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,

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