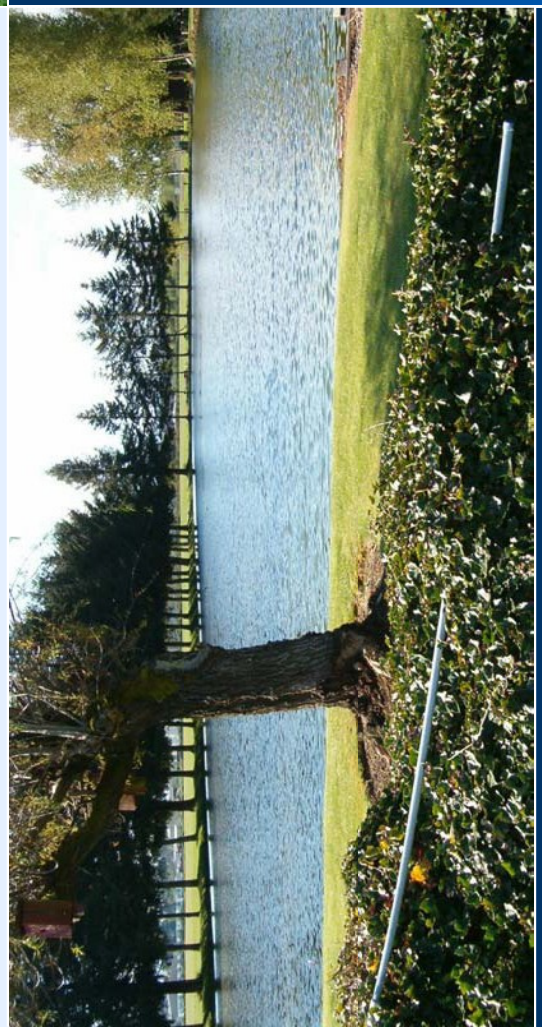
Appendix B

Study Area Data

B.1 - Land Use Compatibility Statement
B.2 - Soil Types and Descriptions
B.3 - Environmental Characteristics
B.4 - Oregon Natural Heritage Information
B.5 - Marion County Standards
B.6 - Threatened and Endangered Species
B.7 - Cultural Resources Review



Appendix B.1

Land Use Compatability Statement

MILL CREEK SANITARY SEWER PROJECT

COPY

Department of Environmental Quality
LAND USE COMPATIBILITY STATEMENT (LUCS)

DEQ
State of Oregon Department of Environmental Quality

WHAT IS A LUCS? The Land Use Compatibility Statement is the process used by the DEQ to determine whether DEQ permits and other approvals affecting land use are consistent with local government comprehensive plans.

WHY IS A LUCS REQUIRED? Oregon law requires state agency activities that impact land use be consistent with local comprehensive plans. DEQ Division 18 administrative rules identify agency activities or programs that significantly affect land use. These programs must have a process for determining local plan consistency.

WHEN IS A LUCS REQUIRED? A LUCS is required for nearly all DEQ permits, some general permits, and certain approvals of plans or related activities that affect land use. These activities are listed in this form. A single LUCS can be used if more than one DEQ permit/approval is being applied for concurrently.

A permit modification requires a LUCS when any of the following applies:

1. physical expansion on the property or proposed use of additional land;
2. a significant increase in discharges to water;
3. a relocation of an outfall outside of the source property; or
4. any physical change or change of operation of an air pollutant source that results in a net significant emission rate increase as defined in OAR 340-200-0020.

A permit renewal requires a LUCS if one has not previously been submitted, or if any of the above four permit modification factors apply.

HOW TO COMPLETE A LUCS:

Step	Who Does It	What Happens
1	Applicant	Completes Section 1 of the LUCS and submits it to the appropriate city or county planning office.
2	City or County Planning Office	Determines if the business or facility meets all local planning requirements, and returns to the applicant the signed and dated LUCS form **with findings of fact for any local reviews or necessary planning approvals.**
3	Applicant	Includes the completed LUCS with **findings of fact** with the DEQ permit or approval submittal application to the DEQ.

WHERE TO GET HELP: Questions about the LUCS process can be directed to the region staff responsible for processing the permit or approval. Headquarters and regional offices may also be reached using DEQ's toll-free telephone number 1-800-452-4011.

SECTION 1 - TO BE FILLED OUT BY APPLICANT *(may be filled in electronically using Tab key to move to each field)*

1. **Applicant Name:** City of Stayton **Contact Person:** Mike Faught
   Location Address: 362 N. Third Ave **Mailing Address:** 362 N. Third Ave
   City, State Zip: Stayton, OR 97383 **City, State Zip:** Stayton, OR 97383
   Telephone: 503-769-2919 **Tax Account No:** Various **Tax Lot No:** See attached map
   Township: _____ **Range:** _____ **Section:** _____
   Latitude: _____ **Longitude:** _____

   *Use the **DEQ Location Finder** (http://deq12.deq.state.or.us/website/findloc) to determine latitude/longitude.*

2. **Describe the type of business or facility and services or products provided:**
   Sanitary sewer pipelines and lift station.

3. **Check the type of DEQ permit(s) or approval(s) being applied for at this time.**

☐ Air Notice of Construction	☐ Pollution Control Bond Request	☑ Clean Water State Revolving Fund Loan Request
☐ Air Discharge Permit *(excludes portable facility permits)*	☐ Solid Waste Compost Registration - Permit	☐ Water Quality NPDES/WPCF *Permit (for onsite construction-installation permits use DEQ's Onsite LUCS form)*
☐ Title V Air Permit	☐ Solid Waste Letter Authorization Permit	☑ Wastewater/Sewer Construction Plan/Specifications *(includes review of plan changes that require use of new land)*
☐ Parking/Traffic Circulation Plan	☐ Solid Waste Material Recovery Facility Permit	☐ Water Quality Storm Water General Permit
☐ Air Indirect Source Permit	☐ Solid Waste Transfer Station Permit	☐ Other Water Quality General Permit *(Generals: 600 (if mobile), 700, 1200CA, 1500, 1700 (if mobile) are exempted))*
☐ Solid Waste Disposal Permit	☐ Solid Waste - Waste Tire Storage Permit	
☐ Solid Waste Treatment Permit	☐ Hazardous Waste/PCB Storage/ Treatment/Discharge Permit	☐ Federal Permit - Water Quality 401 Certification

4. **This application is for:** ☐ permit renewal ☑ new permit ☐ permit modification ☐ other _____

SECTION 2 - TO BE FILLED OUT BY CITY OR COUNTY PLANNING OFFICIAL

5. **The facility proposal is located:** ☒ inside city limits ☒ inside UGB ☐ outside UGB

state cultural resources protection laws. ORS 358.920 prohibits the excavation, injury, destruction, or alteration of an archeological site or object, or removal of archeological objects from public and private lands without an archeological permit issued by the State Historic Preservation Office. 16 USC 470, Section 106, National Historic Preservation Act of 1966 requires a federal agency, prior to any undertaking, to take into account the effect of the undertaking that is included on or eligible for inclusion in the National Register. For further information, contact the State Historic Preservation Office at 503-378-4168, extension 232.

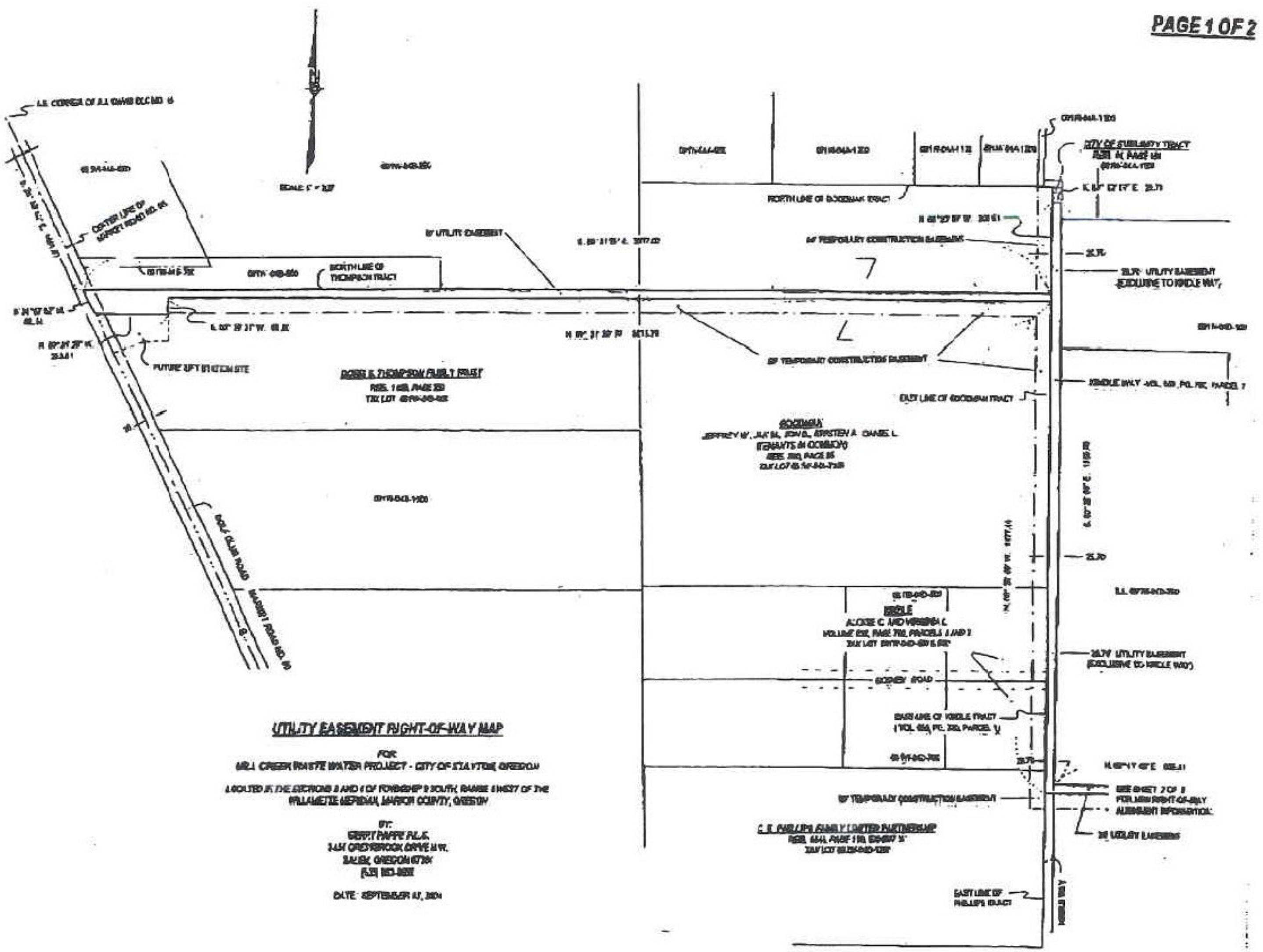
The proposal meets the following City of Stayton Comprehensive Plan Goals and Policies:

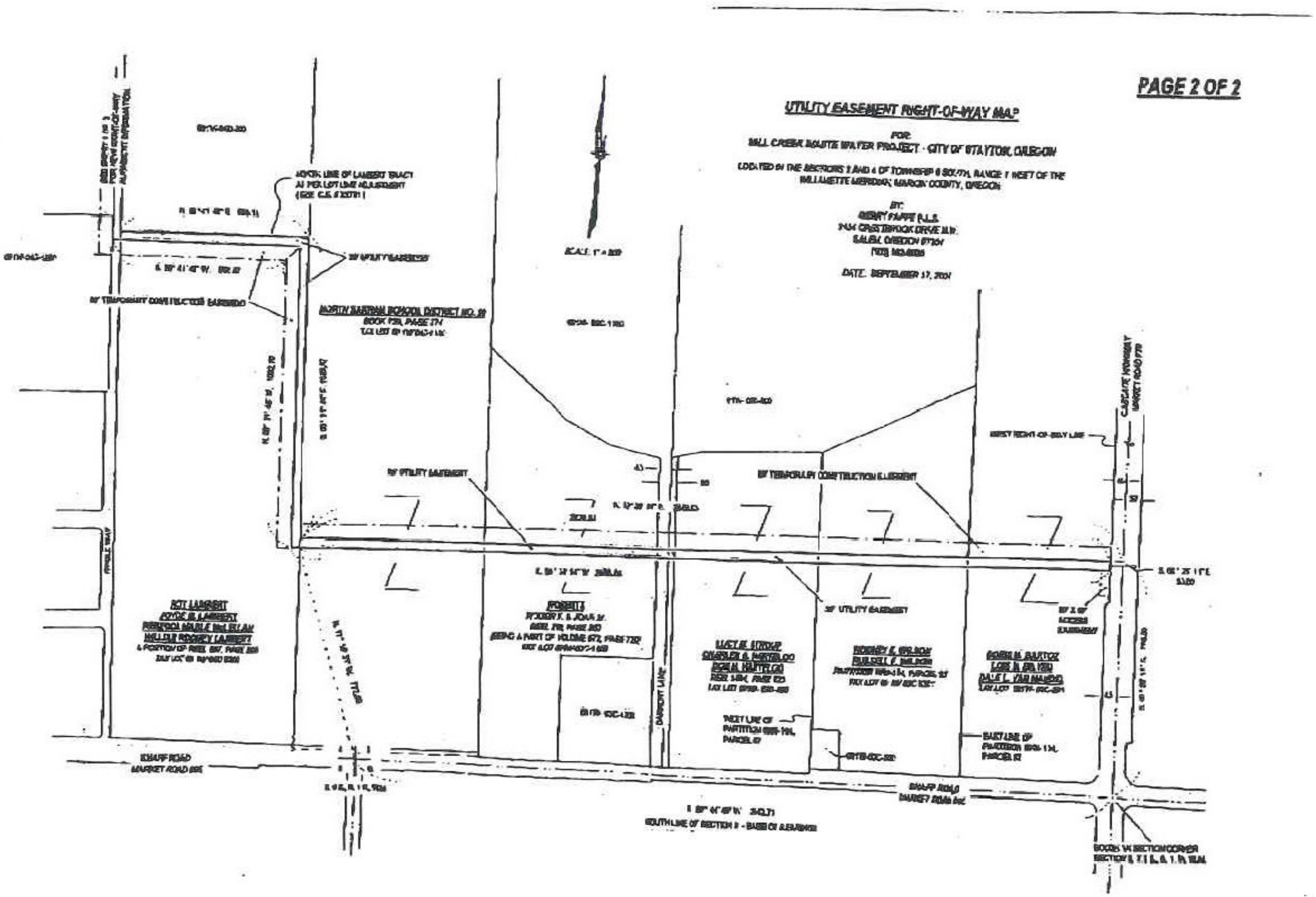
PF-1 The City of Stayton shall be the ultimate provider of the following urban services within the Stayton urban growth boundary: 1) municipal water supply; 2) sanitary sewage collection and treatment; 3) storm sewers; 4) police protection; 5) parks and recreational facilities; and 6) library services.

PF-2 The City of Stayton shall use its Master Utilities Plan and Capital Improvement Program to direct the provision of public facilities within the urban growth boundary.

Encourage urban development in areas with existing services and in those areas where future extensions of those services can be provided in the most feasible, efficient, and economical manner.

PAGE 1 OF 2


NORTH LINE OF GOODMAN TRACT
NORTH LINE OF THOMPSON TRACT
FUTURE LIFT STATION SITE
EAST LINE OF GOODMAN TRACT
GOLF CLUB ROAD
GOODMAN
EAST LINE OF PHILLIPS TRACT
UTILITY EASEMENT RIGHT-OF-WAY MAP
FOR
MILL CREEK WASTE WATER PROJECT - CITY OF STAYTON, OREGON
LOCATED IN THE SECTIONS 3 AND 4 OF TOWNSHIP 9 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, MARION COUNTY, OREGON
BY:
DATE: SEPTEMBER


PAGE 2 OF 2
UTILITY EASEMENT RIGHT-OF-WAY MAP
FOR:
WATER PROJECT - CITY OF STAYTON, OREGON
MARION COUNTY, OREGON
BY:
DATE:
SCALE: 1" = 200'
NORTH SANTIAM SCHOOL DISTRICT NO. 29
20' UTILITY EASEMENT
20' TEMPORARY CONSTRUCTION EASEMENT
WEST RIGHT-OF-WAY LINE
CASCADE HIGHWAY
SHAFF ROAD
SOUTH LINE OF SECTION

Appendix B.2

Soil Types and Description

KELLER associates

Map Unit Symbol	Map Unit Name
91D	Alspaugh clay loam, 15 to 30 percent slopes
92E	Andic Cryaquepts, moderately steep
92F	Andic Cryaquepts, steep
93F	Aschoff-Brightwood complex, 60 to 90 percent slopes
94E	Fernwood very gravelly loam, 30 to 60 percent slopes
95C	Hardscrabble silt loam, 7 to 20 percent slopes
96E	Highcamp very gravelly loam, 30 to 60 percent slopes
97F	Highcamp-Rock outcrop complex, 50 to 90 percent slopes
98D	Highcamp-Soosap complex, 5 to 30 percent slopes
99D	Kinzel-Divers complex, 5 to 30 percent slopes
99E	Kinzel-Divers complex, 30 to 60 percent slopes
100E	Springwater loam, 30 to 60 percent slopes
101D	Wilhoit-Zygore gravelly loams, 5 to 30 percent slopes
102F	Xerochrepts and Haploxerolls, very steep
103E	Zygore-Wilhoit gravelly loams, 30 to 60 percent slopes
AbA	Abiqua silty clay loam, 0 to 3 percent slopes
AbB	Abiqua silty clay loam, 3 to 5 percent slopes
Ad	Alluvial land
Am	Amity silt loam
Ba	Bashaw clay
Ca	Camas gravelly sandy loam
CeC	Chehalem silt loam, 2 to 12 percent slopes
HEF	Henline very stony sandy loam, 30 to 55 percent slopes
HEG	Henline very stony sandy loam, 55 to 80 percent slopes
Ho	Holcomb silt loam
HRD	Horeb loam, 2 to 20 percent slopes
HSC	Horeb gravelly silt loam, gravelly substratum, 0 to 15 percent slopes
HSE	Horeb gravelly silt loam, gravelly substratum, 15 to 35 percent slopes
HTD	Hullt clay loam, 2 to 20 percent slopes
HTE	Hullt clay loam, 20 to 30 percent slopes
HTF	Hullt clay loam, 30 to 60 percent slopes
HuB	Hullt clay loam, 2 to 7 percent slopes
HuD	Hullt clay loam, 7 to 20 percent slopes
JoB	Jory silty clay loam, 2 to 7 percent slopes
JoC	Jory silty clay loam, 7 to 12 percent slopes
JoD	Jory silty clay loam, 12 to 20 percent slopes
JoE	Jory silty clay loam, 20 to 30 percent slopes
KCD	Kinney cobbly loam, 2 to 20 percent slopes

KCF	Kinney cobbly loam, 20 to 50 percent slopes
KCG	Kinney cobbly loam, 50 to 70 percent slopes
La	Labish silty clay loam
MaA	McAlpin silty clay loam, 0 to 3 percent slopes
MaB	McAlpin silty clay loam, 3 to 6 percent slopes
Mb	McBee silty clay loam
McB	McCully clay loam, 2 to 7 percent slopes
McC	McCully clay loam, 7 to 12 percent slopes
McD	McCully clay loam, 12 to 20 percent slopes
McE	McCully clay loam, 20 to 30 percent slopes
MID	McCully stony clay loam, 2 to 20 percent slopes
MmE	McCully very stony clay loam, 2 to 30 percent slopes
MUE	McCully clay loam, 2 to 30 percent slopes
MUF	McCully clay loam, 30 to 50 percent slopes
MUG	McCully clay loam, 50 to 70 percent slopes
MYB	Minniece silty clay loam, 0 to 8 percent slopes
NeB	Nekia silty clay loam, 2 to 7 percent slopes
NeC	Nekia silty clay loam, 7 to 12 percent slopes
NeD	Nekia silty clay loam, 12 to 20 percent slopes
NeE	Nekia silty clay loam, 20 to 30 percent slopes
NeF	Nekia silty clay loam, 30 to 50 percent slopes
NkC	Nekia stony silty clay loam, 2 to 12 percent slopes
NsE	Nekia very stony silty clay loam, 2 to 30 percent slopes
NsF	Nekia very stony silty clay loam, 30 to 50 percent slopes
Nu	Newberg fine sandy loam
Nw	Newberg silt loam
PITS	Pits
Sa	Salem gravelly silt loam
SCE	Steiwer and Chehulpum silt loams, 3 to 40 percent slopes
SkB	Salkum silty clay loam, 2 to 6 percent slopes
SkD	Salkum silty clay loam, 6 to 20 percent slopes
SlB	Salkum silty clay loam, basin, 0 to 6 percent slopes
SnA	Santiam silt loam, 0 to 3 percent slopes
SnB	Santiam silt loam, 3 to 6 percent slopes
SnC	Santiam silt loam, 6 to 15 percent slopes
So	Semiahmoo muck
St	Sifton gravelly loam
SuC	Silverton silt loam, 2 to 12 percent slopes
SuD	Silverton silt loam, 12 to 20 percent slopes
SvB	Stayton silt loam, 0 to 7 percent slopes
SwB	Steiwer silt loam, 3 to 6 percent slopes
SwD	Steiwer silt loam, 6 to 20 percent slopes
Sy	Stony rock land
Te	Terrace escarpments
W	Water
Wa	Waldo silty clay loam
Wc	Wapato silty clay loam
WHE	Whetstone stony loam, 3 to 25 percent slopes
WHF	Whetstone stony loam, 25 to 55 percent slopes
WHG	Whetstone stony loam, 55 to 75 percent slopes

WlA	Willamette silt loam, 0 to 3 percent slopes
WlC	Willamette silt loam, 3 to 12 percent slopes
WtE	Witzel very stony silt loam, 3 to 40 percent slopes
WuA	Woodburn silt loam, 0 to 3 percent slopes
WuC	Woodburn silt loam, 3 to 12 percent slopes
WuD	Woodburn silt loam, 12 to 20 percent slopes

are defined in the Glossary. The acreage and proportionate extent of the mapping units are shown in table 7. The location of the soils in the Marion County Area is shown on the detailed soil map at the back of this survey.

Abiqua Series

The Abiqua series consists of well-drained soils that have formed in alluvium. These soils have slopes of 0 to 5 percent. They occur on low foothills, along small streams and in drainageways, at elevations of 250 to 1,000 feet.. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, native grasses, and shrubs. Abiqua soils are associated with McAlpin and Waldo soils.

In a typical profile, the surface layer is very dark brown silty clay loam about 6 inches thick. The subsurface layer is also very dark brown silty clay loam and is about 15 inches thick. The upper part of the subsoil is dark reddish-brown silty clay that extends to a depth of about 54 inches. The lower part of the subsoil is dark-brown silty clay loam that extends to a depth of 72 inches or more.

The Abiqua soils are used mainly for small grains, grass grown for seed, orchards, and pastures. When irrigated, they are used for other crops.

Abiqua silty clay loam, 0 to 3 percent slopes (AbA).This soil is along streams and in drainageways of the Salem and Waldo Hills. The areas are small.

Representative profile 85 feet east and 60 feet south of road intersection (in the corner of SW1/48W1/4NE1/4 sec. 2, T. 9 S., R. 1 W.)

Ap-0 to 6 inches, very dark brown (10YR 2/2) silty clay loam, dark brown (7.5YR 3/2) when dry; moderate, very fine, granular structure; friable, hard, slightly plastic and slightly sticky; many roots; many interstitial pores; medium ,acid (pH 5.8) ; abrupt, smooth boundary. (5 to 7 inches thick.)

A3-6 to 21 inches, very dark brown (10YR 2/2) silty clay loam, dark brown (7.5YR 3/2) when dry; moderate, fine and very fine, subangular blocky structure; firm, hard, plastic and sticky; many roots; many, fine, tubular pores; thin, patchy, darker colored coatings on ped surfaces; medium acid (pH 5.6); clear, smooth boundary. (13 to 17 inches thick.)

B21-21 to 36 inches, dark reddish-brown (5YR 2/2) silty clay, dark reddish brown (5YR 3/4) when dry; weak, prismatic structure breaking to moderate, medium, subangular blocky structure; firm, very hard, very plastic and very sticky; common roots; many, fine and very fine, tubular pores; thin, continuous, slightly darker colored coatings on ped surfaces; strongly acid (pH 5.4); diffuse, smooth boundary. (10 to 20 inches thick.)

B22-36 to 54 inches, dark reddish-brown (5YR 3/2) silty clay, reddish brown (5YR 4/4) when dry; very weak, prismatic structure breaking to moderate, medium, subangular blocky structure; firm, very hard, very plastic and very sticky; few roots; many, fine and very fine, tubular pores; thin, continuous, dark reddish-brown (5YR 3/4) coatings on ped surfaces when dry; common, fine and very fine fragments of weathered rock; strongly acid (pH 5.3); diffuse, smooth boundary. (13 to 23 inches thick.)

B3-54 to 72 inches, dark-brown (7.5YR 3/2) silty clay loam, reddish brown (5YR 4/3) when dry; moderate, medium, subangular blocky structure, firm, hard, plastic and sticky; very few roots; many, fine and very fine, tubular pores; many fine and very fine fragments of weathered rock; strongly acid (pH 5.3).

Color of the A horizon is dark brown or very dark brown, and texture of that horizon ranges from silt loam to silty clay loam. Color of the B horizon ranges from dark brown to dark reddish brown. Texture of the B horizon ranges from silty clay to clay, except that the B3 horizon is silty clay loam in many places. In some areas a few angular pebbles are scattered throughout the profile.

Included with this soil in mapping were small areas that contain a layer of gravel below a depth of 40 inches. Also included were small areas of McAlpin and Waldo soils.

The available water capacity is 10 to 11 inches, permeability is moderately slow, and fertility is moderate. Runoff is slow, and the hazard of erosion is only slight. Where additions of organic matter are regularly supplied, workability of this soil is good. Depth to which roots can penetrate is not restricted.

This soil is used mainly for small grains, grass grown for seed, orchards, and pasture, but small areas are still in Douglas-fir. When this soil is irrigated, it is used for most of the crops commonly grown in the survey area. It is well suited to most crops, but it is not well suited to potatoes and carrots. (Capability unit I-1; not placed in a woodland suitability group)

Abiqua silty clay loam, 3 to 5 percent slopes (AbB).This soil has a profile similar to the one described for Abiqua silty clay loam, 0 to 3 percent slopes, except that material washed from higher slopes has been deposited on the surface in a few places. Runoff is medium, and the hazard of erosion is slight.

This soil is used for about the same crops as Abiqua silty clay loam, 0 to 3 percent slopes. (Capability unit IIe-2; not placed in a woodland suitability group)

Alluvial Land

Alluvial land (Ad) occurs mostly along the Santiam, North Santiam, and Willamette Rivers, on or near the bed of the main stream, in overflow channels, and on islands or bars. It consists mostly of loose sand, gravel, and cobblestones, but it includes some small areas of silt loam. This material is frequently shifted by floodwaters, for this land type is subject to overflow in winter and spring.

In places this land type supports a good stand of cottonwoods, but use of these trees for timber is restricted by the very severe hazard of erosion if the trees are cut. Other areas have a cover of Douglas-fir. Still other small areas are bare, except for scattered willows. (Capability unit VIIw-1; not placed in a woodland suitability group)

Amity Series

The Amity series consists of somewhat poorly drained soils that have formed in mixed alluvial silts. These soils have slopes of 0 to 2 percent. They occur on broad valley terraces at elevations of 150 to 350 feet. The average annual precipitation is between 40 and 45 inches. The average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly grasses, shrubs, hardwoods, :and scattered, Douglas-firs. Amity soils are associated with Dayton and Concord soils.

In a typical profile, the surface layer is very dark grayish-brown silt loam that is mottled in the lower part and is about 17 inches thick. The subsurface layer is mottled dark-gray silt loam about 7 inches thick. The subsoil is

mottled grayish-brown silty clay loam about 13 inches thick. A substratum of mottled olive-brown silt loam underlies the subsoil.

The Amity soils are used mainly for cereal grains, grass grown for seed, and pasture. When irrigated, areas that are drained can be used for all the crops commonly grown in the survey area.

