Interim Soil Survey Report of the Gerber Block

Curt Leet

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Interim Soil Survey Report for the Gerber Block
Lakeview District Office
Klamath Fall Resource Area

United States Department of Interior
Bureau of Land Management

In Cooperation with

United States Department of Agriculture
Natural Resource Conservation Service

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Gerber Block Legend – May 22, 2001

(50E) 370B	was Lorella stv-l, 2-35% slopes NOT USED 85% Lorella Clayey-skeletal, smectitic, mesic Lithic Argixerolls - SH, WD, stv-l **Juniper Loamy Hills 10-14 021XY200OR (Loamy 10-14)**
(66F) 410D	was Rock outcrop-Dehlinger complex, 35-65% slopes NOT USED 45% Rock outcrop **Miscellaneous Land Type** 40% Dehlinger Loamy-skeletal, mixed, mesic Pachic Haploxerolls - DPV, WD, stv-l **Juniper South 12-16 021XY300OR (South Slopes 14-18)**
300A	Norcross cbv-l, 0-10% slopes 85% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls - SH, WD, cbv-l **Stony Claypan 14-20 021XY216OR (Moist Stony Claypan 15-18)**
310A	Norcross cbx-Dranket-Norcross complex, 0-10% slopes 50% Norcross cbx Clayey, smectitic, fr, shallow Vitrandic Durixerolls - SH, WD, cbx-l 0-10% slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)** 20% Dranket Fine, smectitic, fr Typic Durixerolls - MD, WD, cbv-l, 0-10% slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)** 15% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls - SH, WD, cbv-l 0-10% slopes **Stony Claypan 14-20 021XY216OR (Moist Stony Claypan 15-18)**
312A	Norcross-Dranket complex, 0-8% slopes 65% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls SH to duripan, WD, cbx-l 0-8% slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)** 20% Dranket Fine, smectitic, fr Typic Durixerolls - MD, WD, cbv-l 0-8% slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)**
320A	Pankeybasin loam, 1-2% slopes 85% Pankeybasin Fine, smectitic, fr Palexerollic Durixerolls - MD, WD, l **Claypan 14-20 021XY214OR (Claypan 14-18)**
330B	Casebeer-Norcross-Dranket complex, 1-8% slopes 35% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs - SH, WD, cbv-l 1-6% slopes **Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)** 30% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls - SH, WD, cbv-l,1-6% slopes **Stony Claypan 14-20 021XY216OR (Moist Stony Claypan 15-18)** 20% Dranket Fine, smectitic, fr Typic Durixerolls - MD, WD, stv-l 1-8% slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)**
331B	Norcross-Dranket-Casebeer cbv-l, 0-6% slopes 45% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls - SH, WD, cbv-l,0-6% slopes **Stony Claypan 14-20 021XY216OR (Moist Stony Claypan 15-18)** 30% Dranket Fine, smectitic, fr Typic Durixerolls - MD, WD, cbv-l 0-6% slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)** 15% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs - SH, WD, cbv-l 0-6% slopes **Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)**

(332B) 340A	was Norcross-Casebeer-Norcross, Irr complex, 0-5% slopes 40% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls SH, WD, cbv-l 0-5% slopes **Stony Claypan 14-20 021XY216OR (Moist Stony Claypan 15-18)** 30% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs SH, WD, stx-cl 0-5% slopes **Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)** 15% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls SH, WD, cbv-l 0-2% slopes **(Irrigated) Stony Claypan 14-20 021XY216OR (Moist Stony Claypan 15-18)**
(333B) 342A	was Casebeer-Casebeer, Irr complex, 0-5% slopes 50% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs SH to duripan, WD, stx-l **(Irrigated) Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)** 35% Casebeer, Irr Clayey, smectitic, fr, shallow Typic Durixeralfs SH to duripan, WD, stx-l **Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)**
335B	Norcross-Casebeer complex, 1-10% slopes 55% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls SH, WD, cbv-l 1-10% slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)** 30% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs SH to duripan, WD, cbx-l 1-6% slopes **Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)**
340A (332B)	Norcross,thick surface-Casebeer complex, 0-4% slopes 45% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls SH, WD, cbv-l 0-4% slopes **Stony Claypan 14-20 021XY216OR (Moist Stony Claypan 15-18)** 40% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs - SH, WD, cbx-l, 0-4% slopes **Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)** 3rd component 021XY902OR Irrigated Stony Claypan in some delineations
342A (333B)	Casebeer stv-l, 0-4% slopes 85% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs - SH, WD, stv-l **Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)** 2nd component 021XY900OR, Irrigated Shallow Stony in some delineations
343A	Jennett l, 0-1% slopes 85% Jennett Fine, smectitic, fr Aquic Durixerolls - DP, MWD, l **Claypan Bottom 12-18 021XY506OR (Ponded Claypan)**
344A	Norcross-Boulder Lake-Jennett complex, 0-1% slopes 40% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls - SH, WD, cbv-l,0-1% slopes **Claypan 14-20 021XY214OR** 35% Boulder Lake Fine, smectitic, fr Xeric Epiaquerts - DPV, PD, sil 0-1% slopes **Dry Meadow 021XY314OR (Intermittent Swale) (Arca)** 15% Jennett Fine, smectitic, fr Aquic Durixerolls - DP, MWD, l 0-1% slopes **Claypan Bottom 12-18 021XY506OR (Ponded Claypan)**

345A	Casebeer-Pankeybasin complex, 0-4% slopes 70% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs - SH, WD, stv-l, 0-4 % slopes **Shallow Stony 10-20 021XY204OR (Shallow Stony 10+)** 15% Pankeybasin Fine, smectitic, fr Palexerollic Durixerolls - MD, WD, cbv-l 1-4 % slopes **Stony Claypan 14-20 021XY216OR**
350B	Woolencanyon-Notchcorral-Wonser complex, 0-8% slopes 45% Woolencanyon Clayey, smectitic, mesic, shallow Palexerollic Durixerolls SH, WD, stv-cl 1-8 % slopes **Juniper Claypan 12-16 021XY505OR** 25% Notchcorral Fine, smectitic, mesic Palexerollic Durixerolls - MD, WD, cbv-l 1-8 % slopes **Juniper Claypan 12-16 021XY505OR** 20% Wonser Clayey, smectitic, mesic, shallow Typic Durixerolls SH, WD, cbx-l 0-4 % slopes **Shallow Stony 10-20 021XY204OR**
360B	Devaul-Norcross complex, 2-15% slopes 45% Devaul Loamy-skeletal, mixed, superactive, fr Typic Argixerolls DP, WD, cb-l 2-15 % slopes **Shrubby Loam 16-20 021XY218OR (Loamy 14-18)** 40% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls SH, WD, cbv-l 2-8 % slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)**
362B	Casebeer-Devaul-Norcross complex, 2-8% slopes 30% Casebeer Clayey, smectitic, fr, shallow Typic Durixeralfs SH, WD, cbx-l 2-6 % slopes **Shallow Stony 10-20 021XY204OR** 30% Devaul Loamy-skeletal, mixed, superactive, fr Typic Argixerolls DP, WD, cb-l 2-8 % slopes **Shrubby Loam 16-20 021XY218OR (New site in 98)** 25% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls SH, WD, cbx-l 2-8 % slopes **Juniper Claypan 16-20 021XY501OR**
370B	Widmer-Lorella complex, 2-10% slopes 60% Widmer Fine, smectitic, mesic Typic Argixerolls - MD, WD, st-l 2-10 % slopes **Juniper Loamy Hills 10-14 021XY200OR** 25% Lorella Clayey-skeketal, smectitic, mesic Lithic Argixerolls SH, WD, st-l 2-6 % slopes **Juniper Claypan 12-16 021XY505OR**
380C	Menbo-Drakce-Rock outcrop complex, 15-40% slopes 40% Menbo Clayey-skeletal, smectitic, fr Pachic Argixerolls - MD, WD, stv-l,15-40% slopes **North Slopes 14-18 021XY312OR** 30% Drakce Clayey-skeletal, smectitic, mesic Pachic Argixerolls MD, WD, stv-l 15-40% slopes **South Slopes 14-18 021XY308OR** 20% Rock outcrop **Miscellaneous Land Type**

(385C) 410D	was Drakce-Rock outcrop complex, 10-40% slopes 70% Drakce Clayey-skeletal, smectitic, mesic Pachic Argixerolls - MD, WD, stv-l **Juniper South 12-16 021XY300OR** 15% Rock outcrop **Miscellaneous Land Type**
390A	Teeltruc ashy-sl, 2-5% slopes 85% Teeltruc Coarse-loamy, mixed, superactive, frigid Vitrandic Haploxerolls DP, WD, ashy-sl **Shrubby Loam 16-20 021XY218OR (New site in 98)**
392B	Teeltruc-Schnipps complex, 2-15% slopes 65% Teeltruc Coarse-loamy, mixed, superactive, frigid Vitrandic Haploxerolls DP, WD, ashy-sl 2-8 % slopes **Shrubby Loam 16-20 021XY218OR (New site in 98)** 20% Schnipps Fine, smectitic, fr Pachic Argixerolls - DP, WD, stv-l 5-15 % slopes **Pine-Mahogany-Fescue 16-20 021XY410OR (Dry Pine 16-18)**
400C	Schnipps cb-l, 6-20% slopes 85% Schnipps Fine, smectitic, fr Pachic Argixerolls - DP, WD, cb-l **Juniper-Mahogany-Fescue 16-20 021XY420OR (New site in 98)**
402C	Devaul-Schnipps complex, 6-20% slopes 60% Devaul Loamy-skeletal, mixed, superactive, fr Typic Argixerolls DP, WD, cb-l 6-15 % slopes **Shrubby Loam 16-20 021XY218OR (New site in 98)** 30% Schnipps Fine, smectitic, fr Pachic Argixerolls - DP, WD, cb-l 10-20 % slopes **Juniper-Mahogany-Fescue 16-20 021XY420OR (New site in 98)**
410D (66F, 385C)	Drakce-Rock outcrop complex, 15-50% slopes 65% Drakce Clayey-skeletal, smectitic, mesic Pachic Argixerolls MD, WD, stv-l 15-50 % slopes **South Slopes 14-18 021XY308OR** 20% Rock outcrop 15-50 % slopes **Miscellaneous Land Type**
500C	Mound-Royst-Rock outcrop complex, 10-30% slopes 40% Mound Clayey-skeletal, smectitic, fr Pachic Ultic Argixerolls DP, WD, stv-l 10-30 % slopes **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue)** 30% Royst Clayey-skeletal, smectitic, fr Pachic Argixerolls - MD, WD, cb-l, 10-30 % slopes **Mahogany Rockland 10-20 021XY402OR (Rocky Ridges 14+)** 15% Rock outcrop 20-30 % slopes **Miscellaneous Land Type**
505D	Menbo-Drackce-Rock outcrop complex, 35-65% slopes 40% Menbo Clayey-skeletal, smectitic, fr Pachic Argixerolls MD, WD, stv-l 35-65 % slopes **Pine-Mahogany-Fescue 16-20 021XY410OR (Dry Pine 16-18)** 25% Drackce Clayey-skeletal, smectitic, mesic Pachic Argixerolls DPV, WD, stv-l 35-65 % slopes **South Slopes 14-18 021XY308OR** 20% Rock outcrop 35-65 % slopes **Miscellaneous Land Type**

510B	Schnipps-Norcross complex, 2-15% slopes 45% Schnipps Fine, smectitic, fr Pachic Argixerolls - DP, WD, cb-l 4-15 % slopes **Pine-Mahogany-Fescue 16-20 021XY410OR (Dry Pine 16-18)** 40% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls SH, WD, cbv-l 2-8 % slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)**
515B	Bumpheads, high precipitation-Mound-Norcross complex, 1-10% slopes 35% Bumpheads, high precipitation Fine, smectitic, fr Pachic Argixerolls - MD, WD, stv-l 1-10 % slopes **Pine-Mahogany-Fescue 16-20 021XY410OR (Dry Pine 16-18)** 30% Mound, warm Clayey-skeletal, smectitic, fr Pachic Ultic Argixerolls DP, WD, cb-l 1-10 % slopes **Pine-Sedge-Fescue 16-24 021XY414OR (Pine Fescue)** 25% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls Sh to duripan, WD, cbx-l 1-10 % slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)**
517B	Bumpheads-Mound-Norcross complex, 1-10% slopes 40% Bumpheads Fine, smectitic, fr Pachic Argixerolls - MD, WD, stv-l, 1-10 % slopes **Juniper Dry Pine 14-16 021XY508OR (Dry Pine 14-16)** 30% Mound, warm Clayey-skeletal, smectitic, fr Pachic Ultic Argixerolls DP, WD, st-l 1-10 % slopes **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue)** 25% Norcross Clayey, smectitic, fr, shallow Vitrandic Durixerolls Sh to duripan, WD, cbx-l 1-10 % slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)**
520B	Mound-Benhall complex, 2-20% slopes 45% Mound, warm Clayey-skeletal, smectitic, fr Pachic Ultic Argixerolls DP, WD, st-l 2-20% slopes **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue)** 40% Benhall Loamy-skeletal, mixed, SA, fr Pachic Ultic Argixerolls MD, WD, cb-l 2-20 % slopes **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue)**
525C	Mound cb-l, 15-30% slopes 85% Mound, warm Clayey-skeletal, smectitic, fr Pachic Ultic Argixerolls DP, WD, cb-l **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue**
530B	Benhall-Mound complex, 0-15% slopes 45% Benhall Loamy-skeletal, mixed, SA, fr Pachic Ultic Argixerolls MD, WD, cb-l 0-15 % slopes **Pine-Fir-Sedge 18-30 021XY422OR (Pine-Sedge)** 40% Mound Clayey-skeletal, smectitic, fr Pachic Ultic Argixerolls DP, WD, st-l 0-15 % slopes **Pine-Fir-Sedge 18-30 021XY422OR (Pine-Sedge)**
532B	Tallboy gravelly loam, 0-15% slopes 85% Tallboy Fine, smectitic, fr Pachic Ultic Argixerolls - DP, WD, gr-l **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue)**

533C	Benhall-Mound complex, 15-40% slopes 45% Benhall Loamy-skeletal, mixed, SA, fr Pachic Ultic Argixerolls MD, WD, cb-l 15-40 % slopes **Pine-Fir-Sedge 18-30 021XY422OR (Pine-Sedge)** 40% Mound, north slopes Clayey-skeletal, smectitic, fr Pachic Ultic Argixerolls DP, WD, st-l 15-40 % slopes **Pine-Fir-Sedge 18-30 021XY422OR (Pine-Sedge)**
540C	Schnipps-Mound complex, 2-30% slopes 60% Schnipps Fine, smectitic, fr Pachic Argixerolls - DP, WD, cb-l 2-30 % slopes **Pine-Mahogany-Fescue 16-20 021XY410OR (Moist Dry Pine 16-18)** 25% Mound, warm Clayey-skeletal, smectitic, fr Pachic Ultic Argixerolls DP, WD, stv-l 2-30 % slopes **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue)**
542B	Grohs-Carrbutte complex, 2-20% slopes 45% Grohs Fine, smectitic, mesic Pachic Argixerolls MD, WD, cb-l 2-20 % slopes **Juniper Dry Pine 14-16 021XY508OR (Dry Pine 14-16)** 40% Carrbutte Clayey-skeletal, smectitic, mesic Pachic Ultic Argixerolls DP, WD, st-l 2-20 % slopes **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue)**
543B	Carrbutte st-l, 2-15% slopes 85% Carrbutte Clayey-skeletal, smectitic, mesic Pachic Ultic Argixerolls DP, WD, st-l **Pine-Sedge-Fescue 16-24 021XY414OR (Pine-Fescue)**
550C	Menbo stv-l, 15-40% slopes 85% Menbo Clayey-skeletal, smectitic, fr Pachic Argixerolls MD, WD, stv-l **Pine-Mahogany-Fescue 16-20 021XY410OR (Dry Pine 16-18)**
560C	Drakce-Dranket complex, 4-35% slopes 45% Drakce Clayey-skeletal, smectitic, mesic, Pachic Argixerolls DP to Cr, WD, stv-l 15-35 % slopes **South Slopes 14-18 021XY308OR** 40% Dranket Fine, smectitic, fr Typic Durixerolls MD, WD, cbv-l 4-15 % slopes **Juniper Claypan 16-20 021XY501OR (Juniper Claypan 14-18)**
600A	Boulder Lake-Hippyjim silty clay loams, 0-1% slopes 50% Boulder Lake Fine, smectitic, fr Xeric Epiaquerts DPV, SWPD, sicl 0-1 % slopes **Dry Meadow 021XY314OR (Intermittent Swale) (Arca)** 35% Hippyjim Fine, smectitic, fr Xeric Endoaquerts DP, PD, sicl 0-1 % slopes **Ephemeral Lakebed 021XY503OR (Eleo)**
602A	Boulder Lake sil, 0-1% slopes 85% Boulder Lake Fine, smectitic, fr Xeric Epiaquerts DPV, PD, sil, **Dry Meadow 021XY314OR (Intermittent Swale) (Arca)**

605A	Boulder Lake-Cressler complex, 0-2% slopes 45% Boulder Lake Fine, smectitic, fr Xeric Epiaquerts DPV, PD, sil 0-1 % slopes **Dry Meadow 021XY314OR (Intermittent Swale) (Arca)** 40% Cressler Fine, smectitic, frigid Fluvaquentic Endoaquolls DPV, SWPD, sicl 0-2 % slopes **Wet Meadow 021XY406OR (Dece)**
610A	Hippyjim sicl, 0-1% slopes 85% Hippyjim Fine, smectitic, fr Xeric Endoaquerts DP, PD, sicl **Ephemeral Lakebed 021XY503OR (Eleo)**
615A	Olene-Boulder Lake complex, 0-1% slopes 45% Olene Fine, smectitic, fr Xeric Endoaquerts DP, PD, gr-c 0-1 % slopes **Semi-wet Meadow 021XY509OR (Daca)** 40% Boulder Lake Fine, smectitic, fr Xeric Epiaquerts DPV, PD, sil 0-1 % slopes **Dry Meadow 021XY314OR (Intermittent Swale) (Arca)**
(620A)	Norcross, 0-2% slopes USE A SPOT SYMBOL □ Norcross cbv-l, seasonal reservoir, frequently ponded, mat muhly and annual vegetation
999	Water

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FOREWORD

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

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

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

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

INTRODUCTION

This report presents the finding of the Ecological Site Inventory (ESI) and Soil Survey of the Gerber Block. The inventory encompasses a total of about 113,300 acres, including approximately 94,000 acres of public land administered by the BLM and about 19,300 acres of private land. The survey is a cooperative effort between the BLM and the National Resource Conservation Service (NRCS) formerly called the Soil Conservation Service (SCS). The Gerber Block is located in a soil survey area delineated by the NRCS, called the “Fremont National Forest Area, OR680”. The Gerber Block will not be published in a NRCS Soil Survey until the Fremont National Forest has been mapped to National Cooperative Soil Survey (NCSS) standards. Until the survey is published this interim report will contain the information required for incorporation in the published survey for the Fremont National Forest Area. The BLM crew primarily mapped lands administered by the BLM and the NRCS mapped the private land within the Gerber Block.

The primary purpose of the survey is to provide basic soil and vegetation data for the Bureau’s planning system and to meet Federal Land Policy and Management Act (FLPMA) requirements. The information can be used in developing management objectives for resource planning. This survey is an Order 3 Soil Survey that meets or exceeds the NCSS standards. The inventory defined phases of soil series with map units containing from one to three components, on a map scale of 1:24,000. The soil survey was done concurrently, produce an ecological (range) site condition inventory, which meets or exceeds BLM and NRCS National inventory standards. The inventory was completed using Pseudo Site Write-up Areas (SWA’s) that are not broken out by allotment and pasture boundaries, but are created by changes in the existing plant community of a single range site. However SWA’s can be produced upon completion of the field work, using Arc View (geographical information system, GIS) to overlay the Pseudo-SWA’s with allotment and pasture boundaries. The survey determined site potentials and capabilities in addition to the present ecological condition. The inventory will provide a baseline to facilitate Ecosystem Based Management, enabling resource managers to evaluate levels of use that do not depreciate or degrade the resource. The inventory will aid in making determinations on Rangeland Functionality and Health, in addition to Soil Functionality determinations. Information collection was completed in a usable format for easy entry into the soil, range and GIS databases. This information will also provide a method for reporting present vegetation condition (ecological status) to the BLM Inventory Data System (IDS). The soils data is entered into the National Soil Information System (NASIS), which has been developed by the NRCS. The soils data has been downloaded to Microsoft Access to facilitate use by BLM staff in the Lakeview District.

BOUNDARIES

The survey area is located in south central Oregon, in the Klamath Falls Resource Area and southeastern portion of Klamath County. The survey area is bordered by a small part of Lake County to the east, the Fremont National Forest to the remaining portion of the east, north and northwest. The area is bordered by the Soil Survey of Klamath County, Oregon, Southern Part to the west and bordered by the Modoc National Forest, Modoc County, California to the south. While conducting the field work there was a strong desire to obtain quality joins with existing surveys. A quality join occurs when the delineation lines of two soil survey areas join exactly along common boundaries and share the same map unit name, soil attributes and interpretations. The survey has a quality join with the published survey to the west, and we attempted to join into the Modoc Survey to the south. No attempt was made to join into the Soil Resource Inventory that was done on the Fremont National Forest to the east and north due to the general nature of that survey and the scale of mapping.

GENERAL NATURE OF THE AREA

This area lies within the Basin and Range physiographic province and transitions to the High Cascades to the west. Although the Basin and range province is characterized by internally draining valleys, the Gerber Block is drained by Miller Creek that flows into the Lost River that ends in Tule Lake that has no outlet. Elevations range from about 4,250 feet in Willow Valley to about 5,600 feet to the west. The physiography of the area is dominated by volcanic uplands, with basalt and welded tuff, which have been uplifted and faulted. The faulting has created the north to northwest trending fault block ridges and valleys characteristic of this area.

Climate

Mean annual precipitation ranges from about 14 to 24 inches (refer to map 1). The mean annual air temperature ranges from about 40 to 48 degrees F. Air temperatures can be over 100 degrees during July and August and below zero during December and January. Average annual frost-free period ranges from 60 to 100 days. Refer to Table 1.

Geology

The area dominantly consists of older, mostly Tertiary, volcanic deposits such as basalt, tuffs and breccias. Quaternary stream and lake deposited sediments occur scattered throughout the area but are most common on the western portion of the area.

General Vegetation

1. Coniferous forest occurs on the eastern and northern part, located mainly on lands administered by the Forest Service, which will be mapped by the NRCS. It is generally located along drainages and at the highest elevations of the area. The overstory vegetation consists of ponderosa pine, juniper, mountain mahogany, bitterbrush and ceanothus. The understory vegetation consists of Sandberg bluegrass, Idaho fescue, squirrel tail, needlegrass and sedges. (MLRA D21)

2. Juniper-sagebrush-bunchgrass communities occur on very shallow rocky soils on the uplands. The grass species represented are bluebunch wheatgrass, Idaho fescue, squirrel tail and cheatgrass. This is the dominant vegetation type in the survey. (MLRA D21)

3. Sagebrush-grasslands on the uplands in the western and southern parts. The soils are generally shallow and rocky. The grass species represented are bluebunch wheatgrass, Sandberg bluegrass, Idaho fescue, squirrel tail and cheatgrass. (MLRA D21)

4. Wet Meadow communities are generally ponded until the end of May. The soils are deep, dark and fertile. Major species include Eleocharis, Carex species and Poa species. (MLRA D21)

Broad Vegetative Groupings
The vegetative cover types in the area and their relationship to the general soil map units are discussed in the following paragraphs. The dominant vegetation on the soils in general soil map units 1, 2, 3, 7, and 8 consists of grasses and sedges. Ponding, flooding, or a high water table influences the plant communities in these areas during part of the year. Hardstem bulrush and cattail are on the wettest soils. The majority of the soils in these units support native meadow vegetation, including tufted hairgrass, which is dominant, and Nevada bluegrass, redtop, sedges, and rushes. These soils produce the highest abundance of plants and forage in the survey area. The meadows are used for grazing. The shallow open water areas are used extensively as breeding areas for waterfowl.

Mountain big sagebrush, low sagebrush, antelope bitterbrush, and Idaho fescue are dominant in the 12- to 18-inch precipitation zone. Areas in this zone are best suited to grazing by livestock late in spring and in summer and fall. Big game species also use these areas during these periods. These areas are not suitable as range for big game animals in winter because they usually are covered with snow from late in fall through spring. The dominant vegetation on the soils in general soil map units 15, 16, 17, 18, and 19 is similar to that of general soil map units 9 through 14 except the soils in units 15 through 19 also support western juniper. Because of the high elevation and short growing season, the vegetation on units 17 and 18 is best suited to livestock grazing late in summer and in fall when the snow has melted and the grasses have matured. Western juniper is present in the climax vegetative type on the ridge tops and escarpments. This species is intolerant of fires, but fires occur very infrequently in these areas because of the lack of understory vegetation capable of supplying fuel. As a result of grazing pressure and aggressive fire control during the last few decades, juniper has invaded plant communities. This invasion is occurring in varying degrees on all of the soils in units 15 through 19. The dominant vegetation on the soils in general soil map units 20, 21, 22, and 23 consists of coniferous trees, shrubs, and perennial grasses. These soils are at the highest elevations and receive the highest amount of precipitation of any in the survey area. Elevation ranges from about 5,000 to 5,400 feet. Precipitation ranges from about 18 to 24 inches. Most of the precipitation falls as snow. The principal forest cover types on these soils are interior ponderosa pine, and white fir. The interior ponderosa pine forest cover type is at the lower elevations. This type is associated with general soil map unit 20. The vegetation is dominantly ponderosa pine in the overstory, mountain big sagebrush and antelope bitterbrush in the midstory, and Idaho fescue in the understory. The areas are relatively open. Because sunlight reaches the forest floor, the understory vegetation is palatable for both livestock and wildlife. Because of the short growing season and the period of snow cover, livestock grazing is best suited to periods late in summer and in fall.

General Soils

1. The soils formed under the coniferous forests are generally moderately deep to deep, somewhat excessively drained and formed in volcanic ash and pumice over basalt and receives about 16 to 24 inches of annual precipitation.

2. Soils on Juniper-sagebrush covered hills and a mountain are cool, shallow to moderately deep, well drained, formed in loess and residuum and receives 14 to 20 inches of annual precipitation.

3. Soils on sagebrush-grassland tablelands are shallow to moderately deep, well drained formed in loess and residuum, and receives 14 to 20 inches of annual precipitation.

4. Soils in the wet meadows are usually deep and very deep, well drained and formed in alluvium. The soils in the center of the basins are very deep, poorly drained, formed in lacustrine sediment, receive about 14 to 24 inches of annual precipitation and may pond water seasonally.

GENERAL PROCEDURES

Staffing of the survey crew consisted of two Soil Scientist Curt Leet and Jerry Weinhiemer, and two Rangeland Management Specialists, Bill Lindsey and Dana Eckard. Jerry was responsible for mapping the private land. A team, consisting of the Soil Scientist working together with a Rangeland Management Specialist (RMS) during the 1997 and 1998 field seasons, completed mapping the public land. The survey area was broken out into two units so that each RMS will be responsible for a specific area. Bill Lindsey was primarily responsible for the range inventory on the north half of the area and Dana Eckard was mainly responsible for range mapping on the south half of the area.

Field mapping was completed on black and white orthophotos at a scale of 1:24,000. The orthophotos field sheets were produced on chronopaque, which is stable and waterproof. Dave Collier at the BLM Oregon State Office produced the orthophotos. The orthophotos contain the contour lines and cultural features such as section lines, roads and streams. Ultra fine point Sharpie markers were used in the field for drawing the soil map unit and range pseudo SWA delineations. Soil map unit delineations were drawn in blue and the range information was drawn in green. Paul Whitman at the Lakeview District Office produced scanned topographic maps of the Survey area with precipitation, geology and ownership.

1. Soil mapping was done at an Order 3 level of detail. Order 3 mapping is accurate for Resource Area and allotment planning but is not detailed enough for site-specific projects such as suitability for reservoir construction. Soil series and phases are correlated with each ecological site to establish relationships of individual soil taxa with ecological sites. The map units will be consociations, complexes and associations.

a. Consociations are map units in which 85 percent or more of the delineation fits within the range of characteristics for the soil series that provides the name for the map unit or soils with similar use and management.
b. Complexes are map units that consist of two or three soil series or miscellaneous areas (such as rock outcrop). The components occur in a regularly repeating pattern so intricate that the components cannot be delineated separately at the scale of mapping used for the survey area.

c. Associations are map units consisting of two or three soil series or miscellaneous areas. The major components are associated in a regular repeating pattern and are individually large enough to be separated on the maps. Every delineation of a soil association has the same major components in the same repeating pattern.

