Foreword

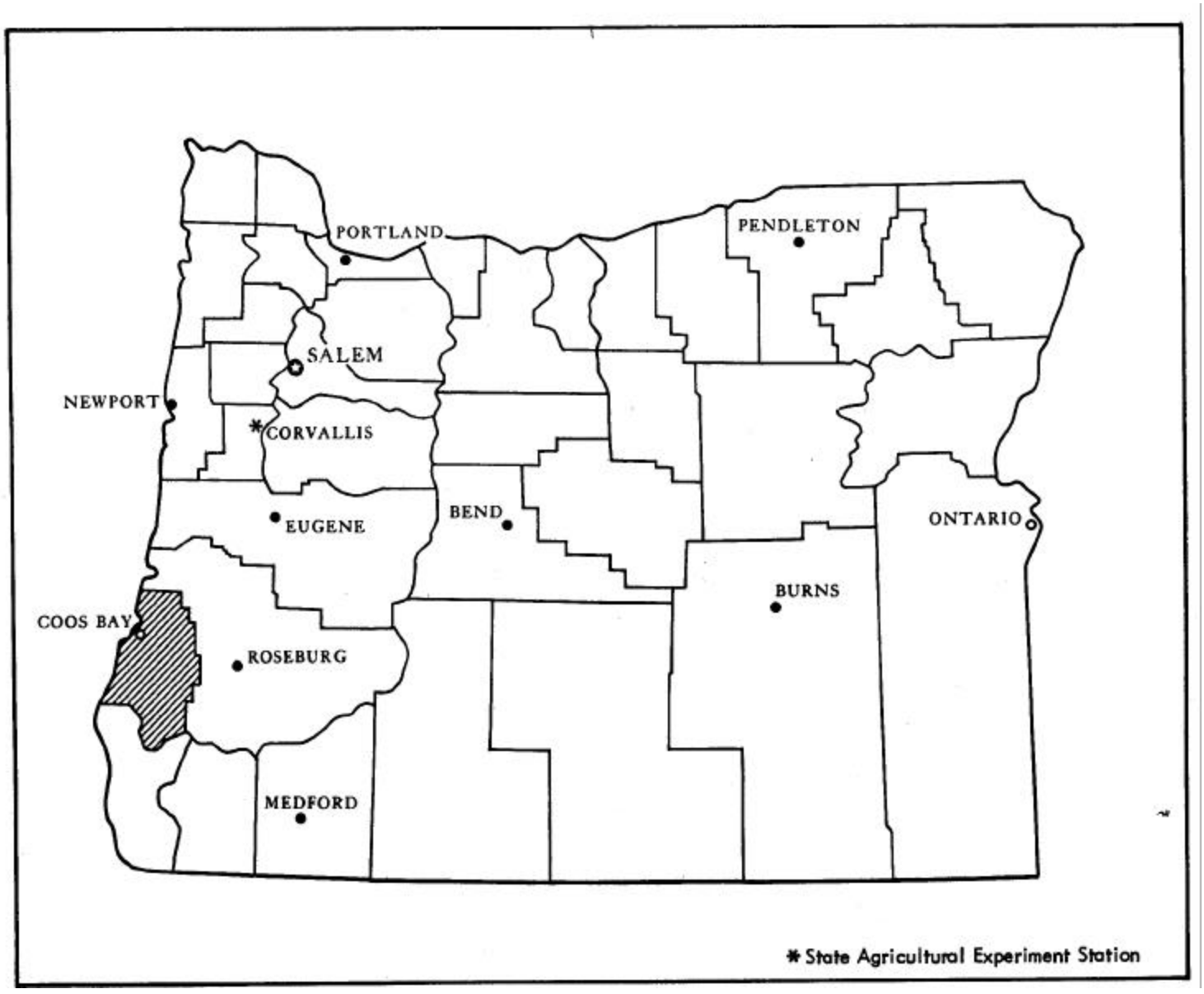
This soil survey contains information that can be used in land-planning programs in Coos County, Oregon. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

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

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

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

Jack P. Kanalz
State Conservationist
Soil Conservation Service



Location of Coos County in Oregon.

Soil Survey of
Coos County, Oregon

By John T. Haagen, Soil Conservation Service

Fieldwork by John T. Haagen, Mark S. Amara, Melvin D. Cheney, Jamie Kienzle, and Fred Gelderman, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with Oregon Agricultural Experiment Station

COOS COUNTY is in the southwestern part of Oregon. It has a total area of about 1,606 square miles, or 1,027,648 acres. Coquille, the county seat, is in the west-central part of the county, along the Coquille River. The population of the county in 1980 was about 63,200.