Amity silt loam (Am).-This is the only soil of the Amity series mapped in the survey area. It occupies slightly convex or nearly level areas on terraces consisting of Willamette silts.

Representative profile 30 feet east of a paved road (SW1/2SE1/4 sec. 10, T. 5 S., R. 2 W.)

Ap-0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) when dry; moderate, fine, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; abundant fine roots; many interstitial pores; medium acid (pH 6.0); clear, smooth boundary. (5 to 8 inches thick.)

A1-7 to 17 inches, very dark grayish-brown (10YR 3/2) silt loam grayish brown (10YR 5/2) when dry; common, fine, faint, reddish-brown mottles; moderate, medium, subangular blocky structure; friable, hard, slightly sticky and slightly plastic; abundant fine roots; common interstitial pores and few, fine and medium, tubular pores; common, fine and medium, reddish-brown concretions; medium acid (pH 6.0); clear, smooth boundary. (5 to 10 inches thick.)

A2-17 to 24 inches, dark-gray (10YR 4/1) silt loam, gray (10YR 6/1) when dry; common, fine, faint, reddish-brown mottles; weak, medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; common fine roots; common interstitial pores and common, fine and medium, tubular pores; common, fine and medium, brown concretions; medium acid (pH 6.0); clear, wavy boundary. (4 to 8 inches thick.)

B21t-24 to 29 inches, grayish-brown (2.5Y 5/2) silty clay loam, light brownish gray (10YR 6/2) when dry; common, fine, distinct, reddish-brown mottles; weak, medium, prismatic structure breaking to moderate, coarse, subangular blocky structure; friable, hard, sticky and plastic; few fine roots; common, medium, tubular pores; thin, patchy clay films in pores, on vertical surfaces of peds, and on some horizontal surfaces of peds; common, fine, red and black concretions; slightly acid (pH 6.2); gradual, wavy boundary. (4 to 9 inches thick.)

B22t-29 to 37 inches, grayish-brown (2.5Y 5/2) silty clay loam, light brownish gray (2.5Y 6/2) when dry; common, fine, distinct, light yellowish-brown and black mottles; weak, medium, prismatic structure breaking to moderate, coarse, subangular blocky structure; friable, hard sticky and plastic; few fine roots; few, medium and fine, tubular pores; thin, patchy clay films in pores and on vertical and horizontal surfaces of peds; many, fine, reddish-brown and few, fine, black concretions; slightly acid (pH 6.2); diffuse boundary. (5 to 14 inches -thick.)

C-37 to 60 inches, olive-brown (2.5Y 4/4) silt loam, light yellowish brown (2.5Y 6/4) when dry; common, fine, faint, brown mottles; massive; friable, hard, slightly sticky and slightly plastic; few fine roots; few fine and medium pores; thick clay films in pores; slightly acid (pH 6.4).

When the soil is moist, color of the A horizon ranges from dark brown to very dark grayish brown. Texture of the B horizon is heavy silt loam in some areas, and the structural grade of that horizon; is moderate in places. In some places the lower part of the B horizon is weakly to moderately brittle. Bedrock is at a depth of more than 60 inches.

Included with this soil is mapping were small areas of soils that are in drainageways and depressions and that have slopes of 2 to 5 percent. Also included were small areas of Woodburn and Concord soils.

The available water capacity ranges from 9 to 12 inches. Permeability is moderately slow, and fertility is moderate. Runoff is slow, and erosion is not a hazard or is only a slight hazard. The depth to which roots can penetrate is moderately restricted by wetness, partly caused by a high water table that is near the surface during winter and spring. Workability is good, but this soil compacts easily if it is cultivated when wet.

Undrained areas of this soil are used for small grains, pasture, and grasses grown for seed, but drainage is needed for berries, vegetables, and specialty crops. If this soil is drained and irrigated, it can be used for all the crops commonly grown in the survey area. Evan after drainage is installed, however, there are slightly restrictions to use of this soil for deep-rooted crops that cannot tolerate excessive moisture. Nevertheless, response to drainage and fertilizer is generally good. (Capability unit IIw-2; not placed in a woodland suitability group)

Bashaw Series

The Bashaw series consists of poorly drained and very poorly drained soils that have formed in alluvium. These soils are in backwater areas of the flood plains and in drainage channels of silty alluvial terraces. They have slopes of 0 to 1 percent. Elevations range from 100 to 400 feet. The average annual precipitation is between 40 and 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly annual and perennial grasses, wild blackberries, sedges, rushes, willows, and a few ash and oak trees. Bashaw soils are associated with Wapato soils.

In a typical profile, the surface layer is about 31 inches thick and consists of mottled very dark gray clay in the uppermost 3 inches and of mottled black clay below. The upper part of the substratum, just beneath the surface layer, is very dark gray clay that extends to a depth of 48 inches. The lower part of the substratum is dark grayish-brown clay or sandy clay that extends to a depth of 60 inches or more. The substratum is mottled throughout.

The Bashaw soils are used mainly for pasture.

Bashaw clay (Ba).-This is the only soil of the Bashaw series mapped in the survey area. It occupies concave backwater areas adjacent to silty alluvial terraces, and it is also in drainage channels on the terraces. The areas are small.

Representative profile (NW1/4SW1/4NE1/4 sec. 9, T. 6 S., R.1 W.)

A11--0 to 3 inches, very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) when dry; many, fine, distinct, yellowish-red (5YR 4/6) mottles; moderate, medium and fine, subangular blocky structure; firm, very hard, very sticky and very plastic; common roots; many very fine pores; medium acid (pH 5.8); abrupt, smooth boundary. (0 to 4 inches thick.)

A12g-3 to 14 inches, black (N 2/0) clay, very dark gray (N 3/0) when dry; few, fine, distinct, yellowish-red (5YR 5/6) mottles; massive when wet; weak, coarse, prismatic structure breaking to weak, coarse, angular blocky structure when moist or dry; very firm, very hard, very sticky and very plastic; common very fine roots; many very fine pores; common, fine, red

and black concretions; few small slickensides; medium acid (pH 6.0); clear, smooth boundary. (6 to 15 inches thick.)

A13g-14 to 31 inches, black (N 2/0) clay, very dark gray (N 3/0) when dry; few, fine, distinct, yellowish-red (5YR 4/6) mottles; massive; very firm, very hard, very plastic and very sticky; few slickensides; few very fine roots; few very fine pores; common, fine, red and black concretions; neutral (pH 6.6); gradual, smooth boundary. (14 to 20 inches thick.)

C1g-31 to 48 inches, very dark gray (N 3/0) clay, dark gray (N 4/0) when dry; common, medium, faint, light olive-brown (2.5Y 5/6) mottles; massive; very firm, very hard, very sticky and very plastic; common large slickensides; common, fine, light-colored fragments; few roots; few very fine pores; neutral (pH 7.0); abrupt, smooth boundary. (10 to 20 inches thick.)

C2g-48 to 60 inches, dark grayish-brown (2.5Y 4/2). clay or sandy clay, light brownish gray (2.5Y 6/2) when dry; many, medium, distinct, dark-brown (7.5YR 3/2) and dark reddish-brown (5YR 3/2) mottles and few, medium, faint, dark-gray (N 4/0) mottles; massive; firm, very hard, sticky and plastic; no roots; common very fine pores; neutral (pH 7.0).

When this soil is moist, the A12g and A13g horizons are generally black, but their color ranges to very dark gray in some areas. In the uppermost 3 to 4 inches of the soil profile, the structure is weak to strong granular or very fine subangular blocky. Texture in the uppermost 3 to 8 inches of the profile ranges from clay to silty clay or silty clay loam. The soil material between depths of 8 and 40 inches is more than 60 percent clay. Reaction ranges from neutral to medium acid in the uppermost 10 to 15 inches of the profile, and it is slightly acid to neutral below.

Included with this soil in mapping were small areas of moderately fine textured soils that have a very dark grayish-brown surface layer. Also included were areas of clayey soils that have a thin, black surface layer.

The available water capacity ranges from 8 to 10 inches. Permeability is very slow, and fertility is moderate. Runoff is very slow to ponded, and the hazard of erosion is slight. Some material is deposited on the surface each year in areas not protected and not drained. Workability is poor. Because of the annual high water table and the very fine texture of the soil material, only a few roots penetrate to depths greater than 31 inches, but roots can penetrate to a depth of about 48 inches.

This soil is used mainly for pasture, but it can be used for spring barley, wheat, improved pasture, and hay if surface drainage is provided. Although drainage is needed, outlets are generally inadequate for surface drainage, and this soil is unsuitable for tile drains, because of its fine texture and very slow permeability. For only short periods is it dry enough to cultivate. (Capability unit IVw-2; not placed in a woodland suitability group)

Camas Series

The Camas series consists of excessively drained soils that formed in recent alluvium derived mainly from basic igneous and sedimentary rocks. These soils have slopes of 0 to 3 percent. They occur on bottom lands of the large streams. Elevations range from 125 to 500 feet. The average annual precipitation is between 40 and 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly ash, oak, alder, rose, blackberry, annual weeds, and grasses. Camas soils are associated with Newberg and Cloquato soils.

In a typical profile, the surface layer is dark-brown gravelly sandy loam about 9 inches thick. The substratum, just beneath the surface layer, is dark yellowish-brown very gravelly sand that extends to a depth of 60 inches or more.

The Camas soils are used mainly for small grains, for pasture, or as woodland. When irrigated, they are used for all the crops commonly grown in the survey area.

Camas gravelly sandy loam (Ca).-This soil occupies small areas along Butte Creek and the Willamette, North Santiam, and Santiam Rivers. It is the only soil of the Camas series mapped in the survey area.

Representative profile (SW1/4SE1/4 sec. 11, T. 9 S., R. 1W.)

A1-0 to 9 inches, dark-brown (10YR 3/3) gravelly sandy loam, brown (10YR 5/3) when dry; weak, medium, subangular blocky structure; friable, slightly hard, nonsticky and nonplastic; many roots; many, fine, interstitial pores; slightly acid (pH 6.1); gradual, smooth boundary. (7 to 11 inches thick.)

C-9 to 60 inches, dark yellowish-brown (10YR 4/4) very gravelly sand, light yellowish brown (10YR 6/4) when dry; single grain; loose, nonsticky and nonplastic; common roots; many interstitial pores; medium acid (pH 6.0).

When the soil is moist, color of the A horizon ranges from very dark grayish brown to dark brown. Texture of the A horizon ranges from silt loam to loamy sand, and texture of the C horizon ranges from very gravelly loamy sand to very gravelly sand or cobbly sand. More than 50 percent of the C horizon, by volume, is coarse fragments. Reaction of the A horizon ranges from neutral to medium acid. Reaction of the C horizon ranges from medium acid to slightly acid.

Included with this soil in mapping were small cobbly areas and other small areas that have a surface layer of silt loam.

The very gravelly or cobbly substratum near the surface restricts the available water capacity, which is 3 inches or less. It also restricts the depth to which roots can penetrate. Permeability is very rapid, and fertility is low. Runoff is very slow, and erosion is generally only a slight hazard. Areas adjacent to streams are moderately susceptible to erosion because they are usually flooded at least once each year. Workability is poor.

This soil is used mainly for small grains, for pasture, or as woodland. When irrigated, it is used for all the crops commonly grown in the survey area, although it is poorly suited to root crops and to many other crops. (Capability unit IVw-3; not placed in a woodland suitability group

Chehalem Series

The Chehalem series consists of somewhat poorly drained soils that have formed in alluvium. These soils have slopes of 2 to 12 percent. They occur on alluvial fans at elevations of 150 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In noncultivated areas the vegetation is mainly ash, cottonwood, willow, oak, sedges, reeds, and grasses. Chehalem soils are associated with Woodburn soils.

In a typical profile, the surface layer is very dark brown silt loam about 16 inches thick. The subsoil is mottled silty clay about 44 inches thick. The upper part of the subsoil is

very dark grayish brown, the middle part is dark grayish brown, and the lower part is olive brown. The Chehalem soils are used mainly for small grains, pasture, hay, and native hardwoods. Mainly irrigated, a small acreage is used for vegetables, improved pasture, and caneberries.

Chehalem silt loam, 2 to 12 percent slopes (CeC).This is the only soil of the Chehalem series mapped in the survey area. It occupies small areas on foot slopes of the Salem and Waldo Hills.

Representative profile (SE1/4SW1/4 sec. 23, T. 9 S., R. 3 W.).

Ap-0 to 8 inches, very dark brown (10YR 2/2) heavy silt loam, very dark grayish brown (10YR 3/2) when dry; moderate, coarse, subangular blocky structure; friable, hard, sticky and plastic; common roots; many, fine, tubular pores; medium acid (pH 5.8); clear, smooth boundary. (6 to 8 inches thick.)

A1-8 to 16 inches, very dark brown (10YR 2/2) heavy silt loam, very dark grayish brown (10YR 3/2) when dry; moderate, coarse, subangular blocky structure breaking to fine, subangular blocky structure; friable, hard, sticky and plastic; common roots; many, fine, tubular pores; medium acid (pH 5.6); abrupt, smooth boundary. (4 to 8 inches thick.)

B21-16 to 31 inches, very dark grayish-brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) when dry; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; firm, very hard, very sticky and very plastic; few roots; many, very fine, tubular pores; medium acid (pH 5.6); gradual, smooth boundary. (6 to 15 inches thick.)

B22 31 to 42 inches, dark grayish brown (2.5Y 4/2) silty clay, light yellowish brown (2.5Y 6/4) when dry; many, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure; very firm, extremely hard, very sticky and very plastic; few roots; common, fine, tubular pores; many particles the size of fine shot; medium acid (pH 5.8); gradual, smooth boundary. (8 to 15 inches thick.)

IIB3-42 to 60 inches, olive-brown (2.5Y 4/4) silty clay, light olive brown (2.5Y 5/4) when dry; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, coarse, prismatic and weak, coarse, angular blocky structure; very firm, extremely hard, sticky and plastic; few roots; common, fine, tubular pores; many manganese stains; many sand-size fragments of rock; medium acid (pH 6.0).

Texture of the A horizon ranges from silt loam to clay loam or silty clay loam. In places the A horizon is dark brown. Color of the B2 horizons ranges from very dark brown to dark grayish brown or very dark grayish brown, and mottling in those horizons ranges from faint to distinct. Weathered coarse fragments of sedimentary rock are common throughout the profile. They make up as much as 40 percent of the lower B horizons. In places the profile also contains fragments of basalt.

Included with this soil in mapping were small areas of a soil along Butte Creek that has a lighter colored surface layer and a more permeable subsoil than this soil. The subsoil of the included soil is silty clay loam.

The available water capacity is 10 to 11 inches. Permeability is slow, and fertility is moderate. Runoff is medium, and the hazard of erosion is slight. This soil is subject to seepage and runoff from higher areas. The depth to which roots can penetrate is restricted by wetness during winter and spring. Workability is fair.

This soil is used mainly for small grains, pasture, hay, and native hardwoods. When irrigated, a small acreage is used for vegetables, improved pasture, and caneberries.

(Capability unit IIIe-5; not placed in a woodland suitability group)

Chehalis Series

The Chehalis series consists of well-drained soils that have formed in alluvium. These soils are nearly level or gently undulating, and they occur on bottom lands that are traversed by old overflow channels and sloughs. Elevations range from 100 to 650 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is about 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly alder, ash bigleaf maple, oak, and an understory of vine maple, wild blackberry, vines, and shrubs. Chehalis soils are associated with Cloquato and Newberg soils.

In a typical profile, the surface layer is dark-brown silty clay loam about 9 inches thick. The subsoil is also dark-brown silty clay loam and is about 28 inches thick. The substratum is silty clay loam that is dark brown in the upper part and dark yellowish brown in the lower part. It extends to a depth of 80 inches or more.

The Chehalis soils are used mainly for pasture, hay, cereal grains, grass grown for seed, and orchards. When irrigated, they are used extensively for vegetables and berries.

Chehalis silty clay loam (Ch).-This is the only soil of the Chehalis series mapped in the survey area. It occupies the higher parts of bottom lands along the larger streams. Overflow occurs only about once in 50 years.

Representative profile (W1/2SE1/4NE1/4 sec. 20, T. 6 S., R. 1 W.)

Ap-0 to 9 inches, dark-brown (10YR 3/3) silty clay loam, dark brown (10YR 4/3) when dry; weak, fine, subangular blocky structure; friable, slightly hard, sticky and plastic; many roots; many fine pores; slightly acid (pH 6.6); abrupt, smooth boundary. (6 to 10 inches thick.)

B2-9 to 37 inches, dark-brown (10YR 3/3) silty clay loam, brown (10YR 5/3) when dry; weak, medium, subangular blocky structure; friable, slightly hard, sticky and plastic; many roots; many very fine and fine pores; slightly acid (pH 6.4); gradual, smooth boundary. (22 to 40 inches thick.)

C1-37 to 63 inches, dark-brown (10YR 3/3) silty clay loam, dark grayish brown (10YR 4/2) when dry; weak, medium, subangular blocky structure; friable, slightly hard, sticky and plastic; few roots; many very fine and fine pores; slightly acid (pH 6.4); gradual, smooth boundary.

C2-63 to 80 inches, dark yellowish-brown (10YR 3/4) silty clay loam, dark grayish brown (10YR 4/2) when dry; massive; friable, slightly hard, sticky and plastic; many fine pores; slightly acid (pH 6.4).

Texture of the Ap horizon is dominantly silty clay loam, but it ranges to heavy silt loam.

Included with this soil in mapping were small areas of Cloquato, Newberg, and Camas soils, and small areas of a steep soil on breaks.

The available water capacity is 11 to 12 inches. Permeability is moderate, and fertility is high. Runoff is slow, and the hazard of erosion is slight. Depth to which roots can penetrate is not restricted. This soil is generally in good tilth if regular additions of organic matter are provided.

This soil is used mainly for pasture, hay, cereal grains, grass grown for seed, and orchards. When irrigated, it is

used extensively for vegetables and berries, but it is also used for all the crops commonly grown in the survey area, except potatoes and carrots. (Capability unit I-1; not placed in a woodland suitability group)

Chehulpum Series

The Chehulpum series consists of well-drained soils formed in mixed material that contains loess and is underlain by sandstone or shale. Bedrock is within 20 inches of the surface. These soils have slopes of 3 to 40 percent. They occur on foot slopes and on low foothills at elevations of 300 to 650 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. The vegetation is mainly oak, poison-oak, wild rose, and grasses. Chehulpum soils are associated with Steiwer soils.

In a typical profile, the surface layer is very dark brown silt loam about 12 inches thick. This is covered with a thin layer of decomposing grass and leaves. The underlying bedrock, at a depth of about 12 inches, is horizontally bedded, fine-grained sandstone.

The Chehulpum soils are used mostly for pasture. In this survey area, the Chehulpum soils were mapped only in an undifferentiated unit with Steiwer soils. A detailed technical profile of a Chehulpum soil is described in the Steiwer series under Steiwer and Chehulpum silt loams, 3 to 40 percent slopes.

Clackamas Series

The Clackamas series consists of somewhat poorly drained soils that have formed in gravelly mixed alluvium. These soils have slopes of 0 to 3 percent. They occur on terraces at elevations of 175 to 650 feet. The average annual precipitation is between 40 and 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, hazel, brackenfern, wild rose, and grasses. Clackamas soils are associated with Sifton and Salem soils.

In a typical profile, the surface layer is very dark grayish-brown gravelly loam about 6 inches thick. The subsurface layer is also very dark grayish-brown gravelly loam, and it is about 9 inches thick. The subsoil is mottled very dark gray and dark reddish-brown gravelly clay loam about 9 inches thick. The substratum is mottled. It consists of dark-brown and strong-brown very gravelly clay loam that extends to a depth of 60 inches or more.

Clackamas soils that are neither drained nor irrigated are used mainly as woodland and for pasture, hay, and cereal grains. When irrigated, the drained areas are used for pole beans, bush beans, sweet corn, berries, squash, and cucumbers.

Clackamas gravelly loam (Ck).-This is the only soil of the Clackamas series mapped in the survey area. It is on terraces between Stayton, Jefferson, and Salem, and along Abiqua Creek, northeast of Silverton. The areas are of medium size.

Representative profile 50 feet east of a paved road (NE1/4SE1/4 sec. 1, T. 8 S., R. 3 W.)

Ap-0 to 6 inches, very dark grayish-brown (10YR 3/2) gravelly loam, dark grayish brown (10YR 4/2) when dry; moderate, medium and fine, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many roots; many very fine and fine pores medium acid (pH -5.6); abrupt, smooth boundary. (5 to 7 inches thick.)

A3-6 to 15 inches, very dark grayish-brown (10YR 3/2) gravelly loam, dark grayish brown (10YR 4/2) and brown (10YR 4/3) when dry; common, fine and medium, black and reddish-brown mottles; moderate, medium, subangular blocky structure; friable, hard, slightly sticky and slightly plastic; many roots; many, very fine and fine, tubular pores; common, fine (1 millimeter in diameter), light-colored fragments; medium acid (pH 5.8); clear, smooth boundary. (7 to 11 inches thick.)

B2tg-15 to 24 inches, mottled very dark gray (10YR 3/1) and dark reddish-brown (2.5YR 3/4) gravelly clay loam, grayish brown (10YR 5/2) and yellowish red (5YR 5/6) when dry; moderate, medium, subangular blocky structure; friable, hard, sticky and plastic; many roots; many fine and medium pores; common moderately thick clay films in pores and on the surfaces of pebbles, and a few on the surfaces of peds; medium acid (pH 5.6); abrupt, smooth boundary. (8 to 10 inches thick.)

IICg-24 to 60 inches, mottled dark-brown (10YR 3/3) and mottled strong-brown (7.5YR 5/6) very gravelly clay loam, light brownish gray (10YR 6/2), pale brown (10YR 6/3), and light yellowish brown (10YR 6/4) when dry; massive; firm, very hard, slightly sticky and slightly plastic; few pores; 80 to 90 percent gravel and cobblestones; strongly acid (pH 5.4).

Color of the A horizon ranges from black to very dark grayish brown. Color of the B horizon is highly variegated. In places texture in the lower part of the B horizon ranges to very gravelly light silty clay. Depth to the gravelly lower part of the B horizon or to the very gravelly C horizon ranges from 20 to 36 inches.

Included with this soil in mapping were small areas of Courtney soils and small areas that have a surface layer of clay loam. These included areas make up as much as 15percent of the acreage in the mapping unit.

The available water capacity is 4 to 5 inches. Permeability is moderately slow, and fertility is moderate. Runoff is slow, and the hazard of erosion is only slight. This soil has a seasonal high water table. In some irrigated areas, there is a permanent high water table as the result of overirrigation and seepage from irrigation ditches. Depth to which roots can penetrate is restricted to about 24 inches by the compact, very gravelly substratum. Workability is poor.

Areas of this soil that are neither drained nor irrigated are used for pasture, hay, and cereal grains, and they are also used as woodland. Areas that are drained are used for pole beans, bush beans, sweet corn, berries, squash, and cucumbers when they are irrigated. If this soil is irrigated and properly fertilized, it is well suited to all the commonly grown crops. (Capability unit IIIw-1; not placed in a woodland suitability group)

Cloquato Series

The Cloquato series consists of well-drained soils that have formed in alluvium. These soils are nearly level and gently undulating, and they are on flood plains of the major streams. The areas are traversed by overflow channels and sloughs. Elevations range from 100 to 650 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is

fir, cottonwood, bigleaf maple, Oregon white oak, ash, and an understory of vine maple, wild blackberry, vines, shrubs, and grasses. Cloquato soils are associated with Chehalis and Newberg soils.

In a typical profile, the surface layer is dark-brown silt loam about 9 inches thick. The subsoil, which is also dark brown silt loam, is about 56 inches thick. The substratum is dark-brown fine sandy loam that extends to a depth of 83 inches or more.

Cloquato soils that are not irrigated are used mainly for small grains, orchards, pasture, hay, and grass grown for seed. When irrigated, these soils are used for all the crops commonly grown in the survey area.

Cloquato silt loam (Cm).-This is the only Cloquato soil mapped in the survey area. It occupies large areas along the Willamette, Pudding, and Santiam Rivers and along Butte Creek.1 Representative profile (E1/2SE1/4 sec. 20, T. 6 S., R.

Ap-0 to 9 inches, dark-brown (10YR 3/3) silt loam, brown (10YR 5/3) when dry; weak, medium and coarse, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many roots; many, fine and very fine, tubular pores; medium acid (pH 6.0); clear, smooth boundary. (6 to 10 inches thick.)

B2-9 to 41 inches, dark-brown (10YR 3/3) silt loam, brown (10YR 5/3) when dry; weak, medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; common roots; many, very fine, tubular pores; slightly acid (pH 6.2); gradual, smooth boundary. (15 to 35 inches thick.)

B3-41 to 65 inches, dark-brown (10YR 4/3) silt loam, pale brown (10YR 6/3) when dry; very weak, coarse, subangular blocky structure; very friable, slightly hard. slightly sticky and nonplastic; few roots; many, fine, tubular pores; slightly acid (pH 6.4); clear, smooth boundary. (0 to 25 inches thick.)

C-65 to 83 inches, dark-brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) when dry; massive; very friable, soft, nonsticky and nonplastic; no roots; many fine pores; slightly acid (pH 6.4).

Texture of the B2 horizon is dominantly silt loam, but this horizon contains thin layers of sandy material in places. This sandy material is generally below a depth of 30 inches.

Included with this soil in mapping were small areas of Chehalis, Newberg, and Camas soils, and small areas in which the substratum is gravelly. Also included were areas of steeper soils that have short slopes and that are adjacent to sloughs and old stream channels. The included areas make up from 10 to 15 percent of the acreage in this mapping unit.

The available water capacity is 12 to 14 inches. Permeability is moderate, and fertility is high. Runoff is slow, but the hazard of erosion is slight to moderate as the result of periodic overflow. Overflow generally occurs about once in 3 or 4 years, but it occurs two or more times in some years. Roots can penetrate to a depth of 5 feet or more. Workability is very good.

This soil is used mainly for small grains, orchards, pasture, hay, and grass grown for seed. When irrigated, it is used for all the crops commonly grown in the survey area.

This soil is well suited to all the commonly grown crops. Floodwaters leave debris, and they can erode deep holes in orchards and in areas occupied by other permanent crops. (Capability unit IIw-3; not placed in a woodland suitability group).

Concord Series

The Concord series consists of poorly drained soils that have formed in alluvium of mixed mineralogy. These soils are on broad valley terraces, in slightly concave depressions and in drainageways. They have slopes of 0 to 2 percent. Elevations range from 125 to 350 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly rushes, sedges, wild blackberry, hazel, annual grasses, and ash trees. Concord soils are associated with Amity and Dayton soils.

In a typical profile, the surface layer is very dark grayish-brown silt loam about 6 inches thick. The subsurface layer is mottled dark-gray silt loam about 9 inches thick. Just below the subsurface layer is a layer of mottled gray and dark-gray silty clay about 4 inches thick. The subsoil is about 10 inches thick. It consists of mottled grayish-brown silty clay in the upper part and of mottled dark grayish-brown silty clay in the lower part. The substratum of mottled dark grayish-brown silt loam extends to a depth of 60 inches or more.

Concord soils that are neither drained nor irrigated are used mainly for cereal grains, pasture, hay, and grass grown for seed. When irrigated, the drained areas are used mainly for berries and vegetables.

Concord silt loam (Co).-This is the only soil of the Concord series mapped in the survey area. It occupies narrow strips along and at the heads of drainageways, and it is also in depressions on terraces. In most places the slope is less than 2 percent.

Representative profile at the eastern edge of the Baldock Freeway, 200 feet north of the overpass (NE1/4NE1/4NW1/4 sec. 33, T. 5 S., R. 2 W.)

Ap--0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) when dry; moderate, fine, subangular blocky structure breaking to moderate, fine, granular structure; friable, hard, sticky and plastic; abundant fine roots; many interstitial pores and wormholes; common, fine, brown concretions; medium acid (pH 6.0); abrupt, smooth boundary. (5 to 7 inches thick.)