2. The range information consists of the ecological site name, and ocular estimates of condition class, existing species composition, foliar cover, annual production and percent of each ecological site present within the delineation. Assignment of condition class as it pertains to present ecological stage of succession or degradation was made in each map unit delineation. A range write up sheet was filled out for a representative area of each polygon delineated, or a write-up may have been used from another area with very nearly the exact composition but the dominant vegetation must be the same. The write up provides documentary support to the condition class assignment and observed apparent trend. It also keys other soil and vegetation write up information to the field sheet on which the specific ecological site is mapped. The soil map unit delineations can be divided by condition breaks or changes in dominant species.

3. The minimum size delineation was about 160 acres on most of the rangeland, but 15 acre delineations were used for areas of high resource value such as riparian areas or wetlands that are at least 200 feet wide. Spot symbols were used for areas of aspen and mountain mahogany that are 40 acres or less and do not have range write-ups. Contrasting inclusions and variations within a map unit delineation are described on the soil and range field sheets and can account for up to 15 percent of each delineation, although no single component can exceed 10 percent.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the Gerber Block. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of native plants and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity. The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape. Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation- landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries. Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research. While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions. Data are assembled from other sources, such as research information, production records, and field experience of specialists. Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date. After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on orthophotographs and identified each as a specific map unit. Orthophotographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Survey Procedures

The general procedures followed in making this survey are described in the National Soil Survey Handbook (34) of the Natural Resources Conservation Service. References used during the development of the survey include the soil surveys of Surprise Valley-Home Camp Area, California-Nevada (42); Modoc County, California, Alturas Area (40); the Fremont National Forest Soil Resource Inventory (32); soil mapping for conservation farm plans; and reconnaissance geologic maps published by the U.S. Geological Survey (USGS) (12, 45, 46, 47). The survey was mapped on high-altitude photographs enlarged to 1:24,000, to create the orthophoto base maps. Cultural features were transferred from USGS 7.5-minute topographic maps to the orthophotos. Slopes or aspects of hillsides and mountainsides generally were determined from contour intervals on the orthophotos and topographic maps, and from clinometer field checks. Preliminary soil map unit boundaries were plotted on these orthophotographs. The map unit boundaries were based on tonal patterns, slope, and aspect. The ESI team reviewed each soil map unit delineation, and on-the-ground sampling was conducted as needed to support soil-landform concepts established for the survey area. For each unit sampled, the team examined soil and plant characteristics. The range site inventory procedures in the National Range Handbook (39) were followed in sampling the vegetation.

The Fremont National Forest Soil Resource Inventory (SRI) was completed in 1979. Field mapping was conducted in April 1973 through October 1976 from black-and-white high-altitude photographs at a scale of 1:70,000. The scale was enlarged to 1:63,360 for publication in the SRI report. Additional fieldwork was done in 1986 through 1988 to correlate the SRI to National Soil Survey Standards. This included describing soil profiles for new soil series and delineating map units. A typical pedon was selected for each new series established for the part of the survey in the Fremont National Forest. Most of the map unit boundaries established for the SRI were retained; however, additional detail was needed as a result of incorporating aspect and soil temperature regimes. For example, frigid (cool) soils at high elevations were separated from mesic (warm) soils at lower elevations. Rangeland and woodland data also were collected for the new series and map units. Range site data were collected over a period of two years by using the standards of the Natural Resources Conservation Service. The intensity of mapping was varied according to the geographic area. Specific soil survey techniques were used for each of these areas. Transects were used in areas where the patterns of the soils were not easily predicted. Tonal patterns and stereoscopic studies of aerial photos helped to predict some preliminary soil delineations, but the extent and composition of each map unit were determined by line-intercept transects. Transect lines and field samples were taken at regular intervals, commonly crossing several delineations on a single geomorphic surface. Where predictable soil patterns existed, such as on terraces and tablelands, landform traverses were used to correlate soils with a particular geomorphic surface. Preliminary soil delineations were drawn using this soil-landform correlation. Traverses were planned using topographic maps and photo-interpretation of tonal patterns, slope, and aspect. These traverses crossed typical geomorphic surfaces and different slopes in each area. Field sampling was done primarily to support the particular soil-landform relationship established for each area.

Potential plant communities were correlated to specific soil characteristics, such as depth to a claypan, drainage, and content of salt.

FORMATION OF THE SOILS

Soil is the collection of natural bodies on the earth's surface that contains living matter and is capable of supporting plants. The nature of a soil depends upon the combination and interaction of five factors = climate, plant and animal life, parent material, topography, and time. The relative influence of each factor varies from place to place, and in some places one factor is dominant over the others. The climate, parent material, vegetation, and topography in this survey area are highly variable. The soil-forming factors of climate, plant and animal life, and parent material are discussed separately in this section. The factors of time and topography are grouped together and discussed under the heading "Geomorphology and Associated Landforms."

Climate

Climate, particularly moisture and temperature, greatly influences soil formation. The chemical and physical reactions taking place in soils are controlled largely by climate. Water dissolves soluble material in soils, and it transports material from one part of a soil to another. Water is necessary for the growth of plants and other organisms that contribute organic matter to soils. Temperature affects the rate of chemical reactions and of physical breakdown caused by the freezing of water. Freezing and thawing of water causes expansion and contraction and influences the movement of soil particles and rock fragments in soils. The kind and amount of living organisms in and on a soil determine the kind and amount of organic matter added to the soil. The rate of decomposition of organic matter is controlled by temperature and moisture. When soils are moist and warm, weathering and organic matter decomposition can occur. When they are dry or cold, reactions are slow and chemical weathering may cease. The past and present climatic conditions in the survey area have greatly influenced soil formation. Soil moisture and temperature vary greatly within the survey area because of the differences in the landscape. Precipitation ranges from about 14 inches in the southwestern area of the Gerber Block (which may be in a small rain shadow of Bryant Mountain) to about 24 inches in the Northeastern portion of the area on the forested mountains. Precipitation falls as rain and snow from late in fall to late in spring with occasional thunderstorms in summer. Maritime tropical air masses account for the thunderstorms in summer, and these masses also can cause heavy rainfall in winter that runs off into the basins and valleys (13). Soil temperatures conducive to chemical reactions are present from about March through November at the lower elevations and from May through October at the higher elevations.

The climate in the survey area has been cyclic during the past 15,000 years. Wetter and drier cycles have occurred throughout this period, and the resulting erosion and deposition of soil material is evident in the soil profiles and in the many shoreline deposits around the basins. About 10,000 years ago, the climate was warmer and drier than it is today. The basin lakes dried and became very shallow, and areas of playas were exposed. About 2,000 to 4,000 years ago, the climate was cooler and moister than it is today. This resulted in the expansion of Summer, Abert, Goose, and Warner Lakes to levels higher than the present levels (2). Marshes formed during this period of lake expansion. The climatic changes are also reflected in the soils on tablelands and terraces. The dense claypan (argillic horizon), as in the Booth, Drakce, Grohs, Mound and Schnipps, soils, and the duripan, as in the Casebeer, Dranket, and Norcross, are evidence of a climate that provided a stronger weathering environment than the one present today. The surface horizon of these soils and others is thin, is low in organic matter content, and reflects the present-day climate. The present climate is characterized by mesic, and frigid soil temperature regimes and aquic, aridic and xeric, soil moisture regimes. The interaction of these regimes with the other soil-forming factors contributes to the development of specific soil characteristics.

The soils in the southeastern area have a mesic soil temperature regime and a xeric soil moisture regime. The soils on the shrub-covered tablelands and mountains have a mesic or frigid soil temperature regime and a xeric soil moisture regime. The soils on the forested mountains and plateaus have a frigid soil temperature regime and a xeric soil moisture regime. The basin soils that have an aquic soil moisture regime and reducing condition because of a lack of oxygen show little evidence of development. Because the rate of decomposition is slow, organic matter accumulation is the primary evidence of soil formation. These soils typically are Mollisols and Vertisols and include those of the Boulder Lake series (Xeric Epiaquerts), Hippyjim and Olene series (Xeric Endoaquerts), Cressler series (Fluvaquentic Endoaquolls.

The tableland soils that have an aridic soil moisture regime (14 to 16 inches of precipitation) typically exhibit minimal organic matter accumulation on the surface and have a weak argillic horizon or have weak structural development in the subsoil. These soils typically are Mollisols that have a xeric moisture regime and include those of the Lorella series, (Lithic Argixerolls), Notchcorral and Woolencanyon series (Palexerollic Durixerolls) and Wonser series (Typic Durixerolls). Some of the soils on these landforms have a dense, clayey argillic horizon, which developed as a result of past climatic conditions.

The tableland soils that have a xeric soil moisture regime (16 to 24 inches of precipitation) exhibit a thin or thick mollic epipedon, minimal carbonate accumulation, and argillic horizon development. These soils typically are Mollisols and include those of the Dranket series (Typic Durixerolls); Norcross series (Vitrandic Durixerolls); Menbo series (Pachic Argixerolls).

On the steep, shrub-covered mountains, the soils range from those on south-facing slopes that have an aridic moisture regime and a mesic temperature regime to those on north-facing slopes that have a xeric moisture regime and a frigid temperature. Precipitation ranges from about 14 to 24 inches. Effective moisture for plant growth and soil development is significantly greater on the north-facing slopes. The epipedon increases in thickness as elevation increases, and it is thickest in the soils on north-facing slopes. The depth to carbonates increases as elevation increases, and the corresponding actual and effective moisture also increase. Weak to strong structural development is dominant throughout the subsoil, reflecting the influence of the active side slope topography. Soils of the Drakce series (Pachic Argixerolls) are on south-facing slopes and have an xeric moisture regime and a mesic temperature regime. Soils of the Menbo series (Pachic Argixerolls) are on north-facing slopes and have a xeric moisture regime and a frigid temperature regime.

The forested mountains and plateaus receive about 18 to 24 inches of precipitation. Elevation is about 5,000 to 5,400 feet. The soils have a frigid temperature regime and a xeric moisture regime. Soils of the Benhall, and Mound series (Pachic Ultic Argixerolls); Royst series (Pachic Argixerolls) are examples. Ponderosa pine plant communities are associated with the soils that are xeric. The parent material from which the soils develop under these plant communities and the soil moisture and temperature regimes strongly affect soil morphology. A thick mollic epipedon and distinct argillic horizon are typical in the soils that formed in material derived from basalt and tuff.

Andic soil properties are dominant in the solum of soils that formed in material derived from volcanic ash and other pyroclastic rock, such as rhyolite. From one lab sample andic soil properties are present in the area but the full extent was not determined. It was decided to wait until the Fremont National Forest Area is mapped to schedule more detailed soil sampling. Soil development is also expressed in the leaching and base saturation of the soil profile. Loss of bases correlates with higher precipitation and changes in the forest plant communities. Soils such as those of the Royst series, which receive about 14 to 20 inches of precipitation, and the Benhall series, which receive about 18 to 20 inches of precipitation, have higher base saturation than those of the Mound, soils, which receive about 20 to 24 inches of precipitation. The Mound soils are associated with the ponderosa pine forest plant community and are Pachic Ultic or Ultic Argixerolls. The Royst soils are associated with the western juniper and ponderosa pine forest plant communities and are Pachic Argixerolls.

Plant and Animal Life

Living organisms, especially the higher plants, are active in soil formation. The changes they bring about depend mainly on the life processes peculiar to each kind of organism. The kinds of organisms that live on and in soils are determined, in turn, by the climate, parent material, topography or relief, and age of soils. In this survey area, the effects of climate on vegetation are significant to soil formation. Plant cover helps to reduce erosion and stabilize the soil surface. Leaves, twigs, roots, and the remains of entire plants accumulate on the surface of soils and are decomposed by microorganisms, earthworms, and other soil fauna. Plant roots widen cracks in the underlying rock, which permits water to penetrate. The uprooting of trees by wind mixes soil layers and loosens the underlying material. Living organisms contribute to important processes such as the accumulation of organic matter, mixing of the soil profile, cycling of nutrients, stabilization of soil structure, and addition of nitrogen.

The soils in this survey area formed under three major types of plant cover, which are influenced by temperature and moisture. Grasses, shrubs and western juniper are dominant on the lower elevations on tablelands. Mixed conifer forest is dominant on the higher, moister mountains.

The grasses, shrubs and western juniper on the lower elevation tablelands are the dominant vegetation in the survey area. Plants such as bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, Thurber needlegrass, low sagebrush, mountain big sagebrush, and antelope bitterbrush are included. The shallow-rooted grasses are important in the development of surface soil structure and the accumulation of organic matter. The shrubs, which are more deeply rooted, are important in the development of subsoil structure.

The forested mountains and plateaus have the most abundant plant cover. Plants such as ponderosa pine, mountain mahogany, common snowberry, antelope bitterbrush, Idaho fescue, and Wheeler bluegrass are dominant. These plants provide a layer of duff 1 inch to 3 inches thick that protects the soil from erosion. The surface layer typically is thick and dark-colored because of the slow rate of decomposition of the organic matter.

Small animals, earthworms, insects, and microorganisms influence the formation of soils in several ways. Seed-eating ants inhabit a high percentage of the soils on tablelands at the lower elevations. The mounds of plant material left by these ants show their importance in breaking down the remains of plants. Small animals burrow into the soil and mix the layers, which improves soil structure. Earthworms and other small invertebrates feed on the organic matter in the upper few inches of soil material. They slowly, but continually, mix the soil material and alter its chemistry. Bacteria, fungi, and other microorganisms hasten the weathering of rocks and the decomposition of organic matter.

Man also has influenced soil development. Fire control and grazing management have had a direct effect on plant community composition, plant competition, and plant succession. Controlling fire results in an increase in woody shrubs and a decrease in grasses.

Parent material

The parent material of the soils in this survey area is derived from extensive interbedded basalt and tuff flows, rhyolitic dikes, and eolian ash deposits from Mt. Mazama (12, 14, 25, 45, 46, 47). The basin and mountain range landscape is a result of the faulting and tilting of the flows. The last major fault episode resulted in fault-block mountain ranges. The displacement along the fault and the exposed north-to-south-tending escarpments are 5,000 feet high or more from base to summit (28).

The soils on the alluvial flats and low terraces formed in lacustrine deposits from the Pleistocene lakes episode. These deposits are very thick and typically are fine textured.

The soils on the middle and high terraces formed in older alluvium. These terrace deposits are very thick, as is evident from the relief and topography of these landforms. The soils typically are fine and medium textured, are high in content of montmorillonitic clay, and overlie deposits of older alluvial gravel and cobbles.

The soils on tablelands formed in colluvium and residuum derived from basalt and tuff. Because the degree of soil development varies within short distances in these areas, erosional and depositional episodes may have occurred prior to the faulting and uplifting of the fault-block tablelands. The soils are fine and medium textured, are high in content of montmorillonitic clay, and have few rock fragments on the surface.

The soils on mountains formed in colluvium and residuum derived from basalt, tuff, and rhyolite. Those that formed in material derived from basalt and tuff typically are fine textured and have varying amounts of rock fragments. The kind and amount of clay minerals are associated with a change in climate and the amount of weathering. Soils that typically receive less than 20 inches of precipitation have a high content of montmorillonitic clay. Soils of the Mound and Royst, series are examples.

Geomorphology and Associated Landforms

Geomorphology is the study of the configuration of the Earth’s surface, including the classification, description, nature, origin, and development of landforms. There are two major landscapes in the survey area tablelands, and mountains. The tablelands are comprised of low and high tablelands with upland basins and narrow flood plains. The mountains are comprised of active and stable side slopes. These landscapes and their component landforms greatly influence soil formation (figs. 27, 28, 29).

Alluvial flats are of the Holocene and are at the lowest positions in the lake basins. These areas are equivalent in geomorphic age to the Horseshoe geomorphic surface of the Willamette Valley (6). The soils are ponded annually for long periods. Because the soils are wet for long periods, soil development is minimal. The main evidences of soil formation are organic matter accumulation and weak structural development. All of the soils on alluvial flats are subject to deposition and erosion. Some of the soils soils have thin strata of volcanic ash or pumice at a depth of 40 inches or less. In the other soils, deposits of ash and pumice occur only sporadically. The ash and pumice maybe from the eruption of Mt. Mazama about 6,600 years ago (2).

Tablelands
The soils on tablelands typically receive 14 to 20 inches of precipitation (xeric). The mean annual air temperature is 43 to 45 degrees F (frigid). Elevation is about 4,700 to 5,200 feet. The tablelands are characterized by basalt and tuff flows that have been uplifted by faulting.

Low tablelands are characterized by the absence of appreciable relief. Slopes typically are less than 15 percent, but they range too as much as 30 percent. The soils on these tablelands are equivalent in geomorphic age to the Calapooyia geomorphic surface of the Willamette Valley (9) and the lower member of the Eetza Formation of the Lahonton Valley Group (19, 20, 22). These soils reflect both present and past soil formation processes and episodes. All of these soils have an argillic horizon, but the degree of development ranges from loamy to clayey. The presence or absence of a duripan is also variable. Because the distinct diagnostic subhorizons vary across this relatively uniform landform, the soil formation processes appear to have been interrupted by different erosional and depositional episodes. These low tablelands receive 14 to 18 inches of precipitation and generally are at an elevation of about 4,200 to 4,700 feet.

High tablelands also are characterized by the absence of appreciable relief. Slopes typically are less than 15 percent, but they range to as much as 50 percent. The age of soil development on these tablelands is similar to that of the soils on high lake terraces. The soils on the high tablelands reflect both present and past soil formation processes and episodes. These soils have a clayey argillic horizon that dominantly contains montmorillonitic clay. Intermittent to continuous, thin duripans or silica deposits are common below the argillic horizon. The surface layer is relatively thin, and there is an abrupt textural change from the surface layer to the dense clay subsoil. The dense clay layer and associated silica deposits reflect past climatic conditions or episodes of deposition. The high tablelands receive 18 to 22 inches of precipitation and generally are at an elevation of about 4,700 to 5,200 feet. Ochric epipedons are dominant at the lower ranges of elevation and precipitation, and mollic epipedons are dominant at the higher ranges.

Upland basins and flood plains are of the Holocene. The soils in these basins and flood plains are equivalent in geomorphic age to the Ingram geomorphic surface of the Willamette Valley (9). The soils on the flood plains are subject to cutting and filling during periods of flooding. The reworking of the soil material is evident by the irregular decrease in organic matter as depth increases. Examples include soils of the Cressler series (Fluvaquentic Haplaquolls). The soils in basins reflect past climatic conditions or episodes of erosion and deposition. These soils have a dense clay layer that has a high content of montmorillonitic clay. Examples include soils of the Boulder Lake series (Aquic Chromoxererts). Many of the basins and flood plains are narrow and small and are associated with older geomorphic surfaces such as the Dolph, Eola, and Looney surfaces (9, 26).

Mountains
The soils on mountains typically receive 20 to 24 inches of precipitation (xeric). The mean annual air temperature is 43 to 45 degrees F (frigid). Elevation is about 5,000 to 5,400 feet. The mountains consist of stable and active slopes that adjoin rock escarpments (27). Slopes range from 0 to 70 percent. Vegetation is forest plant communities.

The soils on these active and stable slopes are extremely variable. Because of the variability of the parent material and climate, soil development ranges from weak to strong. In the less dissected areas, the soils typically exhibit a stronger degree of development that is associated with the Dolph or Eola geomorphic surface of the Willamette Valley (9) and the Lovelock Formation of the pre-Lake Lahonton lacustrine surfaces (21). Soils associated with the more stable slopes include those of the Royst series (Pachic Argixerolls), and Mound series (Pachic Ultic Argixerolls).

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 uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-relatedfailures in land uses. In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior. Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties. Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil. Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation. Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Non-irrigated Cropland

There are no non-irrigated crops, grown in the Gerber Block. A hazard of water erosion and droughtiness are the primary concerns in managing nonirrigated cropland. Resource management systems should be specific to each soil, crop grown, and climatic condition to keep soil and moisture losses to a minimum. Management strategies for a particular farm may include a combination of practices. Because droughtiness is a major limitation to the production of nonirrigated crops, conservation and efficient use of the available moisture is important. Gully, sheet, and rill erosion are serious concerns in this survey area. These types of erosion result in loss of valuable topsoil, sedimentation, loss of soil productivity, poor water quality, and damage to property. If the surface layer is lost through erosion, much of the available plant nutrients and organic matter are lost, which affects soil structure, water infiltration, and soil tilth. The severity of the erosion determines how much productivity is lost. Many years are needed to replace a small portion of the soil surface even under the best soil-building conditions. Soils that have steeper slopes, particularly those that have slopes of more than 25 percent, are highly susceptible to water erosion. Planting permanent vegetation helps to minimize water erosion and rehabilitate severely eroded areas. Soils that freeze are very susceptible to erosion. The water intake rate may be reduced significantly when a soil is frozen, and excessive runoff occurs during periods of freezing and thawing. When the surface of the soil thaws, it becomes supersaturated. The resulting mix of soil and water flows downslope, causing severe gully erosion. Resource management systems that reduce soil erosion from runoff and that conserve soil moisture include both cultural and structural practices. Cultural practices consist of conservation cropping systems and conservation tillage systems, including minimum tillage and no-till farming, and use of chemical fallow and crop residue. Structural practices include the construction of terraces, diversions, and grassed waterways. Farming on the contour and across the slope and stripcropping also reduce erosion and conserve soil moisture.

Residue Management and Tillage Systems

Organic matter provided by crop residue is an important source of nitrogen, phosphorus, and sulfur. It also increases the water intake rate and available water capacity, reduces surface crusting, promotes good soil structure and tilth, and reduces erosion. Research shows that organic matter content gradually decreases in soils that are under a small grain and fallow cropping system for many years, even in areas where straw is incorporated. Use of conservation cropping systems that include additions of straw, however, helps to slow this decline. The organic matter content can be maintained by regularly adding manure. Growing green manure crops or planting severely eroded areas to permanent vegetation hastens rehabilitation. Conservation tillage systems are important in maintaining good soil tilth. Keeping the surface rough and cloddy can reduce runoff. Excessive tillage results in loss of soil moisture, and it pulverizes soil aggregates and destroys soil structure. Overworking the soil in spring and summer before seeding results in crusting of the surface, which reduces infiltration, produces a powdery soil surface that is subject to wind erosion, impairs seedling emergence, and causes excessive runoff and erosion. Proper management of crop residue includes leaving as much plant material on the soil surface throughout the year as needed to control erosion. Residue on the surface reduces erosion and filters out the sediment from runoff. Decomposing residue returns some organic matter to the soil, which helps to improve soil structure and the water infiltration rate. Residue management also is effective in reducing the risk of wind erosion. Removal of residue by grazing, mechanical chopping, tilling, or burning generally is neither desirable nor economically feasible.

Structural Practices

Terraces and diversions are used to reduce the effective length of slopes and therebyreduce runoff, sedimentation, and erosion. They are best suited to soils that have uniform, regular slopes. In areas that have slopes of more than 12 percent, terraces usually are effective in reducing gully erosion. Level or gradient terraces are used in areas of nonirrigated cropland. Level terraces generally are most effective in areas of deep soils that receive a moderate amount of precipitation. Gradient terraces generally are constructed in areas of moderately deep soils that receive a high amount of precipitation. Grassed waterways reduce erosion and sedimentation in areas of concentrated waterflow. Natural or constructed waterways are suitable where there is a nonerosive outlet. Maintaining a plant cover keeps the soil in place and makes it more resistant to water erosion. A plant cover also acts as a filter, reducing the amount of sediment carried by runoff.

Pastures should be kept in good condition, as measured by the quantity of plants present that are high in the ecological succession. Planned grazing systems, fertilizer, fences, irrigation, and other management practices can have a significant effect on yields. Deferring grazing until after grasses are mature helps to maintain the abundance of the desired species. To stimulate regrowth, pastures commonly are irrigated after haying operations. Grazing the hay stubble after mowing also is common, but the pasture should be irrigated first. Grazing of fields that are being irrigated or are wet causes compaction of the soils. High-quality forage species can be sustained if the season and degree of use are properly managed. The length of the periods of grazing and the timing of grazing during the growing season are important considerations. Grazing early in the growing season is feasible if the plants can set seed after the livestock are removed. Sufficient soil moisture and length of growing season are needed for plants to regrow and set seed. Allowing plants to reach maturity maintains the abundance of the desirable species. Pastures that are in poor condition as a result of past use can be improved by changing the duration and intensity of grazing.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive land forming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes. In the capability system (36), soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey. Capability classes, the broadest groups, are designated by numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows: Class I soils have few limitations that restrict their use. Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices. Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both. Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both. Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use. Class VI soils have severe limitations that make them generally unsuitable for cultivation. Class VII soils have very severe limitations that make them unsuitable for cultivation. Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, IIe. The letter e shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry. In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by w, s, or c because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation. The capability class and subclass of each map unit in this survey area are shown in the map unit descriptions.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland. Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service. A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated. The map units in the survey area that are considered prime farmland are listed at the end of this section. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 16. The location is shown on the detailed soil maps that are in GIS. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units." The map units that meet the requirements for prime farmland if irrigated are:

390A Teeltruc ashy-sl, 2-5% slopes

392B Teeltruc-Schnipps complex, 2-15% slopes

Hydric Soils

In this section, hydric soils are defined and described and the hydric soils in the survey area are listed.

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin and others, 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for each of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 1995). These criteria are used to identify a phase of a soil series that normally is associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 1998) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils in this survey area are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and others, 1998).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

The following map units meet the definition of hydric soils and, in addition, have at least one of the hydric soil indicators. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 1998).

    ## AbA Alpha-Beta complex, tidal
    ## IsA Iota muck, tidal

Map units that are made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The following map units, in general, do not meet the definition of hydric soils because they do not have one of the hydric soil indicators. A portion of these map units, however, may include hydric soils. Onsite investigation is recommended to determine whether hydric soils occur and the location of the included hydric soils.
GaA Gamma silt loam

Rangeland

By Dave Franzen, range conservationist, Natural Resources Conservation Service, prepared this section for the Southern Part of Lake Count, Soil Survey. This section has been modified by author for the Gerber Block.

Nearly 85 percent of the survey area is rangeland, the remainder is wetlands or grazable forestland. The vegetation on this land helps to control erosion, conserve water, and maintain watersheds; provides habitat for wildlife; and provides year-round forage for wildlife and livestock. The rangeland also offers scenic and recreational value.

Importance and Uses

The survey area has been used for domestic livestock grazing since the late 1800's. Migrant sheep operators once moved large flocks across the area. As the grazing season progressed from winter to summer, flocks gradually were moved from the basins to the higher elevations. These large sheep operations have been replaced by large cattle operations. Rangeland watersheds provide for the capture, storage, and safe release of water through springs and riparian systems, which helps to maintain the quality and quantity of water for fish. The rangeland also provides habitat for many game and nongame mammals and birds, including some threatened and endangered species. Rangeland provides opportunities for wildlife viewing, photography, landscape painting, hang gliding, hiking, rockhounding, and sightseeing. The vegetation on the rangeland maintains and provides a gene pool for natural maintenance, selection, and propagation of adapted species in their native habitats. These habitats and the associated vegetation are used as seed sources for the development of improved plant material. Historically, edible whole plants or parts of plants were crucial to the survival of Native Americans. The interest in native plants for edible and medicinal purposes has been revived in recent years.

Grazing Management

The key to proper livestock grazing management is use of a system designed with consideration of plant and animal requirements, topography, and management objectives. Grazing systems include rotating pastures, controlling the time and length of the grazing period, and resting or deferring grazing during periods of critical plant growth. Other practices such as fencing, salting, constructing water developments, controlling weeds and brush, thinning, and seeding are used to facilitate the grazing system, to improve livestock distribution, or to increase forage production. An important objective of grazing management should be the maintenance or improvement of the soil, water, and vegetation. Management is needed to achieve an acceptable level of cover and forage production consistent with the limitations of the vegetative site. Areas should be managed to conserve water, improve water quality, and reduce erosion.