The eastern two-thirds of the county is steep, precipitous mountains. The west-central part is low, rolling to steep hills. A series of dissected marine terraces is along the southern coast, and an extensive dunefield is along the northern coast. The county is drained by the Coos and Coquille Rivers and their tributaries.

Timber is the main economic enterprise in the county. The climate and soils are favorable for production of Douglas fir, western hemlock, and other conifers. Agriculture is also important; it includes beef, sheep, and dairy operations.

Soil scientists determined that there are about 46 different named kinds of soil in Coos County. The soils have a wide range in texture, natural drainage, and other characteristics. In the northern and eastern three-fourths of the county, the soils are mostly well drained and loamy or clayey. Steepness of slope is the main limitation of these soils. The soils are well suited to timber. In the southwestern part of the county the soils are steep, wet, and clayey. They are subject to landslides. If well managed, the soils are well suited to pasture and timber. Along the coast the soils are gently sloping, are well drained, and are sandy throughout. They are poorly suited to timber and pasture.

This survey area is adjacent to the Curry Area, Oregon, survey area (25). Descriptions and names of soils in this survey do not fully agree with those on soil maps for the Curry Area soil survey. Differences are the result of better knowledge of the soils, modifications of series concepts, or the extent of soils within the survey.

General Nature of the Survey Area

This section provides general information about the survey area. It briefly discusses history and development; physiography, relief, and drainage; and climate.

History and Development

Dr. Nathan Douthit, professor of history, Southwestern Oregon Community College, and Mark S. Amara, soil conservationist. Soil Conservation Service, prepared this section.

In the late 18th century the Coos County area was inhabited by five Indian groups. The Lower Umpqua Indians inhabited the area north of Tenmile Lake. The territory of the Hanis Indians extended from Tenmile Lake to the vicinity of Empire, on Coos Bay. They include all of the upper estuary, sloughs, and river systems of Coos Bay**.** The Milluk, or Lower Coquille, Indians occupied the lower reaches of the Coquille River from Beaver Slough to Bandon and along the coast as far north as Cape Arago. They also occupied

the South Slough area. The upper Coquille Indians occupied the watershed upstream from Beaver Slough, along the Middle and South Forks of the Coquille River. The Tututni Indians inhabited the area south of the Coquille River.

About 2,000 Indians lived in the Coos Bay area at this time (8). Each family group or village followed a yearly pattern of food gathering activities, called a seasonal round. The length of stay in each area depended on whether or not territorial claims were held, the preferences of the group, and the amount of food available. Throughout the season, salmon, steelhead, flounder, trout, and smelt were harvested on the estuaries and rivers and were dried or smoked for use in winter. In summer the people went to the ocean to fish, to gather and dry intertidal foods, and to pick berries. Late in summer they traveled to the mountains to dig camas roots and to hunt deer and elk. Then, by the first fall rains, they returned to their winter villages.

Coastal and inland explorations in the early part of the 19th century by the Hudson's Bay Company led to the establishment of a fur trading outpost on the Lower Umpqua River. Occasional fur trading and trapping trips were made to the Coos Bay area from this outpost.

The settlement of the Willamette and Umpqua River Valleys in the 1840's and the discovery of gold in southern Oregon led to the first white settlement in the Coos Bay area. In the summer of 1853 a party from Jacksonville set out to explore the region. The party discovered rich coal and forest resources, as well as a potential for use of the area as a harbor. This party, which was called the Coos Bay Commercial Company, established Empire City. Almost immediately some members of the party began to mine coal, and the first ,I shipment went to San Francisco in 1854. In 1856 two enterprising men, Henry Heaton Luse and Asa Meade Simpson, had established sawmills on Coos Bay. In 1859 a group settled in the Coquille Valley. Thus, in less than a decade, settlements and the basic industries of the region had been established.

By 1890 the Coos Bay area had a population of 8,874. Its major industries were agriculture, coal mining, and lumber milling. Field crops led in total value; dairy and livestock production was second. Many creameries were established, which led to a sixfold increase in dairy production by 1925. By this time dairies accounted for more than half of the total agricultural production.

Most of the growth in the forest industry took place after 1900. In 1908 a mill was opened in Marshfield; it was second largest in the Pacific Northwest.