A21-6 to 9 inches, dark-gray (10YR 4/1) silt loam, gray (10YR 6/1) when dry; common, fine, distinct, dark brown (7.5YR 4/2) mottles; moderate, medium, subangular blocky structure; friable, hard, sticky and plastic; abundant fine roots; many, very fine and few, fine, tubular pores; common, fine, very dark brown concretions; medium acid (pH 5.8); clear, smooth boundary. (1 to 6 inches thick.)

A22-9 to 15 inches, dark-gray (10YR 4/1) heavy silt loam, light gray (10YR 7/1) when dry; common, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, medium, prismatic structure breaking to moderate, medium, subangular blocky structure; friable, hard, sticky and plastic; few fine roots; many, very fine and common, fine, tubular pores; common, fine, very dark brown concretions; medium acid (pH 6.0); clear, smooth boundary. (4 to 9 inches thick.)

A&B-15 to 19 inches, gray (10YR 5/1) and dark-gray (10YR 4/1) light silty clay, light gray (10YR 7/1 and 10YR 6/1) when dry; darker colors in ped interiors; common, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, medium, prismatic structure breaking to moderate, medium, subangular blocky structure; friable, hard, sticky and plastic; few fine roots; many, very fine, tubular pores; many, fine, very dark brown concretions; slightly acid (pH 6.2); clear, smooth boundary. (2 to 7 inches thick.)

IIB2t-19 to 24 inches, grayish-brown (2.5Y 5/2) heavy silty clay, light brownish gray (2.5Y 6/2) when dry; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; strong, fine, prismatic structure breaking to strong, medium and fine, angular blocky structure; firm, extremely hard, very sticky and very plastic; very few roots; many, very fine and few, fine and medium, tubular pores; few thin and moderately thick clay films on ped surfaces and in pores; many, fine, very dark brown and few black concretions; slightly acid (pH 6.4); clear, wavy boundary. (4 to 12 inches thick.)

IIB3t 24 to 29 inches, dark grayish-brown (2.5Y 4/2) silty clay, light brownish gray (2.5Y 6/2) when dry; many, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; massive: firm, very hard, sticky and plastic; few fine roots; common fine pores; common moderately thick clay films along lines of weakness, and few clay films in pores; few, fine, dark-brown and black concretions; neutral (pH 6.6); gradual, smooth boundary. (3 to 9 inches thick.)

IIIC-29 to 60 inches, dark grayish-brown (2.5Y 4/2) silt loam, light gray (2.5Y 7/2) when dry; many, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; friable, hard, sticky and plastic; massive; common, very fine, tubular pores; few black stains; neutral (pH 6.6).

The Ap horizon is dominantly silt loam, but the texture ranges to silty clay loam. In places texture of the IIB2t horizon is clay. Soil reaction ranges from medium acid in the A horizon to slightly acid and neutral in the B and C horizons.

Included with this soil in mapping were small areas of Dayton soils. These included soils make up from 5 to 10 percent of the acreage in the mapping unit.

The available water capacity ranges from 9 to 12 inches. Permeability is slow, and fertility is low. Runoff is slow, and ponding occurs in some areas, especially in depressions. The hazard of erosion is slight. Depth to which roots can penetrate is restricted by the silty clay in the subsoil. It is also restricted by wetness, caused by the poor drainage and by the seasonal high water table. This soil is easily worked, but it tends to compact if it is cultivated when too moist.

Areas of this soil that are neither drained nor irrigated are used for spring small grains, pasture, hay, and grass grown for seed. When irrigated, drained areas are used for berries and vegetables. This soil is well suited to vegetables, small grains, pasture, and hay. (Capability unit IIIw-2; not placed in a woodland suitability group)

Courtney Series

The Courtney series consists of poorly drained soils that have formed in alluvial deposits of different ages. These soils are on gravelly alluvial terraces, where they occur in shallow depressions and in drainageways. Slopes range from 0 to 2 percent, and elevations range from 175 to 650 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly ash, vine maple, hazel, wild rose, blackberry, rushes, sedges, and annual and perennial grasses. Courtney soils are associated with Salem and Clackamas soils.

In a typical profile, the surface layer is about 12 inches thick, and it consists of mottled, black gravelly silty clay loam in the upper part and of mottled, very dark gray gravelly silty clay loam in the lower part. The subsoil is mottled dark-gray gravelly clay about 12 inches thick. The substratum consists of a layer of dark grayish-brown very gravelly clay loam, about 25 inches thick, that grades to mottled, dark-brown very gravelly sand, which extends to a depth of 57 inches or more.

Undrained areas of Courtney soils are used mainly for pasture, hay, and grass grown for seed. The drained areas are used for these crops and also for small grains.

Courtney gravelly silty clay loam (Cu).-This soil is on terraces between Stayton and Salem. It is in depressions and in narrow drainageways. This is the only soil of the Courtney series mapped in the survey area.

Representative profile (NW1/4SE1/4 sec. 6, T. 8 S., R. 2 W.).

A11-0 to 4 inches, black (10YR 2/1) gravelly silty clay loam, dark gray (10YR. 4/1) when dry; few, fine, distinct, dark-brown (7.5YR 4/4) mottles; strong, medium and fine, subangular blocky structure; friable, hard, sticky and plastic; many roots; many, very fine and fine, interstitial pores; iron stains in root channels; 20 to 25 percent coarse pebbles; strongly acid (pH 5.4); clear, smooth boundary. (2 to 6 inches thick.)

A12-4 to 12 inches, very dark gray (7.5YR 3/0) gravelly silty clay loam, very dark gray (10YR 3/1) when crushed and dark gray (10YR 4/1) when dry; common, medium, distinct, strong-brown (7.5YR 4/4) mottles; strong, medium and fine, subangular blocky structure; friable, hard, sticky and plastic; many roots; many, very fine, tubular pores; iron stains in root channels; 30 percent pebbles; medium acid (pH 5.8); abrupt, smooth boundary. (7 to 10 inches thick.)

IIB2t-12 to 24 inches, dark-gray (10YR 4/1) gravelly clay, gray (10YR 5/1) when dry; few, fine, distinct mottles; weak, coarse, prismatic structure; firm, very hard, very sticky and very plastic; few roots; 30 percent pebbles and a few cobblestones; slightly acid (pH 6.4); clear, smooth boundary, (10 to 20 inches thick.)

IIIC1-24 to 49 inches, dark grayish-brown (10YR 4/2) very gravelly clay loam, gray (10YR 5/1) when dry; massive; firm, hard, sticky and plastic; iron stains; 85 percent pebbles; few cobblestones; slightly acid (pH 6.2); abrupt, smooth boundary. (24 to 48 inches thick.)

IVC2-49 to 57 inches, mottled dark-brown (7.5YR 3/2) very gravelly sand, strong brown (7.5YR 5/6) when moist; massive; friable, soft, nonsticky and nonplastic; many, medium, interstitial pores; neutral (pH 6.7).

Color of the A horizon ranges from black or very dark brown to very dark gray, and texture of that horizon ranges from silty clay loam or clay loam to silty clay. In some places the B horizon is very dark gray, and it is gravelly silty clay in some areas. The amount of gravel in the B horizon ranges from 20 to 30 percent. Depth to the very gravelly C horizon ranges from 24 to 36 inches. The C horizon is stratified. Both the thickness of the different layers in the C horizon and the amount of gravel and cobblestones in that horizon are highly variable.

Included with this soil in mapping were small areas that have a surface layer of very dark gray silt loam.

Above the clay subsoil, the available water capacity is less than 3 inches. Permeability is very slow, and fertility is moderate. Runoff is ponded or very slow, and the hazard of erosion is slight. The depth to which roots can penetrate is restricted by the claypan in the subsoil, but it ranges from 12 to 16 inches. Workability is fair.

Undrained areas of this soil are used for pasture, hay, and grass grown for seed. The drained areas are used for these crops and also for spring small grains and winter wheat. When irrigated, the drained areas are used for sweet corn, berries, and beans. This soil is used for these irrigated crops because it occupies only small areas and extends through and is managed like the adjacent Sifton, Salem, and Clackamas soils. Courtney soils are poorly

suited to row crops and root crops. (Capability unit IVw-1; not placed in a woodland suitability group)

Cumley Series

The Cumley series consists of moderately well drained soils that have formed in glacial till and colluvium. These soils are on mountain foot slopes, and they have slopes of 2 to 20 percent. Elevations range from 800 to 2,000 feet. The average annual precipitation is between 55 and 75 inches, the average annual air temperature is 48° to 51° F., and the length of the frost-free season is 165 to 190 days. The vegetation is mainly Douglas-fir, maple, alder, brackenfern, and grasses. Cumley soils are associated with McCully, Kinney, and Minniece soils.

In a typical profile, the surface layer is dark-brown silty clay loam about 9 inches thick. This is covered with a thin layer of decomposing leaves, stems, and twigs. The subsoil is about 37 inches thick and is dark reddish-brown silty clay in the upper part, dark-brown heavy silty clay in the middle part, and mottled brown clay in the lower part. The substratum is mottled, olive-brown clay. Bedrock is at a depth of more than 5 feet.

The Cumley soils are used mainly for timber and for watershed.

Cumley silty clay loam, 2 to 20 percent slopes (CLD) -This is the only soil of the Cumley series mapped in the survey area. It occurs in small areas on foot slopes and within slump areas of McCully soils.

Representative profile 25 feet northwest of a logging road (NE1/4NE1/4 sec. 25, T. 9 S., R. 2 E.)

01 and 02-1 inch to 0, layer of duff consisting of partly decomposed leaves, stems. and twigs.

A11-0 to 4 inches, dark-brown (7.5YR 3/2) silty clay loam, dark brown (7.5YR 4/2) when dry; moderate, fine, granular structure; friable, hard, sticky and plastic; many, fine, interstitial pores; many roots; medium acid (pH 6.0); gradual, smooth boundary. (3 to 7 inches thick.)

A12-4 to 9 inches, dark-brown (7.5YR 3/2) silty clay loam, dark brown (7.5YR 4/2) when dry; moderate, fine and medium, subangular blocky structure; friable, hard, sticky and plastic; many, fine and very fine, tubular pores; many roots; slightly acid; clear, smooth boundary. (4 to 8 inches thick.)

B1-9 to 15 inches, dark reddish-brown (5YR 3/4) silty clay, dark brown (7.5YR 4/3) when dry; moderate, medium, subangular blocky structure; firm, very hard, sticky and plastic; common, very fine and fine, tubular pores; many roots; medium acid (pH 5.8); clear, smooth boundary. (4 to 9 inches thick.)

B21t-15 to 25 inches, dark-brown (7.5YR 3/4) heavy silty clay, dark brown (7.5YR 4/4) when dry; moderate, coarse, subangular blocky structure; firm, very hard, very sticky and very plastic; common, very fine and fine, tubular pores; many roots; common thin and moderately thick clay films; common, fine, brown and black concretions; medium acid (pH 5.6). (8 to 14 inches thick.)

B22t-25 to 46 inches, brown (7.5YR 4/4) clay, brown (7.5YR 5/4) when dry; many, coarse, prominent, grayish brown (2.5Y 5/2) mottles; moderate, coarse, subangular blocky structure; very firm, very hard, very sticky and very plastic; common, very fine and fine, tubular pores; common roots; nearly continuous, thin and moderately thick clay films; few coarse fragments of basalt; strongly acid; clear, smooth boundary. (17 to 25 inches thick.)

C-46 to 60 inches, olive-brown (2.5Y 4/4) clay, grayish brown (2.5Y 5/2) when dry; many, coarse, strong brown (7.5YR 4/4) mottles; massive; firm, very hard, very sticky and very plastic; few roots; few coarse fragments of basalt; common, very fine and fine, tubular pores; strongly acid.

Texture of the A horizon ranges from silty clay loam to silty clay. In places the A horizon is very dark brown. Mottling in the B22t horizon is distinct in some places. In some areas the entire profile contains a few pebbles, cobblestones, and other stones.

Included with this soil in mapping were small areas of Minniece soils and stony soils.

The available water capacity ranges from 9 to 12 inches. Permeability is moderately slow, and fertility is low. Runoff is medium, and the hazard of erosion is slight. The depth to which roots can penetrate is restricted by wetness and by the layer of clay at a depth of 46 inches.

This soil is used mainly for growing Douglas-fir to which it is moderately well suited. Where cleared, it can be used for small grains, pasture, hay, and grass grown for seed. If this soil is drained and irrigated, it is suitable for some vegetable and berry crops. (Capability unit IIIe-2; woodland suitability group 3c4)

Dayton Series

The Dayton series consists of soils that are poorly drained. These soils have formed mainly in old mixed alluvium, but their upper layers may have been influenced, to some extent, by loess. The soils are on broad valley terraces, and they occur in drainageways and in shallow depressions. Slopes range from 0 to 2 percent, and elevations range from 125 to 350 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly annual and perennial grasses, wild rose, and scattered ash trees. Dayton soils are associated with Amity and Concord soils.

In a typical profile, the surface layer is very dark grayish-brown silt loam about 7 inches thick. The subsurface layer is mottled dark-gray silt loam about 6 inches thick. The subsoil is mottled and consists of a layer of clay about 33 inches thick. It is dark gray in the upper part and is grayish brown in the lower part. The substratum is mottled grayish-brown silty clay loam that extends to a depth of 60 inches or more.

The Dayton soils are used mainly for small grains, pasture, hay, and grass grown for seed.

Dayton silt loam (Da).-This soil is on terraces, where it occupies small areas in drainageways and depressions. It is the only soil of the Dayton series mapped in the survey area.

Representative profile (SW1/4NE1/4 sec. 16, T. 6 S., R. 2 W.).

Ap-0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) when dry; few, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, fine, subangular blocky and granular structure; friable, hard, slightly sticky and slightly plastic; many roots; many, fine, interstitial pores; few, medium, black and red concretions; medium acid (pH 5.6); clear, smooth boundary. (5 to 9 inches thick.)

A2-7 to 13 inches, dark-gray (10YR 4/1) silt loam, gray (10YR 6/1) when dry; common, fine, faint, brownish-yellow (10YR 6/6) mottles; moderate, medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many roots; common, very fine, tabular pores; few black and red concretions; medium

acid (pH 5.8); abrupt. smooth boundary. (4 to 15 inches thick.)

IIB21t-13 to 25 inches, dark-gray (10YR 4/1) clay, gray (10YR 5/1) when dry; moderate, medium, prismatic structure breaking to coarse and medium, subangular blocky structure; very firm, very hard, very sticky and very plastic; few roots; few, fine, tubular pores; thick, continuous clay films; few black and red concretions; slightly acid (pH 6.4); gradual, smooth boundary. (10 to 24 inches thick.) .

IIB22t-25 to 46 inches, grayish-brown (10YR 5/2) clay, light brownish gray (10YR 6/2) when dry; few, fine, faint, yellowish-brown (10YR 5/6) mottles; massive; firm, very hard, very plastic and very sticky ; few roots; few, fine, tubular pores; slightly acid (pH 6.4); gradual, smooth boundary.

IIIC-46 to 60 inches, grayish-brown (2.5Y 5/2) silty clay loam, light brownish gray (2.5Y 6/2) when dry; common, medium, faint, light olive-brown (2.5Y 5/6) mottles; massive; friable, hard, sticky and plastic; few, fine, tubular pores; slightly acid (pH 6.2).

Color of the Ap horizon ranges from dark gray to very dark grayish brown when the soil is moist. and from light gray to light brownish gray when the soil is dry. Texture of the Ap horizon ranges from silt loam to silty clay loam.

Included with this soil in mapping were small areas of a Concord soil. The included areas make up as much as 5 percent of the acreage in the mapping unit.

The available water capacity above the clay subsoil is 3 to 6 inches. Permeability is very slow, and fertility is low. Runoff is very slow to ponded, and the hazard of erosion is slight. Roots can penetrate to the claypan, which is at a depth of only 12 to 24 inches. Workability is good, but this soil tends to puddle and compact if it is cultivated when too moist.

Undrained areas of this soil are used for small grains, pasture, hay, and grass grown for seed, and the drained areas are used for corn and for winter and spring small grains. When irrigated, this soil is used for sweet corn and bush beans. Even where it is drained, it is not suited to deep-rooted crops, many perennial crops, and crops that cannot tolerate excessive moisture. (Capability unit IVw1; not placed in a woodland suitability group)

Hazelair Series

The Hazelair series consists of moderately well drained soils that formed in material weathered from sandstone and shale. These soils have slopes of 2 to 20 percent. They are on foot slopes adjacent to the valley floor, at elevations of 250 to 650 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that have not been cultivated, the vegetation is mainly Oregon white oak, poison-oak, rose, annual weeds and grasses, and a few Douglas-firs. Hazelair soils are associated with Steiwer soils.

In a typical profile, the surface layer is very dark brown silt loam about 12 inches thick. The subsoil is very dark grayish-brown silty clay loam about 6 inches thick. The substratum, about 20 inches thick, is mottled and is dark grayish brown throughout. It is silty clay in the upper part and clay in the lower part. Sandstone bedrock is at a depth of about 38 inches.

The Hazelair soils are used as woodland and for small grains, pasture, hay, and grass grown for seed.

Hazelair silt loam, 2 to 6 percent slopes (HaB).This soil occupies small areas on the foot slopes of red foothills south of Salem. It also occurs near Scotts Mills.

Representative profile 40 feet south of a gravel road (NE1/4NE1/4 sec. 25, T. 9 S., R. 3 W)

Ap-0 to 6 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) when dry; weak, medium and fine, granular structure; friable, slightly hard, slightly sticky and slightly plastic; few roots; common, very fine and fine, tubular and interstitial pores; common, fine, rounded concretions or fragments of rock; medium acid (pH 5.8); abrupt, smooth boundary. (6 to 10 inches thick.)

A1-6 to 12 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) when dry; moderate, medium, subangular blocky structure breaking to strong, very fine, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; few roots; many, very fine and fine, tubular pores; common gray silt coatings on ped surfaces; medium acid (pH 5.6); clear, smooth boundary. (3 to 6 inches thick.)

B2-12 to 18 inches, very dark grayish-brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) when dry; weak, medium, prismatic structure breaking to strong, fine and very fine, subangular blocky structure; firm, hard, plastic and sticky; few roots; many, very fine and fine, tubular pores; slightly acid (pH 6.2); clear, smooth boundary. (3 to 10 inches thick.)

IIC1-18 to 28 inches, dark grayish-brown (2.5Y 4/2) silty clay, grayish brown (2.5Y 5/2) when dry; few, faint, dark yellowish-brown (10YR 4/4) and few, distinct, light brownish-gray (10YR 6/2) mottles; strong, medium, angular blocky structure; firm very hard, very sticky and very plastic; few fine roots; common, very fine, tubular pores; many slickensides; many, fine and very fine, black concretions; slightly acid (pH 6.2); gradual, wavy boundary. (5 to 10 inches thick.)

IIC2-28 to 36 inches, dark grayish-brown (2.5y 4/2) clay, grayish brown (2.5Y 5/2) when dry; many, medium and fine, distinct, dark yellowish-brown (10YR 4/4) and few, distinct, light brownish-gray (10YR 6/2) mottles; moderate, very coarse and coarse, angular blocky structure; firm, very hard, very sticky and very plastic; no roots; few, very fine, tubular pores; common slickensides; few fine fragments of weathered sandstone; slightly acid (pH 6.4 gradual, wavy boundary. (5 to 8 inches thick.)

IIC3-36 to 38 inches, dark grayish-brown (2.5Y 4/2) clay, grayish brown (2.5Y 5/2) when dry; many, medium and fine, distinct, yellowish-brown (10YR 4/4) mottles; weak to moderate, coarse, angular blocky structure; firm, very hard, very sticky and very plastic; few, very fine, tubular pores; common slickensides; common, fine, black concretions; many fine and medium fragments of weathered sandstone; slightly acid (pH 6.4) abrupt, slightly wavy boundary. (0 to 4 inches thick.)

IIIR-38 inches, dark yellowish-brown (10YR 4/4), hard, fractured, fine-grained sandstone that is horizontally bedded.

Texture of the A horizon ranges from silt loam to silty clay loam. Mottles that are faint or distinct are within 20 inches of the surface. Depth to the C horizon ranges from 12 to 24 inches.

Included with this soil in mapping were small stony areas, and other areas where bedrock is at a depth of 4 to 5 feet.

The available water capacity is 4 to 7 inches. Permeability is slow, and fertility is low. Runoff is slow, and the hazard of erosion is slight. The depth to which roots and water can penetrate is restricted by the layer of dense clay at some depth below 12 to 24 inches. Workability is fair. If this soil is cultivated when too moist, however, it tends to puddle and a tillage pan forms readily.

This soil is used mainly for small grains, pasture, hay, and grass grown for seed. It is not suitable for fruit trees and deep-rooted crops, unless it is irrigated. When this

soil is irrigated, small areas are used for pole beans, sweet corn, strawberries, and caneberries. (Capability unit IIIe-3 ; not placed in a woodland suitability group)

Hazelair silt loam, 6 to 20 percent slopes (HaD).-This soil has slopes of 6 to 12 percent in as much as 85 percent of the acreage. Runoff is medium, and erosion is a moderate hazard. Small grains, pasture plants, hay, and grass grown for seed are the main crops. (Capability unit IVe-2; not placed in a woodland suitability group)

Hazelair silty clay loam, 2 to 15 percent slopes, eroded (HcD2).-This soil has a profile similar to the one described for Hazelair silt loam, 2 to 6 percent slopes. It has lost as much as three-fourths of the original surface layer through erosion, however, and the present surface layer is very dark grayish-brown, slightly acid silty clay loam. Sheet erosion has caused most of the soil losses, but gully erosion has caused formation of a few shallow gullies. Runoff is medium, and further erosion is a moderate hazard. The available water capacity is only 2 to 3 inches.

Included with this soil in mapping were small areas in which slopes are steeper than 15 percent.

Areas of this Hazelair soil that have not been cleared are used mainly as woodland or for woodland pasture. The small areas that have been cleared are used for improved pasture. Because this soil is droughty, the amount of forage produced is small. (Capability unit VIe-1; not placed in a woodland suitability group)

Henline Series

The Henline series consists of well-drained very stony soils that have formed in colluvium from basalt or agglomerate. These soils have slopes of 6 to 80 percent. They occur on mountainous uplands at elevations of 3,000 to 5,000 feet. The average annual precipitation is 70 to 90 inches, the average annual air temperature is 41° to 45° F., and the length of the frost-free season is 90 to 110 days. The vegetation is mainly noble fir, hemlock, Douglas-fir, and an understory of blue huckleberry, Oregongrape, pathfinder, and beargrass.

In a typical profile, the surface layer is very dark brown very stony sandy loam about 10 inches thick. This is covered with a thin layer of decomposing plant remains. The substratum, just beneath the surface layer, is dark-brown very stony sandy loam. Bedrock of fractured basalt is at a depth of about 30 inches.

The Henline soils are used mainly for producing timber, and for watershed and wildlife habitat.

Henline very stony sandy loam, 6 to 30 percent slopes (HEE).-This soil is on foot slopes of the Cascade Mountains.

Representative profile 100 feet north of a logging road (SE1/4NE1/4 sec. 21, T. 9 S., R. 4 E.)

O1-1/2 inch to 0, patchy, partly decomposed plant and animal matter.

A1-0 to 10 inches, very dark brown (10YR 2/2) very stony sandy loam, dark grayish brown (10YR 4/2) when dry; very weak, coarse, subangular blocky structure; very friable, loose, nonsticky and nonplastic; many roots; many very fine pores; 60 to 70 percent coarse fragments; slightly acid (pH 6.4); diffuse, smooth boundary. (5 to 15 inches thick.)

C-10 to 30 inches, dark-brown (10YR 3/3) very stony sandy loam, brown (10YR 5/3) when dry; massive, readily breaking to single grain; very friable, loose, nonsticky and nonplastic; many roots; many interstitial pores; 60 to 70 percent coarse fragments; slightly acid (pH 6.4); clear, wavy boundary. (15 to 30 inches thick.)

IIR-30 inches, fractured basalt.

The content of coarse rock fragments in the soil profile ranges from 50 to 80 percent. In places part of the A horizon has granular structure. Depth to bedrock ranges from 20 to 40 inches.

Included with this soil in mapping were a few rock outcrops and small areas of Whetstone and Kinney soils. These included areas make up as much as 10 percent of the acreage in this mapping unit.

The available water capacity is 3 inches or less. Permeability is moderately rapid, and fertility is low. Runoff is medium, and the hazard of erosion is moderate. Roots can penetrate only to the basalt or agglomerate, at a depth of 20 to 40 inches.

This soil is well suited to forest trees, and it is used mainly for producing timber. It is too stony to be suitable for cultivated crops. (Capability unit VIs-1; woodland suitability group 3o2)

Henline very stony sandy loam, 30 to 55 percent slopes (HEF).-Steep slopes and rapid runoff make this soil highly susceptible to erosion. Rock outcrops are common, and there are a few escarpments.

This soil is used mainly for producing timber. It is more difficult to manage, however, than Henline very stony sandy loam, 6 to 30 percent slopes. Roads are hard to build and are difficult to maintain. (Capability unit VIs-1; woodland suitability group 3r3)

Henline very stony sandy loam, 55 to 80 percent slopes (HEG).-This soil is highly susceptible to erosion because of its very steep slopes and the very rapid runoff. Rock outcrops are numerous, and escarpments are common.

This soil is used mainly for producing timber, but management is extremely difficult. Roads are difficult to build and to maintain. (Capability unit VIIs-1; woodland suitability group 3r4)

Holcomb Series

The Holcomb series consists of somewhat poorly drained soils that are nearly level. These soils have formed mainly in mixed alluvial silts and clays, but they have some loess in the upper layers. They are on terraces. Elevations range from 125 to 350 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly grasses, wild blackberry, rose, and oak. Holcomb soils are associated with Amity and Dayton soils.

In a typical profile, the surface layer is silt loam about 18 inches thick. It is very dark brown in the upper part and is very dark grayish brown in the lower part. The subsurface layer is mottled, dark-brown light silty clay loam about 6 inches thick. The subsoil, about 18 inches thick, is mottled, dark grayish-brown clay in the upper part and is dark grayish-brown silty clay in the lower part.

The Holcomb soils are used mainly for small grains, pasture, hay, and grass grown for seed.

Holcomb silt loam (Ho).-This silty soil occupies small areas adjacent to drainageways on old alluvial terraces. It is the only soil of the Holcomb series mapped in the survey area.

Representative profile (SW1/4SW1/4SE1/4 sec. 4, T. 9 S., R. 2 W.) .

Ap-0 to 6 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) when dry; moderate, coarse, subangular blocky structure breaking to moderate, fine, granular structure; friable, slightly hard, slightly sticky and slightly plastic; many roots; many very fine pores; medium acid (pH 5.6); gradual, smooth boundary. (3 to 9 inches thick.)

A1-6 to 18 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) when dry; moderate, coarse, subangular blocky structure breaking to fine subangular blocky structure; friable, slightly hard, sticky and slightly plastic; many roots; many very fine pores; medium acid (pH 5.8); clear, smooth boundary. (9 to 15 inches thick.)

A2-18 to 24 inches, dark-brown (10YR 3/3) light silty clay loam, light brownish gray (10YR 6/2) when dry; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, fine subangular blocky structure; firm, hard, sticky and plastic; common roots; common fine pores; common grains of clean silt and sand on ped surfaces; slightly acid (pH 6.2); abrupt, smooth boundary. (2 to 7 inches thick.)

IIB2tg-24 to 34 inches, dark grayish-brown (10YR 4/2) clay, grayish brown (2.5Y 5/2) when dry; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, angular blocky structure breaking to strong, fine, angular blocky structure; very firm, very hard, very sticky and very plastic; few roots; few very fine pores; common thin clay films on ped surfaces; neutral (pH 6.6); clear, smooth boundary. (8 to 12 inches thick.)

IIB3tg-34 to 42 inches, dark grayish-brown (10YR 4/2) silty clay, grayish brown (10YR 5/2) when dry; weak, fine, angular blocky structure; firm, very hard, very sticky and very plastic; no roots; common very fine pores; common thin clay films on ped surfaces; common, medium, black concretions; neutral (pH 6.6).

When the soil is moist, color of the A1 horizon ranges from very dark brown to very dark grayish brown. Depth to the upper part of the B horizon ranges from 20 to 30 inches. In places the lower part of the B horizon is gravelly. In most places a gravelly substratum is within 5 feet of the surface.