Limitations for Use as Rangeland

Because of specific characteristics, some areas are unsuited or less suited to particular grazing practices. Important limitations are given in the section "Detailed Soil Map Units." Some of the characteristics that could affect grazing management are discussed briefly in the following paragraphs. Compaction, when wet, these soils are particularly susceptible to compaction by vehicles and livestock. If the heavy clay soils are grazed during wet periods, they are subject to compaction and displacement and the plant crown is subject to damage. Compaction results in reduced permeability and infiltration and restricted root penetration. As water movement in the soils is impeded, runoff increases and erosion occurs. Restricting traffic by equipment and livestock when the soils are wet reduces compaction. Aspect is the direction in which a slope faces. North-facing slopes generally are more productive, but development of plants is slower because of the cool temperatures. Livestock and wildlife prefer these slopes in summer. The vegetation stays green until late in summer because of the cool, moist conditions. South-facing slopes generally have the opposite characteristics of north-facing slopes. Because they are warmer and drier, they are poorly suited to livestock grazing in summer. These slopes are very important to big game in winter because less snow accumulates in these areas and they are the first to green up in spring. Southeast- and west-facing slopes have characteristics similar to those of the south-facing slopes. Droughtiness is a result of low annual precipitation or low available water capacity. It reduces the production of forage and limits the choice of species suitable for seeding. Soil characteristics such as coarse texture, shallow depth, and a high content of rock fragments restrict the available water capacity. Cold temperatures limit the length of the growing season. Below-normal daily temperatures during the growing season delay plant growth. A high water table is present seasonally in some soils and year-round in others. Wetness, even if the root zone is saturated only briefly, has a major impact on plant community composition and production. This is especially true if a soil is ponded or has a water table at or near the surface. If these soils are seeded, mechanical site preparation is difficult because of the limited period when equipment can be used. The species selected for seeding should be tolerant of wetness.

Stock pond construction is not feasible in many locations, due to high content of rock fragments and shallow depth to a duripan or bedrock, and proper construction material is not available in some areas. Unless material for sealing a pond is brought in from outside the area, ponds can be constructed only in areas where the soil material naturally is slowly permeable and can be compacted and sealed properly. Soils that are coarse textured, have a high content of rock fragments, or are shallow to bedrock are subject to excessive seepage and are poorly suited to use as ponds. Even in the higher precipitation zones, the coarse textured, excessively drained soils seldom receive sufficient moisture from runoff to make pond development feasible. Steepness of slope affects livestock use and the feasibility of applying certain management practices. Livestock prefers areas that have slopes of 30 percent or less. Areas that have slopes of more than 50 percent receive very little use even if the forage in these areas is abundant. Limited use of the steep slopes normally is anticipated, and stocking rates are adjusted accordingly. Mechanical seeding with ground equipment generally is impractical in areas that have slopes of more than 35 percent. Stones and cobbles on the soil surface can affect grazing management and the potential for revegetation. Livestock generally avoid areas that have a large amount of stones and cobbles on the surface. The amount of stones on the surface also affects the feasibility of mechanical seedbed preparation and seeding. Loss of site potential is a management concern on some soils in the survey area. Some of the soils in the area have lost a significant amount of the surface layer and are identified as eroded or as having a thin surface layer. Loss of the surface layer can cause major changes in the composition of the plant community. Low sagebrush is better able to adjust to changes in the soil moisture and nutrient content. In areas of Casebeer soils, bluebunch wheatgrass has been replaced by Sandberg bluegrass. These irreversible changes in the plant community as a result of soil erosion are most evident in soils that have a claypan, which restricts plant growth. Loss of total production ranges from 25 to 50 percent, depending on the degree of soil erosion. Rock outcrop and escarpments are throughout the survey area. Typically, they are on steep, south- and west-facing slopes. They generally formed as a result of geologic faults or are exposed areas of sedimentary or igneous rock. The areas of Rock outcrop and the escarpments are as much as several hundred feet long and are 10 to 200 hundred feet high. They are well expressed along the rim on the west side of the survey area. The surface texture also affects use of a soil as rangeland. Soils that have a sandy surface layer are subject to a severe hazard of wind erosion. These areas should be grazed only when the soils are moist and the risk of wind erosion is reduced, generally late in fall to early in spring. Soils that have a silty surface layer are subject to crusting and are sticky when wet. Crusting of the surface reduces infiltration and seedling emergence. Soils that have a clayey surface layer have a slow or very slow infiltration rate and are very sticky and very plastic when wet. The soil surface becomes rutted and compacted if these soils are grazed or traversed by equipment when wet.

Characteristic Plant Communities

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water. Table 3 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. An explanation of the column headings in the table follows. A range site is a distinctive kind of site that produces a characteristic natural plant community that differs from natural plant communities on other vegetative sites in kind, amount, and proportion of plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of plants. Soil reaction, salt content, climate, and a seasonal high water table are also important. Total production is the amount of vegetation that can be expected to grow annually in a well managed potential natural plant community. It includes vegetation that may or may not be palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants that are as much as 4.5 feet tall. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods. Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under composition, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The percent composition has been determined either by the production of air-dry weight or by the abundance of individual species. Pounds per acre of air-dry weight is given in table 3, the percent composition has been determined by air-dry weight. If this is absent, the percent composition has been determined by abundance. The amount of vegetation that can be used as forage depends on the kinds of grazing animals and on the grazing season. Range and forest management requires knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range site condition. Site condition is determined by comparing the present plant community with the potential natural plant community on a particular site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. The objective in range management is to manage grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition slightly below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Woodland Management and Productivity

By Russell R. Hatz, forester, Natural Resources Conservation Service, and David L. Wenzel, soil scientist, Forest Service. This section was originally , prepared for the Southern Part of Lake County, Soil Survey. This section has been modified for the Gerber Block.

The best timber-growing sites generally are in areas of soils that are derived from basalt and are at the highest elevations of the Gerber Block. The lower elevations are too dry. The productivity of a site may be highly variable because of specific environmental and microsite characteristics. About 10 percent of the survey area is classified as commercial forest land. About 5 percent of this land is owned by the forest industry, 10 percent is owned by ranchers and other private landowners, and 85 percent is publicly owned. The publicly owned land is managed by the Bureau of Land Management. The Bureau of Land Management and Oregon State Department of Forestry provide protection from fire. Most of the forest land in the survey area has slopes of 0 to 40 percent. Only a small part of the forest land has slopes of more than 40 percent. Because the forest land is in the rainshadow of the Cascade Mountains, it is characterized by drought-tolerant tree species such as western juniper and ponderosa pine, although stands of white fir occur at the higher elevations. Ponderosa pine is the dominant timber species. The interior ponderosa pine forest cover type is primarily at the middle to high elevations. The soils are moderately deep to very deep and are well drained. Ponderosa pine, western juniper, mountain big sagebrush, wax currant, antelope bitterbrush, snowbrush manzanita, Ross sedge, bottlebrush squirreltail, and Idaho fescue are associated with this forest type. The white fir forest cover type generally is at the highest elevations in areas that are cool and moist. This type is associated with a wide range of soils, landforms, and slopes. The vegetation consists of ponderosa pine, white fir, snowbrush manzanita, wax currant, squawcarpet, Ross sedge, lupine, and bottlebrush squirreltail. Repeated fires in the forested areas once resulted in the establishment of stands of ponderosa pine. Following a half century of fire control and harvest of the Ponderosa Pine, some stands are changing to the white fir forest type. Controlled fires and silvicultural treatments are being used to maintain early seral species in many managed stands. The majority of the woodland in the survey area provides forage for livestock and wildlife. The amount of forage available under many stands of timber is low, and the palatability ranges from low to high. If properly managed, the interior Ponderosa Pine forest type includes high-quality bunchgrass. Timber management can also improve the distribution of livestock and the production of forage for livestock. Harvesting timber creates openings that serve as transitory range. Until planted tree seedlings are large enough to shade the undergrowth (15 to 20 years), this temporary range contributes significantly to the amount of forage available for livestock. Transitory range also makes it possible to move livestock away from traditional areas of concentration, such as riparian areas, and into areas that have received little, if any, use by livestock.

Many diseases and insects that can damage individual stands of trees affect the forested areas in the survey area. The amount of damage varies from year to year. The Modoc budworm (Choristoneura viridis) is abundant in the Warner Mountains. Outbreaks occur sporadically as the populations build and then collapse. Damage is limited to the true firs and generally only results in a slight reduction in growth. The fir engraver (Scolytus tralis) is a native bark beetle that primarily attacks true firs. Outbreaks occur at irregular intervals and generally follow periods of drought or defoliation, which lower the resistance of the trees. This insect can cause a severe rate of tree mortality. The fir tree borer (Semanotus litigiosus) attacks trees that died recently or are dying and degrades the lumber. The mountain pine beetle (Dendroctonus ponderosae), western pine beetle (Dendroctonus brevicomis), pine engraver (Ips pini), and red turpentine beetle (Dendroctonus pseudotsugae) are the most common of the bark beetles that annually kill some ponderosa pine and periodically kill large numbers of trees. Fomes rootrot (Fomes anosa) and brown stringy rot (Echinodontium tinctorium) are examples of the many kinds of fungi that attack live white fir trees. Fire wounds are the most common entry points for fungi. Young, thriving, uninjured fir trees generally are free from rot, but old, overmature trees frequently are badly decayed. Twig dieback (Cytospora abietis) is a fungus that causes cankering and dieback of true firs. It can reach epidemic proportions if the trees are predisposed to attack because of adverse conditions such as drought or beetle infestation. Other diseases also are present and at any given time may cause serious damage to individual stands of trees. Root rot established in the center of trees may limit the growth and potential yield of stands and affect local management. The information in soil surveys is important to woodland managers as they seek ways to increase the productivity of woodland. Some soils respond better to fertilization, some are susceptible to landslides and erosion after road building and harvesting, and others require special management for harvesting and reforestation.

The potential productivity of common trees on a soil is expressed as a site index. Site index is determined by taking height and age measurements on selected trees within stands of a given species. The procedure is given in the site index publications for ponderosa pine (16) and white fir (30). The site index applies to fully stocked, even-aged stands. The highest yields can be expected from soils that have the highest site indexes. Site index values can be converted into estimated yields at various ages by carefully using the appropriate yield tables. Species preferred for wood production are selected for reforestation or are allowed to regenerate naturally. Commercial value, topographic position, survival and growth potential, and natural plant community relationships are some of the factors that can influence the choice of adapted trees suitable for reforestation. A rating of slight, moderate, or severe indicates the degree of the major soil limitations. If a soil has a rating of moderate or severe, additional information is given in the detailed soil map units. The hazard of sheet and rill erosion ratings refer to the probability of excessive erosion occurring as a result of operations that leave the soil exposed. Forest land that is damaged by fire or overgrazing is also subject to erosion. A rating of slight indicates that no particular erosion-control measures are needed under ordinary conditions; moderate that some erosion-control measuresare needed, and severe that extra measures are needed to control erosion during silvicultural activities. These ratings are determined by considering the topography, erodibility of a soil, and local climate. Ratings of moderate or severe may indicate the need for modified road construction, special harvesting systems, and alternative site preparation techniques. The hazard of cut and fill erosion ratings refer to the probability that damage may occur as a result of erosion on road cuts and fills. Cuts and fills should be seeded. A rating of slight indicates that no other erosion-control measures are needed under ordinary conditions; moderate that additional erosion-control measures, such as use of mulch and sediment traps, are needed under certain conditions; and severe that additional erosion-control measures are needed under most conditions. The texture of the surface and subsurface layers and the angle and length of the slope contribute to the risk of cut and fill erosion. The risk of erosion is most severe in areas that have longer cuts and fills and in areas of more highly erodible soils. The equipment limitation ratings refer to the limits on the use of wheeled or tracked, ground-based equipment because of the characteristics of the soil or the topography. A rating of slight indicates that use of equipment normally is not limited to a particular kind of equipment or time of year; moderate that there is a short seasonal limitation or a need for some modification in management or equipment; and severe that there is a seasonal limitation or a need for special equipment or management or that use of equipment is hazardous. Use of equipment is limited mainly by the steepness of slope, soil wetness, and susceptibility to soil compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. Tracked equipment should be used in the steeper areas, and cable yarding systems should be used in the steepest areas. Soil wetness, especially in areas of fine-textured soils, can severely limit the use of equipment and make harvesting practical only during the dry period in summer. The soil compaction ratings refer to the probability that damage will occur to the soil structure as a result of repeated equipment use during periods when the soil is wet or moist. Compaction should always be a consideration during silvicultural activities. Even in areas that have a slight rating, use of designated skid trails and protection of the layer of duff are needed. A moderate rating indicates the potential need for extra precautions, such as use of cable yarding systems instead of ground skidding equipment and seasonal restrictions on equipment use. A severe rating indicates the need for extreme caution and possibly some restorative measures, such as ripping or disking, after harvesting. Soil characteristics considered in the compaction ratings are the thickness of the layer of duff, content of coarse fragments, texture, and plasticity. Soil compaction decreases air spaces in the soil; thus, air and water movement are reduced, which restricts root growth and increases the risk of surface erosion. The soil displacement ratings refer to gouging, scraping, or pushing soil from its natural position by mechanical means. It is most often associated with mechanical slash disposal, tractor yarding operations, and site preparation. A slight rating indicates that equipment use is not restricted and that special precautions generally are not needed; moderate that specialized equipment, such as a brush rake, is needed; and severe that extreme caution should be used in tractor yarding operations and in mechanical slash disposal and site preparation. Soil characteristics considered in the soil displacement ratings are the thickness of the layer of duff and the surface layer, slope, content of coarse fragments, and texture. Removing or mixing the layer of duff and exposing the mineral soil are needed for natural regeneration of many species; however, if the soil displacement is excessive, plant recovery rates may be impaired. Prolonged exposure of the soil may result in an increased risk of erosion and further deterioration of the site. The seedling mortality ratings refer to the probability of death of tree seedlings as a result of the characteristics of the soil or topography. Plant competition and damage by animals are not considered in this rating. The ratings apply to healthy, dormant seedlings from good stock that are properly planted during a period of sufficient moisture. Slight indicates that no problem is expected under normal conditions; moderate that some problems can be expected and that extra precautions are needed; and severe that the potential mortality rate is high and that extra precautions are essential for successful reforestation. Wetness, droughtiness, and topographic conditions contribute to the seedling mortality rate. To offset these concerns, larger than normal planting stock, special site preparation, surface drainage, or additional plantings may be needed. The windthrow ratings refer to the ability of the soil to support the development of tree roots and to hold trees firmly. A rating of slight indicates that trees normally are not blown down by the wind; moderate that an occasional tree may be blown down during periods of soil wetness and moderate or strong winds; and severe that many trees may be blown down during periods when the soil is wet and winds are moderate or strong. Restricted rooting depth because of a high water table, underlying bedrock, or an impervious layer and poor anchoring of roots because of loose soil material contribute to the risk of windthrow. Moderate or severe ratings indicate the need for care in thinning forest stands, periodic salvage of windblown trees, and adequate roads and trails to support salvage operations. The plant competition ratings refer to the likelihood of invasion by undesirable plants when openings are made in the tree canopy. A slight rating indicates that unwanted plants are not likely to retard the development of natural or planted seedlings; moderate that competition will retard natural or planted reforestation; and severe that competition can be expected to prevent natural or planted reforestation. Plant competition is a concern in areas where the climatic conditions and soil characteristics are favorable for plant growth. In many areas the key to predicting plant competition problems is the quantity and proximity of seed sources of undesirable plants or the quantity of unwanted brush rootstock that will resprout after harvesting. Moderate and severe ratings indicate the need for careful and thorough site preparation and the potential need for mechanical or chemical treatment to retard the growth of competing vegetation. The fire damage ratings refer to the probability that a fire of moderate fireline intensity (116 to 520 btus/ sec/ft) will have a negative impact on the characteristics of the soil. A rating of slight indicates that negative impacts to the soil characteristics are not expected; moderate that negative impacts, such as poor infiltration and excessive erosion, may occur and that extra caution is advised in planning prescribed fires; and severe that negative impacts are likely to occur and that extreme caution is advised in planning prescribed fires. The soil characteristics considered in determining the ability of a soil to resist fire damage are the thickness of the layer of duff, the content of organic matter, and the texture. To offset potential damage, winter burning, alternative lighting techniques, monitoring of the fuel and the content of moisture, yarding of unmerchantable material, elimination of prescribed fires, or erosion-control measures may be needed after burning.

Watersheds

Soils affect the cycle of water by capturing, storing, and releasing moisture. Differences in the kind and amount of vegetation produced in a watershed area are closely related to the kinds of soil. Effective management is based on the relationship among the soils, vegetation, and water. The cycle of water affects the production and maintenance of all resources. Water transports nutrients from the soil to the roots of plants and allows the nutrients to move throughout the plants. The amount of water in a soil largely determines the forage or timber species that will grow on a given site. Changes in annual precipitation can increase or decrease the annual growth of plants, including that of trees for use as commercial timber. Water is critical to all wildlife, and thus it influences the distribution and abundance of wildlife populations. As well as supplying drinking water for wildlife, the streams, ponds, and springs support lush riparian habitat that provides food, cover, and nesting areas for wildlife. Most of the water used to irrigate crops originates in the higher upland areas. The amount of water available in the survey area is influenced by the elevation, rate of evapotranspiration, precipitation, and soils. Generally, the annual demand for water exceeds the available supply. Watersheds are composed of aquatic, riparian, and upland terrestrial ecosystems. Riparian areas are wetland ecosystems that have a high water table because of proximity to areas that have an aquatic ecosystem or subsurface water. Riparian ecosystems generally occur as an ecotone between aquatic and upland ecosystems, but they have distinct vegetative and soil characteristics. Riparian areas are uniquely characterized by high diversity, density, and productivity of species. Riparian, aquatic, and upland terrestrial ecosystems interact continuously through exchanges of energy, nutrients, and species. The Boulder Lake-Hippyjim silty clay loams, 0 to 1 percent slopes is an example of a riparian area. Riparian areas represent only a small part of the total acreage of the survey area, but their ecological value is very high. The vegetation in riparian areas provides shade and traps sediment before it reaches stream channels, thus helping to maintain a supply of cool, clean water. Healthy riparian areas store water for release late in the growing season and provide water when the supply is low in other areas. Because many riparian areas are narrow, most are not delineated on the maps for this survey area because of the scale used. Riparian areas provide many types of recreational opportunities, including fishing, hunting, bird watching, nature viewing, boating, hiking, and camping. On a per acre basis, the forage produced in the riparian areas is several times that produced on the adjacent uplands, and it is used by domestic livestock and wildlife. Because riparian areas provide water and succulent forage and have gentle topography, livestock tend to concentrate in these areas. The use and management of the resources in the riparian areas, such as timber harvesting or grazing, directly affect the quality of the water associated with streams and the habitat provided by the riparian vegetation. When livestock concentrate along stream bottom lands, they browse heavily on streamside vegetation and trample streambanks. Because the roots of this streamside vegetation help to stabilize channels and the shrubs and trees shade and cool the water in streams, extensive loss of streamside vegetation increases the risk of channel erosion and increases stream sedimentation and turbidity. Severe channel downcutting can lower the water table adjacent to the stream, which causes changes in production and composition of the plant community. Streambank water storage capabilities can also be reduced, resulting in less water being released for use late in the growing season. The reduction of shade provided by streamside shrubs and trees results in higher water temperatures late in summer. Generally, the quality of the water is good at elevations above 5,000 feet and good to moderate below this elevation. Basalt is the major parent rock in area and watersheds in material derived from basalt are resistant to erosion. The soils in the Mound-Benhall complex, 2 to 20 percent slopes, is an example of soils on stable slopes of forested mountains. The streams at or above 5,000 feet are primarily first- and second-order drainageways.

The condition of most other riparian areas in this survey area is stable or improving. Recent restoration efforts, including construction of structural improvements and implementation of grazing systems designed to promote recovery of these areas, have significantly improved the physical, biological, and ecological condition of a number of riparian areas. Practices include constructing loose rock check dams, shaving banks, fencing, reveting streambanks with juniper, and constructing log or rock structures instream. Changes in management practices and grazing systems have improved the condition of many riparian areas. It will take many decades, however, to return some of the riparian areas in this survey area to the desired ecological condition. The degree of damage to watersheds depends on several physical and biological factors. In managed areas that include bare ground and roads, the most significant factors include the hazard of soil erosion, the steepness of slope, and the rate of runoff or the occurrence of storms. Most precipitation falls as snow from November through March, and most of the runoff from snowmelt occurs in April and May. Most likely to cause damage are high-intensity thunderstorms in summer and periods of rainfall in winter when a snowpack is present. Intense thunderstorms in summer can cause localized erosion and sedimentation. Rain on snow can cause similar results, but the effects usually are more widespread and are greater in stream channel systems.

Windbreaks and Environmental Plantings

Wind can be a serious environmental and economic problem. It can cause erosion, crop damage, safety hazards, and energy loss. Field windbreaks, farmstead windbreaks, and environmental plantings are effective in reducing the problems associated with uncontrolled wind. Field windbreaks protect crops, reduce wind erosion, control snow deposition, and provide cover for wildlife. These windbreaks are narrow plantings made at right angles to the prevailing wind at specific intervals across a field. Many environmental changes occur on the leeward side of a windbreak. Windspeed is reduced, transpiration by plants is reduced, humidity is increased, evaporation is reduced, and soil moisture is increased. Yields can be increased significantly if crops are protected by properly designed and maintained field windbreaks. Farmstead windbreaks protect livestock and structures, reduce heating expenses, and control snow deposition. They also add beauty, protect gardens, and provide habitat for wildlife. Several rows of low- and high-growing shrubs and trees provide the most protection. Environmental plantings help to beautify and screen houses and other buildings and to abate noise. They can also be used to furnish habitat for wildlife. The plants, mostly evergreen shrubs and trees, are closely spaced. For windbreaks and environmental plantings to be effective, the tree or shrub species selected must be adapted to the soil. Selecting the proper trees or shrubs for each soil is key to a successful planting. Additional information can be obtained from the local office of the Natural Resources Conservation Service.

Wildlife Habitat

The survey area supports a wide variety of wildlife species. The closed lake basins support much of the wetland in eastern Oregon. These areas of wetland are an important component of the waterfowl migrating route called the Pacific Flyway System. Habitat for wetland wildlife consists of open water areas surrounded by shallow-water marshes. Plants important for cover include cattails and bulrushes. These areas of wetland provide critical habitat for large numbers of waterfowl during migration in spring and fall. The dominant soils in the marshes are those of the Hippyjim series. The various types of habitat for upland wildlife are associated with the different landscapes and the soils and plant communities that they support. These landscapes include basins, tablelands, and shrub-covered or forested mountains. The basins are important wintering areas for big game and other upland wildlife. The soils on the alluvial flats and low terraces typically have water on the surface or a high water table. The Cressler, and Olene soils are associated with the meadows and stream corridors at the higher elevations. The riparian areas associated with these soils are used heavily by wildlife and need to be considered in the development of conservation and resource management plans. Streambank vegetation provides shade and moderates water temperatures, which are critical for many species of fish. This vegetation also helps to prevent streambank erosion and provides cover for wildlife. Livestock concentrate in the meadows and along riparian areas because of the availability of water. Unless proper grazing management is used, the habitat in these riparian areas and meadows can deteriorate rapidly. Fencing and rotation grazing help to maintain the habitat and forage for both livestock and wildlife.

The tablelands in the survey area can be divided into two habitat types. These types are determined by the plant communities, generally by the dominant kind of sagebrush in an area. The kinds of sagebrush include low sagebrush and mountain big sagebrush. Grasses and forbs are preferred for grazing early in spring, forbs late in spring and in summer, forbs and shrubs in fall, and shrubs in winter. The dominant forbs preferred by antelope include globemallow, small burnet, and Lewis flax. Low sagebrush communities provide important habitat for sage grouse. Soils of the Casebeer, Dranket and Norcross series are in these areas. The grassy areas are the main strutting grounds for sage grouse, and the forbs are used as forage in spring and summer. Chemical spraying to control sagebrush also kills these forbs. Mechanical removal of sagebrush or prescribed burning allows the forbs and grasses to recover and can improve the habitat for brooding. The low sagebrush communities that are in good condition support large populations of sage grouse, vesper sparrow, and western meadowlark. As the condition of the communities degrades, populations of horned lark and Brewer's sparrow increase.

Mountain big sagebrush communities and the associated curlleaf mountain mahogany provide important winter forage for mule deer. The Devaul, Schnipps and Royst soils are examples of those that support mountain big sagebrush or curlleaf mountain mahogany. In areas where fire has been controlled, antelope bitterbrush is also an important forage species for mule deer and antelope. Mule deer fawning and rearing occurs dominantly in the mountain big sagebrush communities along the foot slopes of mountains. Shrub-covered mountains and escarpments provide habitat for mule deer, elk, chukar, and raptors. The north-facing slopes provide forage in summer, and the south-facing slopes provide forage in winter and spring. Mule deer and elk use the western juniper on the lower escarpments and mountainsides as cover and for forage in winter. The forested mountains and hills provide habitat for a variety of species in spring, summer, and fall. Because of the cold temperatures and the depth of the snowpack, many species migrate to lower elevations in winter.

Recreation

The soils of the survey area are rated in the table 4 and 5 "Recreational Development," according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the 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 soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

The interpretative ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use. The degree of soil limitation is expressed as slight, moderate, or severe. Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected. Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated slight. Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly. The information in the tables “Recreational Development,” can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in the table “Building Site Development,” and interpretations for septic tank absorption fields in the table “Sanitary Facilities.”

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the “Soil Properties” section. Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil. The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works. Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses. This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils. The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations. Some of the terms used in this soil survey have a special meaning in soil science and are defined in the “Glossary.”

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 6 show the degree and kind of soil limitations that affect local roads and streets, shallow excavations, and lawns and landscaping. The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Slightly limited indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected. Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00). Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding. Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing. Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Table 7, "Sanitary Facilities," shows the degree and kind of soil limitations that affect septic tank absorption fields, and sewage lagoons. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Slightly limited indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00). Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated. Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter. Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage. The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely. Interpretations developed for waste management may include ratings for manure and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes. Specific information regarding waste management is available at the local office of the Natural Resources Conservation Service or Cooperative Extension.

Construction Materials

Tables 8 and 9, “Construction Materials,” gives information about the soils as potential sources of gravel, sand, topsoil, reclamation material, and roadfill. Normal compaction, minor processing, and other standard construction practices are assumed. The soils are rated good, fair, or poor as potential sources of topsoil, reclamation material, and roadfill. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation. The soils are rated as a probable or improbable source of sand and gravel. A rating of probable means that the source material is likely to be in or below the soil. The numerical ratings in these columns indicate the degree of probability. The number 0.00 indicates that the soil is an improbable source. A number between 0.00 and 1.00 indicates the degree to which the soil is a probable source of sand or gravel.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 8 and 9, “Construction Materials,” only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the lowest layer of the soil contains sand or gravel, the soil is rated as a probable source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness. Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material. The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moistureand nutrients for plant growth. Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility. Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments. The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread. The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Water Management

Table 10 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Slightly limited indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways. Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area. Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction. The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties. Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings. Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. Large stones and depth to bedrock or to a cemented pan affect the construction of a system. The depth of the root zone, the amount of salts or sodium, and soil reaction, affects the performance of a system. Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance. Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages. Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils. The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 11, "Engineering Index Properties" gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet. Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (1) and the Unified soil classification system (2). The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection. If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical Properties of the Soil

Table 12, "Physical Properties of the Soils," show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils. Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In table 12, "Physical Properties of the Soils," the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils. If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed. Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are low, a change of less than 3 percent; moderate, 3 to 6 percent; and high, more than 6 percent. Very high, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. The estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor Kw is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of Kw range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion. Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year. Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility of soil to soil blowing. Soils are grouped according to the following distinctions:

- Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible and vegetation is difficult to establish.
- Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
- Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
- Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
- Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
- Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
- Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.
- Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
- Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to soil blowing, or the tons per acre per year that can be expected to be lost to soil blowing. There is a close correlation between soil blowing and the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence soil blowing.

Chemical Properties of the Soil

Table 13, "Chemical Properties of the Soils," show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils. Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Cation-exchange capacity is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water. Effective cation-exchange capacity refers to the sum of extractable bases plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5. Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is given as the percent, by weight, of hydrated calcium sulfates in the soil. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is the measure of sodium relative to calcium and magnesium in the water extract from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

Table 14, “Water Features” gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations. Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The four hydrologic soil groups are: Group A.##Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission. Group B.##Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission. Group C.##Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission. Group D.##Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission. If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. The months in the table indicate the portion of the year in which the feature is most likely to be a concern. Water table refers to a saturated zone in the soil. Table 14, Water Features,” indicates, by month, depth to the top (upper limit) and base (lower limit) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 14, “Water Features,” indicates surface water depth and the duration and frequency of ponding. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. None means that ponding is not probable; rare that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); occasional that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and frequent that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year). Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding. Duration and frequency are estimated. Duration is expressed as extremely brief if 0.1 hour to 4 hours, very brief if 4 hours to 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. None means that flooding is not probable; very rare that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); rare that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); occasional that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); frequent that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and very frequent that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year). The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development. Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Table 15, "Soil Features," gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations. A restrictive layer is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restricts roots or otherwise provides an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. Depth to top is the vertical distance from the soil surface to the upper boundary of the restrictive layer. Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures. Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer. For uncoated steel, the risk of corrosion, expressed as low, moderate, or high, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract. For concrete, the risk of corrosion also is expressed as low, moderate, or high. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

DETAILED SOIL MAPS

The map units on the detailed maps in Part III of this publication represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the headings "Use and Management of the Soils" and "Soil Properties."