The forest products industry changed during World War I. Production of Port Orford cedar for airplanes, venetian blinds, and battery separators led to the . establishment of new manufacturing plants in the area. As a result the major towns in the area continued to grow. By the 1920's Coquille, the largest town on the Coquille River, had a population of 1,642; Marshfield, 4,034; and North Bend, 3,268. Forest production continued to be the driving force of the economy, and it led to a slow but steady growth in. the population of the area.

By 1950 the Coos Bay area had, changed from a coastal frontier into one of Oregon's major urban and industrial centers. The wood products and related industries, which employed most of the labor force, dominated the local economy. Demand for lumber and wood products by the housing industry and increased export of logs and wood products spurred economic growth and helped to increase the population of the area to 64,200 in 1980. Log production, which reached a peak in the early 1950's, with more than 700 million board feet harvested annually, gradually declined over the next 30 years. In 1980 log production dropped sharply to 240 million board feet.

Future economic growth in Coos County will depend on using timber management practices that will provide a sustained annual harvest and on increasing production in other industries such as agriculture, fishing, mining, and tourism.

Physiography, Relief, and Drainage

Coos County lies within the Pacific Border physiographic province. The county can be divided into five general physiographic areas -the Klamath Mountains, the Coast Range, the Coaledo Basin, the marine terraces, and the coastal dunefields.

The Klamath Mountains make up the southwestern part of the county, mainly that part south of Bandon and Myrtle Point and west of the South Fork of the Coquille River. A small part of the Klamath Mountains is east of Eden Valley. The mountain range consists of metamorphic and igneous rock of Jurassic age. Rock outcrop is common throughout this mountainous area (4). The bedrock has been subjected to severe deformation and shearing. Landslides and hummocky topography are distinctive features of the hillsides in this area. The mountainsides are steep and fairly uniform and have broad, rounded ridgetops.

Elevation ranges from about 250 feet along the marine terraces to 4,319 feet at Mt. Bolivar. Other prominent peaks are Iron Mountain, elevation 3,906 feet, and Granite Peak, 3,174 feet. Relief ranges from about 900 to 2,500 feet in the southern part of the

country and decreases to less than 200 feet along the coast.

The Klamath Mountains are drained by many small tributaries of the Coquille River and the South Fork of the Coquille River. The gradient of the small tributaries is fairly steep in the upper reaches of the watershed. It gradually decreases to sea level along the lower part of the river.

The Coast Range covers all of the northern part of the county and extends south along the eastern side of the county to Oregon Route 42. A small lobe extends into the Klamath Mountains; it extends southwest from Bone Mountain and along Eden Ridge.

The Coast Range consists of rhythmically bedded sandstone and siltstone that have only minor deformation, except along major faults. Intrusions of pillow basalt and other igneous rock are scattered throughout the western edge of this area. The sedimentary rock is weakly consolidated and consequently is easily weathered. The sediment that makes up this mountain range derived from the Klamath Mountains during the middle Eocene and was subsequently uplifted.

Mountains of the Coast Range are characterized by highly dissected ridges with very steep side slopes and narrow, sharply defined ridgetops. Bedrock commonly is exposed on the steeper slopes. Elevation generally increases from west to east and from north to south. North of Coos Bay, elevation ranges from about 400 feet along the coast to 2,097 feet at Elk Peak and 2,400 feet at Ivers Peak. South of Coquille, elevation ranges from about 500 feet along the coast to 2,526 feet at Thomas Mountain, 3,294 feet at Kenyon Mountain, and 3,661 feet at Bone Mountain. Relief averages about 950 to 1,600 feet along the eastern edge of the county and decreases to about 400 feet in the Coaledo Basin.

The Coaledo Basin is a small area of low hills between Coos Bay and Myrtle Point. These hills are composed of sandstone and siltstone of late Eocene age. The bedrock is similar to that of the Coast Range, but topography of the Coaledo Basin is much more subdued. The hillsides are not so steep, and the hilltops are rounded. Elevation ranges from sea level to about 800 feet. Relief is about 200 to 500 feet. This area is drained by tributaries of the Coquille River.

A series of marine terraces extends inland about 2 to 4 miles along the southern half of the coastline in the county. These nearly level to gently sloping terraces are composed of sandy sediment deposited during the early Pleistocene. They were formed as a result of leveling by wave erosion and long-term regional uplift. Prominent terrace levels occur at elevations of 80 to 100 feet at Bandon, 300 to 350 feet at Cape Arago, and 500 to 550 feet at Beaver Hill. A small terrace remnant occurs at an elevation of 1,500 to 1,600 feet on Blue Ridge.