Included with this soil in mapping were areas in which the surface layer is dark brown.

Within the root zone, the available water capacity is 4 to 6 inches. Permeability of the subsoil is very slow, and fertility is moderate. Runoff is slow, and erosion is only a slight hazard. Workability is good, but a tillage pan develops if this soil is cultivated when too moist. Roots can penetrate to depths of 20 to 30 inches.

This soil is well suited to small grains, pasture plants, hay, and grass grown for seed, and it is used mainly for those crops. Small areas are drained. When irrigated, these drained areas are used for pole beans, corn, and blackberries. (Capability unit IIIw-1; not placed in a woodland suitability group)

Horeb Series

The Horeb series consists of moderately well drained and well drained soils that have formed in glacial till and colluvium. These soils have slopes of 0 to 35 percent. They occur on terraces and on mountain foot slopes at elevations of 1,600 to 3,500 feet. The average annual precipitation is 70 to 90 inches, the average annual air temperature is 46° to 50° F., and the length of the frost-free season is 120 to 165 days. The vegetation is mainly Douglas-fir, vine maple, brackenfern, swordfern, huckleberry, and sedges. Horeb soils are associated with Kinney soils.

In a typical profile, the surface layer is loam that is very dark brown in the upper part and is very dark grayish brown in the lower part. This is covered with a thin layer of decomposing leaves, needles, and twigs. The subsoil is about 17 inches thick, and it consists of gravelly loam that is dark brown in the upper part and dark yellowish brown in the lower part. The upper part of the substratum is mottled, light olive-brown gravelly loam about 5 inches thick. The lower part of the substratum is mottled, dark grayish-brown cobbly loam that extends to a depth of 60 inches or more.

The Horeb soils are used mainly for growing timber, for watershed, and as habitat for wildlife.

Horeb loam, 2 to 20 percent slopes (HRD).-Some areas of this soil are on foot slopes of the Cascade Mountains. Others occupy old slide or slip, areas in these mountains.

Representative profile (NE1/4NW1/4 sec. 15, T. 9 S., R. 3 E.).

O1-2 inches to 0, organic litter consisting of needles, fern leaves, twigs, and other residue from plants.

A11-0 to 9 inches, very dark brown (10YR 2/2) loam, dark gray (10YR 4/1) when dry; moderate, fine, granular structure; very friable, slightly hard, nonsticky and nonplastic; many, fine and very fine, interstitial pores; many roots; 5 percent fine and medium pebbles; strongly acid (pH 5.2); gradual, wavy boundary. (6 to 12 inches thick.)

A12-9 to 14 inches, very dark grayish-brown (10YR 3/2) loam, brown (10YR 5/3) when dry; moderate, fine, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many, fine and very fine, interstitial pores; many roots; 10 percent fine and medium pebbles; strongly acid (pH 5.4); clear, wavy boundary. (4 to 7 inches thick.)

B21-14 to 24 inches, dark-brown (10YR 4/3) gravelly loam, light yellowish brown (10YR 6/4) when dry; moderate, fine subangular blocky structure; friable, hard, slightly sticky and slightly plastic; common roots; common very fine pores; 20 percent pebbles; very strongly acid (pH 4.8); clear, wavy boundary. (8 to 14 inches thick.)

B22-24 to 31 inches, dark yellowish-brown (10YR 4/4) gravelly loam, light yellowish brown (10YR 6/4) when dry; weak, medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; few roots; many very fine pores; 25 percent pebbles; very strongly acid (pH 4.8); clear, wavy boundary. (5 to 10 inches thick.)

C1-31 to 36 inches, light olive-brown (2.5Y 5/4) gravelly loam that contains common, medium, distinct, yellowish-brown (10YR 5/6) mottles; pale yellow (2.5Y 8/4) when dry; weak, coarse, subangular blocky structure or massive; friable, slightly hard, slightly sticky and slightly plastic; few roots; common very fine pores; 25 percent pebbles; very strongly acid (pH 4.8); clear, wavy boundary. (4 to 8 inches thick.)

C2-36 to 60 inches, dark grayish-brown (2.5Y 4/2) cobbly loam that contains common, medium, distinct, yellowish-brown (10YR 5/6) mottles; pale yellow (2.5Y 8/4) when dry; massive; firm, hard, sticky and plastic; few roots; many very fine and few medium pores; 15 percent pebbles, and 20 percent cobblestones; very strongly acid (pH 4.8).

Texture of the A horizon ranges to silt loam in some places. Color of the B horizon ranges from dark brown to dark yellowish brown. In some areas as much as 15 percent of the solum consists of fragments coarser than 3 inches in diameter. Thick ness of the solum ranges from 24 to 40 inches. Below a depth of 40 inches, the soil material is cobbly loam to very gravelly sand and the content of coarse fragments ranges from 25 to 85 percent.

Included with this soil in mapping were small areas of a steep Kinney soil, and areas that lack a cobbly or gravelly substratum.

The available water capacity is 5 to 7 inches. Permeability is moderate, and fertility is low. Runoff is medium, and the hazard of erosion is slight to moderate. This soil receives extra water that seeps from higher areas. Depth to which roots can penetrate is restricted by wetness caused by seepage and by the cobblestones and gravel in the substratum. Workability is good.

This soil is fairly well suited to use as woodland, and it is especially well suited to Douglas-fir. It is also suited to cultivated crops. (Capability unit IIIe-2; woodland suitability group 1o1)

Horeb gravelly silt loam, gravelly substratum, 0 to 15 percent slopes (HSC).-This is a well-drained soil on terraces. The depth to which roots can penetrate is restricted to about 40 inches by the very gravelly sand in the substratum. Runoff is slow, and the hazard of erosion is slight. Workability is fair.

Included with this soil in mapping were small areas where material from adjacent higher areas has been deposited on the surface of this soil. These included areas have a reddish color.

This Horeb soil is well suited to forest trees. It is used mainly for growing Douglas-fir, but small areas have been cleared and are used for pasture. Small grains, hay, berries, and vegetables could be grown. (Capability unit IIIe-4; woodland suitability group 2c1)

Horeb gravelly silt loam, gravelly substratum, 15 to 35 percent (HSE).-This soil is on abrupt breaks of terrace fronts. Runoff is rapid, and the hazard of erosion is moderate to severe. Included in mapping in some places were a few, small, very gravel-, and cobbly areas.

This Horeb soil is used mainly for growing Douglas-fir. It is poorly suited to many of the commonly grown cultivated crops, but it can be used for small grains and pasturc. (Capability unit IVe-1; woodland suitability group 2c1)

Hullt Series

The Hullt series consists of well-drained soils that have formed in colluvium derived from sandstone. These soils have slopes of 2 to 60 percent. They occur on the margins of mountainous foot slopes at elevations of 800 to 1,200 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 49° to 51° F., and the length of the frost-free season is 165 to 190 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, hemlock, maple, brackenfern, salal, ocean-spray, hazel, snowberry, thimbleberry, strawberry, and trailing blackberry. Hullt soils are associated with Nekia and McCully soils.

In a typical profile, the surface layer is very dark brown clay loam about 9 inches thick. The subsurface layer is variegated dark-brown clay loam about. 6 inches thick. The subsoil is about 40 inches thick and is silty clay loam throughout. The upper part of the subsoil consists of a layer that is dark reddish brown and that is underlain by a layer that is reddish brown; the middle part of the subsoil is yellowish red; and the lower part is dark brown The substratum is variegated strong-brown to yellowish red, strongly weathered sandstone.

The Hullt soils are used mainly for small grains, pasture, hay, grass grown for seed, trees that grow in wooded areas, acid watershed.

Hullt clay loam, 2 to 7 percent slopes (HuB).-This soil is on the lower foot slopes of the Cascade Mountains.

Representative profile (SW1/4NE1/4 sec. 26, T. 6 S., R. 1 E.).

Ap-0 to 9 inches, very dark brown (7.5YR 2/2) clay loam, dark brown (7.5YR 4/4) when dry; weak, coarse and medium, subangular blocky structure breaking to weak, very fine, subangular (blocky structure; friable, hard, sticky and plastic; many roots; many very fine pores; few, very fine, black and reddish-colored concretions; medium acid (pH 5.8); abrupt, wavy boundary. (8 to 10 inches thick.)

A3-9 to 15 inches, variegated dark-brown (7.5YR 3/2 and 3/4) clay loam, brown (7.5YR 4/4) when dry; weak, coarse, prismatic structure breaking to weak, fine and very fine, subangular blocky structure; friable, hard, sticky and plastic; many roots; many, fine and very fine, tubular pores; common worm casts; strongly acid (pH 5.4); clear, smooth boundary. (0 to 8 inches thick.)

B1-15 to 22 inches, dark reddish-brown (5YR 3/4) silty clay loam, reddish brown (5YR 4/4) when dry; weak, coarse and medium, subangular blocky structure; friable, hard, sticky and very plastic; common roots; many, very fine and few, fine, tubular pores; strongly acid (pH 5.4); clear, smooth boundary. (5 to 9 inches thick.)

B21-22 to 33 inches, reddish-brown (5YR 4/4) silty clay loam, reddish brown (5YR 5/4) when dry; weak, medium, subangular blocky structure; friable, hard, sticky and very plastic; common roots; common fine and very fine pores; very strongly acid (pH 5.0); clear, smooth boundary. (9 to 13 inches thick.)

B22-33 to 46 inches, yellowish-red (5YR 4/6) silty clay loam, yellowish red (5YR 5/6) when dry; weak, medium and fine, subangular blocky structure; firm, very hard, sticky and very plastic; few roots; common, fine and very fine, tubular pores; very strongly acid (pH 5.0); gradual, smooth boundary. (10 to 16 inches thick.)

B3--46 to 55 inches, dark-brown (7.5YR 4/4) silty clay loam, strong brown (7.5YR 5/6) when dry; common, faint, medium and coarse, reddish-brown (5YR 4/4) mottles; weak, coarse, subangular blocky structure; firm, hard, sticky and very plastic; few roots; common, fine and very fine, tubular pores; few, black, medium stains; very strongly acid (pH 5.0); clear, wavy boundary. (6 to 20 inches thick.)

C-55 inches, variegated strong-brown (7.5YR 5/6 and 5/8), pinkish-gray (7.5YR 6/2), and yellowish-red (5YR 4/6), strongly weathered sandstone; massive; clay films along fractures; very strongly acid (pH 4.8).

Color of the horizon ranges from very dark brown to dark reddish brown. In places the A horizon is silty clay loam. Depth to weathered sandstone ranges from 40 to 60 inches.

Included with this soil in mapping were small eroded areas, where weathered sandstone is less than 30 inches from the surface. These areas make up about 5 percent of the acreage in this mapping unit. Also included were small areas of Nekia and McCully soils that make up from 5 to 10 percent of the acreage in the mapping unit.

The available water capacity is 8 to 10 inches. Permeability is moderately slow, and fertility is low. Runoff is slow, and the hazard of erosion is slight. The depth to which roots can penetrate ranges from 40 to 60 inches. Workability is fair, but it becomes progressively poorer as the content of moisture drops below field capacity.

This soil is well suited to most of the crops commonly grown in the survey area. It is used mainly for small grains, pasture, hay, and grass grown for seed, and it is also used as woodland. In addition, a small acreage is used for

pole beans, sweet corn, caneberries, strawberries, and specialty crops. Irrigation is needed if pole beans and sweet corn are to be grown commercially. (Capability unit IIe-3; woodland suitability group 2o1)

Hullt clay loam, 7 to 20 percent slopes (HuD).-In about 60 percent of the acreage, this soil has slopes steeper than 12 percent. Runoff is medium, and erosion is a moderate hazard.

This soil is used for about the same crops as Hullt clay loam, 2 to 7 percent slopes, except that sweet corn is not grown. Tilling of row crops is difficult, and using mechanical methods for harvesting berries and vegetables is not feasible. (Capability unit IIIe-2; woodland suitability group 2o1)

Hullt clay loam, 2 to 20 percent slopes (HTD).-Runoff from this soil is medium, and the hazard of erosion is moderate. Where cleared, this soil is suitable for cultivated crops. It is used mainly as woodland. (Capability unit. IIIe-2; woodland suitability group 2o1)

Hullt clay loam, 20 to 30 percent slopes (HTE).-Runoff from this soil is rapid, and the hazard of erosion is severe. This soil is used mainly as woodland and for small grains, pasture, hay, and grass grown for seed. Small areas are also used for strawberries and cherries. Cultivating and harvesting most crops is difficult. (Capability unit IVe-1; woodland suitability group 2o1)

Hullt clay loam, 30 to 60 percent slopes (HTF).-Runoff from this soil is rapid, and the hazard of erosion is severe. This soil is not suitable for cultivated crops. It is used mainly for pasture, as woodland, and for grass grown for seed. (Capability unit VIe-2; woodland suitability group 2c2)

Jory Series

The Jory series consists of well-drained soils that have formed in colluvium from tuffs and basalt. These soils are on low, red foothills that are deeply dissected by drainageways and streams. They have slopes of 2 to 30 percent. Elevations range from 300 to 1,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, scattered Oregon oaks, and an understory of poison-oak and rose bushes. Jory soils are associated with Nekia soils.

In a typical profile, the surface layer is dark reddish-brown silty clay loam about 8 inches thick. The subsurface layer is also dark reddish-brown silty clay loam and is about 7 inches thick. The upper part of the subsoil consists of a layer of dark reddish-brown silty clay about 21 inches thick. The lower part of the subsoil is dark reddish-brown clay. Basalt is at a depth of more than 5 feet.

The Jory soils are used for small grains, orchards, pasture, hay crops, and grass grown for seed, and they are also used as woodland, for watershed, for wildlife habitat, and as homesites. Some areas are irrigated and are used for truck crops and vegetables.

Jory silty clay loam, 2 to 7 percent slopes (JoB).-This soil is on low foothills south and east of Salem.

Representative profile west of the Salem bypass (U.S. No. 99) and south of the secondary road running east from Grabenhorst Corners (NW1/4NW1/4NE1/4 sec. 13, T. 8 S., R. 3 W.; profile No. 1 in table 9 in the section "Laboratory Data.")

Ap1-0 to 4 inches, dark reddish-brown (5YR 3/3) silty clay loam, reddish brown (5YR 4/3) when dry; strong, medium and fine, granular structure; very friable, slightly hard, plastic and sticky; common, soft, fine, spherical pellets (shot); common roots; many, fine and very fine, interstitial pores; medium acid (pH 5.9); clear, smooth boundary. (4 to 8 inches thick.)

Ap2-4 to 8 inches, dark reddish-brown (5YR 3/3) silty clay loam, color the same when dry; weak, fine and very fine, subangular blocky structure; friable, slightly hard, sticky and plastic; few, soft, fine, spherical pellets; common roots; many, fine and very fine, interstitial pores; strongly acid (pH 5.5); clear, smooth boundary. (4 to 12 inches thick.)

A3--8 to 15 inches, dark reddish-brown (5YR 3/3) silty clay loam, color the same when dry; moderate, fine and very fine, subangular blocky structure: friable, slightly hard, very sticky and very plastic; few, soft, fine, spherical pellets; common roots; many, fine and very fine, interstitial and tubular pores; strongly acid (pH 5.5); gradual, smooth boundary. (4 to 7 inches thick.)

B1t-15 to 20 inches, dark reddish-brown (5YR 3/4) silty clay, reddish brown (5YR 4/3) when dry; moderate, fine, angular blocky structure breaking to strong, very fine, angular blocky structure; friable, hard, very sticky and very plastic; thin, continuous clay films; common roots; many, very fine, tubular pores; strongly acid (pH 5.2); gradual, smooth boundary. (0 to 8 inches thick.)

B21t-20 to 28 inches, dark reddish-brown (5YR 3/4) silty clay, reddish brown (5YR 4/3) when dry; moderate, medium and fine, angular blocky structure; friable, hard, very sticky and very plastic; thin, continuous clay films; common roots; many, very fine, tubular pores; very strongly acid (pH 5.0); clear, smooth boundary. (6 to 15 inches thick.)

B22t-28 to 36 inches, dark reddish-brown (5YR 3/4) silty clay, reddish brown (5YR 4/3) when dry; moderate, medium and fine, angular blocky structure; friable, hard, very sticky and very plastic; thin, continuous clay films; few black splotches 1 to 3 millimeters in diameter; few roots; many, very fine, tubular pores; very strongly acid (pH 4.9); clear, smooth boundary. (8 to 20 inches thick.)

B23t-36 to 50 inches, dark reddish-brown (2.5YR 3/4) clay, reddish brown (2.5YR 4/4) when dry; strong, fine and very fine, angular blocky structure; very firm, very hard, plastic and sticky; common black splotches and concretions 3 to 8 millimeters in diameter; thin, continuous clay films; very few roots; many, very fine, tubular pores; very strongly acid (pH 4.9) ; gradual, smooth boundary. (10 to 20 inches thick.)

B24t-50 to 63 inches, dark reddish-brown (2.5YR 3/4) clay, reddish brown (2.5YR 4/4) when dry; moderate, fine. angular blocky structure; firm, hard, plastic and sticky; few black splotches 3 to 8 millimeters in diameter; thin, continuous clay films; very few roots; many, very fine, tubular pores; very strongly acid (pH 4.9).

Thickness of the A horizon ranges from 12 to 20 inches. Color of the B horizon ranges from dark reddish brown to dark red. The content of clay in the B horizon ranges from about 40 to 60 percent, but the soil material has a coarser feel when rubbed between the fingers. In some places these soils contain a discontinuous stone line at a depth of 2 to 12 feet. In places a few basalt boulders are in all parts of the profile.

Included with this soil in mapping were small areas of a Nekia soil.

The available water capacity is 7 to 10 inches. Permeability is moderately slow, and fertility is moderate. Runoff is slow, and erosion is only a slight hazard. Roots can penetrate to a depth of 5 feet or more. Workability is fair, but it becomes progressively poorer when the content of moisture drops below field capacity.

This soil is used mainly for small grains, orchards (fig. 7), pasture, hay, and grass grown for seed, but a small acreage is used for strawberries, pole beans, sweet corn, caneberries, and specialty crops. When irrigated, this soil is used for most of the crops commonly grown in the survey area. Water for irrigation is obtained from reservoirs and ponds. (Capability unit IIe-3; woodland suitability group 3c1)

Jory silty clay loam, 7 to 12 percent slopes (JoC).-In most places this soil has slopes steeper than 9 percent. Runoff is medium, and the hazard of erosion is moderate. This soil is used for about the same crops as Jory silty clay loam, 2 to 7 percent slopes. (Capability unit IIIe-6; woodland suitability group 3c1)

Jory silty clay loam, 12 to 20 percent slopes (JoD).Runoff from this soil is medium, and erosion is a moderate hazard. This soil is used for about the same crops as Jory silty clay loam, 2 to 7 percent slopes. Sweet corn is not grown, however, because of the difficulty of using machinery for harvesting the crop. (Capability unit IIIe-2; woodland suitability group 3c1)

Jory silty clay loam, 20 to 30 percent slopes (JoE).Runoff from this soil is rapid. The hazard of erosion is severe. This soil is used mainly for small grains, pasture, hay, and grass grown for seed, but a small acreage is used for strawberries, for cherries, and as woodland. (Capability unit IVe-1; woodland suitability group 3cl)

Kinney Series

The Kinney series consists of well-drained soils that have formed in glacial till over basic igneous tuffaceous agglomerate. These soils have slopes of 2 to 70 percent. They occur on mountain foot slopes at elevations of 1,000 to 3,500 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is 46° to 50° F., and the length of the frost-free season is 120 to 165 days. The vegetation is mainly Douglas-fir, hemlock, alder, Oregongrape, salal, vine maple, and rhododendron. Kinney soils are associated with Horeb, McCully, and Henline soils.

In a typical profile, the surface layer is very dark brown cobbly loam about 10 inches thick. This is covered by a thin layer of partly decomposed ferns, fir needles, leaves, and twigs, and by a thin layer of well-decomposed, black organic matter. The subsoil is about 30 inches thick. It consists of dark-brown cobbly clay loam in the upper part and of dark yellowish-brown cobbly clay loam in the lower part. The substratum is dark yellowish-brown cobbly loam about 13 inches thick. It is underlain by variegated light olive-brown to dark-red, weathered, basic igneous agglomerate.

The Kinney soils are used mainly for growing timber and for watershed.

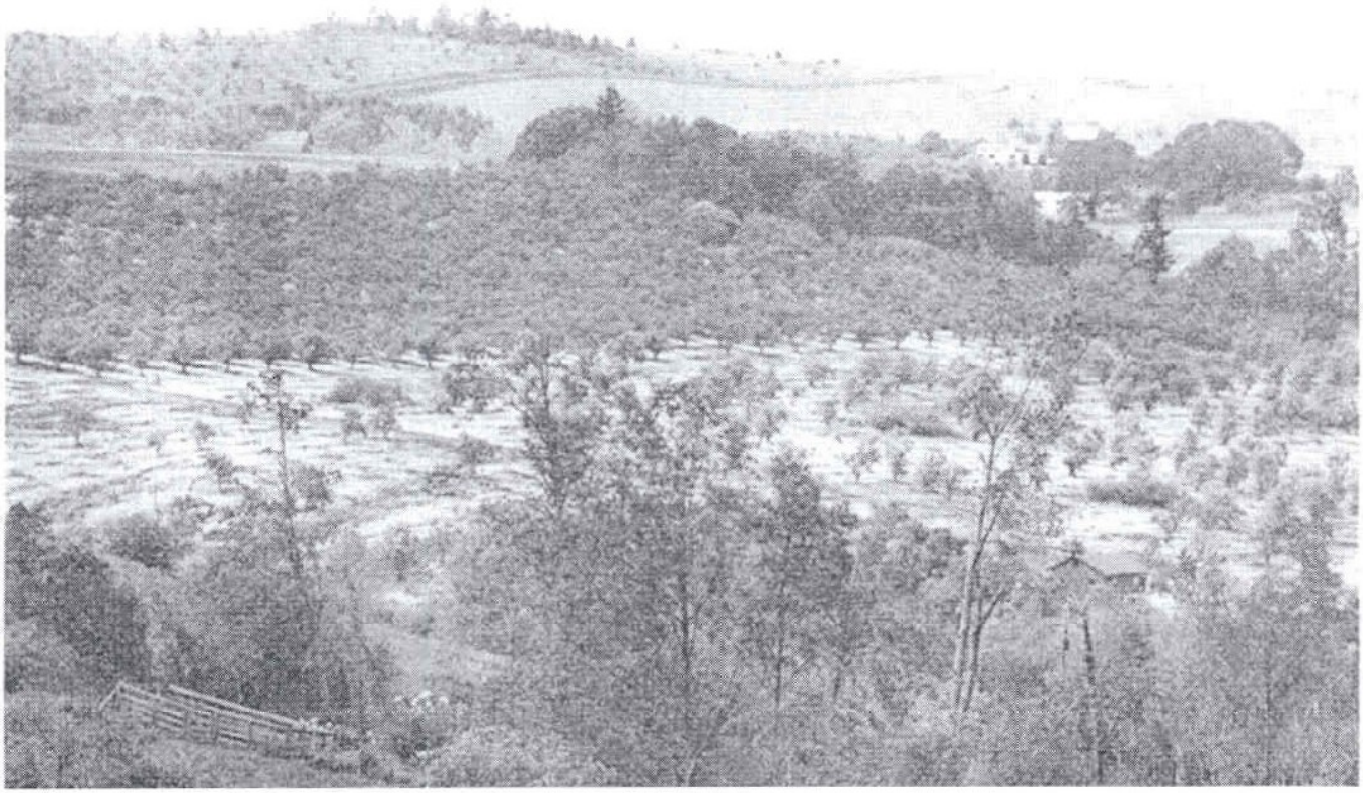


Figure 7.-Orchard on Jory silty clay loam , 2 to 7 percent slopes, in the Salem Hills.

Kinney cobbly loam, 2 to 20 percent slopes (KCD).This soil occupies broad ridges on foot slopes of the Cascade Mountains.

Representative profile about 3 miles southeast of South Burn Guard Station; 60 feet north of South Burn Road (NW1/4NE1/4SE1/4 sec. 31, T. 8 S., R. 2 E.)

O1-2 inches to 1 inch, partly decomposed fern leaves, fir needles, other leaves, and twigs.

O2-1 inch to 0, well-decomposed, black, friable organic matter.

A11-0 to 4 inches, very dark brown (10YR 2/2) cobbly loam, dark brown (10YR 4/3) when dry; moderate, fine, granular structure; friable, slightly hard, slightly sticky and slightly plastic; many fine and medium roots; many, fine, interstitial pores; many medium and fine particles of shot; 25 percent pebbles and angular cobble-size fragments; strongly acid (pH 5.3); clear, smooth boundary. (4 to 6 inches thick.)

A12-4 to 10 inches, very dark brown (10YR 2/2) cobbly loam, dark brown (10YR 4/3) when dry; moderate, medium and fine, granular structure; friable, slightly hard, slightly sticky and slightly plastic; many fine roots; many, fine, interstitial pores; many medium and fine particles of shot; 25 percent pebbles and angular cobble-size fragments; Strongly acid (pH 5.1); abrupt, wavy boundary. (4 to 6 inches thick.)

B1-10 to 15 inches, dark-brown (10YR 3/3) cobbly clay loam, dark brown (10YR 4/3) when dry; weak, fine, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many medium roots; many, very fine, tubular pores; thin, patchy cutans; many medium and fine particles of shot; 30 percent coarse fragments; strongly acid (pH 5.5); clear, wavy boundary. (2 to 6 inches thick.)

B21-15 to 20 inches, dark-brown (7.5YR 3/4) cobbly clay loam, brown (7.5YR 5/4) when dry; weak, medium, subangular blocky structure; friable, slightly hard, sticky and plastic; common roots; many, very fine, tubular pores; thin, continuous cutans on peds, and thin, continuous clay films in root channels and in the larger pores, many, coarse, sand-size particles of material that resembles quartz; 30 percent pebbles and angular cobblestones; very strongly acid (pH 4.6); gradual, smooth boundary. (4 to 20 inches thick.)

B22-20 to 40 inches, dark yellowish-brown (10YR 4/4) cobbly clay loam, yellowish brown (10YR 5/4) when dry; weak, coarse and medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; common roots; many, very fine, tubular pores; moderately thick clay films in some of the larger pores; common, coarse, sand-size particles of material that resembles quartz; 35 percent pebbles and angular, cobble-size fragments of rock; very strongly acid (pH 4.6); clear, wavy boundary. (10 to 25 inches thick.)

C-40 to 53 inches, dark yellowish-brown (10YR 4/4) cobbly loam, light yellowish brown (10YR 6/4) when dry; massive or very weak, medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; few roots; many very fine pores; many, coarse, sand-size particles of material that resembles quartz; 35 percent pebbles and angular, cobble-size fragments of rock; very strongly acid (pH 4.8); abrupt, irregular boundary. (0 to 13 inches thick.)

IIR-54 inches, variegated light olive-brown (2.5Y 5/4), pale yellow (2.5Y 7/4), yellow (2.5Y 7/6), and dark-red (2.5YR 3/6), highly weathered, basic igneous agglomerate; very strongly acid (pH 4.8).

The A horizon is dark brown in some places. The predominant color of the B2 horizon is dark yellowish brown, but the color ranges to strong brown or slightly redder in some areas. Thickness of the solum ranges from 40 to 60 inches, but it is generally between 40 and 48 inches. In places pebbles, cobblestones, and other stones constitute as much as 25 to 50 percent of the solum. The upper part of the profile contains pumice in some areas. Weathered basic igneous agglomerate is at a depth of only 40 to 60 inches in many places, but it is at a much greater depth in some places where the layer of till is many feet thick. Rock crops out in some areas.

Included with this soil in mapping were small areas of McCully and Horeb soils. These included areas make up less than 5 percent of the acreage in the mapping unit.

The available water capacity is 5 to 9 inches. Permeability and fertility are both moderate. Runoff is medium, and erosion is only a slight hazard. Depth to which roots can penetrate ranges from 40 to 60 inches.