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

Most included soils have properties and behavioral characteristics similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape. The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas. An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. The principal hazards and limitations to be considered in planning for specific uses are identified in the tables and narrative in Part II.

Kinds of Map Units

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Some of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Norcross very cobbly loam, 0 to 10 percent slopes is a phase of the Norcross series. Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations. A complex consists of two or more soils or miscellanieous areas in such an intricate pattern or in such small areas that they cannont be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Norcross-Dranket complex, 0 to 8 percent slopes, is an example. An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. There are no association in the curremt legend for the Gerbe Block. This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Acreage and Extent

Table 16 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Headings and Introductory Phases

In the map unit descriptions that follow, a semi-tabular format is used. In this format the major headings are centered in the column (for example, Composition). They identify the information grouped directly below them. Introducing each item of information under the centered heading is a term or phrase (for example, Major Components) that identifies or describes the information. Many of the centered headings and introductory terms are self-explanatory; however, some of them need further explanation and are defined in the Glossary. Explanations of the headings and introductory phrases are provided in the following paragraphs, generally in the order in which they are used in the map unit descriptions.

Composition is given for the components (soils or miscellaneous areas) identified in the name of the map unit as well as for the contrasting inclusions.

Contrasting Inclusions are areas of components that differ sufficiently in use and management from the soils or miscellaneous areas for which the map unit is named. As was explained earlier, inclusions can either be similar or contrasting. Note that in the Composition section a single percentage is provided for a named soil and its similar inclusions because their use and management are similar.

Map Unit Setting is given for the entire map unit. This section gives the position on the landscape. The landscape positions given for the entire map unit generally are broader than those given for each component. Below the map unit setting, the position of each component and inclusion is listed, and the physiographic location of each is identified.
Major Component Description lists the characteristics of the major components. These include elevation, texture of the surface layer, drainage class, parent material, and climatic data.

Dominant Present Vegetation lists the common plants growing on each soil at the present time. The present vegetation may be similar to the potential native plant community, but in some areas it consists of other plants, either cultivated or wild, that dominate the soils in the map unit.

Ecological Site is the assigned rangeland or grazed forest land ecological site that identifies a unique potential native plant community. The plant species and production typical of each ecological site are listed by map unit in the section "Rangeland Plants and Woodland Understory." Additional information about these sites is provided under the heading "Rangeland and Grazeable Woodland Resource Management" in Part II of this publication. Further information also can be obtained from the local office of the Natural Resources Conservation Service.

SOIL MAP UNIT DESCRIPTIONS

(Refer to Attachment 1.)

CLASSIFICATION OF SOILS

The system of soil classification used by the National Cooperative Soil Survey has six categories (38). 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. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

- ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is Incepisols.
- 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 Aquept (Aqu, meaning water, plus ept, from Inceptisol).
- GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquepts (Hapl, meaning minimal horizonation, plus aquept, the suborder of the Inceptisols that has a aquic moisture regime).
- SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Haplaquepts.
- FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, smectitic, nonacid, frigid Typic Haplaquepts.

- SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Taxonomic Units Descriptions
In this section, each taxonomic unit recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each unit. A pedon, a small three-dimensional area of soil, which is typical of the unit in the survey area, is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (35). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (38). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the unit. The map units of each taxonomic unit are described in the section “Detailed Soil Map Units.”

Benhall Series
Depth class: Moderately deep.
Drainage class: Well drained.
Permeability: Moderately slow.
Runoff: Medium to high.
Landform: Hills.
Parent material: Kind - Slope alluvium and residuum; Source – Basalt and tuff.
Slope range: 0 to 40 percent.
Elevation: 4,800 to 5,400 feet.
Mean annual precipitation: 18 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Pine Sedge-Fescue 16-24, 021XY414OR and Pine-Fir-Sedge 18-30, 021XY422OR.
Native plants: Ponderosa pine, Idaho Fescue, Ross sedge, common snowberry and curlleaf mahogany.
Taxonomic class: Loamy-skeletal, mixed, superactive, frigid Pachic Ultic Argixerolls

Typical pedon:
Benhall cobbly loam, 2 to 20 percent slopes in map unit 520B, Klamath County, Oregon,ion in the survey area: Gerber Block, Klamath County, Oregon; near the northwest arm of Gerber Reservoir about 300 feet south of the bridge over Benhall Creek; 950 feet south and 1,450 feet east of the northwest corner of section 2, T. 39 S., R. 13 E.; USGS Goodlow Mountain 7.5 minute topographic quadrangle; 42 degrees, 13 minutes, 17 seconds north latitude and 121 degrees, 08 minutes, 55 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 3 inches; brown (10YR 5/3) cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and common fine roots; common very fine interstitial and common medium tubular pores; 12 percent pebbles and 10 percent cobbles; slightly acid (pH 6.4); clear smooth boundary. (2 to 4 inches thick)

A2--3 to 21 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to strong medium granular; soft, friable, slightly sticky and slightly plastic; few very fine, common fine, common medium, and few coarse roots; common very fine interstitial and common medium tubular pores; 25 percent pebbles and 12 percent cobbles; slightly acid (pH 6.2); clear smooth boundary. (8 to 20 inches thick)

Bt1--21 to 32 inches; light brown (7.5YR 6/3) very cobbly clay loam, brown (7.5YR 4/3) moist; strong medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine, common fine, common medium, and few coarse roots; common fine and common medium tubular pores; common faint clay films on faces of peds; 20 percent pebbles, 15 percent cobbles, and 5 percent stones; slightly acid (pH 6.4); clear smooth boundary. (6 to 14 inches thick)

Bt2--32 to 38 inches; light brown (7.5YR 6/3) very cobbly clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, and few medium roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; 20 percent pebbles, 20 percent cobbles, and 5 percent stones; slightly acid (pH 6.4); clear wavy boundary. (0 to 12 inches thick)

Crt--38 to 44 inches; light brown (7.5YR 6/4) weathered basalt, brown (7.5YR 4/4) moist; few distinct clay films on pararock fragments and few seams of illuvial clay lining fractures in the bedrock. (5 to 22 inches thick)

R--44 inches; hard, unweathered basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Mollic epipedon thickness: 20 to 30 inches, includes the Bt1 horizon in some pedons.
Argillic horizon thickness: 8 to 26 inches.
Depth to base of argillic horizon: 30 to 40 inches.
Depth to bedrock: 30 to 40 inches to a paralithic contact. The paralithic material below the contact is weathered basalt. Hard, unweathered bedrock is typically within 60 inches.
Particle-size control section:
Clay content: 30 to 35 percent
Rock fragments: 35 to 45 percent, mainly cobbles. Lithology of fragments is basalt.

A1 horizon:
 Hue: 10YR or 7.5YR.
 Value: 4 or 5 dry, 2 or 3 moist.
 Chroma: 2 or 3, dry or moist.
 Clay content: 18 to 24 percent.
 Rock fragments: 15 to 35 percent.
 Reaction: Slightly acid or neutral.
 Organic matter content: 2 to 4 percent.

A2 horizon:
 Hue: 10YR or 7.5YR.
 Value: 4 or 5 dry, 2 or 3 moist.
 Chroma: 2 or 3, dry or moist.
 Texture: Cobbly loam, very gravelly loam, or very cobbly loam.
 Clay content: 20 to 25 percent.
 Rock fragments: 20 to 40 percent.
 Reaction: Slightly acid or neutral.
 Organic matter content: 2 to 4 percent.

Bt1 horizon:
 Value: 5 or 6 dry, 3 or 4 moist.
 Chroma: 3 or 4, dry or moist.
 Texture: Cobbly clay loam or very cobbly clay loam.
 Clay content: 27 to 32 percent.
 Rock fragments: 30 to 45 percent.
 Organic matter content: 1 to 3 percent.

Bt2 horizon:
 Value: 5 or 6 dry, 3 or 4 moist.
 Chroma: 3 or 4, dry or moist.
 Texture: Very cobbly clay loam or very cobbly clay.
 Clay content: 30 to 42 percent.
 Rock fragments: 35 to 50 percent, mainly as cobbles.
 Organic matter content: 0.5 to 2 percent.

Boulder Lake Series

Depth class: Very deep.
Drainage class: Somewhat poorly drained.
Permeability: Very Slow.
Runoff: Ponded.

Landform: Depressions.
Parent material: Kind - Lacustrine deposits and alluvium; Source - Basalt.
Slope range: 0 to 1 percent.
Elevation: 4,800 to 5,300 feet.
Mean annual precipitation: 16 to 19 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Dry Meadow 021XY314OR.
Native plants: Silver sagebrush, Nevada bluegrass, mat muhly, some carex and spikerush.
Taxonomic class: Fine, smectitic, frigid Xeric Epiaquerts

Typical pedon:

Boulder Lake silt loam, 0 to 1 percent slopes, in map unit 602A, Klamath County, Oregon, BLM Gerber Block, Klamath County, Oregon; about 100 yards south of the dike on Benhall Creek, at the south end of Dry Prairie, and on the east side of Benhall Creek. 2,600 feet south and 300 feet east of the northwest corner of section 34, T. 38 S., R. 13 E.; USGS Goodlow Mountain 7.5 minute topographic quadrangle; 42 degrees, 13 minutes, 55 seconds north latitude and 121 degrees, 10 minutes, 18 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A--0 to 4 inches: light gray (10YR 7/1) silt loam, very dark gray (10YR 3/1) moist; strong medium platy structure; very hard, very firm, slightly sticky and slightly plastic; common very fine and few fine roots; common fine and common medium vesicular pores; neutral (pH 7.2); clear smooth boundary. (2 to 4 inches thick)

Bw--4 to 12 inches; gray (10YR 6/1) silty clay loam, black (10YR 2/1) moist; strong fine angular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine, common fine and few medium roots; common very fine and few fine vesicular pores; neutral (pH 7.0); clear smooth boundary. (4 to 6 inches thick)

Bss1--12 to21 inches; light gray (10YR 7/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to strong medium angular blocky; hard, firm, moderately sticky and very plastic; common very fine, common fine and common medium roots; few very fine and few fine tubular pores; few intersecting slickensides and wedge shaped peds; common distinct clay films on faces of peds; neutral (pH 7.2); clear smooth boundary. (6 to 12 inches thick)

Bss2--21 to 38 inches; gray (10YR 6/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium angular blocky; hard, firm, moderately sticky and very plastic; few very fine, few fine and few medium roots; few very fine and few fine tubular pores; few intersecting slickensides and wedge shaped peds; common distinct pressure faces on peds; slightly alkaline (pH 7.4); clear smooth boundary. (10 to 18 inches thick)

Bk1--38 to 58 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine and few fine roots; few very fine tubular pores; strongly effervescent; lime segregated in many fine irregular seams and filaments; moderately alkaline (pH 8.0); clear smooth boundary. (15 to 25 inches thick)

Bk2--58 to 65 inches; light brown (7.5YR 6/4) clay loam, dark brown (7.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; lime segregated in common fine irregular seams and masses; moderately alkaline (pH 8.2); clear smooth boundary.

Range in Characteristics:

Soil moisture: Ponded for less than 45 consecutive days in most years, mainly in the late winter and spring. Brief ponding can occur after intense rainfall. Saturated to a depth of 30 to 60 inches in the late winter and spring.
Mean annual soil temperature: 44 to 46 °F.
Depth to bedrock: Greater than 60 inches.
Effervescence: Slightly to strongly effervescent where few to common, fine to medium lime segregation's occur below depths of 20 inches.
Particle-size control section:
Clay content: 45 to 55 percent clay.
Other features: Cracks at the surface are up to 3 inches wide and are 4 to 8 inches apart. These decrease in width as depth increases. Cracks remain open for fewer than 180 consecutive days.

A horizon:
Value: 5 through 7 dry, 3 through 5 moist.
Chroma: 1 through 3, dry or moist.
Textures: Silt loam or silty clay loam.
Percent clay: 22 to 30.
Reaction: Neutral to slightly alkaline.

Bw horizons:
Hue: 10YR or 7.5YR.
Value: 6 or 7 dry, 2 or 3 moist.
Chroma: 1 through 3, dry or moist.
Textures: Silty clay loam.
Percent clay: 27 to 40 percent clay.
Reaction: Neutral to slightly alkaline.

Bss horizons:
Hue: 10YR or 7.5YR.
Value: 6 or 7 dry, 2 or 3 moist.
Chroma: 1 through 3, dry or moist.
Textures: Silty clay or clay.
Percent clay: 40 to 60 percent clay.
Reaction: Neutral to slightly alkaline.

Bk horizons:
Hue: 10YR or 2.5Y.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Textures: Silty clay loam or clay loam.
Percent clay: 25 to 40 percent.
Reaction: Slightly to moderately alkaline.

Bumpheads Series

Depth class: Moderately deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Hills.
Parent material: Kind - Residuum; Source - Basalt and tuff.
Slope range: 1 to 10 percent.
Elevation: 4,800 to 5,200 feet.
Mean annual precipitation: 17 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Pine-Mahogany-Fescue 16-20 021XY410OR and Juniper Dry Pine 14-16 021XY508OR.
Native plants: Forest canopy of western juniper and ponderosa pine with an understory of Idaho fescue, bluebunch wheatgrass, mountain big sagebrush, and curlleaf mountain mahogany.
Taxonomic class: Fine, smectitic, frigid Pachic Argixerolls

Typical pedon:

Bumpheads very stony loam, 1 to 10 percent slopes in map unit 517B, Klamath County, Oregon, BLM Gerber Block; about 2 miles southeast of Antler Point, 1.3 miles east of the Main Haul Road, and 0.5 mile east of the cinder pit at the end of the side road; 1,600 feet north and 500 feet east of the southwest corner of section 3, T. 41 S., R. 15 E.; USGS Antler Point 7.5 minute topographic quadrangle; 42 degrees, 02 minutes, 20 seconds north latitude and 120 degrees, 56 minutes, 06 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated).

A1--0 to 3 inches; dark grayish brown (10YR 4/2) very stony loam, very dark grayish brown (10YR 3/2) moist; strong medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, common fine, and few medium roots; common very fine interstitial pores; 15 percent pebbles, 10 percent cobbles, and 10 percent stones; neutral (pH 6.6); clear smooth boundary. (2 or 3 inches thick)

A2--3 to 12 inches; brown (7.5YR 4/3) cobbly loam, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky structure parting to moderate medium granular; soft, very friable, moderately sticky and slightly plastic; common very fine, common fine, few medium, and few coarse roots; common very fine, common fine, and common medium tubular pores; 15 percent pebbles, 15 percent cobbles, and 4 percent stones; neutral (pH 6.7); clear smooth boundary. (4 to 14 inches thick)

Bt1--12 to 22 inches; brown (7.5YR 5/3) cobbly clay loam, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine, few fine, few medium, and few coarse roots; common very fine and common fine tubular pores; common faint clay films on faces of peds; 10 percent pebbles, 10 percent cobbles, and 4 percent stones; neutral (pH 6.8); clear smooth boundary. (4 to 15 inches thick)

Bt2--22 to 34 inches; brown (7.5YR 5/4) very cobbly clay, brown (7.5YR 4/4) moist; moderate medium angular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; few very fine, few fine, few medium, and few coarse roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; 15 percent pebbles, 15 percent cobbles, and 5 percent stones; neutral (pH 6.8); clear wavy boundary. (8 to 16 inches thick)

Crt--34 to 38 inches; brown (7.5YR 5/4), weathered basalt, brown (7.5YR 4/4) moist; common faint clay films on pararock fragments. (1 to 8 inches thick)

R--38 inches; hard, unweathered basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring, dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Mollic epipedon thickness: 20 to 26 inches; includes the Bt1 horizon.
Argillic horizon thickness: 12 to 24 inches.
Depth to base of argillic horizon: 24 to 40 inches.
Depth to bedrock: 24 to 40 inches to a paralithic contact. The paralithic material below the contact is weathered basalt or tuff. Hard, unweathered bedrock is typically within 60 inches.
Particle-size control section:
Clay content: 35 to 50 percent.
Rock fragments: 15 to 35 percent, mainly cobbles. Lithology of fragments is basalt.
Reaction: Slightly acid or neutral.

A1 horizon:
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Clay content: 20 to 27 percent.
Rock fragments: 35 to 45 percent.
Organic matter content: 2 to 4 percent.

A2 horizon:
Hue: 7.5YR or 10YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 through 4 dry, 2 or 3 moist.
Texture: Cobbly loam, cobbly clay loam, or very cobbly clay loam.
Clay content: 24 to 35 percent.
Rock fragments: 20 to 40 percent.
Organic matter content: 2 to 4 percent.

Bt1 horizon:
Hue: 7.5YR or 10YR.
Value: 5 or 6 dry.

Chroma: 3 or 4 dry.
Texture: Cobbly clay loam or cobbly clay.
Clay content: 32 to 45 percent.
Rock fragments: 15 to 30 percent.
Organic matter content: 1 to 3 percent.

Bt2 horizon:
Hue: 7.5YR or 5YR.
Value: 4 through 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Cobbly clay or very cobbly clay.
Clay content: 40 to 50 percent.
Rock fragments: 20 to 35 percent.

Carrbutte Series
Depth class: Deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Hills.
Parent material: Kind - Loess and residuum; Source - Basalt and tuff.
Slope range: 2 to 20 percent.
Elevation: 4,700 to 5,200 feet.
Mean annual precipitation: 16 to 18 inches.
Mean annual air temperature: 45 to 47 °F.
Frost-free period: 60 to 90 days.
Range site: Pine-Sedge-Fescue 021XY414OR.
Native plants: Forest canopy of ponderosa pine with an understory of Ross sedge, Idaho fescue, and squawcarpet.
Taxonomic class: Clayey-skeletal, smectitic, mesic Pachic Ultic Argixerolls.

Typical pedon:
Carrbutte stony loam, 2 to 15 percent slopes in map unit 543B Klamath County, Oregon, BLM Gerber Block; about 0.2 miles east of Rock Creek and 200 feet south of the State Line road; 1,000 feet north and 1,200 feet west of the southeast corner of section 17, T. 41 S., R. 15 E.; USGS Antler Point 7.5 minute topographic quadrangle; 42 degrees, 00 minutes, 30 seconds north latitude and 120 degrees, 57 minutes, 39 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 3 inches; brown (10YR 5/3) stony loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and common fine interstitial pores; 15 percent pebbles, 5 percent cobbles, and 8 percent stones; neutral (pH 6.8); abrupt smooth boundary. (2 to 4 inches thick)

A2--3 to 10 inches; brown (7.5YR 4/3) very cobbly loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure parting to strong medium granular; soft, friable, slightly sticky and slightly plastic; common very fine, common fine, common medium, and few coarse roots; common very fine and common fine interstitial and tubular pores; 15 percent pebbles, 20 percent cobbles, and 5 percent stones; neutral (pH 6.8); clear smooth boundary. (6 to 14 inches thick)

Bt1--10 to 21 inches; brown (7.5YR 5/3) very cobbly clay loam, dark brown (7.5YR 3/3) moist; strong medium subangular blocky structure parting to weak fine angular blocky; slightly hard, firm, moderately sticky and moderately plastic; few very fine, common fine, few medium, and few coarse roots; few very fine and few fine tubular pores; common faint and few distinct clay films on faces of peds; 20 percent pebbles and 15 percent cobbles; neutral (pH 7.0); clear smooth boundary. (7 to 14 inches thick)

Bt2--21 to 41 inches; brown (7.5YR 5/4) very cobbly clay, dark brown (7.5YR 3/4) moist; strong medium subangular blocky structure parting to moderate medium angular blocky; hard, firm, moderately sticky and very plastic; few very fine, few fine, and few medium roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; 20 percent pebbles and 15 percent cobbles; neutral (pH 7.0); clear wavy boundary. (10 to 24 inches thick)

Crt--41 to 57 inches; light brown (7.5YR 6/4) weathered basalt, brown (7.5YR 4/4) moist; few distinct clay films on pararock fragments and few seams of illuvial clay lining fractures in the bedrock. (10 to 24 inches thick)

R--57 inches; hard, unweathered basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 47 to 49 degrees F.
Mean summer soil temperature: 60 to 62 degrees F.
Mollic epipedon thickness: 20 to 30 inches, includes all subdivisions of the argillic horizon in some pedons.
Argillic horizon thickness: 18 to 36 inches.
Depth to base of argillic horizon: 40 to 50 inches.
Depth to bedrock: 40 to 60 inches to a paralithic contact. The paralithic material below the contact is weathered basalt.
Particle-size control section:
Clay content: 35 to 50 percent
Rock fragments: 35 to 50 percent, mainly cobbles. Lithology of fragments is basalt.

A1 horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Clay content: 22 to 27 percent.
Rock fragments: 15 to 35 percent.
Reaction: Slightly acid or neutral.
Organic matter content: 2 to 4 percent.

A2 horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Texture: Cobbly loam or very cobbly loam.
Clay content: 20 to 27 percent.
Rock fragments: 15 to 40 percent.
Reaction: Slightly acid or neutral.
Organic matter content: 2 to 4 percent.

Bt1 horizon:
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 3 or 4 dry, 2 or 3 moist.
Texture: Very cobbly clay loam or very cobbly clay.
Clay content: 35 to 45 percent.
Rock fragments: 35 to 45 percent.
Organic matter content: 1 to 3 percent.

Bt2 horizon:
Value: 4 or 5 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Clay content: 40 to 55 percent.
Rock fragments: 35 to 50 percent, mainly as cobbles.
Organic matter content: 0.5 to 2 percent.

Casebeer Series
Depth class: Shallow to a duripan.
Drainage class: Well drained.

Permeability: Slow.
Runoff: High.
Landform: Summit positions on plateaus.
Parent material: Kind - Volcanic ash from dacite and residuum; Source - Basalt.
Slope range: 0 to 6 percent.
Elevation: 4,700 to 5,400 feet.
Mean annual precipitation: 16 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Shallow Stony 10-20, 021XY204OR.
Native plants: Sandberg bluegrass with minor amounts of Idaho fescue, bluebunch wheatgrass, and low sagebrush.
Taxonomic class: Clayey, smectitic, frigid, shallow Typic Durixeralfs

Typical pedon:

Casebeer very cobbly loam, 1 to 8 percent slopes in map unit 330B, Klamath County, Oregon, BLM Gerber Block; about 1 mile northeast of Round Valley Reservoir, 0.5 mile north of the junction of the CCC Road with the Round Valley Road, and 50 feet west of the CCC Road; 2,450 feet north and 250 feet west of the southeast corner of section 33, T. 39 S., R. 14 E.; USGS Gerber Reservoir 7.5 minute topographic quadrangle; 42 degrees, 08 minutes 36 seconds north latitude and 121 degrees, 03 minutes, 24 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 2 inches; pale brown (10YR 6/3) very cobbly loam, dark yellowish brown (10YR 3/4) moist; moderate thin platy structure parting to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; common fine and common medium vesicular pores; 20 percent pebbles, 15 percent cobbles, and 5 percent stones; neutral (pH 7.0); abrupt smooth boundary. (2 or 3 inches thick)

A2--2 to 5 inches; pale brown (10YR 6/3) cobbly clay loam, dark yellowish brown (10YR 3/4) moist; weak thin platy structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, and few medium roots; common fine and common medium vesicular pores; 10 percent pebbles and 7 percent cobbles; neutral (pH 7.2); clear smooth boundary. (0 to 4 inches thick)

Bt1--5 to 8 inches; light brown (7.5YR 6/3) clay loam, dark brown (7.5YR 3/4) moist; strong medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, and few medium roots; common fine and common medium tubular pores; common faint and few distinct clay films on faces of peds; neutral (pH 7.3); abrupt smooth boundary. (3 to 7 inches thick)

Bt2--8 to 12 inches; light brown (7.5YR 6/3) clay, brown (7.5YR 4/3) moist; strong medium prismatic structure parting to strong medium angular blocky; very hard, very firm, moderately sticky and very plastic; few very fine and few fine roots; few fine and few medium tubular pores; common distinct clay films on faces of peds; slightly alkaline (pH 7.4); clear smooth boundary. (3 to 7 inches thick)

Bt3--12 to 14 inches; light brown (7.5YR 6/4) clay, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium angular blocky; hard, firm, moderately sticky and very plastic; few very fine roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; slightly alkaline (pH 7.5); abrupt smooth boundary. (0 to 6 inches thick)

Bqm1--14 to 26 inches; pink (7.5YR 7/4) duripan, brown (7.5YR 5/4) moist; strong thick platy structure; very rigid; indurated by secondary silica; widely spaced fractures in the upper inch; thin laminar caps of opal on tops of peds; slightly alkaline (pH 7.6); clear smooth boundary. (2 to 12 inches thick)

Bqm2--26 to 35 inches; pink (7.5YR 7/4) duripan, brown (7.5YR 5/4) moist; moderate medium platy structure; very hard, extremely firm; moderately cemented by secondary silica; thin laminar caps of opal on tops of peds; slightly alkaline (pH 7.6); clear smooth boundary. (0 to 9 inches thick)

R--35 inches; hard vesicular basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring, dry in summer and fall; xeric moisture regime that borders on aridic.

Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Argillic horizon thickness: 6 to 15 inches.
Depth to base of argillic horizon: 10 to 20 inches.
Depth to duripan: 10 to 20 inches.
Duripan thickness: 2 to 24 inches.
Depth to bedrock: 20 to 40 inches to a lithic contact.
Particle-size control section:
Clay content: 35 to 50 percent.
Rock fragments: 0 to 15 percent, mainly pebbles and cobbles. Lithology of fragments is basalt.
Reaction: Neutral or slightly alkaline.
Other features: Some pedons have Btq horizons.

A1 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 2 or 3 dry, 2 through 4 moist.
Texture: Very cobbly loam, extremely cobbly loam, or very stony loam.
Clay content: 22 to 27 percent.
Rock fragments: 40 to 65 percent.

A2 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Cobbly clay loam or very cobbly clay loam.
Clay content: 28 to 36 percent.
Rock fragments: 15 to 40 percent.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Clay loam, clay, cobbly clay loam, or cobbly clay.
Clay content: 34 to 44 percent.
Rock fragments: 0 to 30 percent.

Bt2 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4 dry, 3 through 6 moist.
Texture: Clay loam, clay, or cobbly clay.
Clay content: 38 to 60 percent.
Rock fragments: 0 to 20 percent.

Bt3 horizon:
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Clay or cobbly clay.
Clay content: 45 to 60 percent.
Rock fragments: 0 to 15 percent.

Bqm horizons:
Value: 6 through 8 dry, 4 through 7 moist.
Chroma: 3 through 6, dry or moist.
Cementation: Indurated or very strongly cemented in Bqm1 horizon, strongly cemented or moderately cemented in Bqm2 horizon.

Cressler Series
Depth class: Very deep.
Drainage class: Somewhat poorly drained.
Permeability: Slow.
Runoff: Ponded to very slow runoff.
Landform: Drainageways below springs and seeps on plateaus.
Parent material: Kind - Alluvium; Source - Basalt.
Slope range: 0 to 2 percent.
Elevation: 4,800 to 5,000 feet.
Mean annual precipitation: 17 to 19 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Wet Meadow, 021XY406OR.
Native plants: Dominantly tufted hairgrass with minor amounts of Nebraska sedge and Baltic rush.
Taxonomic class: Fine, smectitic, frigid Fluvaquentic Endoaquolls

Typical pedon:

Cressler silty clay loam, 0 to 2 percent slopes in map unit 605A, Lake County, Oregon, Southern part Soil Survey; Schnipps Valley, northwest of the road. Profile is from about 6.5 miles south of Highway 140, 0.3 miles south of Horse Prairie, between Forest Service Road 3910 and Horse Creek; 2,200 feet south and 200 feet west of the northeast corner of section 25, T 39 S., R 21 E.: USGS Horse Prairie 7.5 minute topographic quadrangle; 47 degrees, 09 minutes, 35 seconds north latitude and 120 degrees, 10 minutes, and 36 seconds west longitude, NAD 27. (Colors are for moist soils unless otherwise stated)

A--0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; hard, friable, moderately sticky and moderately plastic; many very fine, many fine and few medium roots; many very fine irregular pores; moderately acid (pH 5.8); abrupt smooth boundary. (4 to 10 inches thick)

Bt1-- 6 to 15 inches; very dark brown (10YR 2/2) silty clay, dark gray (10YR 4/1) dry; weak fine prismatic structure parting to strong angular blocky; very hard, very firm, very sticky and very plastic; common very fine, common fine and common medium roots; common very fine and common fine tubular pores; common faint clay films on faces of peds; slightly acid (pH 6.2); clear smooth boundary. (7 to 11 inches thick)

Bt2--15 to 38 inches; grayish brown (10YR 5/2) silty clay, light brownish gray (10YR 6/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; very hard, very firm, very sticky and very plastic; few very fine and few fine roots; common fine tubular pores; common distinct clay films on faces of peds and lining pores; neutral (pH 6.6); gradual wavy boundary. (19 to 27 inches thick)

BC--38 to 48 inches; brown (10YR 5/3) clay loam, light brownish gray (10YR 6/2) dry; many distinct yellowish brown (10YR 5/6) mottles; massive; hard, firm, very sticky and moderately plastic, few very fine and few fine roots; common very fine and common fine tubular pores; neutral (pH 6.7); clear smooth boundary. (8 to 11 inches thick)

2C--48 to 60 inches; brown (10YR 5/3) extremely stony clay, brown (10YR 5/3) dry; many fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; 15 percent stones, 35 percent cobbles and 25 percent pebbles; slightly acid (pH 6.4).