The coastline north of Coos Bay consists of an extensive dunefield. It extends inland 2 to 2.5 miles and includes vegetated and active dunes as much as 280 feet in elevation.

Climate

Data were provided by the National Climatic Data Center, Asheville, North Carolina.

The climate of Coos County is greatly tempered by winds from the Pacific Ocean. Summers are fairly warm, but hot days are rare. Winters are cool, but snow and freezing temperatures are common only at higher elevations. During summer, rainfall is extremely light; often several weeks pass without precipitation. Rains are frequent during the rest of the year, especially late in fall and in winter.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at North Bend, Oregon, for the period 1951-78. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 46 degrees F and the average daily minimum temperature is 40 degrees. The lowest temperature on record, which occurred at North Bend on December 8, 1972, is 15 degrees. In summer, the average temperature is 59 degrees and the average daily maximum temperature is 65 degrees. The highest recorded temperature, which occurred on August 30, 1968, is 91 degrees. Every few years, either in winter or summer, an invasion of a large continental airmass from the east causes abnormal temperatures. In winter several consecutive days are well below freezing; in summer a week or longer is sweltering.

Growing degree days, shown in table 1, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). During summer, marine fog is common along the coast and along major drainageways. Fog from the Pacific Ocean begins to move inland about midafternoon and usually does not dissipate until late the next morning. The fog and cool winds from the ocean moderate summer temperatures and limit the accumulation of growing degree days. The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 11 inches, or 20 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 8 inches. The heaviest 1-day rainfall during the period of record was 4.54 inches at North Bend on November 24, 1960. Thunderstorms occur on about 6 days each year, and most occur in summer.

Along the coast, average seasonal snowfall usually is only a trace or less. In most years no snow is recorded. Snow is more abundant in the eastern part of the county at elevations of more than 2,500 feet. No records have been kept at the higher elevations; however, snowfall of several inches occurs occasionally. The snow generally melts within a few days but sometimes lasts for a week or more.

The average relative humidity in midafternoon is about 70 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The percentage of possible sunshine is 60 percent in summer and 40 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 9 miles per hour, in winter.

In most winters, one or two storms over the shore area bring strong and sometimes damaging winds, and in some years the accompanying heavy rains cause serious flooding.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge gradually onto one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils. systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses and under different levels of management. Some interpretations were modified to fit local conditions, and some new interpretations were developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels

of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Map Unit Descriptions

Soils on Dunes, in Deflation Basins, and on Marine Terraces

This group consists of two map units. It makes up about 7 percent of the survey area.

1. Dune Land-Waldport-Heceta

Dune land and sandy, excessively drained and poorly drained soils that formed in eolian material; on sand dunes and in deflation basins

This map unit is on dune ridges and in deflation basins. Barren dune ridges generally are linear and are oriented west to east. The north-facing slopes are short and steep, and the south-facing slopes are longer and moderately steep. Older vegetated dunes are hilly and are gently sloping to steep. A nearly level deflation basin is between the dune ridges and the ocean (fig. 1). Elevation ranges from 0 to 160 feet. Slopes range from 0 to 70 percent. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and average frost-free period is 200 to 240 days.

This unit makes up about 3 percent of the survey area. It is about 30 percent Dune land, 29 percent Waldport soils, and 18 percent Heceta soils. The rest is components of minor extent.

Dune land is barren ridges of sand on the leeward side of deflation basins. It is also in scattered areas within the older wooded dunes, where the vegetation has been removed. Areas of Dune land are dark yellowish brown fine sand throughout.

Waldport soils are excessively drained. They are on stabilized sand dunes on the leeward side of deflation basins. These soils have a dark grayish brown fine sand surface layer and a dark yellowish brown fine sand subsoil.

Heceta soils are poorly drained. They are in deflation basins. These soils have a very dark grayish brown fine sand surface layer and a mottled, grayish brown sand subsoil.

Of minor extent in this unit are somewhat poorly drained Yaquina soils on low terraces; well drained Netarts soils on old stabilized sand dunes; very poorly drained Clatsop soils, Fluvaquents, and Histosols on tidal flats; and coastal Beaches.

This unit is used mainly for recreation, timber production, and wildlife habitat. About 10 percent of the unit is used as homesites.