This soil is used mainly for growing Douglas-fir to which it is well suited. It is not suited to field crops. (Capability unit VIe-2; woodland suitability group 3o1)

Kinney cobbly loam, 20 to 50 percent slopes (KCF).This soil contains more rock outcrops than Kinney cobbly loam, 2 to 20 percent slopes. Bedrock commonly crops out along slope breaks between the two soils. Runoff is rapid, and the hazard of erosion is moderate to severe.

This soil is used and is managed about the same as Kinney cobbly loam, 2 to 20 percent slopes. (Capability unit VIe-2; woodland suitability group 3r1)

Kinney cobbly loam, 50 to 70 percent slopes (KCG).Runoff from this soil is very rapid. The hazard of erosion is very severe.

This soil is used in about the same way as Kinney cobbly loam, 2 to 20 percent slopes. It is not managed, except to harvest the natural stands of timber. Constructing logging roads and performing logging operations are difficult. (Capability unit VIIe-1; woodland suitability group 3r2)

Labish Series

The Labish series consists of poorly drained soils that have formed in mixed mineral and organic material. These soils have slopes of 0 to 1 percent. They occur on the bottoms of former shallow lakes at elevations of 150 to 175 feet. The average annual precipitation is between 40 and 45 inches, the average annual air temperature is 53° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly sedges, tussocks, and . willows. Labish soils are associated with Semiahmoo soils.

In a typical profile the surface layer is black and is about 7 inches tick. It consists of silty clay loam in the upper part and of silty clay in the lower part. The next layer is very dark brown silty clay about 9 inches thick. Below this is very dark gray clay that extends to a depth of 60 inches or more.

The Labish soils are used mainly for onions, small grains, pasture, and hay.

Labish silty clay loam (La).-This is the only soil of the Labish series mapped in the survey area. Nearly all of the acreage is in Lake Labish Bottom and in intermittent drainageways that have their outlets in Lake Labish Bottom.

Representative profile (NE1/4SW1/4 sec. 14, T. 6 S., R. 2 W.)

Ap1-0 to 3 inches, black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) when dry; strong, fine, granular structure; friable, very hard, sticky and plastic; many roots; many, fine, interstitial pores; slightly acid (pH 6.4); abrupt, smooth boundary. (3 to 6 Inches thick.)

Ap2-3 to 7 inches, black (10YR 2/1) silty clay, very dark gray (10YR 3/1) when dry; weak, coarse, subangular blocky structure; firm, very hard, sticky and plastic; com-

mon roots; many, fine and medium, tubular pores; medium acid (pH 5.6); abrupt, smooth boundary. (3 to 5 inches thick.)

AC1g-7 to 16 inches, very dark brown (10YR 2/2) silty clay, very dark gray (10YR 3/1) when dry; moderate, coarse, prismatic structure; firm, very hard, very sticky and very plastic; few roots; common, very fine, tubular pores; very strongly acid (pH 4.8); clear, smooth boundary. (7 to 11 inches thick.)

AC2g-16 to 30 inches, very dark gray (N 3/0) clay, very dark gray (N 3/0) when dry; weak, coarse, prismatic structure, massive when wet; very firm, extremely hard, very sticky and very plastic; few very fine pores; common fibrous roots; very strongly acid (pH 4.6); gradual, smooth boundary. (11 to 17 inches thick.)

C1g-30 to 48 inches, very dark gray (N 3/0) clay, very dark gray (N 3/0) when dry; massive; very firm, extremely hard, very sticky and very plastic; few very fine pores; common, medium-sized, light-colored, porous, soft fragments; very strongly acid (pH 4.6); abrupt, smooth boundary. (5 to 25 inches thick.)

C2g-48 to 60 inches, very dark gray (5Y 3/1) clay, dark gray (5Y 4/1) when dry; massive; very firm, extremely hard, very sticky and very plastic; few very fine pores; neutral (pH 7.0).

In most places the content of organic matter in the A horizon is between 10 and 25 percent. The content of organic matter is so high in some places, however, that the A horizon is almost muck. In a few places, thin layers of peat are within 5 feet of the surface.

Included with this soil in mapping were small areas of Wapato and Semiahmoo soils.

The available water capacity is 12 to 15 inches. Permeability is slow, and fertility is high. Workability is only fair. Runoff is very slow to ponded, and erosion is not a hazard or is only a slight hazard. Depth to which roots can penetrate is limited by the high water table. Annual flooding is a hazard to crops.

This soil is used mainly for onions, small grains, pasture, and hay. When irrigated, drained areas are used for vegetables and specialty crops. (Capability unit IIIw-2; not placed in a woodland suitability group)

McAlpin Series

The McAlpin series consists of moderately well drained and somewhat poorly drained soils that have formed in mixed alluvium. These soils are on alluvial fans and alluvial bottoms of small streams and in drainageways that traverse the low foothills. They have slopes of 0 to 6 percent. Elevations range from 250 .to 1,000 feet. The average annual precipitation is between 40 and 60 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, with some ash, rosebush, and grasses. McAlpin soils are associated with Abiqua and Waldo soils.

In a typical profile, the surface layer is dark-brown silty clay loam about 8 inches thick. The subsurface layer is dark reddish-brown silty clay loam about 6 inches thick. The subsoil is dark reddish-brown silty clay loam in the upper part; mottled, dark reddish-brown silty clay in the middle part; and mottled, dark-brown silty clay in the lower part. It extends to a depth of 65 inches or more.

The McAlpin soils are used mainly for small grains, hay, pasture, and grass grown for seed.

McAlpin silty clay loam, 0 to 3 percent slopes (MaA).This soil is along streams and intermittent drainageways of the Salem, Waldo, and Silverton Hills. The areas are small.

Representative profile 425 feet east and 270 feet north of a road intersection (SE1/4NW1/4SE1/4 sec. 17, T. 9 S., R. 2 W.) .

Ap1-0 to 5 inches, dark-brown (7.5YR 3/2) silty clay loam, brown (7.5YR 4/2) when dry; moderate, fine and very fine, granular structure; friable, slightly hard, slightly plastic and slightly sticky; many roots; many interstitial pores, few, medium and fine, reddish-brown concretions; strongly acid (pH 5.5); abrupt, smooth boundary. (4 to 8 inches thick.)

Ap2-5 to 8 inches, dark-brown (7.5Y 3/2) silty clay loam , brown (7.5YR 4/4) when dry; massive; very firm, hard, slightly plastic and slightly sticky; common roots; few very fine pores; few, medium and fine, reddish-brown concretions; medium acid (pH 5.6); clear, smooth boundary. (0 to 4 inches thick.)

A3-8 to 14 inches, dark reddish-brown (5YR 3/3) silty clay loam, reddish brown (5YR 4/3) when dry; weak, coarse, prismatic structure breaking to moderate, coarse and fine, granular structure; friable, slightly hard, slightly plastic and slightly sticky; few roots; many, very fine, tubular pores; common, medium and fine, reddish-brown concretions; medium acid (pH 5.7); gradual, smooth boundary. (3 to 9 inches thick.)

B1-14 to 23 inches, dark reddish-brown (5YR 3/3) silty clay loam, reddish brown (5YR 4/4) when dry; weak, coarse, prismatic structure breaking to moderate, medium and fine, subangular blocky structure; friable, hard, plastic and sticky; few roots; many, very fine, tubular pores; thin, very dark brown coatings on ped surfaces; common, medium and fine, reddish-brown concretions; medium acid (pH 5.8); gradual, smooth boundary. (6 to 12 inches thick.)

B21-23 to 37 inches, dark reddish-brown (5YR 3/4) silty clay, reddish brown (5YR 4/4) when dry; common, fine, faint mottles; weak, coarse, prismatic structure breaking to moderate, medium and fine, subangular blocky structure; firm, hard, plastic and sticky; few roots; many, very fine, tubular pores; thin, very dark brown coatings on ped surfaces and in pores; common, fine and medium, black and reddish-brown concretions; medium acid (pH 5.9); gradual, smooth boundary. (9 to 15 inches thick.)

B22-37 to 51 inches, dark-brown (7.5YR 3/2) silty clay, brown (7.5YR 5/2) when dry; common, medium and fine, faint, brown (10YR 5/3 and 7.5YR 5/2) and gray (10YR 5/1) mottles when moist; moderate, fine, subangular blocky structure; firm, hard, very plastic and very sticky; few roots; many, fine and very fine, tubular pores; thick, dark coatings in root channels and in wormholes; common, fine and medium, black and reddish-brown concretions; medium acid (pH 5.9); clear, smooth boundary. (12 to 16 inches thick.)

B3-51 to 65 inches, dark-brown (7.5YR 4/2) silty clay, brown (7.5YR 5/4) when dry; many, coarse and medium, distinct mottles of light yellowish brown (10YR 6/4), brown (10YR 5/3), and strong brown (7.5YR 5/8) when moist; moderate, fine subangular blocky structure; firm, hard, very plastic and very sticky; many, very fine and fine, tubular pores; many, fine and medium, black and reddish-brown concretions; medium acid (pH 5.9).

Color of the A horizon ranges from dark brown or very dark brown to dark reddish brown. Color of the B horizon ranges from dark reddish brown. In places the B horizon contains faint mottles below a depth of 20 inches and distinct mottles below a depth of 30 inches. In some areas a few pebbles are scattered throughout the solum.

Included with this soil in mapping were small areas of Abiqua and Waldo soils. These included soils make up less than 5 percent of the acreage in the mapping unit.

The available water capacity is 9 to 11 inches. Permeability is moderately slow, and fertility is moderate. Runoff is slow, and erosion is not a hazard or is only a slight

hazard. Depth to which roots can penetrate is restricted by a seasonal high water table. Workability is fair.

When not irrigated, this soil is used for small grains, hay, pasture, and grass grown for seed. When irrigated, it is used for all the crops commonly grown in the survey area, except potatoes and carrots. This soil is well suited to most of the commonly grown crops, but drainage is needed for deep-rooted crops. Outlets for drainage are adequate in most places, and this soil can be readily drained. (Capability unit IIw-1; not placed in a woodland suitability group)

McAlpin silty clay loam, 3 to 6 percent slopes (MaB).This soil receives runoff from higher areas, and as a result, additional soil material is deposited on its surface. Runoff is medium, and the hazard of erosion is moderate.

About the same kinds of crops are grown on this soil as are grown on McAlpin silty clay loam, 0 to 3 percent slopes: (Capability unit IIe-1; not placed in a woodland suitability group)

McBee Series

The McBee series consists of moderately well drained, undulating soils that formed in mixed alluvium. These soils have slopes of 0 to 3 percent. They occur on flood plains that are traversed by sloughs and old overflow channels. Elevations range from 100 to 650 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, alder, ash, big-leaf maple, oak, and an understory of vine maple, blackberry, shrubs, and grasses. McBee soils are associated with Wapato and Chehalis soils.

In a typical profile, the surface layer is very dark brown silty clay loam about 10 inches thick. The subsoil is about 32 inches thick and is mottled throughout. It is very dark brown silty clay loam in the upper part; dark brown, very dark brown, and very dark grayish-brown silty clay loam in the middle part; and dark grayish-brown clay loam in the lower part. The substratum is mottled, dark gray clay loam that extends to a depth of 65 inches or more.

McBee soils that are not irrigated are used mainly for small grains, orchards, pasture, hay, and grass grown for seed. They are used mostly for row crops when irrigated.

McBee silty clay loam (Mb).-This is the only soil of the McBee series mapped in the survey area. It occurs along Butte Creek and along the Willamette, Pudding, and Santiam Rivers, and it is subject to frequent overflow.

Representative profile (SE1/4SE1/4 sec. 6, T. 6 S., R. 1 E.) .

Ap-0 to 7 inches, very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) when dry; moderate, coarse, medium and fine, granular structure; friable, slightly hard, plastic and sticky; many, medium, fine and very fine, interstitial pores; common very fine roots; medium acid (pH 6.0); abrupt, smooth boundary. (6 to 8 inches thick.)

A1-7 to 10 inches, very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) when dry; few, faint, dark-brown mottles; weak, coarse and medium prismatic structure breaking to moderate, medium and fine, subangular blocky structure; friable, slightly hard, plastic and sticky; common very fine roots; many, very fine, tubular pores; slightly acid (pH 6.2)m ; clear, smooth boundary. (2 to 5 inches thick.)

B1-10 to 22 inches, very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) when dry; common, fine, faint mottles of dark brown; moderate, medium, prismatic structure breaking to strong, fine and very fine, subangular blocky structure; friable, slightly hard, plastic and sticky; many, very fine, tubular pores; few roots; many worm casts; slightly acid (pH 6.2); gradual, smooth boundary. (9 to 15 inches thick.)

B2-22 to 35 inches, faintly mottled, dark-brown (10YR 3/3) , very dark brown (10YR 2/2) , and very dark grayish-brown (10YR 3/2) silty clay loam, grayish brown (10YR 4/2) and brown (10YR 4/3) when dry; weak, medium, prismatic structure breaking to moderate, coarse and medium, subangular blocky structure; friable, slightly hard, plastic and sticky; many, very fine and few, fine, tubular pores; few very fine roots; slightly acid (pH 6.4); gradual, smooth boundary. (10 to 16 inches thick.)

B3-35 to 42 inches, dark grayish-brown (10YR 4/2) clay loam, grayish brown (10YR 5/2) when dry; many, fine and medium, very dark brown (10YR 2/2), brown (10YR 3/3), and dark yellowish-brown (10YR 4/4) mottles and common, fine, strong-brown mottles; medium and fine, subangular blocky structure; friable, slightly hard, plastic and sticky; very few roots; many, very fine and few, fine, tubular pores; slightly acid (pH 6.4); gradual, smooth boundary. (5 to 11 inches thick.)

Cg-42 to 65 inches, dark-gray (10YR 4/1) clay loam; many, medium and fine, distinct, very dark brown (10YR 2/2) and dark-brown (10YR 3/3) mottles; massive; no roots; many very fine and few fine pores; slightly acid (pH 6.4).

Texture of the A horizon ranges from heavy silt loam to silty clay loam. Depth to mottling ranges from 6 to 24 inches, but mottles are at a depth of 18 inches in many places. Mottles in the A1 and B1 horizons appear to be relic. Coarse fragments are commonly absent to a depth of 40 inches. In some places, however, the content of coarse fragments is as high as 20 percent at depths below 35 inches and it is as high as 50 percent at depths below 40 inches.

Included with this soil in mapping were small areas of a soil that has a layer of gravelly material below a depth of 3 feet. Also included were small areas of Wapato and Chehalis soils.

The available water capacity is 12 to 14 inches or more. In many places the drainage has been improved by lowering the water table and by improving outlets. Depth to which roots can penetrate is still restricted, however, by a seasonal high water table. Permeability and fertility are both moderate, and runoff is slow. Because of the frequent overflow, erosion is a moderate hazard. Workability is good, but regular additions of organic matter are needed to keep the soil structure from deteriorating and to keep tillage from becoming more difficult.

When not irrigated, this soil is used mainly for small grains, orchards, pasture, hay, and grass grown for seed. When irrigated, it is used for caneberries, sweet corn, beans, and hops. Drainage is not necessary for many crops, but it is needed if maximum use is to be made of this soil and if best returns are to be realized. Where this soil is drained, it is suited to all the crops commonly grown in the survey area. (Capability unit IIw-5; not placed in a woodland suitability group)

McCully Series

The McCully series consists of well-drained soils that have formed in till or colluvium underlain by basic igneous tuffaceous agglomerate. These soils have slopes of 2 to

70 percent. They occur on the margins of mountainous foot slopes at elevations of 800 to 2,000 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 48° to 51° F., and the length of the frost-free season is 165 to 190 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, hemlock, vine maple, salal, brackenfern, snowberry, trailing blackberry, and wild strawberry. McCully soils are associated with Jory, Hullt, and Kinney soils.

In a typical profile, the surface layer is dark reddish-brown clay loam about 6 inches thick. This is covered with a thin layer of decomposing fern leaves, fir needles, other -leaves, and twigs. The subsurface layer is dark reddish-brown clay loam about 4 inches thick. The subsoil is dark reddish-brown clay about 47 inches thick. A substratum of variegated dark-brown, dark yellowish-brown, and very dark grayish-brown gravelly loam that is mostly weathered agglomerate extends to a depth of 108 inches or more.

The McCully soils are used mainly for timber, watershed, pasture, hay, orchards, small grains, and grass grown for seed. When irrigated, they are used mainly for row crops.

McCully clay loam, 2 to 7 percent slopes (McB).-This soil occurs along the margins of the lower foot slopes of the Cascade Mountains.

Representative profile 0.2 mile southeast of the South Burn guard station, 100 feet east of South Burn Road (SW1/4SE1/4SW1/4 sec. 26, T. 8 S., R.1 E.)

O1&O2-1 inch to 0, partly decomposed fern leaves, fir needles, other leaves, and twigs.

A1-0 to 6 inches, dark reddish-brown (5YR 3/2) clay loam, dark brown (7.5YR 4/4) when dry; strong, medium and fine, granular structure; friable to firm, slightly hard, slightly sticky and slightly plastic; many roots; many, fine, interstitial pores; many medium concretions; many, coarse, sand-size fragments of rock ; strongly acid (pH 5.4); abrupt, smooth boundary. (6 to 8 inches thick.)

A3-6 to 10 inches, dark reddish-brown (5YR 3/2) clay loam, dark brown (7.5YR 4/4) when dry; strong, medium and fine, granular structure; friable, slightly hard, sticky and plastic; many roots; many, fine, interstitial pores; few thin cutans ; common, medium, reddish concretions; common, coarse, sand-size, light-colored fragments of rock; strongly acid (pH 5.2); clear, wavy boundary. (4 to 6 inches thick.)

B21-10 to 24 inches, dark reddish-brown (5YR 3/4) clay, yellowish red (5YR 4/6) when dry; weak, medium, subangular blocky structure; friable, hard, sticky and plastic; many roots; many, very fine, tubular pores; few thin cutans ; few small concretions; few, coarse, sand-size fragments of light-colored rock; very strongly acid (pH 4.6); clear, smooth boundary. (9 to 15 inches thick.)

B22-24 to 49 inches, dark reddish-brown (5YR 3/4) clay, yellowish red (5YR 4/6) when dry; weak, coarse and medium, subangular blocky structure; firm, hard, sticky and plastic; common roots; many, very fine, tubular pores; continuous, thin cutans ; few concretions; very strongly acid (pH 4.6); gradual, smooth boundary. (14 to 30 inches thick.)

B3 49 to 57 inches, dark reddish brown (5YR 3/4) clay, reddish brown (5YR 4/4) when dry; weak, medium and fine, subangular blocky structure; friable, hard, sticky and plastic; few roots; many, very fine, tubular pores; few thin cutans; few small concretions; very strongly acid (pH 4.6); clear, wavy boundary. (7 to 10 inches thick.)

IIC-57 to 108 inches, variegated dark-brown (10YR 4/3), dark yellowish-brown (10YR 4/4), dark-brown (7.5YR 4/4), and very dark grayish-.brown (2.5Y 3/2) gravelly loam that is mostly weathered rock; massive; very strongly acid (pH 4.6); many feet thick.

In some places the A horizon is stony. Rock outcrops are absent from some areas and are common in others. In places a few large boulders are on the surface and angular fragments of rock the size of cobblestones make up from 5 to 15 percent of the A and B horizons. The solum is predominantly dark reddish brown, but the color ranges from dark brown in the A horizon to dark red in the B horizon. In places the B2 horizon is silty clay. The solum ranges from 40 to 60 inches in thickness, but it is commonly 40 to 48 inches thick. Depth to weathered agglomerate ranges from 40 inches to 12 feet. The entire profile is strongly acid or very strongly acid.

Included with this soil in mapping were small areas of Kinney and Cumley soils.

The available water capacity is 8 to 10 inches. Permeability is moderately slow, and fertility is low. Runoff is slow, and the hazard of erosion is slight. The depth to which roots can penetrate is 40 to 60 inches or more. Workability is fair, but it becomes progressively poorer as the content of moisture decreases to below field capacity.

This soil is well suited to pasture plants, hay, orchards, small grains, and grass grown for seed, and it is used mainly for those crops. Much of the acreage has been cleared and is used extensively for crops that require cultivation. A small acreage is used for strawberries, and other small acreages are used for pole beans, sweet corn, berries, and specialty crops. A limited supply of water for irrigation is available from reservoirs and ponds. (Capability unit IIe-3; woodland suitability group 2o1)

McCully clay loam, 7 to 12 percent slopes (McC).-This soil has slopes of more than 9 percent in most places. Runoff is medium, and the hazard of erosion is moderate. Bedrock crops out in a few places.

This soil is used for about the same crops as McCully clay loam, 2 to 7 percent slopes. More careful management is needed, however, to control erosion. (Capability unit IIIe-6; woodland suitability group 2o1)

McCully clay loam, 12 to 20 percent slopes (McD).-This soil contains a few stony areas. Runoff is medium, and erosion is a moderate hazard.

In general, this soil is used for about the same crops as McCully clay loam, 2 to 7 percent slopes. Sweet corn is not grown, however, because of the difficulty of harvesting the crop. Tilling and irrigating row crops so that soil losses will not be excessive is difficult. Mechanical harvesting of vegetables and berry crops is not feasible. (Capability unit IIIe-2; woodland suitability group 2o1)

McCully clay loam, 20 to 30 percent slopes (McE).-In a few places, this soil contains rock outcrops. Runoff is rapid, and the hazard of erosion is severe.

This soil is used mainly as woodland and for small grains, pasture, hay, and grass grown for seed. A small acreage is used for strawberries and cherries. Crops are difficult to cultivate and harvest. For row crops, practices that help to prevent excessive soil losses are necessary, but those practices are difficult to apply without damaging the crop. (Capability unit IVe-1; woodland suitability group 2o1)

McCully clay loam, 2 to 30 percent slopes (MUE).-In a few places, bedrock crops out in areas of this soil. Runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly for growing Douglas-fir. Where cleared, it is suitable for cultivated crops. Logging is best done in summer, when this soil is drier than at other times. (Capability unit IVe-1; woodland suitability group 2o1)

McCully clay loam, 30 to 50 percent slopes (MUF).-In this soil, bedrock crops out in a few places. Runoff is rapid. The hazard of erosion is severe.

This soil is not suitable for crops that require cultivation, and nearly all of the acreage is in Douglas-fir, Small areas are used for improved pasture and for grass grown for seed, although this soil is poorly suited to these uses. (Capability unit VIe-2; woodland suitability group 2c2)

McCully clay loam, 50 to 70 percent slopes (MUG).-Runoff from this soil is very rapid, and the hazard of erosion is very severe. In places small areas that have a stony surface layer were included in mapping.

This McCully soil is used mainly for growing Douglas-fir. Except for harvesting the timber, management is not feasible. Logging is best done in summer, when this soil is drier than at other times. (Capability unit VIIe-1; woodland suitability group 2c3)

McCully stony clay loam, 2 to 20 percent slopes (MID).-Angular pebbles, one-half inch to 3 inches in diameter, make up from 20 to 30 percent, by volume, of the surface layer of this soil. Rock outcrops are common, and small areas of this soil are shallow over bedrock. Runoff is medium, and erosion is a moderate hazard. The available water capacity is moderate.

This soil is used mainly for pasture and for grass grown for seed, but some areas are used for cultivated crops. Tillage is more difficult than for less sloping, less stony McCully soils. In areas to be tilled, the larger stones are usually removed by hand. (Capability unit IIIe-4; woodland suitability group 2o1)

McCully very stony clay loam, 2 to 30 percent slopes (MmE).-From 45 to 55 percent of this soil, by volume, consists of angular fragments of rock. The fragments range from 1 to 9 inches in diameter. Rock outcrops are common. The available water capacity is low.

Because of the stones in the surface layer, this soil is not suitable for crops that require cultivation, and it is used mainly for growing Douglas-fir. Logging is best done in summer, when the soil is drier than at other times. (Capability unit VIs-1; woodland suitability group 3c2)

Minniece Series

The Minniece series consists of deep, somewhat poorly drained and poorly drained soils that have formed in colluvium and alluvium from basic igneous tuffs or agglomerate. These soils have slopes of 0 to 8 percent. They occur in seepage areas and in drainage channels at elevations ranging from 800 to 3,000 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is 47° to 50° F., and the length of the frost-free season is 145 to 190 days. The vegetation is mainly alder, maple, swordfern, skunkcabbage, and sedges. Minniece soils are associated with McCully, Horeb, and Kinney soils.

In a typical profile, the surface layer is very dark grayish-brown silty clay loam about 10 inches thick. The subsoil is mottled throughout and is about 22 inches thick. It is dark grayish-brown silty clay loam in the upper part, dark grayish-brown silty clay in the middle part, and gray clay in the lower part. The substratum is gray clay that extends to a depth of 60 inches or more. The substratum, like the subsoil, is mottled.

The Minniece soils are used mainly for producing timber and for watershed.

Minniece silty clay loam, 0 to 8 percent slopes (MYB).-This soil occupies small seep areas and small areas in drainageways on the lower slopes of the Cascade Mountains. It is the only soil of the Minniece series mapped in the survey area.

Representative profile 50 feet west of logging road (SW1/4NE1/4 sec. 22, T. 9 S., R. 3 E.)

A1-0 to 5 inches, very dark grayish-brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) when dry; moderate, fine, granular structure; friable, hard, slightly sticky and plastic; many roots; many, fine, interstitial pores; medium acid (pH 5.8); clear, smooth boundary. (3 to 7 inches thick.)

A3-5 to 10 inches, very dark grayish-brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) when dry; moderate, medium, subangular blocky structure; firm, hard, sticky and plastic many roots; common, very fine and few, medium, tubular pores; medium acid (pH 5.8); clear, smooth boundary, (3 to 7 inches thick.)

B1-10 to 15 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam, grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) when dry; common, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; firm, hard, sticky and plastic; common roots; common, very fine, tubular pores; few thin clay films; medium acid (pH 5.8); clear, smooth boundary. (3 to 7 inches thick.)

IIB21tg-15 to 19 inches, dark grayish-brown (10YR 4/2) silty clay, light gray (10YR 7/2) when dry; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, prismatic structure breaking to strong, medium, subangular blocky structure; firm, very hard, sticky and plastic; common roots; common, very fine and few, fine, tubular pores; few thin clay films; ped surfaces coated with white (10YR 8/1) particles of silt medium acid (pH 5.8); clear, smooth boundary. (2 to 6 inches thick.)

IIB22tg-19 to 32 inches, gray (10YR 5/1) clay, light gray (10YR 6/1) when dry; many, medium, distinct, strong brown (7.5YR 5/6) mottles; moderate, coarse, prismatic structure breaking to weak, medium, subangular blocky structure; very firm, extremely hard, very sticky and very plastic; few roots; few, very fine and fine, tubular pores; common thin clay films medium acid (pH 5.8); clear, smooth boundary. (14 to 16 inches thick.)

IICg-32 to 60 inches, gray (10YR 5/1) clay, light gray (10YR 6/1) when dry; common, medium, distinct, strong-brown (7.5YR 5/6) mottles-, massive; very firm, extremely hard, very sticky and very plastic; few roots; few, very fine, tubular pores; medium acid (pH 5.8); few black stains.

Color of the A horizon ranges from very dark brown to very dark grayish brown. Color of the B horizon ranges from dark grayish brown to gray. In some places the entire solum contains mottles. A few stones are scattered throughout the solum in some areas.

Included with this soil in mapping were small stony areas.

The available water capacity ranges from 6 to 8 inches. Permeability is very slow, and fertility is low. Runoff is slow to medium, and the hazard of erosion is slight. Depth to which roots can penetrate varies because of differences in the height of the water table, but the root depth is generally shallow. This soil receives additional water as the result of seepage from higher areas. Therefore, it is wet during most of the year.

This soil is used mainly for growing alder and maple to which it is moderately well suited. Small areas have been cleared and are used for pasture. The difficulties of building roads and of conducting logging operations are limitations to use of this soil for producing timber. Because the areas

are small, however, roads can generally be built around them. Drainage is needed in areas used for pasture, and response is generally good where drainage has been established. Under the present management, draining areas of this soil to be used for timber is not economically feasible. (Capability unit VIw-1; not placed in a woodland suitability group)

Nekia Series

The Nekia series consists of well-drained soils that have formed in material weathered from tuffs and basalt. These soils are on low, red foothills that are dissected by drainage channels and streams. They have slopes of 2 to 50 percent. Elevations range from 300 to 1,000 feet. The normal annual precipitation is 40 to 60 inches, the normal annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, but it includes a few scattered oaks and an understory of poison-oak, rose, and brackenfern. Nekia soils are associated with Jory soils.