Range in Characteristics:

Soil moisture: Usually moist in the upper three feet in winter and spring, dry from late July through mid-October; a seasonal high water table is present from the soil surface to 3 feet from December through June; aquic moisture regime.
Mean annual soil temperature: 44 to 46 °F.
Mean summer soil temperature: 59 to 61 °F.
Thickness of the mollic horizon: 10 to 20 inches.
Depth to argillic layer: 4 to 10 inches.
Depth to bedrock: Greater than 60 inches.
Water table is at a depth of: One-half foot above the surface to three feet below the surface from December through June.
Particle-size control section:

Percent clay: 35 to 50.
Percent rock fragments: 0 to 15 percent, mainly as pebbles.
Other features: Distinct and prominent mottles occur at 10 to 20 inches.

A horizon:
Hue: 10YR or 7.5YR.
Value: 2 or 3 moist, 3 or 4 dry.
Chroma: 1 or 2, moist or dry.
Percent clay: 27 to 32.
Percent rock fragments: 0 to 10.
Percent organic matter: 2 to 4.
Reaction: Moderately acid or slightly acid.

Bt horizons:
Hue: 10YR or 7.5YR.
Value: 2 through 5 moist, 4 or 5 dry.
Chroma: 1 or 2, moist or dry.
Textures: Clay loam, clay or silty clay.
Percent clay: 35 to 45.
Percent rock fragments: 0 to 15, mainly as pebbles.
Percent organic matter: 1 to 3.
Reaction: Slightly acid to neutral.

BC horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 moist, 5 or 6 dry.
Chroma: 2 through 4, moist or dry.
Textures: Clay loam or clay.
Percent clay: 35 to 45.
Percent rock fragments: 0 to 15, mainly as pebbles.
Percent organic matter: 0.5 to 1.
Reaction: Slightly acid to neutral.

2C horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 moist, 5 or 6 dry.
Chroma: 2 through 4, moist or dry.
Percent clay: 40 to 50.
Rock fragments: Total range is 60 to 85 percent, with 35 to 65 percent cobbles and stones, 15 to 30 percent pebbles.
Percent organic matter: 0.5 to 1.
Reaction: Slightly acid to neutral.

Devaul Series
Depth class: Deep.
Drainage class: Well drained.
Permeability: Moderately slow.
Runoff: Medium to high.
Landform: Toeslope positions on plateaus.
Parent material: Kind - Alluvium; Source - Basalt and tuff.
Slope range: 2 to 15 percent.
Elevation: 4,800 to 5,100 feet.
Mean annual precipitation: 17 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Shrubby Loam 16-20, 021XY218OR.
Native plants: Idaho fescue, bluebunch wheatgrass, mountain big sagebrush, antelope bitterbrush, and western juniper.
Taxonomic class: Loamy-skeletal, mixed, superactive, frigid Typic Argixerolls

Typical pedon:

Devaul cobbly loam, 2 to 15 percent slopes in map unit 360B Klamath County, Oregon, BLM Gerber Block; about 1 mile east of Gerber Reservoir, 0.5 mile north of Casebeer Spring, and 100 yards east of the CCC road; 2,400 feet south and 1,400 feet east of the northwest corner of section 4, T. 39 S., R. 14 E.; USGS Gerber Reservoir 7.5 minute topographic quadrangle; 42 degrees, 13 minutes, 02 seconds north latitude and 121 degrees, 04 minutes, 14 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 3 inches; grayish brown (10YR 5/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate medium platy structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; common very fine, few fine, few medium, and few coarse roots; common fine and medium interstitial and tubular pores; 15 percent pebbles and 12 percent cobbles; neutral (pH 7.0); abrupt smooth boundary. (2 to 4 inches thick)

A2--3 to 12 inches; grayish brown (10YR 5/2) cobbly loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, common medium, and few coarse roots; common fine and medium interstitial and tubular pores; 15 percent pebbles and 12 percent cobbles; neutral (pH 7.2); clear smooth boundary. (8 to 16 inches thick)

Bt1--12 to 18 inches; brown (10YR 5/3) cobbly clay loam, dark yellowish brown (10YR 3/4) moist; strong medium subangular blocky structure parting to weak fine angular blocky; slightly hard, firm, moderately sticky and moderately plastic; few very fine, common fine, common medium, and few coarse roots; common medium tubular pores; common faint clay films on faces of peds; 15 percent pebbles and 15 percent cobbles; neutral (pH 7.3); clear smooth boundary. (6 to 15 inches thick)

Bt2--18 to 33 inches; yellowish brown (10YR 5/4) very cobbly clay loam, brown (10YR 4/3) moist; moderate medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, and few medium roots; common fine and medium interstitial and tubular pores; common faint and few distinct clay films on faces of peds; 20 percent pebbles and 20 percent cobbles; slightly alkaline (pH 7.4); clear smooth boundary. (8 to 16 inches thick)

Bt3--33 to 42 inches; brown (7.5YR 5/4), very cobbly clay loam, brown (7.5YR 4/3) moist; strong medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; few fine tubular pores; common distinct clay films on faces of peds; 20 percent pebbles and 20 percent cobbles; slightly alkaline (pH 7.5); gradual wavy boundary. (6 to 10 inches thick)

Bt4--42 to 56 inches; light brown (7.5YR 6/3), very cobbly clay loam, brown (7.5YR 4/4) moist; strong medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; few fine tubular pores; common faint and common distinct clay films on faces of peds; 20 percent pebbles and 20 percent cobbles; slightly alkaline (pH 7.5); gradual wavy boundary. (0 to 20 inches thick)

2Cr--56 to 62 inches; pink (7.5YR 7/3), weathered ash-flow tuff, strong brown (7.5YR 4/6) moist.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring, dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Mollic epipedon thickness: 10 to 18 inches.
Argillic horizon thickness: 18 to 30 inches.
Depth to base of argillic horizon: 40 to 50 inches.
Depth to bedrock: 45 to 60 inches to a paralithic contact. The paralithic material below the contact is weathered basalt or tuff.
Particle-size control section:
Clay content: 30 to 35 percent.
Rock fragments: 35 to 45 percent, mainly pebbles and cobbles. Lithology of fragments are basalt and tuff.

A horizons:
Chroma: 2 or 3, dry or moist.
Clay content: 20 to 27 percent.

Rock fragments: 20 to 35 percent.
Reaction: Slightly acid or neutral.
Organic matter content: 2 to 6 percent.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Clay content: 28 to 35 percent.
Rock fragments: 25 to 35 percent.
Reaction: Slightly acid to slightly alkaline.

Bt2, Bt3, and Bt4 horizons:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Clay content: 32 to 40 percent.
Rock fragments: 35 to 50 percent.
Reaction: Slightly acid to slightly alkaline.

Drakce Series
Depth class: Deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: Very high.
Landform: Escarpments.
Parent material: Kind - Colluvium; Source - Basalt and tuff.
Slope range: 15 to 65 percent.
Elevation: 4,400 to 5,300 feet.
Mean annual precipitation: 14 to 18 inches.
Mean annual air temperature: 45 to 47 °F.
Frost-free period: 60 to 90 days.
Range site: South Slopes 14-18, 021XY308OR.
Native plants: Forest canopy of western juniper with an understory of Idaho fescue, bluebunch wheatgrass, and mountain big sagebrush.
Taxonomic class: Clayey-skeletal, smectitic, mesic Pachic Argixerolls

Typical pedon:
Drakce very stony loam, 15 to 50 percent slopes in map unit 410D Gerber Block, Klamath County, Oregon; about 0.5 miles southwest of Adobe Reservoir and 1.5 miles south of Miller Creek; 2,150 feet north and 2,300 feet west of the southeast corner of section 3, T. 40 S., R. 14 E.; USGS Goodlow Mountain 7.5 minute topographic quadrangle; 42 degrees, 07 minutes, 42 seconds north latitude and 121 degrees, 09 minutes, 46 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 3 inches; grayish brown (10YR 5/2) very stony loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to strong medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and common fine roots; common fine and medium interstitial and tubular pores; 15 percent pebbles, 15 percent cobbles, and 10 percent stones; neutral (pH 6.8); clear smooth boundary. (2 to 4 inches thick)

A2--3 to 9 inches; grayish brown (10YR 5/2) very cobbly clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, and few medium roots; common fine and common medium tubular pores; 15 percent pebbles, 15 percent cobbles, and 10 percent stones; neutral (pH 6.8); abrupt smooth boundary. (4 to 10 inches thick)

Bt1--9 to 14 inches; gray (10YR 5/1) very cobbly clay loam, very dark gray (10YR 3/1) moist; strong medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, few medium, and few coarse roots; common fine and medium tubular pores; common faint and few distinct clay films on faces of peds; 15 percent pebbles, 20 percent cobbles, and 10 percent stones; neutral (pH 7.0); clear smooth boundary. (3 to 6 inches thick)

Bt2--14 to 21 inches; grayish brown (10YR 5/2) very cobbly clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure parting to strong fine angular blocky; hard, firm, moderately sticky and very plastic; few very fine, few fine, few medium, and few coarse roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; 15 percent pebbles, 25 percent cobbles, and 10 percent stones; neutral (pH 7.2); clear smooth boundary. (6 to 14 inches thick)

Bt3--21 to 44 inches; yellowish brown (10YR 5/4) extremely cobbly clay, dark yellowish brown (10YR 3/4) moist; strong coarse angular blocky structure parting to moderate medium angular blocky; hard, firm, moderately sticky and very plastic; few fine and few medium roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; 20 percent pebbles, 30 percent cobbles, and 10 percent stones; neutral (pH 7.2); clear smooth boundary. (10 to 24 inches thick)

2R--44 inches; hard basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 47 to 49 degrees F.
Mean summer soil temperature: 60 to 62 degrees F.
Mollic epipedon thickness: 20 to 26 inches.
Argillic horizon thickness: 20 to 42 inches.
Depth to base of argillic horizon: 40 to 50 inches.
Depth to bedrock: 40 to 50 inches to a lithic contact.
Particle-size control section:
Clay content: 35 to 50 percent;
Rock fragments: 35 to 50 percent, mainly cobbles. Lithology of fragments is basalt.

A1 horizon:
- Value: 4 or 5 dry, 2 or 3 moist.
- Chroma: 2 or 3, dry or moist.
- Clay content: 20 to 27 percent.
- Rock fragments: 35 to 55 percent.
- Organic matter content: 2 to 4 percent.

A2 horizon:
- Value: 4 or 5 dry, 2 or 3 moist.
- Chroma: 2 or 3, dry or moist.
- Texture: Very cobbly loam or very cobbly clay loam.
- Clay content: 24 to 35 percent.
- Rock fragments: 35 to 50 percent.
- Organic matter content: 2 to 4 percent.

Bt1 horizon:
- Hue: 10YR or 7.5YR.
- Value: 4 or 5 dry, 2 or 3 moist.
- Chroma: 1 through 4 dry, 1 through 3 moist.
- Texture: Cobbly clay loam or very cobbly clay loam.
- Clay content: 35 to 40 percent.
- Rock fragments: 30 to 45 percent, mainly as cobbles.
- Organic matter content: 1 to 3 percent.

Bt2 horizon:
- Hue: 10YR or 7.5YR.
- Value: 3 through 5 dry, 3 or 4 moist.
- Chroma: 2 or 3, dry or moist.
- Clay content: 40 to 50 percent.
- Rock fragments: 35 to 50 percent, mainly as cobbles.

Reaction: Neutral or slightly alkaline.
Organic matter content: 1 or 2 percent.

Bt3 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Very cobbly clay or extremely cobbly clay.
Clay content: 40 to 55 percent.
Rock fragments: 40 to 65 percent, mainly as cobbles.
Reaction: Neutral or slightly alkaline.

Dranket Series

Depth class: Moderately deep to duripan.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Summit positions on plateaus.
Parent material: Kind - Volcanic ash from dacite and residuum; Source - Basalt.
Slope range: 0 to 15 percent.
Elevation: 4,800 to 5,400 feet.
Mean annual precipitation: 16 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Juniper Claypan 16-20, 021XY501OR.
Native plants: Idaho fescue, bluebunch wheatgrass, low sagebrush, and western juniper.
Taxonomic class: Fine, smectitic, frigid Typic Durixerolls

Typical pedon:

Dranket very stony loam, 1 to 8 percent slopes in map unit 330B, Klamath County, Oregon, BLM Gerber Block; about 1.5 miles south of Barnes Valley Creek, 0.75 miles north of Wildhorse Creek, and 100 feet east of the CCC road; 550 feet north and 800 feet east of the southwest corner of section 27, T. 39 S., R. 14 E.; USGS Gerber Reservoir 7.5 minute topographic quadrangle; 42 degrees, 09 minutes, 10 seconds north latitude and 121 degrees, 03 minutes, 11 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 2 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 3/3) moist; moderate medium platy structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common fine and common medium vesicular pores; 20 percent pebbles, 20 percent cobbles, and 15 percent stones; neutral (pH 7.0); clear smooth boundary. (2 or 3 inches thick)

A2--2 to 8 inches; brown (7.5YR 5/3) very cobbly loam, dark brown (7.5YR 3/3) moist; weak medium subangular blocky structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; common very fine, common fine, and few medium roots; common fine and common medium tubular pores; 20 percent pebbles, 15 percent cobbles, and 5 percent stones; neutral (pH 7.1); clear smooth boundary. (0 to 6 inches thick)

Bt1--8 to 15 inches; brown (7.5YR 5/4) very cobbly clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine, few fine, and common medium roots; common fine and common medium tubular pores; common faint clay films on faces of peds; 15 percent pebbles, 20 percent cobbles, and 5 percent stones; neutral (pH 7.3); abrupt smooth boundary. (4 to 10 inches thick)

Bt2--15 to 23 inches; light brown (7.5YR 6/3) clay, brown (7.5YR 4/3) moist; moderate medium prismatic structure parting to strong medium angular blocky; hard, firm, moderately sticky and very plastic; few very fine, few fine, few medium, few coarse, and few very coarse roots; few fine and few medium tubular pores; few pressure faces; common distinct and few prominent clay films on faces of peds; neutral (pH 7.3); abrupt smooth boundary. (4 to 12 inches thick)

Btq--23 to 25 inches; light brown (7.5YR 6/4) gravelly clay, brown (7.5YR 4/4) moist; moderate medium angular blocky structure; hard, firm, moderately sticky and very plastic; few very fine and few fine roots; few very fine tubular pores; 20 percent pebble-size detached duripan fragments; common distinct clay films on faces of peds; slightly alkaline (pH 7.4); abrupt smooth boundary. (0 to 5 inches thick)

Bqm--25 to 28 inches; pink (7.5YR 7/3) duripan, brown (7.5YR 5/4) moist; strong thick platy structure; very rigid; indurated by secondary silica; widely spaced fractures in the upper inch; thin laminar caps of opal on top of peds; slightly alkaline (pH 7.4); abrupt wavy boundary. (2 to 20 inches thick)

R--28 inches; hard vesicular basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring, dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Mollic epipedon thickness: 7 to 15 inches; includes the Bt1 horizon in some pedons.
Argillic horizon thickness: 7 to 16 inches.
Depth to base of argillic horizon: 20 to 30 inches.
Depth to duripan: 20 to 30 inches.
Duripan thickness: 2 to 20 inches.
Depth to bedrock: 25 to 40 inches to a lithic contact.
Particle-size control section:
Clay content: 35 to 45 percent;
Rock fragments: 5 to 25 percent, mainly pebbles and cobbles. Lithology of fragments is dominantly basalt.
Reaction: Neutral or slightly alkaline.
Other features: Some pedons have Bt3 horizons.

A1 horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Texture: Very cobbly loam or very stony loam.
Clay content: 22 to 27 percent.
Rock fragments: 35 to 55 percent.
Organic matter content: 2 to 4 percent.

A2 horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Texture: Cobbly loam, cobbly clay loam, very cobbly loam, and very cobbly clay loam.
Clay content: 26 to 34 percent.
Rock fragments: 15 to 45 percent.
Organic matter content: 2 to 4 percent.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 2 through 4, dry or moist.
Texture: Clay loam, cobbly clay loam, and very cobbly clay loam.
Clay content: 32 to 40 percent.
Rock fragments: 5 to 40 percent.
Organic matter content: 1 to 3 percent.

Bt2 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Clay or cobbly clay.

Clay content: 40 to 55 percent.
Rock fragments: 0 to 20 percent.
Organic matter content: 1 to 3 percent.

Btq horizon:
Value: 5 through 7 dry, 3 or 4 moist.
Chroma: 3 through 6, dry or moist.
Texture: Clay or gravelly clay.
Clay content: 45 to 60 percent.
Rock fragments: 5 to 20 percent, mainly as basalt cobbles or as pebble-size detached fragments of duripan which have cementation classes ranging from strongly cemented through indurated.

Bqm horizon:
Value: 7 or 8 dry, 4 through 6 moist.
Chroma: 3 through 6, dry or moist.
Cementation: Indurated or very strongly cemented.

Grohs Series
Depth class: Moderately deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Hills.
Parent material: Kind - Loess and residuum; Source - Basalt and tuff.
Slope range: 2 to 20 percent.
Elevation: 4,700 to 5,200 feet.
Mean annual precipitation: 16 to 18 inches.
Mean annual air temperature: 45 to 47 °F.
Frost-free period: 60 to 90 days.
Range site: Juniper Dry Pine 14-16, 021XY508OR.
Native plants: Forest canopy of western juniper and ponderosa pine with an understory of Idaho fescue, bluebunch wheatgrass, mountain big sagebrush, and curlleaf mountain mahogany.
Taxonomic class: Fine, smectitic, mesic Pachic Argixerolls

Typical pedon:

Grohs cobble loam, 2 to 20 percent slopes in map unit 542B, Klamath County, Oregon, BLM Gerber Block; about 2 miles south of Brady Butte, 50 feet south of the State Line Road, and 200 feet east of the telephone repeater road; 400 feet north and 1,500 feet west of the southeast corner of section 23, T. 41 S., R. 14.5 E.; USGS Sagebrush Butte 7.5 minute topographic quadrangle; 41 degrees, 59 minutes, 40 seconds north latitude and 121 degrees, 01 minute, 22 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 2 inches; brown (7.5YR 4/3) cobbly loam, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky structure parting to moderate medium and coarse granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine interstitial and common very fine tubular pores; 5 percent pebbles, 15 percent cobbles, and 5 percent stones; neutral (pH 6.8); abrupt smooth boundary. (2 to 4 inches thick)

A2--2 to 5 inches; dark brown (7.5YR 3/4) cobbly loam, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; many very fine, common fine, and few medium roots; common very fine and common fine tubular pores; 5 percent pebbles, 10 percent cobbles, and 10 percent stones; neutral (pH 6.8); abrupt smooth boundary. (3 to 10 inches thick)

Bt1--5 to 9 inches; dark brown (7.5YR 3/4) cobbly clay loam, dark brown (7.5YR 3/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky and moderately plastic; common very fine, common fine, common medium, and few coarse roots; common very fine and common fine tubular pores; few faint clay films on faces of peds; 10 percent pebbles and 10 percent cobbles; neutral (pH 6.8); clear smooth boundary. (4 to 8 inches thick)

Bt2--9 to 14 inches; dark brown (7.5YR 3/4) gravelly clay, dark brown (7.5YR 3/2) moist; moderate medium and coarse angular blocky structure; hard, firm, very sticky and moderately plastic; common very fine, common fine, many medium, many coarse, and many very coarse roots; common very fine and few fine tubular pores; common distinct clay films on faces of peds; 10 percent pebbles and 5 percent cobbles; neutral (pH 6.8); clear smooth boundary. (4 to 14 inches thick)

Bt3--14 to 23 inches; brown (7.5YR 4/3) gravelly clay, dark brown (7.5YR 3/3) moist; moderate medium angular blocky structure; hard, firm, very sticky and moderately plastic; common fine, common medium, many coarse, and common very coarse roots; common very fine, common fine, and few medium tubular pores; common distinct clay films on faces of peds; 20 percent pebbles; neutral (pH 6.6); abrupt wavy boundary. (4 to 18 inches thick)

Cr--23 to 25 inches; weathered basalt. (2 to 8 inches thick)

R--25 inches; hard, unweathered basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 47 to 49 degrees F.
Mean summer soil temperature: 60 to 62 degrees F.
Mollic epipedon thickness: 20 to 28 inches, includes all subdivisions of the argillic horizon, except for the Bt3 horizon in some pedons.
Argillic horizon thickness: 14 to 28 inches.
Depth to base of the argillic horizon: 20 to 36 inches.
Depth to bedrock: 20 to 36 inches to a paralithic contact. The paralithic material below the contact is weathered basalt. Hard, unweathered basalt bedrock is typically within 40 inches.
Particle-size control section:
Clay content: 35 to 50 percent.
Rock fragments: 15 to 35 percent, mainly pebbles and cobbles. Lithology of fragments is basalt.
Reaction: Neutral or slightly alkaline.

A1 horizon:
Hue: 10YR or 7.5 YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Clay content: 16 to 24 percent.
Rock fragments: 15 to 35 percent.
Organic matter content: 2 to 4 percent.

A2 horizon:
Hue: 10YR or 7.5YR.
Value: 3 or 5 dry, 2 or 3 moist.
Chroma: 2 through 4 dry, 2 or 3 moist.
Textures: Cobbly loam or very cobbly loam.
Clay content: 20 to 27 percent.
Rock fragments: 20 to 40 percent.
Organic matter content: 2 to 4 percent.

Bt1 horizon:
Value: 3 through 5 dry, 2 or 3 moist.
Chroma: 2 through 4 dry, 2 or 3 moist.
Textures: Cobbly clay loam or very cobbly clay loam.
Clay content: 30 to 40 percent.
Rock fragments: 15 to 40 percent.
Organic matter content: 1 to 3 percent.

Bt2 horizon:
Value: 3 through 5 dry, 3 or 4 moist.
Chroma: 3 or 4 dry, 2 or 3 moist.
Textures: Gravelly clay loam, gravelly clay, or very cobbly clay.

Clay content: 35 to 45 percent.
Rock fragments: 15 to 40 percent.
Organic matter content: 1 to 3 percent.

Bt3 horizon:
Value: 4 through 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Textures: Gravelly clay or cobbly clay.
Clay content: 40 to 55 percent.
Rock fragments: 20 to 35 percent.
Organic matter content: 0.5 to 2 percent.

Hippyjim Series
Depth class: Deep.
Drainage class: Poorly drained.
Permeability: Very slow.
Runoff: Negligible to ponded.
Landform: Depressions.
Parent material: Kind - Lacustrine deposits and alluvium; Source - Basalt.
Slope range: 0 to 1 percent.
Elevation: 4,800 to 5,000 feet.
Mean annual precipitation: 17 to 19 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Ephemeral Lakebed, 021XY503OR.
Native plants: Spikerush.
Taxonomic class: Fine, smectitic, frigid Xeric Endoaquerts

Typical pedon:
Hippyjim silty clay loam, 0 to 2 percent slopes in map unit 610A, Klamath County, Oregon, BLM Gerber Block; 0.3 mile west of the Gerber Fire Guard Station in the southern most Gerber pothole; about 1,700 feet west and 150 feet north of the southeast corner sec. 2, T. 39 S., R. 13 E., on the USGS Goodlow Mountain 7.5 minute topographic quadrangle; 42 degrees, 12 minutes, 34 seconds north latitude and 121 degrees, 08 minutes, 27 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 4 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; soft very friable, sticky and slightly plastic; many very fine and few fine roots; many very fine and fine interstitial and tubular pores; neutral (pH 6.8); clear smooth boundary. (2 to 6 inches thick)

A2--4 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium and moderate fine angular blocky structure; soft, very friable, sticky and plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; common faint pressure faces on peds; neutral (pH 7.0); abrupt smooth boundary. (2 to 6 inches thick)

E--10 to 13 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 6/1) dry; moderate coarse parting to moderate medium subangular blocky structure; slightly hard, firm, very sticky and plastic; few very fine and common fine roots; common fine and medium interstitial and tubular pores; slightly alkaline (pH 7.4); abrupt smooth boundary. (2 to 6 inches thick)

Btss--13 to 28 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; strong coarse prismatic structure parting to strong coarse angular blocky; extremely hard, extremely firm, moderately sticky and very plastic; few very fine and common fine roots; few fine and few medium tubular pores; common pressure faces on angular blocks and few intersecting slickensides at base of prisms; common distinct clay films on faces of peds; neutral (pH 7.0); clear smooth boundary. (10 to 20 inches thick)

Bg--28 to 47 inches; olive gray (5Y 4/2) clay, light olive gray (5Y 6/2) dry; moderate medium angular blocky structure; extremely hard, extremely firm, moderately sticky and very plastic; few very fine roots; few very fine and few fine tubular pores; common pressure faces; slightly alkaline (pH 7.6); clear smooth boundary. (15 to 24 inches thick)

2Cr--47 to 62 inches; brown (7.5YR 4/3) weathered basalt, reddish yellow (7.5YR 6/6) dry.

Range in Characteristics:

Soil moisture: The moisture control section is usually wet during winter and spring and moist during summer and fall; aquic moisture regime that borders on xeric.
Mean annual soil temperature: 44 to 46 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Depth to horizons with aquic conditions: 0 to 20 inches.
Mollic epipedon thickness: 7 to 12 inches.
Depth to base of argillic horizon: 14 to 30 inches.
Cracks: Few or common, which open and close once a year in normal years. The root mass in the upper few inches of the soil usually obscures or prevents the cracks from opening to the surface. The soil surface is not self-mulching.
Depth to bedrock: 45 to 60 inches to a paralithic contact. The paralithic material below the contact is weathered basalt bedrock.
Particle-size control section:
Clay content: Averages 45 to 60 percent.
Rock fragments: 0 to 5 percent pebbles.

A horizons:
  Hue: 10YR or 7.5YR.
  Value: 2 or 3 moist, 3 through 5 dry.
  Clay content: 30 to 40 percent.
  Reaction: Slightly acid or neutral.
  Organic matter content: 2 to 4 percent.

E horizon:
  Hue: 10YR or 7.5YR.
  Value: 2 or 3 moist, 6 or 7 dry.
  Chroma: 1 or 2, moist or dry.
  Texture: Silty clay loam or clay loam.
  Clay content: 32 to 38 percent.
  Reaction: Neutral or slightly alkaline.

Btss horizon:
  Hue: 10YR or 7.5YR.
  Value: 2 or 3 moist, 3 or 4 dry.
  Texture: Clay or silty clay.
  Clay content: 50 to 65 percent.
  Consistence: Very hard or extremely hard, dry.
  Reaction: Neutral or slightly alkaline.

Bg horizon:
  Hue: 2.5Y or 5Y.
  Value: 3 or 4 moist, 4 through 6 dry.
  Chroma: 1 or 2, moist or dry.
  Texture: Clay or silty clay.
  Clay content: 45 to 55 percent.
  Reaction: Neutral or slightly alkaline.

Jennett Series
Depth class: Moderately deep to duripan.
Drainage class: Moderately well drained.
Permeability: Slow.
Runoff: Medium.
Landform: Drainageways and depressions.
Parent material: Kind - Alluvium and lacustrine deposits; Source - Basalt and tuff.
Slope range: 0 to 1 percent.