The hazard of soil blowing, the hazard of ground water pollution, and droughtiness are the main limitations for recreational and urban development. Maintaining plant cover prevents soil blowing. Sewer

Figure 1.-Area of general soil map unit 1. Heceta soils in nearly level deflation basin in background; barren Dune land in foreground.

systems should be used to prevent contamination of ground water. Irrigation is needed to maintain lawn grasses and shrubs.

The soils in this unit are poorly suited to timber production. Productivity is very low because of the high winds and very low soil fertility. The vegetation is dominantly shore pine; some Douglas fir is in protected areas.

2. Bullards-Bandon-Blacklock

Well *drained and poorly drained, loamy and sandy soils that formed in marine sediment; on marine terraces*

This map unit is on a series of dissected marine terraces that parallel the coast and extend inland 2 to 4 miles. Most areas of this unit are drained by small streams that flow directly into the ocean. Elevation

ranges from 25 to 600 feet. Slopes range from 0 to 50 percent. The average annual precipitation is 50 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the frost-free period is 200 to 240 days.

This unit makes up about 4 percent of the survey area. It is about 58 percent Bullards soils, 20 percent Bandon soils, and 18 percent Blacklock soils. The rest is soils of minor extent.

Bullards soils are well drained. They are in the more highly dissected areas of marine terraces and on steep slopes along drainageways. These soils have a very dark grayish brown sandy loam surface layer and a dark reddish brown to strong brown gravelly sandy loam subsoil.

Bandon soils are well drained. They are in broad, gently sloping to moderately sloping areas of marine terraces. These soils have a dark grayish brown sandy loam surface layer and a dark reddish brown to strong brown sandy loam subsoil that is cemented below a depth of 30 inches.

Blacklock soils are poorly drained. They are in nearly level depressional areas of marine terraces. These soils have a black fine sandy loam surface layer and a mottled, strong brown to yellowish brown sand subsoil that is cemented below a depth of 15 inches.

Of minor extent are well drained Nehalem soils and poorly drained Nestucca soils on flood plains and poorly drained Joeney soils on older marine terraces.

This unit is used mainly for timber production and as wildlife habitat and homesites. Some areas are used for pasture and cranberry production.

Slow permeability, slope, and droughtiness are the main limitations. Septic tank filter fields do not function properly where the subsoil is cemented or wet. Slope restricts development in some areas. Irrigation is required for maximum production of pasture grasses and for maintenance of lawns and shrubs.

The soils in this unit are suited to timber production. Productivity is low because of low soil fertility and high winds from the Pacific Ocean. As a result, these soils are not intensively managed for timber production. The dominant tree species are Douglas fir, Sitka spruce, shore pine, and Port Orford cedar.

Soils on Flood Plains and Terraces

This group consists of two map units. It makes up about 5 percent of the survey area.

3. Coquille-Nestucca-Langlois

Somewhat poorly drained and very poorly drained, silty and clayey soils that formed in alluvium; on flood plains

This map unit is on flood plains along the lower reaches of major rivers and coastal streams. It is subject to flooding during high tides. Elevation ranges from 0 to 40 feet. Slopes range from 0 to 3 percent. The average annual precipitation is 50 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the frost-free period is 200 to 240 days.

This map unit makes up about 3 percent of the survey area. It is about 22 percent Coquille soils, *19* percent Nestucca soils, and 14 percent Langlois soils. The rest is soils of minor extent.

Coquille soils are very poorly drained. They are in nearly level areas of flood plains. These soils have a very dark grayish brown silt loam surface layer over dark grayish brown and olive gray silty clay loam.

Nestucca soils are somewhat poorly drained. They are in depressional areas. These soils have a mottled, dark brown silt loam surface layer and a mottled, dark grayish brown silty clay loam subsoil.

Langlois soils are very poorly drained. They are in depressional areas. They have a mottled dark grayish brown silty clay loam surface layer over dark grayish brown and dark gray silty clay and clay.

Of minor extent in this unit are well drained Nehalem soils on slightly higher elevations of flood plains; poorly drained, clayey Chetco soils and loamy Willanch soils in depressional areas; and very poorly drained Brallier soils in old stream channels.

This unit is used mainly for hay and pasture.

The main limitations are the susceptibility of the surface layer to compaction, wetness, the hazard of flooding, and high humidity. Grazing when the soil is wet results in compaction of the surface layer and poor tilth. Drainage is needed for maximum production of pasture grasses. Flooding restricts grazing in winter. High humidity and frequent periods of rainfall prevent the curing of high-quality hay.