In a typical profile, the surface layer is dark reddish-brown silty clay loam about 9 inches thick. The subsoil is dark reddish-brown clay about 27 inches thick. Basalt bedrock underlies the subsoil at a depth of about 36 inches.

The Nekia soils are used mainly as woodland and for small grains, orchards, pasture, hay, and grass grown for seed. Some areas are irrigated.

Nekia silty clay loam, 2 to 7 percent slopes (NeB).-This soil is in the Salem, Waldo, and Silverton Hills.

Representative profile 150 feet south of a paved road (NW1/4SW1/4NW1/4 sec. 17, T. 8 S., R. 1 W.)

Ap-0 to 9 inches, dark reddish-brown (5YR 2/2) silty clay loam, reddish brown (5YR 4/3) when dry; moderate, medium and fine, granular structure; friable, slightly hard, plastic and sticky; many roots; many, fine, interstitial pores; medium acid (pH 5.6); abrupt, wavy boundary. (5 to 10 inches thick.)

B1-9 to 18 inches, dark reddish-brown (5YR 3/3) clay, reddish brown (5YR 4/4) when dry; weak, medium, prismatic structure breaking to weak, very fine, granular structure; friable, slightly hard, plastic and sticky; common roots; many, very fine, tubular pores; strongly acid (pH 5.5); clear, smooth boundary. (3 to 12 inches thick.)

B21t-18 to 24 inches, dark reddish-brown (5YR 3/3) clay, reddish brown (5YR 4/4) when dry; weak, very coarse, prismatic structure breaking to moderate, fine and very fine, subangular blocky structure; friable, hard, plastic and sticky; common roots; many, very fine, tubular pores; few thin clay films on ped surfaces and in pores; strongly acid (pH 5.4) ; clear, smooth boundary. (4 to 18 inches thick.)

B22t-24 to 36 inches, dark reddish-brown (5YR 3/4) clay, yellowish red (5YR 4/6) when dry; very weak, coarse, prismatic structure breaking to moderate fine and very fine, subangular blocky structure; firm, hard, very plastic and very sticky; few roots; many, very fine, tubular pores; many moderately thick clay films on ped surfaces and in pores; very few, faint, black coatings on ped surfaces; very few, fine, black concretions; many, coarse, sand-size fragments; strongly acid (pH 5.3); clear, wavy boundary. (8 to 18 inches thick.)

R1-36 to 45 inches, fractured bedrock, the fractures filled with reddish-brown (5YR 4/4) clay, reddish brown (5YR 5/3) when dry; weak, fine and very fine, subangular blocky structure; firm, hard, very plastic and very sticky; few large roots; many, very fine, tubular pores, few thick clay films on stone surfaces and in pores; variegations in color caused by weathering of the fragments of rock; many, medium, black coatings on stone surfaces; few, medium, black concretions; 90 percent of horizon is fractured, hard rock; strongly acid (pH 5.3); clear, wavy boundary.

R2-45 inches, basalt bedrock.

Color of the A horizon ranges from dark brown to dark reddish brown. Color of the B2 horizon ranges from dark reddish brown to yellowish red, but it is dominantly dark reddish brown. In places the B2 horizon is silty clay. The content of coarse fragments of hard basalt in the A horizon ranges from 0 to 15 percent, but the content of coarse fragments in the B22t horizon is as high as 50 percent. Depth to bedrock ranges from 20 to 40 inches. Bedrock is at a depth of more than 30 inches in most places.

Included with this soil in mapping were small areas of Jory and McCully soils. These included soils make up from 10 to 15 percent of the acreage in the mapping unit.

The available water capacity is 4 to 7 inches. Permeability is moderately slow, and fertility is moderate. Runoff is slow, and erosion is only a slight hazard. The depth to which roots can penetrate ranges from 20 to 40 inches, but it is more than 30 inches in most places. Workability is only fair, and it becomes progressively poorer as the content of moisture drops below field capacity.

This Nekia soil is well suited to the commonly grown crops. Nonirrigated areas are used mainly for small grains, orchards, pasture, hay, and grass grown for seed, but small acreages are used for strawberries, field corn, caneberries, and specialty crops. When irrigated, this soil is used for pole beans and sweet corn (fig. 8). Irrigation water is obtained from reservoirs and ponds. (Capability unit IIe-3; woodland suitability group 3c1)

Nekia silty clay loam, 7 to 12 percent slopes (NeC).- This soil has slopes that are mainly steeper than 9 percent. Bedrock crops out in a few places. Runoff is medium, and erosion is a moderate hazard.

Included with this soil in mapping were areas of Jory, McCully, and Witzel soils. These included soils make up from 5 to 10 percent of the acreage in this mapping unit.

This Nekia soil is used for about the same crops as Nekia silty clay loam, 2 to 7 percent slopes, but irrigation and tillage of row crops are more difficult. Mechanical harvesting of vegetables and berries is not feasible. (Capability unit IIIe-6; woodland suitability group 3c1)

Nekia silty clay loam, 12 to 20 percent slopes (NeD).-This soil contains a few stony areas and areas of rock outcrop. Runoff is medium. The hazard of erosion is moderate.

Included with this soil in mapping were areas of Jory, McCully, and Witzel soils. These included soils make up from 5 to 10 percent of the acreage in this mapping unit.

This Nekia soil is used for about the same crops as Nekia silty clay loam, 2 to 7 percent slopes, except that sweet corn is not grown. Row crops are grown on a small acreage but it is difficult to till and irrigate them. Mechanical harvesting of vegetables and berries is not feasible. (Capability unit IIIe-2; woodland suitability group 3c1)

Nekia silty clay loam, 20 to 30 percent slopes (NeE).-On steep breaks a few small areas of this soil are stony and rock crops out in places. Runoff is rapid, and the hazard of erosion is severe.

Included with this soil in mapping were areas of Witzel soils. These included areas make up about 5 percent of the acreage in the mapping unit.

This Nekia soil is used mainly for small grains, pasture, hay, and grass grown for seed, but a small acreage is used for strawberries, for cherries, or as woodland. The crops

Figure 8.-Irrigated sweet corn on Nekia silty clay loam, 2 to 7 percent slopes, near Stayton.

are difficult to cultivate and to harvest. If row crops are grown, practices required to prevent excessive soil losses are difficult to apply without damaging the crop. (Capability unit IVe-1; woodland suitability group 3c1)

Nekia silty clay loam, 30 to 50 percent slopes (NeF).-In a few places, this soil contains small stony areas that lie below tile few areas of rock outcrop. Runoff is rapid or very rapid, and the hazard of erosion is severe.

Included with this soil in mapping were areas of Witzel soils. These included areas make up less than 5 percent of the acreage in the snapping unit.

This Nekia soil is used mainly for pasture or as woodland. (Capability unit VIe-2,; woodland suitability group 3c3)

Nekia stony silty clay loam, 2 to 12 percent slopes (NkC).-This soil has a profile similar to the one described for Nekia silty clay loam, 2 to 7 percent slopes, except that the surface layer is stony and bedrock crops out in a few places. The stones hinder tillage and make this soil slightly droughty. The available water capacity is 2 1/2 to 7 inches. Runoff is medium, and erosion is a moderate hazard.

Included with this soil in mapping were areas of Witzel soils. These included areas make up from 5 to 10 percent of the acreage in this mapping unit.

This Nekia soil is used for about the same crops as Nekia silty clay loam, 2 to 7 percent slopes, but irrigation and tillage of row crops are more difficult. Mechanical harvesting of vegetables and berries is feasible where the slopes are less than 5 percent. (Capability unit IIIe-4; woodland suitability group 3c1)

Nekia very stony silty clay loam, 2 to 30 percent slopes (NsE).-This soil has a profile similar to the one described for Nekia silty clay loam, 2 to 7 percent slopes, except that the surface layer is very stony and rock outcrops are common. The available water capacity is 2 1/2 to 5 1/2, inches. Runoff is medium, and the hazard of erosion is slight to moderate.

Included with this soil in mapping were areas of Witzel soils. These included areas make up from 10 to 15 percent of the acreage in this mapping unit.

This Nekia soil is not suited to cultivated crops, and it is used mainly for woodland-grass pasture and as woodland. The wooded areas are within or adjacent to fields where grass is grown for seed. When these fields are burned over each year, extreme care is necessary to protect the wooded areas from fire. (Capability unit VIs-1 ; woodland suitability group 3c2)

Nekia very stony silty clay loam, 30 to 50 percent slopes (NsF).-This soil has a profile similar to the one; described for Nekia silty clay loam, 2 to 7 percent slopes, except that the surface layer is very stony and rock outcrops are common. Runoff is rapid, and the hazard of erosion is severe.

Included with this soil in mapping were areas of Witzel soils. These included areas make up from 5 to 10 percent of the acreage in this mapping unit.

This Nekia soil is not suited to cultivated crops, and it is used mainly as woodland and for woodland-grass pasture. The wooded areas are within or adjacent to fields where grass is grown for seed. When these fields are burned over each year, extreme care is necessary to protect the wooded areas from fire. (Capability unit VIs-1; woodland suitability group 3c3)

Newberg Series

The Newberg series consists of somewhat excessively drained soils that have formed in mixed alluvium over sandy or gravelly material. These soils are on flood plains that are traversed by old, meandering overflow channels and sloughs, and they are subject to frequent overflow. Slopes range from 0 to 3 percent, and elevations range from 100 to 650 feet. The average annual precipitation is between 40 and 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly ash, oak, Douglas-fir willow, rose, blackberry, annual grasses, and weeds. Newberg soils are associated with Cloquato, Chehalis, and Camas soils.

In a typical profile, the surface layer is very dark grayish-brown fine sandy loam about 10 inches thick. The substratum, just beneath the surface layer, is dark yellowish-brown sandy loam that extends to a depth of 60 inches or more.

The Newberg soils are used mainly for small grains, orchards, pasture, row crops, and grass grown for seed.

Newberg fine sandy loam (Nu).-This soil is along the channels of Butte Creek and the Willamette, Pudding, and Santiam Rivers.

Representative profile (NE1/4SE1/4 sec. 24, T. 9 S., R. 2 W.).

Ap-0 to 10 inches, very dark grayish-brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) when dry; weak, medium and fine, subangular blocky structure; very friable, soft, nonsticky and nonplastic; many, fine and very fine, tubular pores; many roots; medium acid (pH 6.0); clear, smooth boundary. (7 to 12 inches thick.)

C-10 to 60 inches, dark yellowish-brown (10YR 3/4) sandy loam, grayish brown (10YR 5/2) when dry; massive; very friable, soft, nonsticky and nonplastic; many roots; many, fine, interstitial pores; neutral (pH 6.6).

Texture of the A horizon ranges from fine sandy loam to silt loam. When the soil is moist, the color of the A horizon is as dark or darker than dark brown. Color of the C horizon ranges from dark grayish brown to dark yellowish brown. In some places the C horizon is structureless, and in others it has weak, subangular blocky structure. Depth to sand and gravel is more than 40 inches. In some areas as much as 15 percent of the material between depths of 10 and 40 inches is coarse fragments.

Included with this soil in mapping were small areas that have a few pebbles in the surface layer and that have a gravelly subsoil. Also included were small areas of Camas, Cloquato, and Chehalis soils.

The available water capacity is 5 to 7 inches. Permeability is moderately rapid, and fertility is moderate. Roots can penetrate to a depth of 5 feet or more. Runoff is slow, and the hazard of erosion is moderate. Even where management is poor, workability of this soil is excellent, for the texture and structure of the soil material are difficult to change.

This soil is well suited to small grains, orchards, pasture, and grass grown for seed, and it is used mainly for those crops. When irrigated, it is used for all the crops commonly grown in the survey area. (Capability unit IIw-4; not placed in a woodland suitability group)

Newberg silt loam (Nw).-This soil has a profile similar to the one described for Newberg fine sandy loam, except that the surface layer is finer textured and is dark brown. Because of this finer texture of the surface layer, the range of moisture content within which this soil can be satisfactorily worked is narrower than for Newberg fine sandy loam. Also, the infiltration rate is reduced, and movement of water is slower through the surface layer to the coarser textured material below. The available water capacity is 6 to 7 inches.

This soil is used for about the same crops as Newberg fine sandy loam, except that it is not used for crops that are harvested late in fall. Irrigation is difficult because areas of this soil are small and are within larger areas of Cloquato and Chehalis soils. (Capability unit IIw-6; not placed in a woodland suitability group)

Salem Series

The Salem series consists of well-drained soils that are nearly level. These soils have formed in gravelly alluvium that is of mixed mineralogy and contains a large amount of basaltic pebbles. They occur on terraces at elevations of 100 to 600 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, oak, maple, wild rose, and grasses. Salem soils are associated with Sifton and Clackamas soils.

In a typical profile, the surface layer is very dark brown gravelly silt loam about 9 inches thick. The subsoil is about 21 inches thick and is very dark brown gravelly silty clay loam in the upper part and is dark-brown gravelly clay loam in the lower part. The substratum is grayish-brown very gravelly sand that extends to a depth of 60 inches or more.

The Salem soils are used mainly for small grains, pasture, vegetables, orchards, and berries.

Salem gravelly silt loam (Sa).-This is the only soil of the Salem series mapped in the survey area. It is along the margins of gravelly terraces, adjacent to the alluvial bottoms of the North Santiam and Santiam Rivers.

Representative profile 100 feet south of the Marion to West Stayton highway (SE1/4NW1/4SW1/4 sec. 14, T. 9 S., R. 2 W.).

Ap-0 to 9 inches, very dark brown (10YR 2/2) gravelly silty loam, dark grayish brown (10YR 4/2) when dry; cloddy and has weak, medium and fine, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many roots; many, very fine, tubular pores; 15 percent pebbles; slightly acid (pH 6.2); gradual, smooth boundary. (6 to 12 inches thick.)

B2t-9 to 18 inches, very dark brown (10YR 2/2) gravelly silty clay loam, brown (10YR 4/3) when dry; moderate, medium, subangular blocky structure; friable, hard, sticky and plastic; many roots; many, fine and very fine, tubular pores; 15 percent pebbles; few thin and moderately thick clay films; slightly acid (pH 6.4); abrupt, smooth boundary. (8 to 20 inches thick.)

B3t-18 to 30 inches, dark-brown (10YR 3/3) gravelly clay loam; brown (10YR 5/3) when dry; massive; firm,

hard, slightly sticky and plastic; common roots; common, fine and very fine, tubular pores; thin clay coatings on sand grains; 45 percent pebbles; neutral (pH 6.6) ; clear, smooth boundary. (0 to 14 inches thick.)

IIC-30 to 60 inches, grayish-brown (10YR 5/2) very gravelly sand, pale brown (10YR 6/3) when dry; single grain; very friable, loose, nonsticky and nonplastic; few roots; many, medium, interstitial pores; 60 percent pebbles; slightly acid (pH 6.2) ; many feet thick.

Texture of the A horizon ranges from gravelly silt loam to gravelly loam. Texture of the B horizon ranges from gravelly clay loam to gravelly silty clay loam. The content of pebbles and cobblestones in the A and B horizons ranges from 10 to 50 percent, but it is less than 35 percent in most places. In the C horizon, the content of coarse fragments, mostly pebbles, ranges from 35 to 80 percent. Depth to the very gravelly sand of the C horizon ranges from 20 to 40 inches.

Included with this soil in mapping were small areas in which the content of pebbles in the surface layer is less than 15 percent. Also included were areas of a soil that is shallow over very gravelly sand and has a surface layer of dark-brown loam.

The available water capacity is 5 to 6 inches. Permeability and fertility are both moderate. Runoff is slow, and erosion is not a hazard. Depth to which roots can penetrate is restricted by the gravelly substratum. Workability is generally good, but some small areas that have a gravelly surface layer are hard to cultivate.

This soil is used mainly for cereal grains, pasture, caneberries, strawberries, vegetables, and orchards. Irrigation is necessary if vegetables and berries are to be grown commercially. (Capability unit IIs-1; not placed in a woodland suitability group)

Salkum Series

The Salkum series consists of well-drained soils that have formed in weathered gravelly alluvium. These soils have slopes of 0 to 20 percent. They occur on remnants of old, high terraces at elevations of 300 to 1,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 200 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, poison-oak, and rose. Salkum soils are associated with Nekia and Jory soils.

In a typical profile, the surface layer is very dark brown silty clay loam about 14 inches thick. The subsoil is dark brown and is about 26 inches thick. The upper part of the subsoil is silty clay loam, and the lower part is mottled silty clay. The upper part of the substratum is variegated light-gray, yellowish-red, brown, and strong-brown silty clay loam to a depth of about 48 inches. The lower part of the substratum is mottled, variegated strong-brown and dark-brown gravelly and cobbly clay loam or silty clay loam that extends to a depth of 65 inches or more.

The Salkum soils are used mainly for small grains, orchards, pasture, hay, and grass grown for seed.

Salkum silty clay loam, 2 to 6 percent slopes (SkB).This soil is on high terraces north of Mill Creek. The areas are between Sublimity and Aumsville.

Representative profile along the Stayton-Sublimity Highway and 35 feet east of the center of the highway (SW1/4NE1/4 sec. 3, T. 9 S., R. 1 W.)

Ap-0 to 5 inches, very dark brown (7.5YR 2/2) silty clay loam, dark brown (10YR 4/3) when dry; weak, very coarse, prismatic structure breaking to moderate, fine and very fine, granular; friable, slightly hard, plastic and sticky; abundant roots; many, fine and. very fine, interstitial pores; strongly acid (pH 5.2); abrupt, smooth boundary. (5 to 9 inches thick.)

A1-5 to 14 inches, very dark brown (7.5YR 2/2) silty clay loam, dark brown (7.5YR 4/4) when dry; weak, very coarse, prismatic structure breaking to weak, medium and coarse, subangular blocky structure that breaks, in turn, to moderate, fine and very fine, granular structure; friable, slightly hard, plastic and sticky; many roots; few thin clay films; common, very fine and fine, tubular pores; very strongly acid (pH 5.0); clear, smooth boundary. (0 to 9 inches thick.)

B1t-14 to 20 inches, dark-brown (7.5YR 4/4) heavy silty clay loam, brown (7.5YR 5/4) when dry; weak, very coarse, prismatic structure breaking to moderate, coarse and medium, subangular blocky structure; firm; slightly hard, very plastic and sticky; thin, nearly continuous clay films; common worm casts; very strongly acid (pH 5.0); clear, smooth boundary. (6 to 12 inches thick.)

B2t-20 to 29 inches, dark-brown (7.5YR 4/4) silty clay, brown (7.5YR 5/4) when dry; moderate, coarse and medium, subangular blocky structure; firm, hard, very plastic and sticky; moderately thick, continuous clay films; few, coarse, and common, fine and very fine, tubular pores; few roots; very strongly acid (pH 5.0); clear, smooth boundary. (6 to 15 inches thick.)

B3t-29 to 40 inches, dark-brown (7.5YR 4/4) silty clay, strong brown (7.5YR 5/6) when dry; few to common, fine, light-gray mottles and few, fine, strong-brown specks; weak, coarse, subangular blocky structure; firm, hard, very plastic and sticky; many thin clay films; few roots; few, fine and very fine, tubular pores; strongly acid (pH 5.2); clear, smooth boundary. (0 to 12 inches thick.)

C1-40 to 48 Inches, variegated light-gray (7.5YR 7/1), yellowish-red (5YR 4/6), brown (7.5YR 5/2), and strong brown (7.5YR 5/8) silty clay loam, reddish yellow (7.5YR 6/6) when dry; firm, very hard, plastic and sticky; thin, patchy clay films; few, fine and very fine, tubular pores; no roots; very strongly acid (pH 5.0); gradual, smooth boundary. (0 to 15 inches thick.)

IIC2-48 to 65 inches, finely variegated strong-brown (7.5YR 5/8) and dark-brown (7.5YR 3/2 and 4/4) gravelly and cobbly clay loam or silty clay loam, very pale brown (10YR 7/4) when dry; few, fine, reddish-brown mottles; massive; firm, extremely hard, plastic and sticky; no roots; very few, fine and very fine, tubular pores; thin, patchy clay films; very strongly acid (pH 5.0); the cobblestones and pebbles are so strongly weathered that they can be broken easily in the hand.

The solum ranges from 24 to 50 inches in thickness over weathered gravel, but it is more than 30 inches thick in most places. In places the A horizon is dark brown. The IIC2 horizon contains weathered pebbles of basalt and a few pebbles of hard quartzite as much as 1 inch in diameter.

Included with this soil in mapping were small areas of Nekia and Jory soils.

The available water capacity ranges from 9 to 12 inches. Permeability is slow, and fertility is low. Runoff is slow, and the hazard of erosion is slight. Roots can penetrate to a depth of 4 to 5 feet. Workability is fair, but it becomes progressively poorer as the content of moisture drops below field capacity.

This soil is used mainly for cereal grains, orchards, pasture, hay, and grass grown for seed, but a small acreage is used for strawberries, field corn, caneberries, and specialty crops. When irrigated, this soil is used for pole beans and sweet corn. (Capability unit IIe-3; woodland suitability group 3c1)

Salkum silty clay loam, 6 to 20 percent slopes (SkD).In nearly 70 percent of the acreage, this soil has slopes of less than 12 percent. Runoff is medium, and erosion is a moderate hazard. Mapped with this soil were a few areas in which the surface layer is gravelly.

This Salkum soil is used for about the same crops as Salkum silty clay loam, 2 to 6 percent slopes, but tilling the small acreage of row crops so that excessive losses of soil are prevented is more difficult on this soil. Mechanical harvesting of vegetables and berries is not feasible. (Capability unit IIIe-2; woodland suitability group 3c1)

Salkum silty clay loam, basin, 0 to 6 percent slopes (SlB).-This soil is on foot slopes and in drainageways of old, high terraces. In winter it sometimes receives additional soil material washed from higher lying soils that are not protected by a cover crop. This material is deposited in a thin layer on the surface of this soil. Fertility is moderate, and this soil is well drained. In winter and spring, however, the additional water received from higher areas causes the water table to rise to the lower part of the subsoil. In some places small areas of McAlpin, Waldo, or Stayton soils block runoff from this soil. As a result, the water table is high for short periods during storms of high intensity. Nevertheless, water moves rapidly through this soil, and wetness is not a serious hazard to crops. Included with this soil in mapping were small areas of McAlpin, Waldo, and Stayton soils.

This Salkum soil is used for about the same crops as Salkum silty clay loam, 2 to 6 percent slopes. To make this soil more suitable for strawberries, and to make farming easier, the runoff from higher areas should be intercepted and safely diverted to other areas before it reaches this soil. (Capability unit IIe-1; woodland suitability group 3c1)

Santiam Series

The Santiam series consists of moderately well drained soils that formed in silty material over weathered gravelly alluvium or weathered basalt. These soils occur on remnants of old, high terraces along the foot slopes of low, red foothills. They have slopes of 0 to 15 percent. Elevations range from 300 to 375 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 53° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, vine maple, poison-oak, hazel, ocean-spray, trailing blackberry, wild strawberry, thimbleberry, brackenfern, and grass. Santiam soils are associated with Silverton soils.

In a typical profile, the surface layer is dark-brown silt loam about 6 inches thick. The subsurface layer is mottled, dark-brown silt loam about 7 inches thick. The subsoil is mottled, dark yellowish-brown silty clay loam about 17 inches thick. The substratum is mottled, dark grayish-brown and brown silty clay or clay that extends to a depth of 60 inches or more.

The Santiam soils are used for small grains, orchards, pasture, vegetables, berries, and grass grown for seed. They are also used as woodland.

Santiam silt loam, 0 to 3 percent slopes (SnA).-This soil occupies terrace remnants along the foot slopes of the Salem, Waldo, and Silverton Hills. It is adjacent to the valley floor.

Representative profile 15 feet south of the center of a gravel road and 475 feet east of the corner of the road (NW1/4SE1/4 sec. 1, T. 10 S., R. 3 W.)

Ap-0 to 6 inches, dark-brown (10YR 3/3) silt loam, pale brown (10YR 6/3) when dry; moderate, medium and fine, granular structure; friable, slightly hard, plastic and sticky; many roots; many, very fine and fine, interstitial pores; medium acid (pH 5.6); abrupt, smooth boundary. (4 to 7 inches thick.)

A3-6 to 13 inches, dark-brown (10YR 3/3) silt loam, pale brown (10YR 6/3) when dry; contains common, fine and very fine, faint, very dark grayish-brown (10YR 3/2) mottles when moist; weak, very coarse, prismatic structure breaking to moderate, medium and fine, subangular blocky structure; friable, slightly hard, plastic and sticky; many roots; many, fine and very fine, tubular pores; few pebbles; medium acid (pH 5.6) ; abrupt, smooth boundary. (6 to 10 inches thick.)

B21t-13 to 22 inches, dark yellowish-brown (10YR 4/4) silty clay loam, pale brown (10YR 6/3) when dry; contains many, medium and fine, faint, dark grayish-brown mottles; common, fine, black stains and concretions; weak, very coarse, prismatic structure breaking to moderate, medium and fine, subangular blocky structure; friable, hard, plastic and sticky; common roots; many, fine and very fine, tubular pores; few pebbles; few thin clay films; peds thinly coated with gray silt and very fine sand; strongly acid (pH 5.4) ; gradual, wavy boundary. (6 to 10 inches thick.)

B22t-22 to 30 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam, light yellowish brown (10YR 6/4) when dry; contains common, fine and medium, faint, dark-brown (10YR 3/3) mottles and common black mottles; thick, grayish-brown (10YR 5/2), silty coatings on ped surfaces, light gray (10YR 7/2) when dry; weak, fine, prismatic structure breaking to moderate, fine and medium, subangular and angular blocky structure; firm, very hard, plastic and sticky; few roots; many, medium, fine and very fine, tubular pores; few pebbles; common, moderately thick clay films; strongly acid (pH 5.2) ; clear, smooth boundary. (8 to 14 inches thick.)

IIC-30 to 60 inches, dark grayish brown (10YR 4/2) and brown (10YR 4/3) silty clay or clay, pale brown (10YR 6/3) and light gray (10YR 7/1) when dry; few, fine, distinct, yellowish-brown (10YR 5/8) mottles; massive; firm, very hard, very plastic and very sticky; few roots; common, fine and very fine, tubular pores; medium and coarse, light-colored sand grains and few medium-sized pebbles that increase in number with depth; strongly acid (pH 5.2).

The A horizon ranges from dark brown to brown in color. The B horizon is dark brown to dark yellowish brown, and it contains mottles that range from faint to distinct in contrast. In places the color of the A and B horizons is slightly redder than shown in the typical profile. Texture of the B horizon ranges from silty clay loam to light silty clay or clay, with a weighted average of 35 to 42 percent clay. In places strongly weathered and unweathered pebbles make up as much as 15 percent, by volume, of the lower part of the B horizon. Depth to the C horizon ranges from 24 to 40 inches, and depth to bedrock is more than 40 inches. In places the C horizon consists of highly weathered basalt tuffs, or of gravelly material that has a matrix of clay.

Included with this soil in mapping were small areas that have a strong-brown surface layer, and small areas of a well-drained soil.

The available water capacity ranges from 8 to 11 inches. Permeability is moderately slow in the B horizon and slow in the C horizon. Fertility is moderate. This soil receives extra water as the result of seepage from higher areas, and it contains a perched water table in winter and spring. Runoff is slow, and erosion is not apparent. Below 22 to 30 inches, the depth to which roots can penetrate is re-

stricted by excess moisture and by the clayey texture of the soil material. Workability is good.

