner family
					Loamy, mixed, mesic	Castlevale family
		Xerollic Haplargids	Loamy, mixed, mesic, shallow	Casuse family		
		Xerollic Haplargids	Fine-loamy, mixed, mesic	Wenatchee family		
Entisols	Fluvents Orthents	Xerofluvents Cryorthents	*	*	*	
			Typic Cryorthents	Ashy-skeletal	Wuksi family	
			Cindery	Lapine family		
			Loamy-skeletal, mixed, non-acid	Gralic family		
			Xerorthents	Typic Xerorthents	Cindery, mesic	Alcot family
			Sandy-skeletal, mixed, frigid	Wapal family		
		Dystric Xerorthents	Cindery, frigid	Stonewell family		
		Lithic Xerorthents	*	*		
Histosols	Saprists	*	*	*	*	
Inceptisols	Andepts Ochrepts	Dystrandeps Cryochrepts	Entic Dystrandeps	Medial, frigid	Zynbar family	
			Andic Cryochrepts	Medial-skeletal	Divers family	
			Lithic Cryochrepts	*	*	

ORDER	SUBORDER	GREAT GROUP	SUBGROUP	FAMILY	SOIL NAME
		Xerochrepts	Typic Xerochrepts	Loamy-skeletal, mixed, frigid	Merkel family
			Andic Xerochrepts	Coarse-loamy, mixed, mesic Medial-skeletal, frigid Medial-skeletal, mesic Medial, mesic	Menzel family Yallani family Neer family Sadie family
	Umbrepts	Xerumbrepts	Andic Xerumbrepts	Medial-skeletal, frigid Medial, frigid Medial, mesic	Sheld family Ahart family Germany family
			Lithic Xerumbrepts	*	*
Mollisols	Aquolls	*	*	*	*
	Borolls	Cryoborolls	Typic Cryoborolls	Loamy-skeletal, mixed	Supervisor family
			Argic Pachic Cryoborolls	Fine, montmorillonitic Loamy-skeletal, mixed	Frana family Woodhurst family
			Lithic Cryoborolls Loamy-skeletal, mixed	Loamy, mixed Cheadle family	Duncom family
			Pachic Cryoborolls	Fine-loamy, mixed Loamy-skeletal, mixed	Gallatin family Behanin family
	Xerolls	Durixerolls	Aridic Durixerolls	Clayey, montmorillonitic, mesic, shallow Fine, montmorillonitic, mesic Loamy, mixed, mesic, shallow	Bieber family Barnard family Roal family
		Argixerolls	Typic Argixerolls	Fine, montmorillonitic, frigid Clayey-skeletal, montmorillonitic, mesic Fine, montmorillonitic, mesic Fine-loamy, mixed, mesic Loamy-skeletal, mixed, mesic	Manila family Hiibner family Keating family Los Gatos family Ridd family
			Aridic Argixerolls	Fine, montmorillonitic, mesic Fine-loamy, mixed, mesic Loamy-skeletal, mixed, mesic	Simpson family Cowiche family Searles family

ORDER	SUBORDER	GREAT GROUP	SUBGROUP	FAMILY	SOIL NAME
			Lithic Argixerolls	Clayey, montmorillonitic, mesic Clayey-skeletal, montmorillonitic, mesic Loamy, mixed, mesic Loamy-skeletal, mixed, mesic Clayey, montmorillonitic, frigid Loamy, mixed, frigid Loamy-skeletal, mixed, frigid	Deven family Ruckles family Pass Canyon family Gwin family Merlin family Bearskin family Mascamp family
			Pachic Argixerolls	Fine-loamy, mixed, frigid Loamy-skeletal, mixed, frigid Fine, montmorillonitic, mesic Fine-loamy, mixed, mesic	Hades family Vipont family Jacknife family Supan family
			Pachic Ultic Argixerolls	Fine, montmorillonitic, frigid Fine-loamy, mixed, frigid Loamy-skeletal, mixed, frigid Fine, montmorillonitic, mesic Fine-loamy, mixed, mesic Loamy-skeletal, mixed, mesic	Bertag family DeMasters family Smarts family Jacket family Elmore family Lawyer family
			Ultic Argixerolls	Clayey-skeletal, montmorillonitic, frigid Loamy-skeletal, mixed, mesic	Cavanaugh family Fordice family
	Haploxerolls		Entic Haploxerolls	Coarse-loamy, mixed, mesic	Gleason family
			Lithic Haploxerolls	Loamy-skeletal, mixed, frigid Loamy-skeletal, mixed, mesic Loamy, mixed, mesic	Anatone family Bakeoven family Stukel family
			Pachic Haploxerolls	Loamy-skeletal, mixed, frigid Loamy-skeletal, mixed, mesic Fine-loamy, mixed, mesic	Ginser family Wrentham family Alicel family
			Pachic Ultic Haploxerolls	Loamy-skeletal, mixed, frigid	Lamondi family
			Ultic Haploxerolls	Loamy-skeletal, mixed, frigid	Patio family
Vertisols	Xererts	Chromoxererts	Typic Chromoxererts	Fine, montmorillonitic, mesic	Aikman family
		Pelloxererts	Chromic Pelloxererts	Fine, montmorillonitic, mesic	Cardon family