4. Kirkendall-Chismore-Wintley

Well drained and somewhat poorly drained, silty and clayey soils that formed in alluvium; on flood plains and stream terraces

This map unit is on flood plains and terraces along the upper reaches of major rivers and streams. The flood plains are subject to frequent periods of flooding in fall and winter. Elevation ranges from 20 to 750 feet. Slopes range from 0 to 30 percent. The average annual precipitation is 60 to 90 inches, the average annual air temperature is 50 to 53 degrees F, and the frost-free period is 180 to 220 days.

This unit makes up about 2 percent of the survey

Figure 2.-Area of general soil map unit 5.

area. It is about 36 percent Kirkendall soils, 22 percent Chismore soils, and 19 percent Wintley soils. The rest is soils of minor extent.

Kirkendall soils are well drained. They are on flood plains. These soils have a dark brown silt loam surface layer and a dark brown and brown silt loam subsoil.

Chismore soils are somewhat poorly drained. They are on intermediate terraces. These soils have a very dark grayish brown silt loam surface layer and a mottled, brown and yellowish brown silty clay loam subsoil.

Wintley soils are well drained. They are on older high terraces. These soils have a dark brown silt loam surface layer and a strong brown silty clay and silty clay loam subsoil.

Of minor extent in this unit are poorly drained Quosatana soils on flood plains; poorly drained Zyzzug soils and well drained Eilertsen soils on low terraces; somewhat excessively drained Gauldy Variant soils, well drained Meda soils, and poorly drained Pyburn soils on intermediate terraces; and moderately well drained McCurdy soils on high terraces.

This unit is used mainly for hay and pasture and homesite development. Most areas of this unit have been cleared. Beef and dairy cattle are the main livestock enterprises. Homesites are mainly on terraces.

Susceptibility of the surface layer to compaction, droughtiness in summer, flooding, and high humidity are the main limitations of this unit for hay and pasture. Grazing when the soil is wet results in compaction of the surface layer and poor tilth. Irrigation is needed for maximum production of pasture grasses. Flooding

restricts grazing on flood plains in winter. High humidity and frequent periods of rainfall prevent the production of high-quality hay.

Wetness and slow permeability are the main limitations of this unit for homesite development. Septic tank absorption fields may not function properly during rainy periods.

Soils on Low Hills

This group consists of four map units. It makes up about 27 percent of the survey area.

5. Rinearson-Etelka

Well drained and moderately well drained silty and clayey soils that formed in colluvium and residuum derived from sedimentary rock

This map unit is on low foothills on the west side of the Klamath Mountains (fig. 2). Slopes generally are long and irregular. Areas of Rock outcrop and slumps are common. Elevation ranges from 50 to 1,800 feet. Slopes range from 0 to 70 percent. The average annual precipitation is 60 to 85 inches, the average annual air temperature is 50 to 54 degrees F, and the frost-free period is 180 to 240 days.

This unit makes up about 5 percent of the survey area. It is about 72 percent Rinearson soils and 15 percent Etelka soils. The rest is soils of minor extent.

Rinearson soils are well drained. They are on steep side slopes and on rounded ridgetops. These soils have a dark reddish brown silt loam surface layer and a reddish brown and dark reddish brown silty clay loam subsoil.

Etelka soils are moderately well drained. They are on ridgetops, benches, and low gradient side slopes. These soils have a dark grayish brown silt loam surface layer. The upper part of the subsoil is dark brown silty clay loam. and the lower part is mottled, olive brown silty clay.

Of minor extent in this unit are deep, well drained, gravelly Remote soils on steep side slopes; deep, well drained Orford soils on broad ridgetops; moderately deep, well drained, gravelly Digger soils on steep side slopes: and somewhat poorly drained Whobrey soils on benches.

This unit is used for timber production, wildlife habitat, and pasture. About 20 percent of the unit has been cleared for pasture. The main livestock enterprises are beef cattle and sheep. The susceptibility of the surface layer to compaction and landslide potential are the main limitations. Grazing when the soil is wet results in compaction of the surface layer. Forage production is low in summer because of droughtiness. Livestock facilities should be placed in areas that are not subject to landslides.

The soils in this unit are suited to trees. Productivity is moderate. Using wheeled vehicles causes compaction of the surface layer. Cable yarding systems damage the soil less. Roadcuts may increase the hazard of landsliding and slumping if road systems are not carefully planned and constructed. The dominant tree species are Douglas fir, Port Orford cedar, western hemlock, and western redcedar.