When not irrigated, this soil is used mainly for small grains, orchards, pasture, and grass grown for seed, and it is also used as woodland. It is used for pole beans, sweet corn, caneberries, and strawberries when irrigated. Because of the extra moisture received as the result of seepage, this soil is not well suited to deep-rooted crops and to crops that cannot tolerate excessive moisture. (Capability unit IIw-1; not placed in a woodland suitability group)

Santiam silt loam, 3 to 6 percent slopes (SnB).-This soil has slightly better drainage than Santiam silt loam, 0 to 3 percent slopes, but it is used for about the same crops. Runoff is slow, and the hazard of erosion is slight. Drainage is needed for deep-rooted crops and for crops that cannot tolerate excessive moisture. (Capability unit IIe-1; not placed in a woodland suitability group)

Santiam silt loam, 6 to 15 percent slopes (SnC).-This soil has better drainage than Santiam silt loam, 0 to 3 percent slopes. Runoff is medium, and erosion is a moderate hazard.

This soil is used mainly for small grains, pasture, hay, and grass grown for seed, but a small acreage is used as woodland or for orchards, vegetables, and berries. Growing row crops or tilling so that excessive soil losses are prevented is difficult, and mechanical harvesting of vegetables and berries is not feasible. Drainage is needed for deep-rooted crops and for crops that cannot tolerate excessive moisture. (Capability unit IIIe-1; not placed in a woodland suitability group)

Semiahmoo Series

The Semiahmoo series consists of poorly drained organic soils that formed in partly decomposed organic material. These soils occur on the bottoms of former shallow lakes at elevations of 130 to 150 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 53° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly sedges, tussocks, and willows. Semiahmoo soils are associated with Labish soils.

In a typical profile, the surface layer is black muck about 9 inches thick. The next layer consists of very dark brown peaty muck about 21 inches thick. Below this is a layer of peat that extends to a depth of 60 inches or more.

The Semiahmoo soils are used mostly for growing vegetables.

Semiahmoo muck (So).-This soil is on the Labish Bottom. It is the only soil of the Semiahmoo series mapped in the survey area.

Representative profile one-fourth mile north of Labish Center, 100 feet east of road, and 200 feet south of Labish Ditch (NW1/4SW1/4 sec. 22, T. 6 S., R. 2 W.)

1-0 to 2 inches, black (10YR 2/1) muck, very dark gray (10YR 3/1) when dry; weak, very fine, granular structure; very friable, loose, nonsticky and nonplastic; many roots; many, fine, interstitial pores; medium acid (pH 6.0); abrupt, smooth boundary. (0 to 4 inches thick,)

2--2 to 9 inches, black (10YR 2/1) muck, very dark gray (10YR 3/1) when dry; weak, medium, subangular blocky structure; very friable, loose, nonsticky and nonplastic; many roots; many fine pores; medium acid (pH 6.0); clear, smooth boundary. (6 to 10 inches thick.)

3-9 to 30 inches, very dark brown (10YR 2/2) peaty muck; massive; very friable, soft, nonsticky and nonplastic; many pores; slightly acid (pH 6.2); gradual, smooth boundary. (10 to 30 inches thick.)

4-30 to 60 inches, variegated peat; massive; very friable, slightly hard, nonsticky and nonplastic; slightly acid (pH 6.4); many feet thick.

Included with this soil in mapping were small areas that have a surface layer of peaty muck; areas in which a layer of clay is at a depth of 14 to 15 inches; and areas along the boundary between the soil and mineral soils where the depth to mineral material in the substratum is less than 5 feet.

The available water capacity ranges from 13 to 30 inches. Permeability is moderate, acid fertility is high. Runoff is slow, and the hazard of erosion is moderate. The depth to which roots can penetrate is limited by the high water table. This is subject to annual flooding. Workability is excellent.

This soil is well suited to onions and to other shallow-rooted crops, and it is used mainly for growing onions. A minor acreage is used for pole beans, sweet corn, mint, pasture, hay, and blackberries. Drainage is needed to keep the water table below the root zone. (Capability unit IIIw-3; not placed in a woodland suitability group

Sifton Series

The Sifton series consists of excessively drained soils that are underlain by gravelly sand. These soils are nearly level. They occur on alluvial terraces at elevations of 100 to 600 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, vine maple, hazel, ocean-spray, poison-oak, blackberry, and brackenfern. Sifton soils are associated with Clackamas and Salem soils.

In a typical profile, the surface layer is black gravelly loam about 17 inches thick. The subsoil is dark-brown gravelly loam about 7 inches thick. The substratum is dark-brown very gravelly and cobbly sand that extends to a depth of 60 inches or more.

The Sifton soils are used for small grains, pasture, vegetables, and caneberries, and they are also used as woodland.

Sifton gravelly loam (St).-This is the only soil of the Sifton series map in the survey area. It is on terraces along the North Santiam River and Mill Creek.

Representative profile beside old farm buildings (SE1/4SW1/4 sec. 6, T. 9 S., R. 1 W.)

Ap-0 to 7 inches, black (10YR 2/1) gravelly loam, dark grayish brown (10YR 4/2) when dry; moderate, fine, granular structure, friable, soft, slightly plastic and very slightly sticky; many roots: very many, fine and very fine, interstitial pores; high content of organic matter; neutral (pH 6.9); abrupt, smooth boundary. (4 to 8 inches thick.)

A1-7 to 17 inches, black (10YR 2/1) gravelly loam, dark grayish brown (10YR 4/2) when dry; coarse and very coarse, subangular blocky structure; friable, soft, slightly plastic and slightly sticky; common, fine, tubular pores; few roots; common worm casts; high in content of organic matter; neutral (pH 6.9); clear, wavy boundary. (4 to 12 inches thick.)

B2-17 to 24 inches, dark-brown (10YR 3/3) gravelly loam, dark brown (10YR 4/3) when dry: weak, coarse, subangular blocky structure breaking to moderate.

fine, subangular blocky structure; friable, soft, plastic and slightly sticky; many, medium, fine and very fine, tubular pores; few roots; slightly acid (pH 6.2); gradual, wavy boundary. (7 to 10 inches thick.)

IIC-24 to 60 inches, dark-brown (10YR 4/3) very gravelly and cobbly sand that is mostly of basaltic origin, brown (10Y R 5/3) when dry; massive; loose, nonsticky and nonplastic; medium acid; most of the soil material and fragments of basalt are at least moderately magnetic.

Color of the A horizon ranges from black to very dark brown. In places the A horizon is gravelly silt loam, and in some places the B horizon is gravelly very fine sandy loam. Pebbles and cobblestones in the solum constitute from 25 to 40 percent of the soil mass in some areas. Depth to the very gravelly material in the substratum ranges from 20 to 30 inches.

Included with this soil in mapping were small areas of Clackamas soils and small areas of cobbly, brown soils.

The available water capacity is 4 to 5 inches. Permeability is moderately rapid in the solum and very rapid in the substratum. Fertility is low. Runoff is very slow, and erosion is not a hazard. Roots can penetrate to depths of only 20 to 30 inches. Workability is only fair because of the gravel in the surface layer. Even though this soil is intensively used, it does not become compacted and the rate of infiltration remains high.

This soil is used mainly as woodland and for cereal grains, pasture, pole beans, bush beans, sweet corn, and caneberries. When irrigated, it is well suited to forage crops and other crops that require little cultivation. This soil is poorly suited to root crops, and it is unsuitable for mechanical harvesting of root crops. Tillage is hindered by the gravel in the surface layer. Irrigation is needed for adequate growth of most crops. It is essential for growing vegetables and berries, and for extending the use of pastures during the dry, warm summers. (Capability unit IIIs-1; not placed in a woodland suitability group)

Silverton Series

The Silverton series consists of well-drained soils that have formed in silty material over fine-textured material that contains gravel. These soils are on dissected terraces or on the foot slopes of low foothills. They have slopes of 2 to 20 percent. Elevations range. from 225 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly Douglas-fir, vine maple, hazel, poison-oak, ocean-spray, thimbleberry, blackberry, strawberry, pathfinder, brackenfern, and bentgrass. Silverton soils are associated with Santiam and Nekia soils.

In a typical profile, the surface layer is dark-brown silt loam about 7 inches thick. The subsurface layer is dark-brown heavy silt loam about 9 inches thick: The upper part of the subsoil consists of a layer of dark-brown silty clay loam about 9 inches thick. The lower part of the subsoil is dark-brown gravelly silty clay about 12 inches thick. The substratum is fractured and partly weathered, consolidated basalt bedrock.

The Silverton soils are used mainly as woodland and for pasture, hay, orchards, caneberries, and grass grown for seed.

Silverton silt loam, 2 to 12 percent slopes (SuC).-This soil occupies remnants of old, high terraces along the foot slopes of low foothills. It is in areas adjacent to the terraces of Willamette silts.

Representative profile 2,640 feet south of the city limits of Silverton and 65 feet west of the highway that leads from Silverton to Stayton (in northeast corner of SW1/4NW1/4 sec. 3, T. 7 S., R.1 W.)

Ap-0 to 7 inches, dark-brown (10YR 3/3) silt loam, yellowish brown (10YR 5/4) when dry; moderate, medium, subangular blocky structure breaking to moderate, very fine, granular structure; friable, slightly hard, slightly plastic and slightly sticky; many roots; many interstitial pores; few, medium and fine, distinct, black concretions; medium acid (pH 5.8) ; clear, smooth boundary. (6 to 8 inches thick.)

A3-7 to 16 inches, dark-brown (7.5YR 3/3) heavy silt loam, brown (7.5YR 5/4) when dry; weak, medium, subangular blocky structure breaking to moderate, fine and very fine, subangular blocky structure; friable, slightly hard, slightly plastic and slightly sticky; many roots; many interstitial pores, and many, very fine, tubular pores; common gray coatings of silt on some vertical surfaces of peds; few, medium and fine, dark-colored concretions; common, medium, black sand grains; 3 percent, by volume, fine pebbles; medium acid (pH 6.0) ; clear, smooth boundary. (4 to 10 inches thick.)

B21t-16 to 25 inches, dark-brown (7.5YR 3/3) silty clay grains; 3 percent, by volume, fine pebbles; medium loam, brown (7.5YR 5/4) when dry; moderate, fine and very fine, subangular blocky structure; firm, hard, plastic and sticky; many roots; few coatings of silt on the surfaces of peds; many, fine and very fine, tubular pores; few thin clay films in pores; common, medium and fine, dark-colored concretions; common, medium, black sand grains; 3 percent, by volume, fine pebbles and cobblestones; medium acid (pH 5.9); clear, wavy boundary. (5 to 12 inches thick.)

IIB22t-25 to 37 inches, dark-brown (7.5YR 4/3) gravelly silty clay, light brown (7.5YR 6/4) when dry; moderate, medium, subangular blocky structure breaking to strong, very fine, subangular blocky structure; firm, very hard, plastic and sticky; few roots; many, fine and very fine, tubular pores; thin, nearly continuous clay films; common coarse and medium sand grains; 20 percent, by volume, pebbles and partly weathered cobblestones; medium acid (pH 5.8); abrupt, wavy boundary. (5 to 15 inches thick.)

IIIR-37 inches, fractured and partly weathered, consolidated basalt bedrock.

Depth to the nonconforming IIB22t horizon ranges from 15 to 30 inches. As much as 50 percent of this horizon is coarse fragments that are mostly strongly weathered. Depth to weathered basalt ranges from 20 to 40 inches, but it is more than 30 inches in most places.

Included with this soil in mapping were small areas of Jory and Nekia soils.

The available water capacity is 5 to 7 inches. Permeability is moderately slow, and fertility is moderate. Runoff is slow, and the hazard of erosion is slight. Roots can penetrate to depths of 20 to 40 inches. Workability is generally good, but it is variable where this soil is near areas of Jory and Nekia soils.

This soil is used mainly as woodland and for pasture, orchards, caneberries, and grass grown for seed. When irrigated, a small acreage is used for strawberries, sweet corn, and pole beans. (Capability unit IIe-3; woodland suitability group 3c1)

Silverton silt loam, 12 to 20 percent slopes (SuD).Runoff from this soil is medium, and erosion is a moderate

hazard. Included in mapping were small areas of Witzel soils.

This Silverton soil is used mainly for small grains, pasture, hay, and grass grown for seed, but a small acreage is used for strawberries, for cherries, or as woodland. Crops are difficult to cultivate and harvest. Cultivation and harvesting of row crops require practices that are difficult to apply without causing excessive soil losses and damage to the crops. The strong slopes and the water received from higher areas intensify the hazard of erosion. (Capability unit IIIe-2; woodland suitability group 3c1)

Stayton Series

The Stayton series consists of well-drained soils that have formed in alluvium underlain by basalt. These soils are on foot slopes and in drainageways of the red foothills. They have slopes of 0 to 7 percent. Elevations range from 250 to 1,200 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 50° to 53° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly oak, vine maple, sedges, and grass. Stayton soils are associated with Nekia and Jory soils.

In a typical profile, the surface layer is black silt loam about 17 inches thick. Just below the surface layer is a layer of dark reddish-brown silt loam about 3 inches thick. Hard basalt bedrock is at a depth of about 20 inches.

The Stayton soils are used mainly for pasture, for grass grown for seed, and as woodland.

Stayton silt loam, 0 to 7 percent slopes (SvB).-This soil is in drainageways and on foot slopes of the red foothills. It is the only soil of the Stayton series mapped in the survey area.

Representative profile 150 to 200 yards north of Drift Creek where that creek flows under Drift Creek Road; about 1 1/2 miles south of Drift Creek Falls (NW1/4SW1/4 sec. 17, T. 8 S., R.1 E.)

A11-0 to 12 inches, black (5YR 2/1) silt loam, dark reddish brown (5YR 3/3) when dry; moderate, very fine, granular structure; very friable, slightly hard, slightly sticky and slightly plastic; plentiful roots; many, very fine, interstitial pores; medium acid (pH 5.6); gradual wavy boundary. (7 to 14 inches thick.)

A12-12 to 17 inches, black (5YR 2/1) silt loam, dark reddish brown (5YR 3/3) when dry; weak, very fine and fine, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; plentiful roots; few fine pores and common very fine pores; medium acid (pH 5.8); clear, wavy boundary. (3 to 8 inches thick.)

AC-17 to 20 inches, dark reddish-brown (5YR 3/2) silt loam, reddish brown (5YR 4/4) when dry; weak, medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; common fine roots; few medium pores and common very fine pores; medium acid (pH 5.8); abrupt, wavy boundary. (0 to 6 inches thick.)

IIR-20 inches, hard basalt bedrock.

Color of the A horizon ranges from black to very dark brown. Depth to bedrock ranges from 15 to 20 inches. Where the solum is shallowest over bedrock, the AC horizon is thin or absent. Where the profile lacks an AC horizon, the A horizon rests directly on bedrock. In places bedrock crops out at the surface. A few fragments of rock the size of pebbles are scattered throughout the solum.

The available water capacity ranges from 2 to 4 inches. Permeability and fertility are both moderate. Runoff is medium, and erosion is a moderate hazard. Roots can penetrate to a depth of only 15 to 20 inches.

This soil is used for pasture, for grass grown for seed, and as woodland. It is well suited to forage plants grown for pasture and to early maturing grasses grown for seed. This soil is droughty, however, and forage plants grow well only in spring. (Capability unit VIe-1; not placed in a woodland suitability group)

Steiwer Series

The Steiwer series consists of well-drained soils on foot slopes and on low foothills. These soils have formed in a thin mantle of material consisting partly of silty alluvium and colluvium and partly of sedimentary material derived from the underlying bedrock. They have slopes of 3 to 40 percent. Elevations range from 250 to 650 feet. The average annual precipitation is between 40 and 60 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly oak, wild rose, poison-oak, annual bromegrass, and velvetgrass. Steiwer soils are associated with Chehulpum and Hazelair soils.

In a typical profile, the surface layer is about 17 inches thick and consists of very dark brown silt loam in the upper part and of very dark grayish-brown silt loam in the lower part. A subsurface layer of dark-brown silt loam, about 4 inches thick, is just beneath the surface layer. The subsoil is dark yellowish-brown silty clay loam about 11 inches thick. Fine-grained sandstone is at a depth of about 32 inches.

Steiwer soils are used mainly as woodland and for small grains, pasture, hay, and grass grown for seed.

Steiwer silt loam, 3 to 6 percent slopes (SwB).-This soil is on low foothills and on foot slopes of the Salem and Waldo Hills.

Representative profile in a field just south of a barn, about 30 feet south of the center of a road (NW1/4NE1/4 sec. 25, T. 9 S., R. 3 W.)

Ap1-0 to 5 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) when dry; cloddy, breaking to very weak, coarse, granular structure; friable, hard, slightly plastic and slightly sticky; common roots; many interstitial pores; many wormholes and worm casts; common, very fine, black concretions; common very fine fragments of weathered rock; medium acid (pH 5.6); abrupt, smooth boundary. (4 to 8 inches thick.)

Ap2--5 to 8 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) when dry; massive, breaking to very weak, coarse, subangular blocky structure; friable, hard, slightly plastic and slightly sticky; few, very fine and fine, tubular pores; common, very fine, black concretions; common fine fragments of weathered rock; medium acid (pH 5.9); clear, smooth boundary. (0 to 4 inches thick.)

A1-8 to 17 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) when dry; weak, medium, prismatic structure and moderate to strong, coarse and medium, subangular blocky structure; very friable, slightly hard, slightly plastic and slightly sticky; few roots; common, very fine and fine, tubular pores; very few, fine, black concretions; medium acid (pH 5.9); clear, smooth boundary. (0 to 10 inches thick.)

A3--17 to 21 inches, dark-brown (10YR 3/3) silt loam; pale brown (10YR 6/3) when dry; weak, coarse, prismatic structure and moderate, medium, subangular blocky structure; very friable, slightly hard, slightly plastic

and slightly sticky; few roots; common, very fine and fine, tubular pores; medium acid (pH 5.8); clear, smooth boundary. (0 to 8 inches thick.)

B21-21 to 29 inches, dark yellowish-brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) when dry; weak, coarse, prismatic structure breaking to moderate, coarse and medium, subangular blocky structure; firm, hard, plastic and sticky; few roots; many, very fine and fine, tubular pores; dark grayish-brown (10YR 4/2) coatings on ped surfaces; few, fine, black concretions; common medium and fine fragments of sandstone; medium acid (pH 5.9); clear, smooth boundary. (6 to 15 inches thick.)

B22-29 to 32 inches, dark yellowish-brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) when dry; weak, medium, prismatic structure breaking to moderate, medium, subangular blocky structure; firm, hard, plastic and sticky; few roots; many, very fine and fine, tubular pores; dark grayish-brown (10YR 4/2) coatings on ped surfaces; few very fine concretions; many, coarse, medium and fine fragments of sandstone; slightly acid (pH 6.2); abrupt, wavy boundary. (3 to 12 inches thick.)

R-32 inches, dark yellowish-brown (10YR 4/4), hard, fractured, fine-grained sandstone that is horizontally bedded.

When the soil is moist, color of the A horizon ranges from very dark grayish brown to very dark brown or dark brown, and color of the B horizon ranges from dark brown to dark yellowish brown. Texture of the A horizon ranges from silt loam to silty clay loam, and texture of the B horizon ranges from clay loam to heavy silty clay loam. The number of fragments of siltstone, sandstone, and shale ranges from few in the upper part of the solum to many (as much as 30 percent) in the lower part of the B horizon. Depth to sedimentary bedrock ranges from 20 to 40 inches, but the depth is generally between 24 and 32 inches. Where bedrock is at the greatest depth, these soils contain a clayey horizon, as much as 4 inches thick, that lies just above the bedrock.

Included with this soil in mapping were small areas of Hazelair soils.

The available water capacity ranges from 4 to 8 inches. Permeability is moderately slow, and fertility is moderate. Runoff is slow, and the hazard of erosion is slight. Roots can penetrate to a depth of 20 to 40 inches.

This soil is well suited to winter cereal grains, forage crops, and early maturing grasses grown for seed. It is used mainly for those crops and for improved or woodland-grass pasture. The small irrigated acreage is used to grow pole beans, sweet corn, blackberries, and strawberries. (Capability unit IIIe-3; not placed in a woodland suitability group)

Steiwer silt loam, 6 to 20 percent slopes (SwD).-This soil has slopes that are mainly steeper than 12 percent. Runoff is medium, and the hazard of erosion is moderate. Included in mapping were some areas of sandstone outcrops, and small areas of Chehulpum soils.

This Steiwer soil is used mainly for small grains, grass grown for seed, cleared pasture, hay, and woodland pasture. (Capability unit IVe-2; not placed in a woodland suitability group)

Steiwer and Chehulpum silt loams, 3 to 40 percent slopes (SCE).-This undifferentiated unit consists of gently sloping to steep Steiwer and Chehulpum soils that are moderately deep and shallow over bedrock. Some areas consist wholly of Steiwer soils, others consist wholly of Chehulpum soils, and still others consist of both soils. The soils are on foot slopes and foothills. In areas that are not cultivated, the vegetation is mainly velvetgrass, annual bromegrass, poison-oak, rose, and oak trees.

The profile of the Steiwer soil is similar to the one described as typical for Steiwer silt loam, 3 to 6 percent slopes, except that bedrock is at a depth of only 20 to 24 inches. A representative profile of the Chehulpum soil follows

Representative profile 25 feet south of county road NE1/4NE1/4NE1/4 sec. 25, T. 9 S., R,. 2 W.)

01&02-1/2 inch to 0, grass and leaves in varying degrees of decomposition.

A11-0 to 4 inches, very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) when dry; moderate, medium, subangular blocky and moderate, fine, granular structure; friable, slightly hard, sticky and plastic; many roots; many, very fine, interstitial and tubular pores; medium acid (pH 5.9) ; clear, smooth boundary. (2 to 6 inches thick.)

A12-4 to 12 inches, very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) when dry; moderate, medium and fine, subangular blocky structure; friable, hard, sticky and plastic; many roots; many, very fine and fine, tubular pores; common fine fragments of sandstone; medium acid (pH 5.9); abrupt, smooth boundary. (6 to 14 inches thick.)

IIR-12 inches, horizontally bedded, fine-grained sandstone.

Texture throughout the profile ranges from silt loam to loam., In places the A horizon is dark brown. Depth to bedrock ranges from 10 to 20 inches.

Included with these soils in mapping were small areas of Hazelair, Witzel, and Nekia soils, and many areas of rock outcrops.

The available water capacity of the Steiwer soil of this undifferentiated unit is 4 to 5 inches, and that of the Chehulpum soil is 2 to 4 inches. Permeability of the Steiwer soil is moderately slow, and that of the Chehulpum soil is moderate. Runoff is medium to rapid, and the hazard of erosion is severe. Roots can penetrate to a depth of 20 to 24 inches in the Steiwer soil, but to a depth of only 10 to 20 inches in the Chehulpum soil.

This undifferentiated unit is mainly in native pasture (fig. 9) and in wooded areas. Most of the forage is produced in spring, for the forage plants make little growth in summer and fall. These soils are not suited to Douglas-fir. Douglas-fir grows only where additional soil material has been deposited on the surface of these soils, or it grows on deeper included soils. (Capability unit VIe-1; not placed in a woodland suitability group)

Stony Rock Land

Stony rock land (Sy) is a miscellaneous land type in which 25 percent or more of the acreage is nearly bare and very stony or consists of outcrops of basalt. This land type is nearly level to very steep. Except where some areas have a sparse cover of forage plants or of stunted trees that grow where there are small pockets of soil material, the land has no value for farming. (Capability unit VIIIs-1; not placed in a woodland suitability group)

Terrace Escarpments

Terrace escarpments (Te) consists of gravelly and silty alluvium that is too variable in characteristics to be classified as soil. It is moderately steep or steep and occurs along the sidewalls of the major streams, on terrace scarps, and on the side slopes bordering channels of intermittent streams. The vegetation is mainly Douglas-fir, maple,

hazel, swordfern, brackenfern, poison-oak, tussock, sedges, and grasses.

This land type is suitable for pasture and for use as woodland. The short, steep slopes make tillage impracticable. (Capability unit VIe-2; not placed in a woodland suitability group

Waldo Series

The Waldo series consists of poorly drained soils that have formed in alluvium. These soils are nearly level. They are on bottom lands along small streams and in drainageways that dissect low foothills. Elevations range from 250 to 1,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 190 to 210 days. In areas that are not cultivated, the vegetation is mainly sedges, grasses, willow, cottonwood, ash, and oak. Waldo soils are associated with Abiqua and McAlpin soils.

In a typical profile, the surface layer is very dark grayish-brown silty clay loam that is mottled in the lower part and is about 10 inches thick. The subsoil is mottled throughout and is about 36 inches thick. It is very dark grayish-brown clay in the upper part, dark-gray clay in the middle part, and gray silty clay in the lower part. The substratum is mottled gray silty clay that extends to a depth of 60 inches or more.

The Waldo soils are used mainly for small grains, pasture, and grass grown for seed.

Waldo silty clay loam (Wa).-This is the only soil of the Waldo series mapped in the survey area. It occupies narrow strips along small streams and in drainageways of the Salem, Waldo, and Silverton Hills.

Representative profile 475 feet west and 175 feet south of the center of a gravel road that crosses over Beaver Creek (SE1/4NE1/4 sec. 29, T. 8 S., R. 1 W.)

Ap1-0 to 2 inches, very dark grayish-brown (10YR 3/2) silty clay loam, grayish brown (10YR 4/2) when dry; moderate, very fine, granular structure; friable, slightly hard, plastic and sticky; many interstitial pores; many, fine, reddish-brown and black concretions; medium acid (pH 5.6); abrupt, smooth boundary. (0 to 3 inches thick.)

Ap2-2 to 7 inches, very dark grayish-brown (10YR 3/2) silty clay loam, grayish brown (10YR 4/2) when dry; cloddy, breaking to very weak, fine, granular structure; very firm, very hard, plastic and sticky; few roots; few interstitial and very fine, tubular pores; many, fine, reddish-brown and black concretions ; medium acid (pH 5.7) ; abrupt, smooth boundary. (4 to 7 inches thick.)

A1-7 to 10 inches, very dark grayish-brown (10YR, 3/2) silty clay loam, dark grayish brown (10YR 4/2) when dry; common, medium, distinct, dark gray (10YR 4/1), very dark gray (10YR 3/1), and red (2.5YR 4/8) mottles; strong, medium and fine, granular structure; friable, hard, plastic and sticky; common roots; many interstitial pores; many, coarse, medium and fine, reddish-brown and black concretions; medium acid (pH 5.8); abrupt, wavy boundary. (2 to 4 inches thick.)

B1-10 to 15 inches, very dark grayish-brown (10YR 3/2) clay, gray (10YR 5/1) when dry; common, medium, distinct, very dark gray (10YR 3/1) and yellowish-red (5YR 5/8) mottles; strong, coarse, subangular blocky structure breaking to strong, very fine, subangular blocky structure; firm, very hard, very plastic and very sticky; common roots; many, very fine and fine, tubular pores; ; thin coatings of silt on the surfaces of peds ; many, fine and very fine, reddish-brown and black concretions; slightly acid (pH 6.1); clear, wavy boundary. (3 to 8 inches thick.)

B21g-15 to 23 inches, dark-gray (N 4/0) clay, gray (N 5/0) when dry; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; strong prismatic structure breaking to strong, coarse, subangular blocky structure; very firm, very hard, very plastic and very sticky; common roots; many, very fine and fine. tubular pores; thin coatings of silt on the surfaces of peds; many, fine, reddish-brown and black concretions; medium acid (pH 5.9); clear, smooth boundary. (6 to 10 inches thick.)

B22g-23 to 37 inches, dark-gray (N 4/0) clay, gray (N 5/0) when dry; many, medium, prominent, strong-brown (7.5YR 5/8) mottles; strong prismatic structure breaking to moderate coarse, subangular blocky structure; firm, very hard, very plastic and very sticky; common roots; many, very fine and fine, tubular pores; few, fine, reddish-brown and black concretions; medium acid (pH 5.8) gradual, smooth boundary.

B3g-37 to 146 inches, gray (N 5/0) silty clay, gray (N 6/0) when dry; many, prominent, strong-brown (7.5YR 5/8) and yellowish-red (5YR 4/8) mottles; weak, coarse, subangular blocky structure; firm, very hard, very plastic and very sticky; few roots; few, very fine, tubular pores; few, moderately thick, gray clay films in the larger pores; few, fine, reddish-brown and black concretions; medium acid (pH 5.7); gradual, smooth boundary. (6 to 12 inches thick.)