Elevation: 4,700 to 4,900 feet.
Mean annual precipitation: 16 to 18 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Claypan Bottom 12 to 18, 021XY506OR.
Native plants: Silver sagebrush and Nevada bluegrass.
Taxonomic class: Fine, smectitic, frigid Aquic Durixerolls

Typical pedon:

Jennett loam, 0 to 1 percent slopes in map unit 343A, Location in the survey area: Klamath County, Oregon, BLM Gerber Block; about 1 mile southeast of Kilgore Reservoir along the Alkaline Springs Road; 1,500 feet east and 2,000 feet south of the northwest corner of section 2, T. 41 S., R. 14 ½ E.; USGS Brady Butte 7.5 minute topographic quadrangle; 42 degrees, 02 minutes, 36 seconds north latitude and 121 degrees, 01 minute, 50 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 2 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate coarse platy structure parting to weak fine platy; slightly hard, very friable, moderately sticky and moderately plastic; common very fine, few fine, and few medium roots; common fine, common medium, and common coarse vesicular pores; slightly alkaline (pH 7.4); clear smooth boundary. (2 to 4 inches thick)

A2--2 to 8 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to moderate medium granular; soft, very friable, moderately sticky and moderately plastic; few very fine, few fine, and few medium roots; common fine and medium interstitial and tubular pores; slightly alkaline (pH 7.5); clear smooth boundary. (4 to 8 inches thick)

Btg--8 to 13 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong coarse subangular blocky structure parting to weak fine angular blocky; slightly hard, firm, very sticky and moderately plastic; few very fine, few fine, and few medium roots; common fine and common medium tubular pores; common faint clay films on faces of peds; slightly alkaline (pH 7.6); abrupt smooth boundary. (4 to 10 inches thick)

Bt--13 to 21 inches; brown (7.5YR 5/3) clay, brown (7.5YR 4/3) moist; strong medium prismatic structure parting to strong medium angular blocky; very hard, very firm, moderately sticky and very plastic; few very fine and few fine roots; few fine and few medium tubular pores; common distinct clay films on faces of peds; slightly alkaline (pH 7.6); gradual smooth boundary. (3 to 10 inches thick)

Btqm--21 to 36 inches; light gray (10YR 7/2) duripan, brown (10YR 4/3) moist; massive; extremely hard, extremely firm; moderately cemented by secondary silica; few faint clay films lining fractures; slightly alkaline (pH 7.8); gradual smooth boundary. (1 to 15 inches thick)

Bqkm--36 to 62 inches; very pale brown (10YR 7/4) duripan, brown (10YR 4/3) moist; weak thick platy structure; extremely hard, extremely firm; moderately cemented by secondary silica; secondary calcium carbonate segregated in common medium coats on bottom faces of peds; slightly effervescent; few medium prominent strong brown (7.5YR 4/6) moist masses of iron accumulation; moderately alkaline (pH 8.0).

Range in Characteristics:

Soil moisture: Usually wet in winter and spring, dry in summer and fall; xeric moisture regime that borders on aquic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Depth to horizons with aquic conditions: 10 to 20 inches.
Mollic epipedon thickness: 7 to 14 inches.
Argillic horizon thickness: 8 to 18 inches.
Depth to duripan: 20 to 30 inches.
Particle-size control section:
Clay content: 35 to 50 percent.
Reaction: Slightly alkaline or moderately alkaline.

A horizons:
Hue: 10YR or 7.5YR.

Value: 5 or 6 dry, 3 or 4 moist; Dry values of 6 and moist values of 4 are only in thin subhorizons in some pedons and the upper 7 inches when mixed has a dry value of 5 and moist value of 3.
Chroma: 2 or 3, dry or moist.
Texture: Loam or silt loam.
Clay content: 20 to 27 percent.
Organic matter content: 2 to 4 percent.

Btg horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 1 or 2, dry or moist.
Texture: Clay loam or silty clay loam.
Clay content: 32 to 40 percent.
Redoximorphic features: The gleying in the horizon matrix is assumed to be a redox depletion. Redox concentrations are not normally present.

Bt horizon:
Hue: 10YR or 7.5YR.
Value: 3 or 4, dry or moist.
Chroma: 2 or 3, dry or moist.
Texture: Clay loam, silty clay loam, or clay.
Clay content: 35 to 55 percent.

Btqm and Bqkm horizons:
Hue: 10YR or 7.5YR.
Value: 6 or 7 dry, 4 or 5 moist.
Chroma: 3 or 4, dry or moist.
Other features: Clay films are present along fractures in the duripan. Redox concentrations of iron may also be present.

Lorella Series
Depth class: Shallow.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High and very high.
Landform: Hills and plateaus.
Parent material: Kind - Colluvium and residuum, Source - basalt and tuff.
Slope range: 2 to 10 percent.
Elevation: 4,140 to 4,400 feet.
Mean annual precipitation: 13 to 15 inches.
Mean annual air temperature: 45 to 51 °F.
Frost-free period: 60 to 90 days.
Range site: Juniper Claypan 12-16, 021XY505OR.
Native plants: Scattered overstory of western juniper and an understory of bluebunch wheatgrass, Idaho fescue and Thurber needlegrass.
Taxonomic class: Clayey-skeletal, smectitic, mesic Lithic Argixerolls

Typical pedon:
Lorella stony loam, 2 to 10 percent slopes in map unit 370B, Klamath County, Oregon, BLM Gerber Block; about 1.5 miles southeast of the East Langell Valley Road, in the Willow Valley chaining, and 0.5 miles east of the intersection of jeep trails; 2,150 feet south and 1,000 feet east of the northwest corner of section 21, T. 41 S., R. 14 E.; USGS Langell Valley 7.5 minute topographic quadrangle; 42 degrees, 00 minutes, 01 seconds north latitude and 121 degrees, 11 minutes, 21 seconds west longitude, NAD 27.(Colors are for dry soils unless otherwise stated)

A--0 to 2 inches; brown (10YR 5/3) stony loam, very dark grayish brown (10YR 3/2) moist; moderate medium platy structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common fine and common medium vesicular pores; 15 percent pebbles, 10 percent cobbles and 6 percent stones; neutral (pH 6.8); abrupt smooth boundary. (2 to 8 inches)

Bt1--2 to 6 inches: dark grayish brown (10YR 4/2) very cobbly loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to moderate medium granular; hard, firm, moderately sticky and moderately plastic; common very fine, common fine and few medium roots; common fine and common medium interstitial and tubular pores; common faint clay films on faces of peds; 15 percent pebbles, 20 percent cobbles and 5 percent stones; neutral (pH 7.0); clear smooth boundary. (3 to 8 inches thick)

Bt2--6 to 13 inches; dark grayish brown (10YR 4/2) very cobbly clay, very dark grayish brown (10YR 3/2) moist; strong medium prismatic structure parting to strong medium angular blocky; hard, firm, moderately sticky and very plastic; few very fine, common fine and few medium roots; common very fine and common fine tubular pores; common distinct clay films on faces of peds; 15 percent pebbles, 20 percent cobbles and 5 percent stones; neutral (pH 7.2); abrupt smooth boundary. (4 to 7 inches thick)

Btkq--13 to 19 inches; brown (7.5YR 5/3) very cobbly clay, brown (7.5YR 4/3) moist; strong fine and medium prismatic structure; very hard, firm moderately sticky and very plastic; few very fine and few fine roots; few very fine and fine tubular pores; common distinct and few prominent clay films on faces of peds; 15 percent pebbles, 25 percent cobbles and 5 percent stones; slightly effervescent; secondary calcium carbonate segregated in common medium coats on bottom of peds and rock fragments; neutral (pH 7.2); abrupt smooth boundary. (0 to 8 inches thick)

R--19 inches; hard basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 49 to 51 °F. Mesic temperature regime that borders on frigid.
Mean summer soil temperature: 57 to 62 °F.
Thickness of the mollic horizon: 7 to 14 inches and may include the upper part of the Bt horizon.
Depth to argillic layer: 2 to 8 inches.
Depth to bedrock: 10 to 20 inches.
Particle-size control section:
Percent clay: 35 to 50 percent
Percent rock fragments: 35 to 60.

A horizon:
    Value: 4 or 5 dry, 2 or 3 moist.
    Chroma: 2 or 3, dry and moist.
    Percent clay: 20 to 27.
    Percent rock fragments: 15 to 35.
    Percent organic matter: 2 to 4.
    Reaction: Slightly acid to neutral.

Bt horizon:
    Hue: 10YR or 7.5 YR.
    Value: 4 through 6 dry, 2 through 4 moist.
    Chroma: 2 through 4, dry or moist.
    Textures: Very cobbly clay loam and very cobbly clay.
    Percent clay: 35 to 50.
    Percent rock fragments: 35 to 60.
    Percent organic matter: 1 to 3.
    Reaction: Neutral to mildly alkaline

Menbo Series
Depth class: Moderately deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: Very high.
Landform: Slopes of hills.
Parent material: Kind - Colluvium; Source - Basalt.

Slope range: 15 to 65 percent.
Elevation: 4,400 to 5,500 feet.
Mean annual precipitation: 14 to 18 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: North Slopes 14-18, 021XY312OR and Pine-Mahogany-Fescue 16-20, 021XY410OR.
Native plants: North Slopes 14-18 Antelope bitterbrush, mountain big sagebrush, Idaho fescue and bluebunch wheatgrass. Pine-Mahogany-Fescue 16-20 has an overstory of scattered Ponderosa pine and western Juniper with an understory of curleaf mountain mahogany and Idaho fescue.
Taxonomic class: Clayey-skeletal, smectitic, frigid Pachic Argixerolls

Typical pedon:

Menbo very stony loam, 15 to 40 percent slopes in map unit 380C, Klamath County, Oregon, BLM Gerber Block; about 1 mile south of the Willow Valley Road, and ¾ mile north of the state line, on the north aspect of East branch of Lost Creek, 300 feet west of the diversion dam; 200 feet south and 250 feet east of the northwest corner of section 24, T.41 S., R 14 E.; USGS Langell Valley 7.5 minute topographic quadrangle; 42 degrees, 00 minutes, 20 seconds north latitude and 121 degrees, 08 minutes, 00 seconds west longitude NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 4 inches; gray (10YR 5/1) very stony loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and common fine roots; common fine and common medium interstitial and tubular pores; 15 percent pebbles, 15 percent cobbles, 20 percent stones and 5 percent boulders; neutral (pH 6.7); clear smooth boundary. (2 to 6 inches thick)

A2--4 to 10 inches; dark grayish brown (10YR 4/2) very cobbly clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to strong medium granular; soft, friable, moderately sticky and moderately plastic; common very fine, common fine, few medium and few coarse roots; common fine and common medium tubular pores; 15 percent pebbles, 25 percent cobbles and 10 percent stones; neutral (pH 6.8); clear smooth boundary. (4 to 12 inches thick)

Bt1--10 to 20 inches; grayish brown (10YR 5/2) very cobbly clay loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure parting to moderate fine angular blocky; hard, firm, moderately sticky and moderately plastic; common very fine, common fine, few medium and few coarse roots; common very fine and common fine tubular pores; common faint and few distinct clay films on faces of peds; 15 percent pebbles, 25 percent cobbles, and 10 percent stones; neutral (pH 7.0); clear smooth boundary. (8 to 16 inches thick)

Bt2--20 to 28 inches; brown (7.5YR 5/4) very cobbly clay, dark brown (7.5YR 3/4) moist; moderate medium angular blocky structure parting to strong fine angular blocky; hard, firm, moderately sticky and moderately plastic; few very fine, common fine, few medium and few coarse roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; 15 percent pebbles, 25 percent cobbles, and 10 percent stones; neutral (pH 7.0); clear smooth boundary. (0 to 12 inches thick)

2R--28 inches; hard basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; Xeric moisture regime that borders on aridic at the lowest elevations.
Mean annual soil temperature: 45 to 47 °F.
Mean summer soil temperature: 59 to 61 °F.
Thickness of the mollic horizon: 20 to 30 inches.
Thickness of the argillic layer: 12 to 18 inches.
Depth to bedrock: 20 to 40 inches.
Particle-size control section:
Percent clay: 35 to 50.
Percent rock fragments: 35 to 50.

A horizons:
Value: 4or 5 dry, 2 or 3 moist.
Chroma: 1 through 3, dry or moist.
Percent clay: 20 to 32.

Percent rock fragments: 35 to 55.
Percent organic matter: 2 to 4.

Bt horizons:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 3 or 4 moist.
Chroma: 2 through 4, dry or moist.
Textures: Very cobbly clay loam and very cobbly clay.
Percent clay: 35 to 50.
Percent rock fragments: 35 to 50.
Percent organic matter: 1 to 3.

Mound Series
Depth class: Deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: Very high.
Landform: Hills.
Parent material: Kind - Colluvium over residuum; Source - Basalt and tuff.
Slope range: 0 to 40 percent.
Elevation: 4,700 to 5,400 feet.
Mean annual precipitation: 18 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Pine-Sedge-Fescue, 021XY414OR and Pine-Fir-Sedge, 021XY422OR.
Native plants: Forest land with an overstory of ponderosa pine and white fir at the highest elevations with an understory of Wheeler's bluegrass, Ross sedge, common snowberry and heartleaf arnica.
Taxonomic class: Clayey-skeletal, smectitic, frigid Pachic Ultic Argixerolls

Typical pedon:

Mount cobbly loam, 15 to 30 percent slopes in map unit 525C, Mound cobbly loam, 15 to 30 percent slopes.Location in the survey area: Gerber Block, Klamath County, Oregon; about 1 mile east of Norcross spring and 200 feet north of the road; 400 feet north and 2,650 feet east of the southwest corner of section 11, T 39 S., R 14 E.; USGS Gerber Reservoir 7.5 minute topographic quadrangle; 42 degrees, 11 minutes, 45 seconds north latitude and 121 degrees, 01 minute, 35 seconds west longitude NAD 27. (Colors are for dry soils unless otherwise stated)

The surface is covered with partially decomposed pine needles.

A1--0 to 3 inches; brown (10YR 5/3) cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and common fine roots; common fine and common medium interstitial pores; 15 percent pebbles and 15 percent cobbles; moderately acid (pH 6.0); clear smooth boundary. (2 to 4 inches thick)

A2--3 to 16 inches; brown (10YR 5/3) very cobbly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, common medium and few coarse roots; common fine and common medium interstitial and tubular pores; 20 percent pebbles and 15 percent cobbles; moderately acid (pH 6.0); clear smooth boundary. (5 to 14 inches thick)

Bt1--16 to 24 inches; brown (7.5YR 5/3) very cobbly clay loam, dark brown (7.5YR 3/3) dry; moderate medium subangular blocky structure parting to weak fine angular blocky; slightly hard, firm, slightly sticky and moderately plastic; few very fine, common fine, common medium and few coarse roots; common fine and common medium tubular pores; common faint clay films on faces of peds and in some pores; 15 percent pebbles, 15 percent cobbles, and 5 percent stones; slightly acid (pH 6.1); gradual smooth boundary.

Bt2--24 to 31 inches; brown (10YR 5/3) very cobbly clay loam, dark brown (10YR 3/3) moist; strong medium subangular structure parting to moderate fine angular blocky; hard, firm, moderately sticky and moderately plastic; few very fine, common fine, common fine and few coarse roots; common fine and common medium tubular pores;

common distinct clay films on faces of peds and in pores; 15 percent pebbles, 20 percent cobbles and 10 percent stones; slightly acid (pH 6.2); gradual wavy boundary.

Bt3--31 to 42 inches; yellowish brown (10YR 5/4) very cobbly clay, dark yellowish brown (10YR 3/4) moist; strong medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, few fine and few medium roots; few fine and few medium tubular pores; common distinct clay films on faces of peds and in pores; 15 percent pebbles, 20 percent cobbles and 10 percent stones; slightly acid (pH 6.2); abrupt wavy boundary. (Combined thickness of the Bt horizons is 16 to 43 inches.)

Cr--42 to 56 inches; brown (7.5YR 6/4) weathered basalt, dark brown (7.5YR 4/4) moist. (5 to 20 inches thick.)

R--56 inches; hard basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime.
Mean annual soil temperature: 45 to 47 °F.
Mean summer soil temperature: 59 to 61 °F.
Thickness of the mollic horizon: 20 to 30 inches.
Depth to bedrock: 40 to 60 inches.
Particle-size control section:
Percent clay: 35 to 50.
Percent rock fragments: 35 to 50.

A horizons:
- Value: 3 through 5 dry, 2 or 3 moist.
- Chroma: 2 or 3, dry or moist.
- Textures: Cobbly loam, stony loam and very stony loam.
- Percent clay: 20 to 27.
- Percent rock fragments: 20 to 45.
- Percent organic matter: 4 or 5.
- Reaction: Moderately acid or slightly acid.

Bt horizons:
- Hue: 10YR or 7.5YR
- Value: 4 through 6 dry, 3 or 4 moist.
- Chroma: 3 or 4, dry or moist.
- Textures: Very cobbly clay loam, very cobbly clay or very stony clay loam.
- Percent clay: 35 to 50.
- Percent rock fragments: 35 to 50.
- Percent organic matter: 1 to 3.
- Reaction: Slightly acid to neutral.

Cr horizon:
- Hue: 10YR or 7.5YR
- Value: 5 or 6 dry, 3 or 4 moist.
- Chroma: 3 through 5, dry or moist.
- Reaction: Slightly acid to neutral.

<u>Norcross Series</u>

Depth class: Shallow to duripan.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Plateaus.
Parent material: Kind - Volcanic ash from dacite and residuum; Source - Basalt.
Slope range: 0 to 10 percent.
Elevation: 4,800 to 5,400 feet.
Mean annual precipitation: 16 to 20 inches.
Mean annual air temperature: 43 to 45 °F.

Frost-free period: 50 to 80 days.
Range site: Stony Claypan 14-20, 021XY216OR, Claypan 14-20, 021XY214OR, Juniper Claypan 16-20, 021XY501OR.
Native plants: Idaho fescue, Sandberg bluegrass, bluebunch wheatgrass, low sagebrush, and western juniper.
Taxonomic class: Clayey, smectitic, frigid, shallow Vitrandic Durixerolls

Typical pedon:

Norcross very cobbly ashy loam, 1 to 8 percent slopes in map unit 330B, Klamath County, Oregon, BLM Gerber Block; about 0.25 mile west of the CCC road on the access road to the Barnes Valley Creek boat launch, 75 feet north of the road and close to the range trend plot stake; 1,000 feet north and 150 feet west of the southeast corner of section 21, T. 39 S., R. 14 E.; USGS Gerber Reservoir 7.5 minute topographic quadrangle; 42 degrees, 10 minutes, 06 seconds north latitude and 121 degrees, 03 minutes, 23 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 3 inches; light brown (7.5YR 6/3) very cobbly ashy loam, dark brown (7.5YR 3/3) moist; weak thick platy structure parting to moderate thin platy; hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; common fine and common medium vesicular pores; 15 percent pebbles, 20 percent cobbles, and 5 percent stones; neutral (pH 7.2); abrupt smooth boundary. (2 or 3 inches thick)

A2--3 to 6 inches; brown (7.5YR 5/3) cobbly ashy loam, dark brown (7.5YR 3/3) moist; weak thin platy structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; common very fine, common fine, and few medium roots; common fine and common medium tubular pores; 15 percent pebbles and 12 percent cobbles; neutral (pH 7.2); clear smooth boundary. (0 to 5 inches thick)

Bt1--6 to 10 inches; brown (7.5YR 5/3) cobbly ashy clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure parting to weak fine angular blocky; slightly hard, firm, moderately sticky and moderately plastic; common very fine, few fine, and few medium roots; common fine and common medium tubular pores; common faint clay films on faces of peds; 5 percent pebbles and 15 percent cobbles; slightly alkaline (pH 7.4); abrupt smooth boundary. (3 to 8 inches thick)

Bt2--10 to 18 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 3/4) moist; strong medium prismatic structure parting to strong medium angular blocky; very hard, very firm, moderately sticky and very plastic; few very fine and few fine roots; few fine tubular pores; few pressure faces; common distinct clay films on faces of peds; slightly alkaline (pH 7.5); clear smooth boundary. (3 to 10 inches thick)

Bt3--18 to 20 inches; light brown (7.5YR 6/3) clay, brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium and strong fine angular blocky; hard, firm, moderately sticky and very plastic; few very fine and few fine roots; few very fine and few fine tubular pores; common pressure faces; common distinct and few faint clay films on faces of peds; slightly alkaline (pH 7.6); abrupt smooth boundary. (0 to 7 inches thick)

Bqm--20 to 31 inches; pink (7.5YR 7/4) duripan, strong brown (7.5YR 4/6) moist; strong thick platy structure; very rigid; indurated by secondary silica; widely spaced fractures in the upper inch; thin laminar caps of opal on top of peds; slightly alkaline (pH 7.8); abrupt wavy boundary. (2 to 20 inches thick)

R--31 inches; hard vesicular basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring, dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Mollic epipedon thickness: 7 to 12 inches; includes the Bt1 horizon, and in some pedons also includes the Bt2 horizon, when the upper 7 inches of soil is mixed.
Argillic horizon thickness: 7 to 16 inches.
Depth to base of argillic horizon: 12 to 20 inches.
Depth to duripan: 12 to 20 inches.
Duripan thickness: 2 to 26 inches.
Depth to bedrock: 18 to 46 inches to a lithic contact.
Particle-size control section:
Clay content: 45 to 55 percent;

Rock fragments: 0 to 10 percent, mainly pebbles and cobbles. Lithology of fragments is dominantly basalt.
Reaction: Neutral or slightly alkaline.
Vitrandic intergrade properties: Occurs in horizons from the soil surface to at least 7 inches in depth within horizons having clay content of less than about 40 percent.
Other features: Some pedons have Btq horizons.

A1 horizon:
Hue: 10YR or 7.5YR.
Value: 4 through 6 dry, 2 or 3 moist; a dry value of 6 is only in thin subhorizons in some pedons and the upper 7 inches when mixed has a dry value of 5.
Chroma: 2 or 3, dry or moist.
Texture: Very cobbly ashy loam or extremely cobbly ashy loam.
Clay content: 22 to 27 percent.
Rock fragments: 40 to 65 percent.
Organic matter content: 2 to 4 percent.
Volcanic glass content: 15 to 30 percent in coarse silt through fine sand fractions.
Oxalate Al + 1/2 oxalate iron: 0.2 to 0.4 percent.

A2 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 2 or 3 moist; a dry value of 6 is only in thin subhorizons in some pedons and the upper 7 inches when mixed has a dry value of 5.
Chroma: 2 or 3, dry or moist.
Texture: Cobbly ashy loam, cobbly ashy clay loam, very cobbly ashy loam, or very cobbly ashy clay loam.
Clay content: 26 to 36 percent.
Rock fragments: 20 to 40 percent.
Organic matter content: 2 to 4 percent.
Volcanic glass content: 15 to 30 percent in coarse silt through fine sand fractions.
Oxalate Al + 1/2 oxalate iron: 0.2 to 0.4 percent.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 2 through 4, dry or moist.
Texture: Ashy clay loam, cobbly ashy clay loam, clay, or cobbly clay.
Clay content: 36 to 46 percent.
Rock fragments: 0 to 25 percent.
Organic matter content: 1 to 3 percent.
Volcanic glass content: 10 to 25 percent in coarse silt through fine sand fractions.
Oxalate Al + 1/2 oxalate iron: 0.2 to 0.4 percent.

Bt2 horizon:
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Clay or cobbly clay.
Clay content: 40 to 55 percent.
Rock fragments: 0 to 25 percent.
Organic matter content: 1 to 3 percent.
Other features: Some pedons have texture of ashy clay loam in thin subhorizons.

Bt3 horizon:
Value: 5 through 7 dry, 3 or 4 moist.
Chroma: 3 through 6, dry or moist.
Clay content: 45 to 60 percent.
Rock fragments: 0 to 10 percent, mainly cobbles.

Bqm horizon:
Value: 7 or 8 dry, 4 through 6 moist.
Chroma: 3 through 6, dry or moist.
Cementation: Indurated or very strongly cemented.

Notchcorral Series
Depth class: Moderately deep to a duripan.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Summit positions on plateaus.
Parent material: Kind - Volcanic ash from dacite and residuum; Source - Basalt.
Slope range: 1 to 8 percent.
Elevation: 4,200 to 5,000 feet.
Mean annual precipitation: 14 to 16 inches.
Mean annual air temperature: 45 to 47 °F.
Frost-free period: 60 to 90 days.
Range site: Juniper Claypan 12-16, 021XY505OR.
Native plants: bluebunch wheatgrass, Idaho fescue, low sagebrush, and western juniper.
Taxonomic class: Fine, smectitic, mesic Palexerollic Durixerolls

Typical pedon:

Notchcorral very cobbly loam, 0 to 8 percent slopes in map unit 350B, Klamath County, Oregon, BLM Gerber Block; about 0.3 miles east of the Notch Corrals and 200 feet north of the Oregon-California state line; 200 feet north and 1,800 feet east of the southwest corner of section 22, T. 41 S., R. 14 1/2 E.; USGS Sagebrush Butte 7.5 minute topographic quadrangle; 41 degrees, 59 minutes, 38 seconds north latitude and 121 degrees, 02 minutes, 54 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A--0 to 3 inches; brown (10YR 5/3) very cobbly loam, dark brown (10YR 3/3) moist; moderate thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and common fine vesicular pores; 15 percent pebbles, 15 percent cobbles, and 7 percent stones; neutral (pH 7.3); abrupt smooth boundary. (2 to 4 inches thick)

Bt1--3 to 6 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 3/3) moist; weak coarse and moderate medium subangular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; common very fine, common fine, and few medium roots; common very fine and common fine tubular pores; common faint clay films on faces of peds; 10 percent pebbles and 5 percent cobbles; slightly alkaline (pH 7.4); clear smooth boundary. (2 to 6 inches thick)

Bt2--6 to 11 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; strong coarse subangular blocky structure parting to weak fine angular blocky; hard, firm, moderately sticky and very plastic; few very fine, few fine, few medium, and few coarse roots; common very fine and common fine tubular pores; common faint and few distinct clay films on faces of peds; slightly alkaline (pH 7.5); abrupt smooth boundary. (5 to 16 inches thick)

Bt3--11 to 22 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 3/4) moist; strong medium prismatic structure parting to strong medium angular blocky; very hard, very firm, moderately sticky and very plastic; few very fine, few fine, few medium, few coarse, and few very coarse roots; few very fine tubular pores; common vertical cracks 2 to 5 millimeters wide and 2 to 3 inches apart extending through the horizon; common distinct and few prominent clay films on faces of peds; slightly alkaline (pH 7.6); clear smooth boundary. (6 to 12 inches thick)

Bqkm1--22 to 31 inches; pink (7.5YR 7/4) duripan, brown (7.5YR 5/4) moist; strong thick platy structure; very rigid; indurated by secondary silica; slightly to strongly effervescent; secondary carbonates segregated as common coats on bottom faces of peds; moderately alkaline (pH 8.2); clear smooth boundary. (2 to 10 inches thick)

Bqkm2--31 to 50 inches; very pale brown (10YR 7/4), duripan, dark yellowish brown (10YR 4/4) moist; moderate thick platy structure; rigid; moderately to strongly cemented by secondary silica; secondary carbonates segregated as common fine threads on faces of peds; non-effervescent to strongly effervescent; moderately alkaline (pH 8.4). (15 to 22 inches thick)

R--50 inches; hard basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 47 to 49 °F.
Mean summer soil temperature: 60 to 62 °F.
Thickness of the mollic horizon: 7 to 12 inches; includes the Bt1 and Bt2 horizons, or only part of the Bt2 horizon when the upper 7 inches of the soil is mixed.
Thickness of the argillic horizon: 16 to 20 inches.
Depth to the base of the argillic layer: 20 to 25 inches.
Thickness of the duripan: 17 to 30 inches.
Depth to duripan: 20 to 25 inches.
Depth to bedrock: 40 to 60 inches.
Particle-size control section:
Percent clay: Averages 40 to 55 percent with an abrupt increase of 15 percent or more between *the Bt2 and Bt3 horizons;*
Percent rock fragments: 0 to 15 percent, mainly pebbles and cobbles. Lithology of fragments is basalt.
Reaction: Neutral to slightly alkaline.

A horizon:
- Value: 4 or 5 dry, 2 or 3 moist.
- Chroma: 2 or 3, dry or moist.
- Clay content: 22 to 27 percent.
- Rock fragments: 35 to 50 percent.
- Organic matter content: 2 to 4 percent.

Bt1 horizon:
- Hue: 10YR or 7.5YR.
- Value: 4 or 5 dry, 2 or 3 moist.
- Chroma: 2 or 3, dry or moist.
- Texture: Gravelly clay loam or cobbly clay loam.
- Clay content: 28 to 40 percent.
- Rock fragments: 15 to 35 percent.
- Organic matter content: 2 to 4 percent.
- Other features: Some pedons have texture of clay.

Bt2 horizon:
- Hue: 10YR or 7.5YR.
- Value: 5 or 6 dry, 3 or 4 moist.
- Chroma: 3 or 4 dry.
- Clay content: 40 to 50 percent.
- Rock fragments: 0 to 5 percent.
- Organic matter content: 1 to 3 percent.