6. Etelka-Whobrey

Moderately well drained and somewhat poorly drained, clayey soils that formed in colluvium and residuum derived from sedimentary rock

This map unit is on low foothills on the north side of the Klamath Mountains (fig. 3). Hilltops generally are broad and have irregular and short to long slopes because of numerous landslides and slumps. Elevation ranges from 100 to 1,800 feet. Slopes range from 7 to 60 percent. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 220 days.

This unit makes up about 6 percent of the survey area. It is about 45 percent Etelka soils and 19 percent Whobrey soils. The rest is components of minor extent.

Etelka soils are moderately well drained. They are on broad ridgetops and foot slopes. These soils have a dark grayish brown silt loam surface layer. The upper part of the subsoil is dark brown silty clay loam, and the lower part is mottled, olive brown silty clay.

Whobrey soils are somewhat poorly drained. They are in depressional areas on broad ridgetops and on benches. These soils have a brown and dark brown silt loam surface layer and a mottled, dark yellowish brown silt loam subsoil. Below this is mottled, very dark gray clay.

Of minor extent in this unit are well drained, gravelly Remote and Digger soils on steep side slopes, well drained Preacher soils on ridgetops, and Rock outcrop.

This unit is used for timber production, wildlife habitat, and pasture. About 35 percent of the unit has been cleared for pasture. The main livestock enterprise is raising sheep. Most of the cleared areas are on hilltops and lower foot slopes. The steeper side slopes are dominantly in timber. Slope, the hazard of erosion, susceptibility of the surface layer to compaction, and landslide potential are the main limitations. Grazing

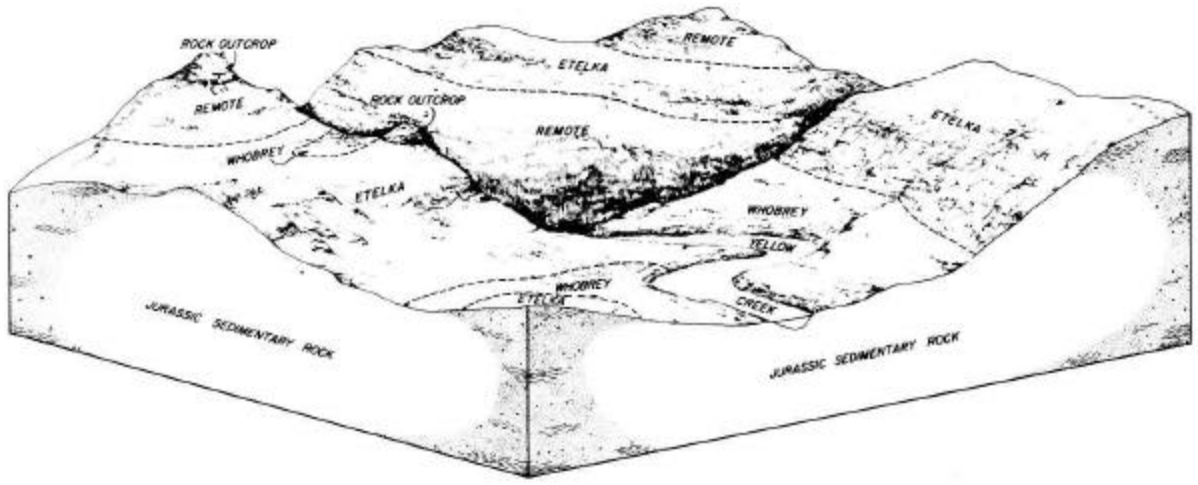


Figure 3.-Cross section of part of the Klamath Mountains, showing relationship of soils, relief, and parent material in general soil map unit 6.

when the soil is wet results in compaction of the surface layer. Livestock facilities should be placed in areas that are not subject to landslides.

The soils in this unit are suitable for trees. Use of wheeled vehicles for harvesting timber causes compaction of the surface layer. Cable yarding systems damage the soil less and are safer in the steeper areas. Erosion is a hazard along logging roads and skid trails, and maintenance costs in these areas are higher because of the landslide potential. The dominant tree species are Douglas fir, grand fir, and Port Orford cedar.

7. Templeton-Salander

Well drained, loamy soils that formed in colluvium derived from sedimentary rock

This map unit is on low foothills on the west side of the Coast Range. The ridgetops are rounded and have moderate, uniform side slopes. Most of this unit is drained by small intermittent streams that drain into sloughs and major streams. Elevation ranges from 50 to 800 feet. Slopes range from 0 to 75 percent. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the frost-free period is 200 to 240 days.