Cg-46 to 60 inches, gray (N 5/0) silty clay, gray (N 6/0) when dry; many, medium, prominent, strong-brown (7.5YR 5/8) mottles; massive; friable, very hard, very plastic and very sticky; very few roots; common, very fine, and very few, medium, tubular pores; thick, continuous clay films in cracks, pores, and root channels; few, medium, black concretions; medium acid (pH 5.7).

In the A horizon and the upper part of the B horizon, thickness of the soil material that is as dark as very dark grayish brown is less than 24 inches. Color of the B horizon ranges from very dark grayish brown to gray. Structure in the B1 and B2 horizons ranges from moderate to strong prismatic and subangular blocky or blocky. Depth to the clay or silty clay of the B horizon is less than 25 inches. In some places mottling is near the surface. In others it is at a depth of as much as 15 inches.

Included with this soil in mapping were small areas of McAplin soils and small areas of very poorly drained soils.

The available water capacity is 9 to 11 inches. Permeability is slow, and fertility is moderate. Runoff is slow, and erosion is not a hazard. Depth to which roots can penetrate is limited by a seasonal high water table. Workability is fair, but it becomes progressively poorer as the content of moisture drops below field capacity.

This soil is used mainly for small grains, pasture, and grass grown for seed. When irrigated, areas that are drained are used for pole beans and sweet corn. Surface drainage and subsurface drainage are both needed, but establishing outlets is necessary in most places. Even after adequate surface drainage has been installed, subsurface drainage it still difficult. (Capability unit IIIw-2; not placed in a woodland suitability group)

Wapato Series

The Wapato series consists of poorly drained soils that have formed in mixed alluvium. These soils are nearly level. They occur in depressions and overflow channels on flood plains at elevations of 100 to 650 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is about 53° F., and the length of the

Figure 9.-Clearing an area for pasture on Steiwer and Chehulpum silt loams, 3 to 40 percent slopes. Typical vegetation on these soils is oak trees and annual grasses.

frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly willow, ash, tussocks, sedges, and grasses. Wapato soils are associated with McBee and Bashaw soils.

In a typical profile, the surface layer is mottled very dark brown silty clay loam about 16 inches thick. The subsoil is mottled very dark grayish-brown silty clay loam about 20 inches thick. The substratum is mottled dark-brown silty clay loam that extends to a depth of 60 inches or more.

The Wapato soils are used mainly for pasture, hay, small grains, vegetables, and caneberries.

Wapato silty clay loam (Wc).-This is the only soil of the Wapato series mapped in the survey area. It occurs in backwater areas of the flood plains, in most places adjacent to the terraces.

Representatives profile (SE1/4NE1/4 sec. 15, T. 6 S., R. 1 W.).

Ap-0 to 6 inches, very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) when dry; few, fine, faint, yellowish-brown (10YR 5/4) mottles; cloddy; moderate, fine, subangular blocky structure; friable, hard, sticky and plastic; many roots; common, fine, tubular pores; few reddish-brown and black concretions, slightly acid (pH 6.2), clear, smooth boundary. (6 to 9 inches thick.)

A1-6 to 16 inches, very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) when dry; common, fine, distinct, dark reddish-brown (5YR 3/4) mottles; moderate, medium, subangular blocky structure; firm, hard, sticky and plastic; many roots; many, fine, tubular pores; many reddish-brown concretions; slightly acid (pH 6.4); gradual, smooth boundary. (6 to 10 inches thick.)

B2-16 to 36 inches, very dark grayish-brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 5/2) when dry; few, fine, faint, dark-gray (10YR 5/1) mottles; weak, coarse, subangular blocky structure; firm, hard, sticky and plastic; common roots; many, fine, tubular pores; few, fine, reddish-brown and black concretions; slightly acid (pH 6.2); clear, smooth boundary. (14 to 20 inches thick.)

C-36 to 60 inches, dark-brown (7.5YR 4/4) silty clay loam, brown (7.5YR 5/4) when dry; many, medium, prominent, grayish-brown (2.5Y 5/2) mottles; massive; friable, hard, sticky and plastic; many, fine, tubular pores; common black concretions and stains; slightly acid (pH 6.2).

Color of the A horizon ranges from very dark brown to very dark grayish brown. In places the B horizon is dark grayish brown. Texture of the B horizon ranges from silty clay loam to light silty clay. Texture of the C horizon ranges from clay

loam or silty clay loam to light silty clay. In some places this soils is mottled at or near the surface. In others mottling is at depths of as much as 12 inches.

Included with this soil in mapping were small areas of better drained soils, and small areas of a soil that has a surface layer of silt loam.

The available water capacity is 10 to 12 inches. Permeability is moderately slow, and fertility is moderate. Runoff is slow and erosion is not a hazard or is only a slight hazard. The depth to which roots can penetrate is restricted by a high water table during winter and spring. Workability is good where the content of organic matter is adequate. Overflow occurs during winter and early in spring.

Undrained areas of this soil are used for pasture and hay. Drained areas are used for small grains, sweet corn, pole beans, hops, and blackberries. Irrigation is needed for vegetables to be grown commercially. It is also needed to make this soil better suited to forage plants and to extend the period during with these plants produce forage. Drainage is needed for most crops. Adequate outlets for surface runoff are needed. Subsurface tile drainage is needed to lower the water table for deep-rooted crops and to make tillage possible early in spring. Providing drain age for deep-rooted crops is of questionable value in most areas, however, for adequate drainage generally cannot be maintained during winter and spring. (Capability unit IIIw-2; not placed in a woodland suitability group)

Whetstone Series

The Whetstone series consists of well-drained soils that have formed in till -and colluvium from basalt and tuffs. These soils are on mountainous uplands. They are underlain by basalt and have slopes of 3 to 75 percent. Elevations range from 3,000 to 4,000 feet. The average annual precipitation is 70 to 90 inches, the average annual air temperature is 41° to 45° F., and the length of the frost-free season is 90 to 110 days. The vegetation is mainly noble fir, silver fir, hemlock, Douglas-fir, blue huckleberry, rhododendron, fireweed, and beargrass. Whetstone soils are associated with Henline, Kinney, and Horeb soils.

In a typical profile, the surface layer is dark-gray stony sandy loam that is only about 1 inch thick. This is covered with a thin layer of undecomposed and partly decomposed tree limbs, twigs, leaves, needles, and grass. The subsoil is about 18 inches thick, and it consists of dark reddish-brown stony loam in the upper part and of dark-brown stony loam in the lower part. The substratum is dark yellowish-brown stony loam. It is underlain by basalt bedrock at a depth of about 38 inches.

Whetstone stony loam, 3 to 25 percent slopes (WHE).-This soil occupies large areas on the middle slopes of the slopes of the Cascade Mountains. Some of the areas are steep.

Representative profile 50 feet north of a steel gate at junction of roads (NE1/4NE1/4 sec. 9, T. 8 S., R. 3 E.)

O1-4 to 2 inches, undecomposed limbs, twigs, leaves, needles, and grass.

O2-2 inches to 0, partly decomposed plant and animal matter.

A2-0 to 1 inch, dark-gray (5YR 4/1) stony sandy loam, gray (5YR 5/1) when dry; single grain; friable, soft, nonsticky and nonplastic; many, fine, interstitial pores; many roots; extremely acid (pH 4.0); abrupt, wavy boundary. (1/2 to 1 1/2 inches thick.)

B21ir-1 to 5 inches, dark reddish-brown (5YR 3/3) stony loam, reddish brown (5YR 4/4) when dry; massive; weakly cemented; firm, hard, slightly sticky and nonplastic; common roots; 20 percent, by volume, cobblestones, other stones, and pebbles; common fine and very fine pores dark coatings of iron on incipient surfaces of peds; dark reddish-brown (2.5YR 2/4) stains of organic matter; extremely acid (pH 4.2); abrupt, wavy boundary. (3 to 8 inches thick.)

B22ir-5 to 19 inches dark-brown (7.5YR 3/2) stony loam, brown (7.5YR 5/4) when dry; massive; friable, hard, slightly sticky and nonplastic; common roots; common fine and very fine pores; 30 percent, by volume, cobblestones, other stones, and pebbles; bands of iron accumulation 1 to 2 inches thick along planes of weakness of incipient surfaces of peds; many, dark reddish-brown, firm nodules 5 to 25 millimeters in diameter; very strongly acid (pH 4.6); clear, wavy boundary. (12 to 16 inches thick.)

C-19 to 38 inches, dark yellowish-brown (10YR 4/4) stony loam, brown (10YR 5/3) when dry; massive; friable, slightly hard, slightly sticky and nonplastic; few roots; common fine and very fine pores; 40 percent, by volume, cobblestones, other stones, and pebbles; very strongly acid (pH 4.6).

R-38 inches, basalt bedrock.

The A2 horizon appears to be intermittent because it has been destroyed by burning or logging in many places. It is present wherever the original surface layer is present. The B horizon ranges from dark reddish brown to dark brown in color, and it has firm or friable consistence. Thickness of the B horizon ranges from 15 to 24 inches. The content of cobblestones, other stones, and pebbles in that horizon is less than 50 percent. Depth to bedrock ranges from 20 to more than 40 inches.

Included with this soil in mapping were areas that are deeper over bedrock than typical and that have only a trace of the dark-gray surface layer remaining. Also included were areas where the dark-gray surface layer is missing. Other inclusions consist of a few rock outcrops.

The available water capacity is 3 to 6 inches. Permeability is moderate, and fertility is low. Runoff is medium, and the hazard of erosion is moderate. Roots can penetrate to a depth of 20 to 40 inches.

This soil is well suited to forest trees, and it is used mainly for growing timber. It is not suited to cultivated crops. Snow usually covers the surface in winter and early in spring. (Capability unit VIe-2; woodland suitability group 3o2)

Whetstone stony loam, 25 to 55 percent slopes (WHF).-Runoff from this soil is rapid, and the hazard of erosion is severe. Rock outcrops are common.

Included with this soil in mapping were areas of Henline soils. The included areas make up from 5 to 10 percent of the acreage in this mapping unit.

This Whetstone soil is used mainly for growing timber. (Capability unit VIe-2; woodland suitability group 3r3)

Whetstone stony loam, 55 to 75 percent slopes (WHG).-Runoff from this soil is very rapid, and the hazard of erosion is very severe. Rock outcrops are numerous, and rock escarpments are common.

Included with this soil in mapping were areas of Henline soils. The included areas make up from 10 to 15 percent of the acreage in this mapping unit.

This Whetstone soil is used mainly for growing timber. (Capability unit VIIe-1; woodland suitability group 3r4)

Willamette Series

The Willamette series consists of deep, well-drained soils that have formed in silty alluvium. These soils are on low, broad valley terraces. They have slopes of 0 to 12 percent. Elevations range from 150 to 350 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 50° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly oatgrass and other native grasses, hazel, blackberry, Oregon white oak, and Douglas-fir. Willamette soils are associated with Woodburn soils.

In a typical profile, the surface layer is very dark grayish-brown silt loam about 12 inches thick. A subsurface layer that also consists of very dark grayish-brown silt loam and that is about 5 inches thick is just beneath the surface layer. The upper part of the subsoil is dark-brown silt loam about 7 inches thick; the middle part of the subsoil is dark-brown silty clay loam about 14 inches thick; and the lower part is dark-brown silt loam about 16 inches thick. A substratum of dark yellowish-brown silt loam underlies the subsoil, and it extends to a depth of 65 inches or more.

The Willamette soils are used mainly for small grains, pasture, hay, orchards, berries, and vegetables.

Willamette silt loam, 0 to 3 percent slopes (WIA).-This soil is on broad valley terraces that lie between the flood plains of the North Santiam, Santiam, and Willamette Rivers and the red foothills. The areas are between Marion and Aurora.

Representative profile (NW1/4NE1/4SE1/4 sec. 22, T. 5S.,R.1W.):

Ap-0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) when dry; moderate, medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many roots; many, fine, tubular pores; few reddish-brown and black concretions; slightly acid (pH 6.1); clear, smooth boundary. (5 to 7 inches thick.)

A1-6 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) when dry; moderate, coarse and medium, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many roots; common, very fine and fine, tubular pores; iron stains along root channels; common, fine, reddish-brown and black concretions; slightly acid (pH 6.1); clear, smooth boundary. (4 to 8 inches thick.)

A3-12 to 17 inches, very dark grayish-brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) when dry; moderate, medium, subangular blocky structure; friable, hard, slightly sticky and slightly plastic; common roots; common, very fine and fine, tubular pores; common, medium and fine, reddish-brown and black concretions; slightly acid (pH 6.2); clear, smooth boundary. (3 to 12 inches thick.)

B1t-17 to 24 inches, dark-brown (10YR 3/3) silt loam, dark brown (10YR 4/3) when dry; moderate, medium, subangular blocky structure; friable, hard, sticky and slightly plastic; common roots; common, very fine and fine, tubular pores; few thin clay films; common, medium and fine, reddish-brown and black concretions; strong-brown (7.5YR 3/2) coatings on ped surfaces; few black stains; slightly acid (pH 6.2) ; gradual, smooth boundary. (7 to 11 inches thick.)

B2t-24 to 38 inches, dark-brown (10YR 3/3) silty clay loam, dark yellowish brown (10YR 4/4) when dry; moderate, coarse, subangular blocky structure; friable, hard, sticky and plastic; common roots; common, very fine, tubular pores; medium, continuous clay films; dark-brown (10YR 4/3) mottles and common gray coatings of silt on ped surfaces (10YR 5/1); few reddish-brown and black concretions; slightly acid (pH 6.2); gradual, smooth boundary. (10 to 14 inches thick.)

B3t-38 to 54 inches, dark-brown (10YR 3/3) silt loam, dark yellowish brown (10YR 4/4) when dry; moderate, coarse, subangular blocky structure; friable, hard, slightly sticky and slightly plastic; few roots; common, very fine, tubular pores; medium, patchy clay films; few reddish-brown and black concretions; slightly acid (pH 6.4); gradual, smooth boundary. (6 to 18 inches thick.)

C-54 to 65 inches, dark yellowish-brown (10YR 4/4) silt loam, brown (10YR 5/3) when dry; massive; friable. hard, slightly sticky and slightly plastic; common, very fine, tubular pores; slightly acid (pH 6.5).

The A horizon ranges from 15 to 25 inches in thickness and from very dark brown or dark brown to very dark grayish brown in color. The B horizon ranges from silty clay loam to silt loam in texture and from moderate or weak, medium, prismatic to moderate subangular blocky in structure. In places the B horizon contains faint mottles in the lower part, and distinct mottles below a depth of 40 inches. The C horizon is mainly silt loam or silty clay loam that is massive, but in places it contains thin layers that have other texture or structure.

Included with this soil in mapping were areas of Amity and Woodburn soils. The areas of Amity soils make up less than 2 percent of the total acreage in the mapping unit. Those of Woodburn soils make up as much as 15 percent.

The available water capacity is 12 to 14 inches. Permeability is moderate, and fertility is high. Runoff is slow, and no apparent erosion has taken place. Internal drainage is medium. Roots can penetrate to a depth of 5 feet or more.

This soil is used mainly for small grains, field corn, orchards, pasture, hay, caneberries, strawberries, and vegetables, but it is suited to all the crops commonly grown in the survey area. Irrigation makes this soil even better suited to crops, and it improves the quality of most crops. (Capability unit I-1; not placed in a woodland suitability group)

Willamette silt loam, 3 to 12 percent slopes (WIC).-This soil has slopes of 3 to 7 percent in about 70 percent of the acreage; Runoff is slow to medium, and the hazard of erosion is slight to moderate.

Included with this soil in mapping were small areas of Woodburn soils, and small areas in which slopes are as steep as 20 percent.

This Willamette soil is used mainly for small grains, pasture, hay, and orchards, but a moderate acreage is used for vegetables and berries. This soil is less suitable for vegetables and berries than Willamette silt loam, 0 to 3 percent slopes. Mechanical harvesting of crops is difficult on slopes steeper than 5 percent. (Capability unit IIe-2; not placed in a woodland suitability group)

Witzel Series

The Witzel series consists of well-drained, very stony soils on breaks in red foothills. These soils have formed partly in loess but mainly in colluvium from basic igneous rock. They have slopes of 3 to 40 percent. Elevations range from 300 to 1,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 52°

to 54° F., and the length of the frost-free season is 190 to 200 days. The vegetation is mainly grass, poison-oak, rose, oak, and scattered Douglas-firs. Witzel soils are associated with Nekia and Jory soils.

In a typical profile, the surface layer is dark-brown very stony silt loam about 4 inches thick. The subsoil is about 15 inches thick, and it consists of dark-brown very stony silty clay loam in the upper part and of dark reddish-brown very stony silty clay loam in the lower part. Partly fractured basalt bedrock is at a depth of about 19 inches.

The Witzel soils are used mainly for pasture and as woodland.

Witzel very stony silt loam, 3 to 40 percent slopes (ME).-This is the only soil of the Witzel series mapped in the survey area. It is on slope breaks and in red foothills. The dominant slopes are less than 12 percent.

Representative profile (NE1/4SE1/4 sec. 8, T. 8 S., R. 2W.):

A1--0 to 4 inches, dark-brown (7.5YR 3/2) very stony silt loam, brown (7.5YR 5/4) when dry; moderate, fine, granular structure; friable, hard, slightly sticky and slightly plastic; 60 percent roots; many, very fine and fine, interstitial pores; many coarse fragments; medium acid (pH 6.0); clear, smooth boundary. (2 to 6 inches thick.)

B21-4 to 9 inches, dark-brown (7.5YR 3/2) very stony silty clay loam, brown (7.5YR 5/4) when dry; moderate, fine, subangular blocky structure; firm, hard, sticky and plastic; many roots; common, very fine, tubular pores; 60 percent coarse fragments; medium acid (pH 6.0); gradual, wavy boundary. (3 to 10 inches thick.)

B22-9 to 19 inches, dark reddish-brown (5YR 3/4) very stony silty clay loam, reddish brown (5YR 5/4) when dry; weak, medium, subangular blocky structure; friable, hard, sticky and plastic; many roots; common, very fine, tubular pores; 60 percent coarse fragments; medium acid (pH 6.0); clear, smooth boundary, (2 to 6 inches thick.)

IIR-19 inches, partly fractured basalt bedrock.

The A horizon ranges from silt loam to silty clay loam or clay loam in texture, and in places the B horizon is clay loam. Color of the B horizon ranges from dark brown to dark reddish brown. Thickness of the solum over basalt bedrock ranges from 12 to 20 inches. The content of coarse fragments of rock in the soil mass ranges from 50 to 75 percent.

Included with this soil in mapping were some areas in which bedrock is as deep as 30 inches.

The available water capacity is 1 to 3 inches. Permeability is moderately slow, and fertility is low. Roots can penetrate to a depth of 12 to 20 inches. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

This soil is not used for cultivated crops, but it is used mainly for native pasture and as woodland. The high content of stones, low available water capacity, and hazard of erosion make this soil poorly suited to use for pasture. (Capability unit VIs-1; not placed in a woodland suitability group)

Woodburn Series

The Woodburn series consists of moderately well drained soils that have formed in silty alluvium and loess of mixed mineralogy. These soils are on broad valley terraces. They have slopes of 0 to 20 percent. Elevations range from 150 to 350 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52° to 54° F., and the length of the frost-free season is 200 to 210 days. In areas that are not cultivated, the vegetation is mainly grass and Douglas-fir. Woodburn soils are associated with Willamette soils.

In a typical profile, the surface layer is about 17 inches thick and is very dark brown silt loam in the upper part and dark-brown silt loam in the lower part. The subsoil is about 37 inches thick. It is dark yellowish-brown silty clay loam in the upper part; mottled dark-brown silty clay loam in the middle part; and mottled, dark-brown silt loam in the lower part. The substratum is dark-brown silt loam that extends to a depth of 68 inches or more.

The Woodburn soils are used mainly for small grains, pasture, hay, orchards, berries, and vegetables.

Woodburn silt loam, 0 to 3 percent slopes (WuA).-This soil is on broad terraces of Willamette silts.

Representative profile about 200 feet west of the paved road to Champoeg (SW1/4SE1/4SE1/4 sec. 2, T. 4 S., R. 2 W.; profile No. 5 in table 9 in the section "Laboratory Data.") .

Ap-0 to 9 inches, very dark brown (10YR 2/2) silt loam, brown (10YR 5/3) when dry; cloddy and has very weak, subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; many roots; many, fine and very fine, tubular pores; few, fine, interstitial pores; common, medium and fine, reddish-brown and black concretions; medium acid (pH 5.9); abrupt, smooth boundary. (6 to 10 inches thick.)

A1-9 to 17 inches, dark-brown (10YR 3/3) silt loam, brown (10YR 5/3) when dry; moderate, medium, subangular blocky structure; friable, hard, slightly sticky and slightly plastic; common clean silt and sand grains on ped surfaces; many roots; many, very fine, tubular pores; few, thin, darker (10YR 2/2) coatings on ped surfaces; few reddish-brown and black concretions; slightly acid (pH 6.2), smooth boundary. (3 to 8 inches thick.)

B21t-17 to 25 inches, dark yellowish-brown (10YR 3/4) silty clay loam, brown (7.5YR 5/4) when dry; moderate, coarse and medium, subangular blocky structure; friable, hard, sticky and plastic; common roots; many, very fine, tubular pores; few thin clay films on peds; few reddish-brown and black concretions; few black stains on ped surfaces; medium acid (pH 6.0); clear, smooth boundary. (7 to 9 inches thick.)

B22t-25 to 32 inches, dark-brown silty clay loam, brown (10YR 5/3) when dry; few, fine and medium, distinct, dark-gray (10YR 4/1) mottles, light brownish gray (10YR 6/2) when dry; moderate, medium and coarse, subangular blocky structure; friable, hard, brittle, sticky and plastic; common roots; many, very fine, tubular pores; continuous, moderately thick clay films on ped surfaces and in pores; few, fine, black concretions and stains on ped surfaces; medium acid (pH 5.8); abrupt, smooth boundary. (6 to 10 inches thick.)

B31t-32 to 39 inches, dark-brown (10YR 4/3) silt loam, brown (10YR 5/3) when dry; distinct, dark grayish-brown (10YR 4/2) mottles in a few root channels; thin, dark grayish-brown (10YR 4/2) coatings on plane surfaces, light gray (10YR 7/2) when dry; nearly massive; some planes of weakness that are indistinct; vertical planes are more distinct than horizontal planes; very firm, very hard, brittle, slightly sticky and slightly plastic; few roots; many, fine and very fine, tubular pores; continuous, moderately thick clay films on plane surfaces and in some root channels and pores; few, fine and medium, black concretions and few, black coatings on plane surfaces; medium acid (pH 5.7); gradual, smooth boundary. (7 to 10 inches thick.)

B32t-39 to 54 inches, dark-brown (10YR 4/3) silt loam, pale brown (10YR 6/3) when dry; nearly massive, and has some indistinct vertical planes of weakness; very firm, very hard, brittle, slightly sticky and slightly plastic;

no roots; many, fine and very fine, and few, medium, tubular pores; continuous, thin clay films in pores and in old root channels; few black concretions, and some patchy, black coatings on plane surfaces; medium acid (pH 5.9); gradual, wavy boundary. (11 to 17 inches thick.)

C-54 to 68 inches, dark-brown (10YR 4/3) silt loam, pale brown (10YR 6/3) when dry; massive; very firm, very hard, brittle, slightly sticky and slightly plastic; no roots; many, very fine, tubular pores; common moderately thick clay films in larger pores and in old root channels or worm channels; few black coatings in pores and in channels; medium acid (pH 5.9); gradual, wavy boundary. (14 to 16 inches thick.)

When the soil is moist, color of the A horizon ranges from dark grayish brown to very dark brown or dark brown, and color of the B2 horizon ranges from very dark grayish brown or dark brown to dark yellowish brown or strong brown. In all areas the A horizon is thicker than 10 inches. The B2 horizon ranges from heavy silt loam to silty clay loam in texture. Structure of the B2 horizon ranges from weak to moderate, medium or coarse, prismatic to moderate, fine to coarse, subangular blocky. Distinct mottling occurs at a depth above 30 inches. In some places the B3 horizon has weak to moderate subangular blocky or prismatic structure. In others it is massive and has vertical planes of weakness. Consistence of the B3 horizon is firm or very firm when the soil is moist. The substratum is stratified. It ranges from silty clay loam or silt loam to very fine sandy loam or fine sandy loam in texture.

Included with this soil in mapping were small areas of Amity and Willamette soils, and small areas of a somewhat poorly drained soil. The areas of Amity soils occupy less than 5 percent of the acreage in this mapping unit. The areas of Willamette soils occupy as much as 10 percent.

The available water capacity is 11 to 13 inches. Permeability is moderate in the upper part of the subsoil, and it is slow in the lower part. Fertility is high. Depth to which roots can penetrate is restricted by a seasonal perched water table and as the result of the type of structure. Runoff is slow, and no apparent erosion has taken place.

This soil is used mainly for small grains, field corn, orchards, pasture, hay, caneberries, and vegetables. Areas that are drained are used for all the crops commonly grown in the survey area. Because of the perched water table, drainage is needed for crops that cannot tolerate excessive moisture. (Capability unit IIw-1; not placed in a woodland suitability group)

Woodburn silt loam, 3 to 12 percent slopes (WuC).-This soil has slopes of 3 to 5 percent in about 60 percent of the acreage. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

Included with this soil in mapping were small areas that have a thin surface layer and that have distinct mottling within 12 inches of the surface.

This Woodburn soil is used for about the same crops as Woodburn silt loam, 0 to 3 percent slopes. It is less suitable for vegetables and berries, however, because of the difficulty of cultivating those crops so that erosion is controlled without damaging the crop. Mechanical harvesting of vegetables and berries is difficult where slopes are steeper than 5 percent. (Capability unit IIe-1; not placed in a woodland suitability group)

Woodburn silt loam, 12 to 20 percent slopes (WuD).-Where this soil occurs along creeks, intermittent drainageways, and terrace fronts, its slopes are short and abrupt. Runoff is rapid, and the hazard of erosion is moderate.

Included with this soil in mapping were small areas that hve a thin surface layer and that have distinct mottling within 12 inches of the surface.

This Woodburn soil is used mainly for pasture, hay, and small grains, although some small areas are used for row crops and orchards. This soil is poorly suited to row crops; for the slopes are too short and steep for mechanical harvesting of vegetables, berries, and other row crops to be feasible. Tilling row crops so that excessive soil losses are avoided is also difficult. (Capability unit IIIe-1; not placed in a woodland suitability group)

Formation and Classification of Soils

Soils of the Marion County Area differ in fertility, in physical and chemical properties, and in productivity. These differences are the result of differences in parent material and of local differences in the environment under which the soils have formed. This section describes some factors in the environment, and major processes that have affected the formation of soils of the Marion County Area. It also defines the current system, for classifying soils and shows the classification of the soils by series and by higher categories.

Formation of Soils

Soil is a natural body on the surface of the earth. It consists of mixtures of rocks and minerals that have been subjected to various degrees of weathering and that contain greatly varying amounts of organic matter, water, and air. Soils have more or less distinct horizons that have developed under the influence of local factors in the environment. The soil-forming processes that produce different kinds of soils are parent material, which affects the physical and chemical composition of the soils; climate, principally precipitation and temperature; biological forces., or the plant and animal life in and on the soil; relief, or topography; and the time in which the soil-forming processes have acted on the parent material. These five factors, in many different combinations and intensities, produce soils that differ from place to place. The influence of each soil-forming factor on the soils of the Marion County Area is described in the following paragraphs.

Parent material

Soils in the survey area have formed in eight major kinds of parent material. These are (1) recent alluvium, (2) gravelly alluvium, (3) young, silty terrace alluvium, (4) weakly consolidated, old gravelly alluvium, (5) basic colluvium from basalt and massive tuffs, (6) sedimentary alluvium and colluvium derived from tuffaceous sandstone and shale, (7) glacial till, and (8) deposits of organic material. The soils in about 80 percent of the survey area have formed in recent alluvium (Willamette silts); in basic igneous material (basic colluvium derived from basalt and massive tuffs); or in glacial till. Figure 10 shows the approximate distribution of the different kinds of parent materials in the survey area. This figure is based only partly on the results of geologic studies, and therefore it cannot be called a geologic map. The distribution shown is the result of combining information obtained