Bt3 horizon:
- Hue: 7.5YR or 10YR.
- Value: 5 or 6 dry, 3 or 4 moist.
- Chroma: 3 or 4, dry or moist.
- Clay content: 55 to 65 percent.

Bqkm horizons:
- Hue: 7.5YR or 10YR.
- Value: 6 through 8 dry, 4 or 5 moist.
- Chroma: 4 or 6, dry or moist.
- Cementation: Indurated in Bqkm1 horizon, very strongly cemented to moderately cemented in Bqkm2 horizon.

<u>Olene Series</u>
Depth class: Deep.
Drainage class: Poorly drained.
Permeability: Slow.
Runoff: Medium.

Landform: Drainageways.
Parent material: Kind - Alluvium; Source - Basalt and tuff.
Slope range: 0 to 1 percent.
Elevation: 5,100 to 5,300 feet.
Mean annual precipitation: 18 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Semi-wet meadow, 021XY509OR.
Native plants: California oatgrass, sedges and slender wheatgrass.
Taxonomic class: Fine, smectitic, frigid Xeric Endoaquerts

Typical pedon:

Olene gravelly clay, 0 to 1 percent slopes in map unit 615A, Klamath County Oregon, BLM Gerber Block; about 1 mile northeast of Holbrook Spring and 1 mile west of the Main Haul Road; 600 feet west and 400 feet south of the northeast corner of section 6, T. 41 S., R. 15 E.; USGS Antler Point 7.5 minute topographic quadrangle; 42 degrees, 02 minutes, 54 seconds north latitude and 120 degrees, 58 minutes, 44 seconds west longitude, NAD 27.
(Colors are for moist soils unless otherwise stated)

A1--0 to 2 inches; very dark brown (10YR 2/2) gravelly clay, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; many very fine and few fine roots; many very fine and fine tubular pores; 20 percent pebbles and 5 percent cobbles; slightly alkaline (pH 7.4); abrupt smooth boundary. (2 to 4 inches thick)

A2--2 to 8 inches; very dark brown (10YR 2/2) clay, dark grayish brown (10YR 4/2) dry; moderate medium prismatic structure parting to weak medium angular blocky; hard, firm, moderately sticky and moderately plastic; common very fine, common fine, and few medium roots; common very fine and common fine tubular pores; 10 percent pebbles; slightly alkaline (pH 7.4); abrupt smooth boundary. (0 to 6 inches thick)

Bss1--8 to 16 inches; very dark brown (10YR 2/2) clay, dark grayish brown (10YR 4/2) dry; strong coarse prismatic structure parting to moderate fine wedge; very hard, very firm, moderately sticky and very plastic; few very fine, few medium, and common fine roots; common very fine and common fine tubular pores; few intersecting slickensides; slightly alkaline (pH 7.5); clear smooth boundary. (6 to 10 inches thick)

Bss2--16 to 26 inches; dark grayish brown (10YR 4/2) clay, pale brown (10YR 6/3) dry; moderate medium prismatic structure parting to moderate fine wedge; very hard, very firm, very sticky and very plastic; few very fine, few fine, and few medium roots; few fine and few medium tubular pores; common pressure faces and few intersecting slickensides; few medium prominent yellowish red (5YR 4/6) masses of iron accumulation; slightly alkaline (pH 7.6); clear wavy boundary. (6 to 12 inches thick)

BC--26 to 42 inches; brown (7.5YR 4/3) very cobbly clay, light brown (7.5YR 6/4) dry; moderate medium angular blocky structure; very hard, very firm, moderately sticky and very plastic; few very fine roots; few very fine and few fine tubular pores; 15 percent pebbles, 20 percent cobbles, and 5 percent stones; common medium prominent greenish gray (5BG 5/1) iron depletions and common medium prominent yellowish red (5YR 4/6) masses of iron accumulation; slightly alkaline (pH 7.5); clear wavy boundary. (15 to 24 inches thick)

C--42 to 52 inches; brown (7.5YR 5/4) very gravelly clay, light brown (7.5YR 6/4) dry; massive; very hard, very firm, very sticky and very plastic; 30 percent pebbles and 10 percent cobbles; slightly alkaline (pH 7.5); clear smooth boundary. (8 to 16 inches thick)

2Cr--52 to 62 inches; brown (7.5YR 4/3) weathered basalt, reddish yellow (7.5YR 6/6) dry.

Range in Characteristics:

Soil moisture: Usually wet during winter and spring and moist during summer and fall. These soils occur downstream from springs and seeps and remain moist throughout the profile in most years; aquic moisture regime that borders on xeric. Endosaturation is present with a seasonal high water table between the soil surface and 12 inches (very shallow and shallow internal free water occurrence classes) from December to May. During summer months in normal years the zone of saturation drops between 26 and 42 inches. Cumulative annual duration class is Common. These soils receive run-on moisture and are frequently ponded for very long duration (more than 45 consecutive days in normal years), mainly in the late winter and spring. They can be ponded for as

long as 4 months in a normal year and periods of brief duration ponding can occur after intense rainfall events. Depth of water during ponding is 2 to 6 inches.
Water table is at a depth of: 0 to 12 inches.
Mean annual soil temperature: 44 to 46 °F.
Mean summer soil temperature: 59 to 61 °F.
Thickness of the mollic epipedon: 12 to 18 inches.
Depth to bedrock: 45 to 60 inches to a paralithic contact.
Cracks: Few or common which open and close in normal years. The root mass in the upper few inches of the soil usually obscures or prevents the cracks from opening to the surface. The soil surface is not self-mulching.
Particle-size control section:
Percent clay: 45 to 60.
Percent rock fragments: 15 to 35 mainly as pebbles and cobbles.
Reaction: Neutral to slightly alkaline.
Other features: Redox concentrations are not normally present in the horizons with low chroma that constitute the mollic epipedon, due to masking by high amounts of dark organic matter.

A horizons:
Hue: 10YR or 7.5YR
Value: 2 or 3 moist, 3 or 4 dry.
Chroma: 1 or 2, moist or dry.
Clay content: 40 to 45 percent.
Rock fragments: 5 to 30 percent.
Organic matter content: 2 to 4 percent.

Bss1 horizon:
Hue: 10YR or 7.5YR.
Value: 2 or 3 moist, 4 or 5 dry.
Chroma: 2 or 3, moist or dry.
Texture: Clay or silty clay.
Clay content: 50 to 60 percent.
Organic matter content: 1 to 3 percent.

Bss2 horizon:
Hue: 10YR or 7.5YR.
Value: 2 through 4 moist, 4 or 5 dry.
Chroma: 2 or 3, moist or dry.
Texture: Clay or silty clay.
Clay content: 50 to 60 percent.
Redoximorphic features: Few or common, distinct or prominent redox concentrations of iron.

BC horizon:
Hue: 5YR or 7.5YR.
Value: 2 through 4 moist, 4 or 5 dry.
Chroma: 2 or 3, moist or dry.
Texture: Very cobbly clay or very cobbly silty clay.
Clay content: 45 to 55 percent.
Rock fragments: 35 to 60 percent.
Redoximorphic features: Few or common, distinct or prominent redox deletions or redox concentrations of iron.

C horizon:
Hue: 7.5YR or 10YR.
Value: 3 through 5 moist, 4 through 6 dry.
Chroma: 3 or 4, dry or moist.
Texture: Very gravelly clay or very cobbly clay.
Clay content: 40 to 50 percent.
Rock fragments: 35 to 60 percent.

Pankeybasin Series
Depth class: Moderately deep to a duripan.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Plateaus.
Parent material: Kind - Volcanic ash from dacite and residuum; Source - Basalt.
Slope range: 1 to 4 percent.
Elevation: 4,800 to 5,000 feet.
Mean annual precipitation: 17 to 19 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Claypan 14-20, 021XY214OR and Stony Claypan 14-20, 021XY216OR.
Native plants: Idaho fescue, Sandberg bluegrass, low sagebrush, and scattered western juniper.
Taxonomic class: Fine, smectitic, frigid Palexerollic Durixerolls

Typical pedon:

Pankeybasin very cobbly loam, 0 to 4 percent slopes in map unit 345A, Klamath County, Oregon, BLM Gerber Block; about 0.3 mile southwest of DeVaul Lake and 100 yards north of the paved road to Gerber Reservoir; 2,525 feet north and 2,350 feet west of the southeast corner of section 15, T. 39 S., R. 13 E.; USGS Goodlow Mountain 7.5 minute topographic quadrangle; 42 degrees, 11 minutes, 16 seconds north latitude and 121 degrees, 09 minutes, 45 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 2 inches; grayish brown (10YR 5/2) very cobbly loam, dark brown (10YR 3/3) moist; weak thick platy structure parting to moderate thin platy; soft, very friable, slightly sticky and slightly plastic; many very fine and common fine roots; common fine and common medium vesicular pores; 15 percent pebbles, 15 percent cobbles, and 7 percent stones; slightly alkaline (pH 7.4); clear smooth boundary. (2 to 5 inches thick)

A2--2 to 7 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to strong medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and few medium roots; common very fine interstitial and common medium tubular pores; 10 percent pebbles and 5 percent cobbles; slightly alkaline (pH 7.5); clear smooth boundary. (4 to 9 inches thick)

Bt1--7 to 11 inches; brown (7.5YR 5/3) clay loam, dark brown (7.5YR 3/3) moist; strong medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, few medium, and few coarse roots; common fine and common medium tubular pores; common faint clay films on faces of peds; 5 percent pebbles and 5 percent cobbles; slightly alkaline (pH 7.6); abrupt smooth boundary. (4 to 9 inches thick)

Bt2--11 to 19 inches; brown (7.5YR 5/3) clay, dark brown (7.5YR 3/4) moist; strong medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, moderately sticky and very plastic; few very fine and few fine roots; few very fine and few fine tubular pores; few pressure faces; common distinct clay films on faces of peds; slightly alkaline (pH 7.7); clear smooth boundary. (7 to 12 inches thick)

Btq--19 to 23 inches; light brown (7.5YR 6/4) clay, brown (7.5YR 4/4) moist; moderate medium angular blocky structure parting to strong fine angular blocky; hard, firm, moderately sticky and very plastic; few very fine roots; few very fine tubular pores; 10 percent medium pebble-size detached duripan fragments; many distinct clay films on faces of peds; slightly alkaline (pH 7.8); abrupt smooth boundary. (0 to 6 inches thick)

Bqkm1--23 to 32 inches; pinkish gray (7.5YR 7/2), duripan, brown (7.5YR 5/4) moist; moderate very thick platy structure; very rigid; indurated by secondary silica; secondary carbonates segregated as common medium threads on faces of peds; non-effervescent and strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary. (6 to 10 inches thick)

Bqkm2--32 to 65 inches; light brown (7.5YR 6/4), duripan, strong brown (7.5YR 4/6) moist; weak very thick platy structure; extremely hard, extremely firm; moderately to strongly cemented by secondary silica; secondary carbonates segregated as few fine threads on faces of peds; non-effervescent and strongly effervescent; moderately alkaline (pH 8.4).

Range in Characteristics:

Soil moisture: Usually moist in winter and spring, dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Mollic epipedon thickness: 7 to 14 inches, includes the Bt1 horizon.
Argillic horizon thickness: 10 to 18 inches.
Depth to base of argillic horizon: 20 to 25 inches.
Depth to duripan: 20 to 25 inches.
Duripan thickness: Greater than 40 inches.
Depth to bedrock: Greater than 60 inches. Hard bedrock is estimated to be within 80 inches.
Particle-size control section:
Clay content: Averages 40 to 50 percent with an abrupt increase of 15 to 25 percent between the Bt1 and Bt2 horizons.
Rock fragments: Averages 5 to 20 percent, mainly pebbles and cobbles. Lithology of fragments is dominantly basalt.
Reaction: Neutral or slightly alkaline.

A1 horizon:
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Texture: Loam or very cobbly loam.
Clay content: 20 to 25 percent.
Rock fragments: 5 to 50 percent.
Organic matter content: 2 to 4 percent.

A2 horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Texture: Cobbly loam, gravelly loam, or cobbly clay loam.
Clay content: 24 to 32 percent.
Rock fragments: 15 to 35 percent.
Organic matter content: 2 to 4 percent.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry.
Chroma: 2 through 4 dry, 2 or 3 moist.
Texture: Clay loam or cobbly clay loam.
Clay content: 32 to 40 percent.
Rock fragments: 10 to 25 percent.
Organic matter content: 1 to 3 percent.

Bt2 horizon:
Hue: 7.5YR or 10YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Clay or cobbly clay.
Clay content: 55 to 65 percent.
Rock fragments: 0 to 20 percent.

Btq horizon:
Value: 5 or 6 dry, 4 or 5 moist.
Chroma: 4 or 6, dry or moist.
Clay content: 40 to 50 percent.
Rock fragments: 5 to 10 percent; mainly fine or medium pebble-size detached fragments of indurated duripan.

Bqkm horizons:
Value: 6 or 7 dry, 4 through 6 moist.
Chroma: 3 through 6, dry or moist.

Cementation: Indurated or very strongly cemented in Bqkm1 horizon, strongly cemented to weakly cemented in Bqkm2 horizon.

Royst Series

Depth class: Moderately deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: Very high.
Landform: Escarpment.
Parent material: Kind - Volcanic ash and colluvium over residuum; Source - Basalt and tuff.
Slope range: 10 to 30 percent.
Elevation: 4,700 to 5,200 feet.
Mean annual precipitation: 18 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Mahogany Rockland 10-20, 021XY402OR.
Native plants: Forestland overstory of scattered ponderosa pine and western juniper with an understory dominated by curlleaf mountain mahogany and minor amounts of antelope bitterbrush, mountain big sagebrush, bittercherry, Idaho fescue and bluebunch wheatgrass.
Taxonomic class: Clayey-skeletal, smectitic, frigid Pachic Argixerolls

Typical pedon:

Royst cobbly loam, 10 to 30 percent slopes in map unit 500C, BLM Gerber Block, Klamath County, Oregon; ¾ mile east of the CCC Road, 200 feet north of the cattle guard on the Horse Camp Rim Road; 1,300 feet north and 2,550 feet west of the southeast corner of section 3, T. 40 S., R. 14 1/2 E.; USGS Gerber Reservoir 7.5 minute topographic quadrangle; 42 degrees 7 minutes 37 seconds north latitude and 121 degrees 2 minutes 44 seconds west longitude, NAD 27.(Colors are for dry soils unless otherwise stated)

A1--0 to 6 inches; dark gray (10YR 3/1) cobbly loam, very dark gray (10YR 4/1) moist; weak medium subangular blocky structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; few very fine, few fine and few medium roots; common fine and common medium interstitial and tubular pores; 15 percent gravel, 10 percent cobbles and 4 percent stones; slightly acid (pH 6.4); clear smooth boundary. (2 to 6 inches thick)

A2--6 to 13 inches; dark gray (10YR 4/1) cobbly clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to strong medium granular; soft, friable, moderately sticky and moderately plastic; few very fine, common fine and common medium roots; common fine and common medium tubular pores; 15 percent gravel, 10 percent cobbles and 4 percent stones; slightly acid (pH 6.4); clear smooth boundary. (4 to 10 inches thick)

Bt1--13 to 26 inches; dark grayish brown (10YR 4/2) cobbly clay loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure paring to moderate fine angular blocky; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, few medium, few coarse and few very coarse roots; common very fine and common fine tubular pores; common distinct clay films on the face of peds; 15 percent gravel, 10 percent cobbles and 4 percent stones; slightly acid (pH 6.5); clear wavy boundary. (5 to 12 inches thick)

Bt2--26 to 38 inches; brown (10YR 5/3) very paragravelly clay, brown (10YR 4/3) moist; string medium angular blocky structure parting to moderate fine angular block; hard, firm, very sticky and very plastic; few very fine, few fine and few medium roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds and in pores; 25 percent paragravel, 10 percent cobbles and 5 percent stones; neutral (pH 6.6); clear smooth boundary. (5 to 12 inches thick)

Cr--38 to 45 inches; light gray (10YR 7/2) fractured weathered basalt, grayish brown (10YR 5/2) moist. (2 to 10 inches thick)

R--45 inches; hard unweathered basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime.
Mean annual soil temperature: 45 to 47°F.

Mean summer soil temperature: 59 to 61 °F.
Thickness of the mollic horizon: 20 to 30 inches and include all or part of the argillic horizon.
Thickness of the argillic horizon: 5 to 24 inches thick.
Depth to the base of the argillic layer: 20 to 40 inches.
Depth to bedrock: 20 to 40 inches to a paralithic contact. Hard bedrock is typically above 60 inches.
Particle-size control section:
Percent clay: 35 to 45.
Percent rock fragments: 35 to 60.

A horizons:
Hue: 10YR or 7.5YR
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 1 through 3, dry or moist.
Clay content: 22 to 27 percent.
Rock fragments: 25 to 35 percent.
Organic matter content: 2 to 4 percent.
Reaction: Moderately acid to slightly acid.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 through 4, dry or moist.
Textures: Very gravelly clay loam, cobbly clay loam or very cobbly clay loam.
Clay content: 35 to 40 percent.
Rock fragments: 35 to 60 percent.
Organic matter content: 1 to 3 percent.
Reaction: Slightly acid to neutral.

Bt2 horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 through 4, dry or moist.
Textures: Very paragravelly clay or very cobbly clay.
Clay content: 35 to 45 percent.
Rock fragments: 35 to 60 percent.
Organic matter content: 1 to 3 percent.
Reaction: Slightly acid to neutral.

Cr layer:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.

Schnipps Series
Depth class: Deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High or very high.
Landform: Hills.
Parent material: Kind - Alluvium and residuum; Source - Basalt and tuff.
Slope range: 2 to 30 percent.
Elevation: 4,800 to 5,450 feet.
Mean annual precipitation: 17 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Pine-Mahogany-Fescue 16-20, 021XY410OR and Juniper-Mahogany-Fescue 16-20, 021XY420OR.
Native plants: Forest canopy of western juniper and ponderosa pine with an understory of Idaho fescue, bluebunch wheatgrass, mountain big sagebrush, and curlleaf mountain mahogany.
Taxonomic class: Fine, smectitic, frigid Pachic Argixerolls

Typical pedon:

Schnipps cobbly loam, 6 to 20 percent slopes in map unit 402C, Klamath County, Oregon, BLM Gerber Block; about 2.5 miles east of Boggs Lake and near the end of the road south of Copeland Reservoir; 750 feet north and 1,100 feet east of the southwest corner of section 13, T. 40 S., R. 14 E.; USGS Langell Valley 7.5 minute topographic quadrangle; 42 degrees, 05 minutes, 42 seconds north latitude and 121 degrees, 07 minutes, 50 seconds west longitude, NAD 27.
(Colors are for dry soils unless otherwise stated)

A1--0 to 3 inches; grayish brown (10YR 5/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and common fine roots; common very fine interstitial pores; 15 percent pebbles, 10 percent cobbles, and 5 percent stones; neutral (pH 6.6); clear smooth boundary. (2 to 6 inches thick)

A2--3 to 14 inches; grayish brown (10YR 5/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; soft, friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots; many fine and many medium tubular pores; 15 percent pebbles, 10 percent cobbles, and 5 percent stones; neutral (pH 6.6); clear smooth boundary. (5 to 14 inches thick)

Bt1--14 to 25 inches; brown (10YR 5/3) cobbly clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, few medium, and few coarse roots; common fine and common medium tubular pores; common faint and few distinct clay films on faces of peds; 15 percent pebbles and 15 percent cobbles; neutral (pH 6.8); clear smooth boundary. (6 to 15 inches thick)

Bt2--25 to 49 inches; brown (7.5YR 5/4) very cobbly clay loam, dark brown (7.5YR 3/4) moist; strong medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, few medium, and few coarse roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; 20 percent pebbles, 15 percent cobbles, and 3 percent stones; neutral (pH 6.6); clear wavy boundary. (8 to 25 inches thick)

Crt--49 to 65 inches; light brown (7.5YR 6/3), soft weathered vesicular basalt, brown (7.5YR 4/3) moist; common distinct clay films on pararock fragments.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring, dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 °F.
Mean summer soil temperature: 59 to 61 °F.
Thickness of the mollic horizon: 20 to 30 inches, includes the Bt1 horizon.
Thickness of the argillic horizon: 18 to 36 inches.
Depth to base of argillic horizon: 40 to 50 inches.
Depth to bedrock: 40 to 50 inches to a paralithic contact. The paralithic material below the contact is weathered basalt or tuff. Hard, unweathered bedrock is typically within 80 inches.
Particle-size control section:
Percent clay: 35 to 42:
Percent rock fragments: 15 to 35 percent, mainly cobbles. Lithology of fragments is basalt.
Reaction: Slightly acid to neutral.
Other features: Some pedons have Bt3 horizons.

A1 horizon**:**
  Value: 4 or 5 dry, 2 or 3 moist.
  Chroma: 2 or 3, dry or moist.
  Texture: Cobbly loam or very stony loam.
  Clay content: 20 to 25 percent.
  Rock fragments: 20 to 45 percent.
  Organic matter content: 2 to 4 percent.

A2 horizon:

Hue: 10YR or 7.5YR.
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 through 4 dry, 2 or 3 moist.
Texture: Cobbly loam, cobbly clay loam, very cobbly loam, very cobbly clay loam, or stony loam.
Clay content: 24 to 32 percent.
Rock fragments: 20 to 40 percent.
Organic matter content: 2 to 4 percent.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Chroma: 2 through 4 dry, 2 or 3 moist.
Texture: Cobbly clay loam or very cobbly clay loam.
Clay content: 32 to 40 percent.
Rock fragments: 25 to 45 percent.
Organic matter content: 1 to 3 percent.

Bt2 horizon:
Hue: 7.5YR or 10YR.
Value: 4 through 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Cobbly clay loam, cobbly clay, very cobbly clay loam, or very cobbly clay.
Clay content: 36 to 50 percent.
Rock fragments: 15 to 40 percent.

Tallboy Series
Depth class: Deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: Medium.
Landform: Summit or toeslope positions on plateaus.
Parent material: Kind - Minor amounts of ash over slope alluvium and residuum; Source - Basalt and tuff.
Slope range: 0 to 15 percent.
Elevation: 4,900 to 5,300 feet.
Mean annual precipitation: 18 to 20 inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Pine-Sedge-Fescue, 021XY414OR.
Native plants: Forest land with an overstory of ponderosa pine with an understory of Wheeler's bluegrass, Ross sedge, Idaho fescue, common snowberry, heartleaf arnica and squaw carpet.
Taxonomic class: Fine, smectitic, frigid Pachic Ultic Argixerolls

Typical pedon:

Tallboy gravelly loam, 0 to 15 percent slopes in map unit 532B, Klamath County, Oregon, BLM Gerber Block; about 0.75 mile west of Barnes Creek and 0.75 mile north of the Gerber Road along the Fremont National Forest boundary; 350 feet south and 150 feet west of the northeast corner of section 25, T. 38 S., R. 13 E.; USGS Horsefly Mountain 7.5 minute topographic quadrangle; 42 degrees, 15 minutes, 09 seconds north latitude and 121 degrees, 06 minutes, 54 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A1--0 to 2 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; strong thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and common fine roots; common fine and common medium interstitial and tubular pores; 10 percent pebbles, 5 percent cobbles, and 2 percent stones; slightly acid (pH 6.5); abrupt smooth boundary. (2 to 4 inches thick)

A2--2 to 7 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; strong thick platy structure parting to strong medium granular; slightly hard, friable, slightly sticky and slightly plastic; few very fine, common fine, common medium, and few coarse roots; common fine and common medium interstitial and tubular pores; 10 percent pebbles and 5 percent cobbles; neutral (pH 6.6); abrupt smooth boundary. (4 to 15 inches thick)

A3--7 to 21 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine, common fine, common medium, and few coarse roots; common fine and common medium tubular pores; 10 percent pebbles; neutral (pH 6.6); clear smooth boundary. (0 to 15 inches thick)

Bt1--21 to 34 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; few very fine, common fine, common medium, and few coarse roots; common fine and common medium tubular pores; common faint and few distinct clay films on faces of peds; 10 percent pebbles; neutral (pH 6.6); gradual smooth boundary. (6 to 14 inches thick)

2Bt2--34 to 46 inches; light brown (7.5YR 6/3) very cobbly clay, brown (7.5YR 4/3) moist; strong medium subangular blocky structure parting to moderate fine angular blocky; slightly hard, firm, moderately sticky and moderately plastic; few very fine, few fine, and few medium roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; 15 percent pebbles, 20 percent cobbles, and 5 percent stones; neutral (pH 6.8); clear wavy boundary. (8 to 14 inches thick)

2Crt--46 to 56 inches; light brown (7.5YR 6/4) weathered basalt, brown (7.5YR 4/4) moist; few distinct clay films on pararock fragments and few seams of illuvial clay lining fractures in the bedrock. (6 to 18 inches thick)

2R--56 inches; hard, unweathered basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Mollic epipedon thickness: 20 to 35 inches, includes the Bt1 horizon in some pedons.
Argillic horizon thickness: 16 to 30 inches.
Depth to base of argillic horizon: 40 to 50 inches.
Depth to bedrock: 40 to 50 inches to a paralithic contact. The paralithic material below the contact is weathered basalt. Hard, unweathered bedrock is typically within 70 inches.
Particle-size control section:
Clay content: 35 to 45 percent.
Rock fragments: 15 to 30 percent, mainly pebbles and cobbles. Lithology of fragments is basalt.
Other features: Some pedons lack A3 horizons.

A1 horizon:
- Value: 4 or 5 dry, 2 or 3 moist.
- Chroma: 2 or 3, dry or moist.
- Clay content: 18 to 24 percent.
- Rock fragments: 15 to 35 percent.
- Reaction: Slightly acid or neutral.
- Organic matter content: 2 to 4 percent.

A2 horizon:
- Value: 4 or 5 dry, 2 or 3 moist.
- Chroma: 2 or 3, dry or moist.
- Texture: Gravelly loam, cobbly loam, or very cobbly loam.
- Clay content: 20 to 27 percent.
- Rock fragments: 15 to 40 percent.
- Reaction: Slightly acid or neutral.
- Organic matter content: 2 to 4 percent.

Bt1 horizon:
- Hue: 10YR or 7.5YR.
- Value: 5 or 6 dry, 3 or 4 moist.
- Chroma: 3 or 4, dry or moist.
- Texture: Clay loam or cobbly clay loam.
- Clay content: 32 to 40 percent.

Rock fragments: 10 to 30 percent.
Reaction: Slightly acid or neutral.
Organic matter content: 1 to 3 percent.

Bt2 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Clay, cobbly clay loam, or very cobbly clay.
Clay content: 37 to 50 percent.
Rock fragments: 10 to 40 percent.
Reaction: Slightly acid or neutral.
Organic matter content: 0.5 to 2 percent.

Teeltruc Series
Depth class: Very deep.
Drainage class: Somewhat excessively drained.
Permeability: Moderately rapid.
Runoff: Very low or low.
Landform: Toeslope positions on plateaus.
Parent material: Kind - Eolian deposits and alluvium; Source – Basalt, tuff and volcanic ash derived from dacite.
Slope range: 2 to 8 percent.
Elevation: 4,800 to 5,000 feet.
Mean annual precipitation: 17 to 19 inches inches.
Mean annual air temperature: 43 to 45 °F.
Frost-free period: 50 to 80 days.
Range site: Shrubby Loam 16-20, 021XY218OR.
Native plants: Idaho fescue, antelope bitterbrush, and mountain big sagebrush with scattered western juniper and ponderosa pine.
Taxonomic class: Coarse-loamy, mixed, superactive, frigid Vitrandic Haploxerolls

Typical pedon:

Teeltruc sandy loam, 2 to 5 percent slopes in map unit 890A, Klamath County, Oregon, BLM Gerber Block; about 1.5 miles north of DeVaul Lake and 0.75 mile south of Ben Hall Creek; 1,450 feet north and 1,800 feet east of the southwest corner of section 3, T. 39 S., R. 13 E.; USGS Goodlow Mountain 7.5 minute topographic quadrangle; 42 degrees, 12 minutes, 50 seconds north latitude and 121 degrees, 10 minutes, 02 seconds west longitude, NAD 27.
(Colors are for dry soils unless otherwise stated)

A1--0 to 3 inches; brown (10YR 5/3) ashy sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; common very fine and common fine roots; common very fine interstitial pores; slightly acid (pH 6.5); clear smooth boundary. (2 to 6 inches thick)

A2--3 to 15 inches; grayish brown (10YR 5/2) ashy sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to strong medium granular; soft, very friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots; common very fine interstitial and common medium tubular pores; neutral (pH 6.6); clear smooth boundary. (5 to 15 inches thick)

Bw1--15 to 26 inches; brown (10YR 5/3) ashy sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, few medium, and few coarse roots; common fine and medium tubular pores; neutral (pH 6.7); gradual smooth boundary. (6 to 15 inches thick)

Bw2--26 to 51 inches; brown (10YR 5/3) cobbly ashy sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine, few fine, and few medium roots; common very fine and common fine tubular pores; 10 percent pebbles and 15 percent cobbles; neutral (pH 6.8); abrupt smooth boundary. (10 to 26 inches thick)

Bq--51 to 61 inches; light yellowish brown (10YR 6/4) ashy sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; hard, firm, slightly sticky and nonplastic; weak discontinuous cementation by secondary silica; 10 percent pebbles; common fine opal coats on faces of peds; neutral (pH 7.0); abrupt wavy boundary. (5 to 14 inches thick)

2R--61 inches; unweathered basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring, dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 45 to 47 degrees F.
Mean summer soil temperature: 59 to 61 degrees F.
Mollic epipedon thickness: 20 to 36 inches; includes the Bw1 horizon.
Depth to base of cambic horizon: 40 to 55 inches.
Depth to horizons with secondary silica: 40 to 55 inches.
Depth to bedrock: 60 to 80 inches to a lithic contact.
Particle-size control section:
Clay content: 15 to 18 percent.
Rock fragments: 0 to 10 percent, mainly cobbles. Lithology of fragments is basalt.
Andic intergrade properties: Volcanic glass content is 10 to 30 percent in coarse silt through fine sand fractions; Phosphate retention is estimated to be less than 25 percent; Oxalate extractable aluminum plus 1/2 iron percentages are estimated to be 0.4 to 0.6.

A1 horizon:
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Clay content: 12 to 16 percent.
Rock fragments: 0 to 15 percent.
Reaction: Slightly acid or neutral.
Organic matter content: 1 to 3 percent.

A2 horizon:
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Clay content: 14 to 18 percent.
Rock fragments: 0 to 5 percent.
Reaction: Slightly acid or neutral.
Organic matter content: 1 to 3 percent.

Bw1 horizon:
Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 through 4 dry, 2 or 3 moist.
Clay content: 15 to 18 percent.
Rock fragments: 0 to 15 percent, mainly cobbles.
Organic matter content: 1 to 3 percent.

Bw2 horizon:
Value: 4 through 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Textures: Ashy sandy loam or cobbly ashy sandy loam.
Clay content: 15 to 18 percent.
Rock fragments: 0 to 30 percent.

Bq horizon:
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Clay content: 15 to 18 percent.
Consistence: Slightly hard to hard, dry.
Cementation: Discontinuous, extremely weakly to weakly cemented by secondary silica.

Widmer Series

Depth class: Moderately deep.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Summit positions on plateaus.
Parent material: Kind - Residuum; Source - Basalt.
Slope range: 2 to 10 percent.
Elevation: 4,140 to 4,400 feet.
Mean annual precipitation: 13 to 15 inches.
Mean annual air temperature: 46 to 48 °F.
Frost-free period: 60 to 90 days.
Range site: Juniper Loamy Hills 10 to 14, 021XY200OR.
Native plants: Western juniper, bluebunch wheatgrass, Idaho fescue, antelope bitterbrush, and basin big sagebrush.
Taxonomic class: Fine, smectitic, mesic Typic Argixerolls

Typical pedon:

Widmer stony loam, 2 to 10 percent slopes in map unit 370B. BLM Gerber Block, Klamath County, Oregon; in the Willow Valley chaining about 0.75 mile northeast of Malone Dam and 0.3 miles east of the East Langell Valley Road; 2,200 feet north and 850 feet east of the southwest corner of section 17, T. 41 S., R. 14 E.; USGS Langell Valley 7.5 minute topographic quadrangle; 42 degrees 0 minutes 44 seconds north latitude and 121 degrees 12 minutes 33 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A--0 to 3 inches; brown (10YR 5/3) stony loam, dark brown (10YR 3/3) moist; weak medium platy structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; common fine and common medium vesicular pores; 10 percent pebbles, 5 percent cobbles, and 7 percent stones; slightly alkaline (pH 7.4); abrupt smooth boundary. (2 to 3 inches thick)

Bt1--3 to 8 inches; grayish brown (10YR 5/2) very cobbly clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse subangular blocky structure parting to strong medium granular; soft, very friable, slightly sticky and slightly plastic; common very fine, common fine, and few medium roots; common fine and common medium tubular pores; common faint clay films on faces of peds; 15 percent pebbles, 15 percent cobbles and 5 percent stones; slightly alkaline (pH 7.5); clear smooth boundary. (4 to 9 inches thick)

Bt2--8 to 12 inches; brown (10YR 5/3) cobbly clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and moderately plastic; few very fine, common fine, and few medium roots; common fine and common medium tubular pores; common faint clay films on faces of peds; 10 percent pebbles and 10 percent cobbles; slightly alkaline (pH 7.5); abrupt smooth boundary. (3 to 12 inches thick)

Bt3--12 to 18 inches; light brown (7.5YR 6/3) clay, dark brown (7.5YR 3/4) moist; weak medium prismatic structure parting to moderate medium angular blocky; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, and few medium roots; few very fine and few fine tubular pores; common distinct clay films on faces of peds; slightly alkaline (pH 7.6); gradual smooth boundary. (5 to 10 inches thick)

CBt--18 to 31 inches; pink (7.5YR 7/3) very paragravelly loam, brown (7.5YR 4/4) moist; massive with rock structure; slightly hard, firm, slightly sticky and slightly plastic; few very fine and few fine roots; few very fine and few fine interstitial pores; few faint clay films on pararock fragments; 50 percent parapebbles of weathered vesicular basalt; slightly alkaline (pH 7.8); clear smooth boundary. (6 to 14 inches thick)

Cr--31 to 41 inches; pink (7.5YR 7/4) weathered vesicular basalt, brown (7.5YR 5/4) moist; clear smooth boundary. (8 to 14 inches thick)

R--41 inches; hard vesicular basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.

Mean annual soil temperature: 48 to 50 °F.
Mean summer soil temperature: 60 to 62 degrees F.
Mollic epipedon thickness: 7 to 14 inches, includes the Bt1 and Bt2 horizons and may include part of the Bt3 horizon when the upper 7 inches of soil is mixed.
Argillic horizon thickness: 12 to 22 inches.
Depth to base of argillic horizon: 16 to 30 inches.
Depth to bedrock: 20 to 40 inches to a paralithic contact. The paralithic material below the contact is weathered basalt. Hard basalt bedrock is typically within 60 inches.
Particle-size control section:
Clay content: 35 to 45 percent.
Rock fragments: 5 to 20 percent, mainly pebbles and cobbles. Lithology of fragments is basalt.
Other features: Some pedons have A2 horizons.

A horizon:
Value: 5 or 6 dry, 2 or 3 moist; A dry value of 6 is only in some pedons and the upper 7 inches when mixed has a dry value of 5.
Chroma: 2 or 3 dry and moist.
Clay content: 20 to 27 percent.
Rock fragments: 15 to 30 percent.
Reaction: Neutral or slightly alkaline.
Organic matter content: 2 to 4 percent.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry; A dry value of 6 is only in some pedons and the upper 7 inches when mixed has a dry value of 5.
Chroma: 2 or 3, dry or moist.
Textures: Cobbly clay loam, very cobbly clay loam, or cobbly clay.
Clay content: 35 to 45 percent.
Rock fragments: 15 to 40 percent.
Reaction: Neutral or slightly alkaline.
Organic matter content: 1 to 3 percent.

Bt2 horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist; Dry values of 6 and moist values of 4 are only in some pedons and the upper 7 inches when mixed has a dry value of 5 and moist value of 3.
Chroma: 3 or 4 dry.
Textures: Clay loam, clay, cobbly clay loam, or cobbly clay.
Clay content: 35 to 50 percent.
Rock fragments: 0 to 25 percent.
Organic matter content: 1 to 3 percent.

Bt3 horizon:
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Textures: Clay or cobbly clay.
Clay content: 45 to 55 percent.
Rock fragments: 0 to 20 percent.
Reaction: Slightly alkaline or moderately alkaline.
Organic matter content: 1 or 2 percent.

CBt horizon:
Value: 7 or 8 dry, 4 through 6 moist.
Chroma: 3 through 6, dry or moist.
Reaction: Slightly alkaline or moderately alkaline.
Pararock fragments: 35 to 60 percent paragravel of weathered basalt.

Wonser Series
Depth class: Shallow to a duripan.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.
Landform: Summit positions on plateaus.
Parent material: Kind - Minor amounts of volcanic ash derived from dacite and residuum; Source - Basalt.
Slope range: 0 to 4 percent.
Elevation: 4,200 to 5,000 feet.
Mean annual precipitation: 14 to 16 inches.
Mean annual air temperature: 45 to 47 °F.
Frost-free period: 60 to 90 days.
Range site: Shallow Stony 10-20, 021XY204OR.
Native plants: Bluebunch wheatgrass, Idaho fescue, low sagebrush, and western juniper.
Taxonomic class: Clayey, smectitic, mesic, shallow Typic Durixerolls

Typical pedon:

Wonser extremely cobbly loam, 0 to 8 percent slopes in map unit 350B. Klamath County, Oregon, BLM Gerber Block; about 0.5 mile south of Threemile Reservoir and 100 feet south of Willow Valley Road; 2,500 feet south and 2,100 feet west of the northeast corner of section 10, T. 41 S., R. 14 E.; USGS Langell Valley 7.5 minute topographic quadrangle; 42 degrees, 01 minute, 41 seconds north latitude and 121 degrees, 09 minutes, 34 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A--0 to 2 inches; grayish brown (10YR 5/2) extremely cobbly loam, very dark grayish brown (10YR 3/2) moist; strong thick platy structure; hard, firm, slightly sticky and slightly plastic; common very fine and few fine roots; common fine and common medium vesicular pores; 25 percent pebbles, 25 percent cobbles, and 10 percent stones; slightly alkaline (pH 7.6); abrupt smooth boundary. (2 or 3 inches thick)

Bt1--2 to 4 inches; brown (10YR 5/3) cobbly clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine, common fine, and few medium roots; common fine and common medium tubular pores; common faint clay films on faces of peds; 10 percent pebbles and 10 percent cobbles; slightly alkaline (pH 7.5); abrupt smooth boundary. (2 to 10 inches thick)

Bt2--4 to 6 inches; brown (10YR 5/3) cobbly clay, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to strong medium subangular blocky; hard, firm, moderately sticky and moderately plastic; few very fine, few fine, and few medium roots; common fine and common medium tubular pores; few pressure faces; common faint and few distinct clay films on faces of peds; 10 percent pebbles and 8 percent cobbles; slightly alkaline (pH 7.5); abrupt smooth boundary. (2 to 8 inches thick)

Bt3--6 to 13 inches; light brown (7.5YR 6/3) cobbly clay, brown (7.5YR 4/3) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, moderately sticky and very plastic; few very fine, few fine, and few medium roots; few very fine tubular pores; common pressure faces; common distinct clay films on faces of peds; 10 percent pebbles and 10 percent cobbles; slightly alkaline (pH 7.5); abrupt smooth boundary. (5 to 8 inches thick)

Bqm--13 to 15 inches; reddish yellow (7.5YR 7/6) duripan, strong brown (7.5YR 5/6) moist; strong medium platy structure; very rigid; indurated by secondary silica; slightly alkaline (pH 7.6); abrupt wavy boundary. (1 to 6 inches thick)

R--15 inches; hard basalt.

Range in Characteristics:

Soil moisture: Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 47 to 49 °F.
Mean summer soil temperature: 60 to 62 °F.
Thickness of the mollic horizon: 7 to 10 inches; includes the Bt1 and Bt2 horizons and part of the Bt3 horizon when the upper 7 inches of the soil is mixed.
Thickness of the argillic horizon: 8 to 18 inches.

Depth to base of argillic horizon: 12 to 20 inches.
Depth to duripan: 12 to 20 inches.
Thickness of the duripan: 1 to 6 inches.
Depth to bedrock: 13 to 26 inches to a lithic contact.
Particle-size control section:
Percent clay: 40 to 50.
Percent rock fragments: 15 to 35, mainly as cobbles.

A horizon:
Value: 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Clay content: 22 to 27 percent.
Rock fragments: 60 to 70 percent.
Reaction: Neutral or slightly alkaline.
Organic matter content: 2 to 4 percent.

Bt1 horizon:
Hue: 10YR or 7.5YR.
Value: 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Texture: Cobbly clay loam or very cobbly clay loam.
Clay content: 30 to 40 percent.
Rock fragments: 15 to 45 percent.
Reaction: Neutral or slightly alkaline.
Organic matter content: 2 to 4 percent.

Bt2 horizon:
Hue: 10YR or 7.5YR.
Chroma: 3 or 4 dry.
Texture: Clay or cobbly clay.
Clay content: 40 to 55 percent.
Rock fragments: 5 to 35 percent.
Reaction: Slightly alkaline or moderately alkaline.
Organic matter content: 1 to 3 percent.
Other features: Some pedons have texture of very cobbly clay.

Bt3 horizon:
Hue: 7.5YR or 10YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Cobbly clay or very cobbly clay.
Clay content: 50 to 60 percent.
Rock fragments: 15 to 40 percent.
Reaction: Slightly alkaline or moderately alkaline.
Organic matter content: 1 to 3 percent.

Bqm horizon:
Hue: 7.5YR or 10YR.
Value: 7 or 8 dry, 5 or 6 moist.
Chroma: 4 or 6, dry or moist.
Reaction: Slightly alkaline or moderately alkaline.
Cementation: Indurated or very strongly cemented.
Other features: Some pedons have minor amounts of identifiable secondary carbonates.

Woolencanyon Series
Depth class: Shallow to a duripan.
Drainage class: Well drained.
Permeability: Slow.
Runoff: High.

Landform: Summit positions on plateaus.
Parent material: Kind - Minor amounts of volcanic ash and residuum; Source - Ash from dacite and residuum from basalt.
Slope range: 1 to 8 percent.
Elevation: 4,200 to 5,000 feet.
Mean annual precipitation: 14 to 16 inches.
Mean annual air temperature: 45 to 47 °F.
Frost-free period: 60 to 90 days.
Range site: Juniper Claypan 12-16, 021XY505OR.
Native plants: bluebunch wheatgrass, Idaho fescue, low sagebrush, and western juniper.
Taxonomic class: Clayey, smectitic, mesic, shallow Palexerollic Durixerolls.

Typical pedon:

Map Unit Name: 350B, Woolencanyon-Notchcorral-Wonser complex, 0 to 8 percent slopes. Location in the survey area: Gerber Block, Klamath County, Oregon; about 2 miles southwest of Antelope Flat, 1.5 miles south of Bumphead Reservoir, and 50 feet north of the Alkali Springs Road; 900 feet north and 2,250 feet west of the southeast corner of section 6, T. 41 S., R. 14 1/2 E.; USGS Brady Butte 7.5 minute topographic quadrangle; 42 degrees 2 minutes 13 seconds north latitude and 121 degrees 5 minutes 58 seconds west longitude, NAD 27. (Colors are for dry soils unless otherwise stated)

A--0 to 2 inches; grayish brown (10YR 5/2) very stony clay loam, very dark grayish brown (10YR 3/2) moist; moderate thick platy structure; hard, friable, moderately sticky and slightly plastic; common very fine and few fine roots; common very fine and common fine vesicular pores; 15 percent pebbles, 15 percent cobbles, and 15 percent stones; slightly alkaline (pH 7.4); clear smooth boundary. (2 or 3 inches thick)

Bt--2 to 5 inches; brown (10YR 5/3) cobbly clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, moderately sticky and moderately plastic; common very fine, common fine, few medium, and few coarse roots; common fine and common medium tubular pores; common faint clay films on faces of peds; 5 percent pebbles and 10 percent cobbles; slightly alkaline (pH 7.5); abrupt smooth boundary. (3 to 6 inches thick)

Btss--5 to 12 inches; brown (7.5YR 5/3) clay, brown (7.5YR 4/3) moist; strong medium prismatic structure parting to strong medium angular blocky; very hard, very firm, moderately sticky and very plastic; few very fine and few fine roots; few very fine and few fine tubular pores; few intersecting slickensides tilted 30 degrees from horizontal bounding weak wedge-shaped peds; common distinct and few prominent clay films on faces of peds; slightly alkaline (pH 7.6); abrupt smooth boundary. (6 to 10 inches thick)

Bqkm--12 to 19 inches; pink (7.5YR 7/4) duripan, strong brown (7.5YR 5/6) moist; strong medium platy structure; very rigid; indurated by secondary silica; widely spaced fractures in the upper inch; thin laminar caps of opal on top of peds; non-effervescent to slightly effervescent; secondary carbonates segregated in very few fine coats on bottom of peds; slightly alkaline (pH 7.8); abrupt wavy boundary. (2 to 7 inches thick)

R--19 inches; hard basalt.

Range in Characteristics:

Soil moisture: - Usually moist in winter and spring and dry in summer and fall; xeric moisture regime that borders on aridic.
Mean annual soil temperature: 47 to 49 °F.
Mean summer soil temperature: 60 to 62 °F.
Thickness of the mollic horizon: 7 to 10 inches; includes the Bt horizon and also includes part of the Btss horizon when the upper 7 inches of the soil is mixed.
Thickness of the argillic horizon: 7 to 14 inches.
Depth to the base of the argillic horizon: 12 to 19 inches.
Depth to duripan: 12 to 19 inches.
Depth to bedrock: 14 to 26 inches to a lithic contact.
Particle-size control section: Percent clay - averages 40 to 50 percent with an abrupt increase of 15 percent or more between the Bt and Btss horizons: Percent rock fragments - 5 to 15 percent, mainly cobbles. Lithology of fragments is basalt.

A horizon:

Value: 4 or 5 dry, 2 or 3 moist.
Chroma: 2 or 3, dry or moist.
Clay content: 27 to 32 percent.
Rock fragments: 35 to 60 percent.
Reaction: Neutral or slightly alkaline.
Organic matter content: 2 to 4 percent.
Other features: Some pedons have very thin A2 horizons.

Bt horizon:
Hue: 10YR or 7.5YR.
Value: 4 or 5 dry
Chroma: 3 or 4 dry.
Texture: Clay, cobbly clay loam, or cobbly clay.
Clay content: 32 to 45 percent.
Rock fragments: 10 to 30 percent.
Reaction: Neutral or slightly alkaline.
Organic matter content: 2 to 4 percent.

Btss horizon:
Hue: 10YR or 7.5YR.
Value: 5 or 6 dry, 3 or 4 moist.
Chroma: 3 or 4, dry or moist.
Texture: Clay or cobbly clay.
Clay content: 50 to 60 percent.
Rock fragments: 0 to 20 percent.
Organic matter content: 1 to 3 percent.
Other features: Few or common slickensides are present and typically bound wedge-shaped peds.

Bqkm horizon:
Value: 7 or 8 dry, 5 or 6 moist.
Chroma: 3 through 6, dry or moist.
Reaction: Slightly alkaline or moderately alkaline.
Cementation: Indurated or very strongly cemented.

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GLOSSARY

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone. The material washed down the sides of mountains and hills by ephemeral streams and deposited at the mouth of gorges in the form of a moderately steep, conical mass descending equally in all directions from the point of issue.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Andic soil properties. A collection of physical and chemical properties given in “Keys to Soil Taxonomy” that are the taxonomic criteria for the Andisol order.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial silicate clay. This horizon has a minimum thickness, depending on the thickness of the solum; a minimum content of clay as compared to the overlying eluvial horizon; and generally has coatings of oriented clay on the surface of pores or peds or bridging sand grains.

Ash, volcanic. Fine pyroclastic material less than 2 millimeters in diameter.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Basalt. A dark, commonly extrusive (locally, intrusive as in dikes) mafic igneous rock composed mainly of calcic plagioclase, generally labradorite, and clinopyroxene in a glassy or fine grained mass. The extrusive equivalent of gabbro.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Basin. A broad, structural lowland between mountain ranges. It commonly is elongated and many miles wide. Also used to refer to a depressional area that has few, if any, outlets.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.
Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.
Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.
Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.
Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.
Bottom land. The normal flood plain of a stream, subject to flooding.
Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.
Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.
Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.
Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.
Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.
Butte. An isolated small mountain or hill with steep or precipitous sides and a top variously flat, rounded, or pointed that may be a residual mass isolated by erosion or an exposed volcanic neck.
Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.
Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.
Calcic horizon. A subsurface horizon that has an accumulation of calcium carbonate or of calcium and magnesium carbonate. It has secondary carbonate of at least 5 percent more than the C horizon or is 5 percent, by volume, identifiable secondary carbonates; is at least 15 centimeters thick; and has 15 percent calcium carbonate equivalent or more.
Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.
Cambic horizon. A subsurface horizon that is finer than loamy fine sand and consists of material that has been altered or removed but has not accumulated. Evidences of alteration include the elimination of fine strata; changes caused by wetness, such as gray colors and mottles; redistribution of carbonates; and colors that are yellower or redder than those in the underlying horizons.
Canopy. The leafy crown of trees or shrubs. (See Crown.)
Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.
Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.
Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.
Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.
Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.
Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.
Cement rock. Shaly limestone used in the manufacture of cement.
Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.
Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.
Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.
Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.
Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.
Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.
Coarse textured soil. Sand or loamy sand.
Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.
Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.
Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.
Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.
Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.
Compressible (in tables). Excessive decrease in volume of soft soil under load.
Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.
Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.
Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.
Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.
Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”
Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.
Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
Coppice dune. A small dune of fine grained soil material stabilized around shrubs or small trees.
Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.
Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.
Cropping system. Growing crops according to a planned system of rotation and management practices.
Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.
Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.
Crown. The upper part of a tree or shrub, including the living branches and their foliage.
Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean

annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.
Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.
Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.
Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.
Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.
Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.
Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.
Depth to rock (in tables). Bedrock is too near the surface for the specified use.
Desert pavement. On a desert surface, a layer of gravel or larger fragments that was emplaced by upward movement of the underlying sediments or that remains after finer particles have been removed by running water or the wind.
Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.
Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.
Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.
Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized = excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the “Soil Survey Manual.”
Drainage, surface. Runoff, or surface flow of water, from an area.
Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.
Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.
Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.
Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.
Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.
Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.
Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.
Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.
Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.
Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.
Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.
Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.
Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.
Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.
Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.
Fast intake (in tables). The rapid movement of water into the soil.
Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.
Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.
Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called normal field capacity, normal moisture capacity, or capillary capacity.
Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.
Fine textured soil. Sandy clay, silty clay, or clay.
Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.
First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.
Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.
Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.
Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.
Foot slope. The inclined surface at the base of a hill.
Forb. Any herbaceous plant not a grass or a sedge.
Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.
Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.
Fragile (in tables). A soil that is easily damaged by use or disturbance.
Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.
Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
Geomorphic surface. A surface consisting of one or more landforms that represents an episode of landscape development. It is a mappable part of the land surface that is defined in terms of morphology, age, origin, and stability of component landforms.
Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.
Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.
Graded stripcropping. Growing crops in strips that grade toward a protected waterway.
Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.
Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.
Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.
Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.
Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.
Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.
Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.
Head out. To form a flower head.
Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.
High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.
Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.
Holocene. The second epoch of the Quaternary, extending from the end of the Pleistocene (about ten thousand years ago) to the present.
Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:
O horizon. = An organic layer of fresh and decaying plant residue.
A horizon. = The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
E horizon. = The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
B horizon. = The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.
C horizon. = The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.
Cr horizon. = Soft, consolidated bedrock beneath the soil.
R layer. = Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.
Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.
Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.
Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.
Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.
Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.
Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.
Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.
Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.
Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin. = Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border. = Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding. = Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation. = Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle). = Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow. = Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

prinkler. = Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation. = Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding. = Water, released at high points, is allowed to flow onto an area without controlled distribution.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: *abundance* = few, common, and many; *size* =fine, medium, and coarse; and *contrast* = faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).
Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.
Mountainside. The part of a mountain between the summit and the foot.
Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)
Munsell notation. A designation of color by degrees of three simple variables = hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.
Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. It is similar to a broad-base terrace, except for the width of the ridge and channel.
Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.
Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)
Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.
Ochric epipedon. A surface layer that is too light in color (has higher value of chroma than a mollic epipedon), too low in content of organic matter, or too thin to be either a mollic epipedon or an umbric epipedon.
Organic matter. Plant and animal residue in the soil in various stages of decomposition.
Paleosol. A soil with distinctive morphological features, such as color and structure, that can be described consistently and that formed on a landscape that resulted from a soil-forming environment that no longer exists at the site. The former pedogenic process was altered because of changes in the external environment or was interrupted by burial.
Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, duripan, hardpan, fragipan, claypan, plowpan, and traffic pan.
Paralithic contact. The boundary between soil and continuous, coherent underlying material that has a hardness of less than 3 (Mohs scale).
Parent material. The unconsolidated organic and mineral material in which soil forms.
Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.
Pediment. A gently sloping, erosional surface at the foot of a receding hill or mountain.
Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.
Percolation. The downward movement of water through the soil.
Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.
Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as “permeability.” Terms describing permeability, measured in inches per hour, are as follows:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.
pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)
Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.
Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.
Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.
Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.
Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary ponding occurs primarily in response to precipitation and runoff.
Pleistocene. The first epoch of the Quaternary (about two million to ten thousand years ago).
Plowpan. A compacted layer formed in the soil directly below the plowed layer.
Pluvial lake. A lake that formed during a period of exceptionally heavy rainfall; a lake that formed during the Pleistocene at a time of glacial advance and is now either extinct or exists as a remnant.
Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.
Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not what was you adequately filter effluent from a waste disposal system.
Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.
Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.
Potential native plant community. See Climax plant community.
Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.
Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.
Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.
Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.
Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.
Puddling. A process by which a soil loses its structure and becomes massive as a result of traffic or tillage during wet periods. The soil becomes hard and cloddy when dry.
Pumice. Light-colored, vesicular, glassy volcanic rock fragments that can float on water.
Quaternary. The second period of the Cenozic Era extending from the end of the Tertiary (about two million years ago) to the present and comprising the Pleistocene (ice age) and the Holocene (present).
Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.
Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.
Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.
Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	less than 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth’s surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.
Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.
Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.
Riparian areas. Wetland ecosystems that have a high water table because of proximity to aquatic ecosystems or subsurface water. Riparian areas usually occur as an ecotone between aquatic and upland ecosystems, but they have distinct plant and soil characteristics. Riparian areas are uniquely characterized by a combination of high diversity, high density, and high productivity of species. Continuous interaction occurs among riparian, aquatic, and upland terrestrial ecosystems through exchange of energy, nutrients, and species.
Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.
Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.
Root zone. The part of the soil that can be penetrated by plant roots.
Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.
Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.
Salic horizon. A subsurface horizon that contains a secondary enrichment of salts that are more soluble in cold water than in gypsum. The horizon must be at least 15 centimeters thick and contain at least 2 percent salts. The product of its thickness, in centimeters, and percentage of salts, by weight, is 60 or more.
Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.
Salty water (in tables). Water that is too salty for consumption by livestock.
Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.
Sandstone. Sedimentary rock containing dominantly sand-sized particles.
Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.
Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.
Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.
Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.
Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.
Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.
Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)
Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.
Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.
Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.
Silica. A combination of silicon and oxygen. The mineral form is called quartz.
Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.
Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.
Siltstone. Sedimentary rock made up of dominantly silt-sized particles.
Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site class. A grouping of site indexes into 5 to 7 production capability levels. Each level can be represented by a site curve.
Site curve (50-year). A set of related curves on a graph that shows the average height of dominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant trees that are 50 years old or are 50 years old at breast height.
Site curve (100-year). A set of related curves on a graph that show the average height of dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant and codominant trees that are 100 years old or are 100 years old at breast height.
Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.
Skid trails. The paths created by skidding logs and the bulldozer or tractor used to pull them.
Skidding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most skidding systems involve pulling the trees with wire cables attached to a bulldozer or rubber-tired tractor. Generally, one end is lifted when the felled trees are skidded or pulled. As a result, friction and surface disturbance are minimized.
Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.
Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.
Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.
Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.
Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.
Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.
Slow intake (in tables). The slow movement of water into the soil.
Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.
Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.
Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.
Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.
Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.
Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these

horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.
Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.
Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.
Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.
Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.
Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are = *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. Structureless soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).
Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.
Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.
Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.
Substratum. The part of the soil below the solum.
Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.
Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.
Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”
Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.
. In nonglaciated regions, alluvium deposited by heavily loaded streams.
Variegation. Refers to patterns of contrasting colors assumed to be inherited from the **Tableland**. A broad upland with a large nearly level or undulating summit area and steep side slopes descending to surrounding lowlands. Types of tableland include plateaus and mesas.
Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.
Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.
Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.
Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.
Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”
Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.
Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.
Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.
Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.
Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.
Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.
Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.
Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.
Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.
Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwaterparent material rather than to be the result of poor drainage.
Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.
Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.
Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.
Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.
Windthrow. The uprooting and tipping over of trees by the wind.

TABLES

(Refer to Attachment 2.)