This unit makes up about 11 percent of the survey area. It is about 69 percent Templeton soils and 17 percent Salander soils. The rest is soils of minor extent.

Templeton soils are well drained. They are on ridgetops and side slopes. These soils have a very dark brown and dark brown silt loam surface layer and a reddish brown to strong brown silty clay loam subsoil.

Salander soils are well drained. They are on side slopes. These soils have a dark reddish brown silt loam surface layer and a dark reddish brown and reddish brown silty clay loam subsoil.

Of minor extent are well drained Geisel and Millicoma soils on hilltops and side slopes; well drained, sandy Bullards soils on escarpments of marine terraces; poorly drained Joeney soils on marine terraces; and poorly drained Nestucca soils and well drained Nehalem soils on flood plains.

This unit is used mainly for timber production and wildlife habitat. Some areas are used for pasture and homesite development. About 10 percent of the unit has been cleared for pasture. The main livestock enterprises are beef and dairy cattle. Susceptibility of the surface layer to compaction, depth to bedrock, slow permeability, and slope are the main limitations. Grazing when the soil is wet results in compaction of the surface layer and poor tilth. Use of the soils in this unit as homesites is limited by the steepness of slope. Septic tank absorption fields may function poorly because of the slow permeability and shallow depth of the soils.

The soils in this unit are suited to trees. Productivity is high. Susceptibility of the surface layer to compaction, steepness of slope, and the hazard of erosion are the main limitations. Using standard

wheeled and tracked equipment causes compaction of the surface layer. Cable yarding systems damage the soil less and are safer in the steeper areas. Erosion is a hazard along logging roads and skid trails. The dominant tree species are Douglas fir, Sitka spruce, western hemlock, and western redcedar.

8. Honeygrove-Blachly-Dement

Well drained, clayey soils that formed in colluvium and residuum derived from sedimentary and igneous rock

This map unit is on low rounded foothills on the west side of the Coast Range. The hills and ridges are more rounded in the lower lying areas near major drainageways but are steeper and more irregular in the higher lying areas. Elevation ranges from 20 to 1,000 feet. Slopes range from 0 to 70 percent. The average annual precipitation is 55 to 85 inches, the average annual air temperature is 50 to 53 degrees F, and the frost-free period is 140 to 240 days.

This unit makes up about 5 percent of the survey area. It is about 33 percent Honeygrove soils, 31 percent Blachly soils, and 31 percent Dement soils. The rest is soils of minor extent.

Honeygrove soils are well drained. They are on broad ridgetops and moderate side slopes. These soils have a dark reddish brown silty clay loam surface layer and a subsoil of dark red and red clay over gravelly clay.

Blachly soils are well drained. They are on broad ridgetops and benches. They have a very dusky red silty clay loam surface layer and a dark red and yellowish red silty clay and silty clay loam subsoil.

Dement soils are well drained. They are on ridgetops and side slopes. These soils have a very dark grayish brown silt loam surface layer and a reddish brown silty clay loam subsoil.

Of minor extent are extremely gravelly Harrington soils on steep side slopes, loamy Preacher soils on benches and side slopes, moderately deep, gravelly Bohannon soils on steep side slopes, and well drained Kirkendall soils on flood plains.

This unit is used mainly for timber production and wildlife habitat. It is also used for pasture and homesite development. About 20 percent of the unit has been cleared for pasture. Homesites and pasture are mainly on the Dement and Honeygrove soils.

Susceptibility of the surface layer to compaction, slope, and moderately slow permeability are the main limitations. Grazing when the soil is wet results in compaction of the surface layer and poor tilth.

Steepness of slope limits the installation of septic tank absorption fields. Absorption fields may not function properly during rainy periods because of the moderately slow permeability of the subsoil.

The soils in this unit are suited to trees. Productivity is moderately high. Susceptibility of the surface layer to compaction and the hazard of erosion are the main limitations. Using standard wheeled and tracked equipment causes compaction of the surface layer. Cable yarding systems damage the soil less and are safer in the steeper areas. Erosion is a hazard along logging roads and skid trails. The dominant tree species are Douglas fir, western hemlock, western redcedar, and grand fir.

Soils on Mountains

This group consists of five map units. It makes up about 61 percent of the survey area.

9. Milbury-Bohannon-Umpcoos

Moderately deep and shallow, gravelly and loamy soils that formed in colluvium derived from sedimentary rock

This map unit on is strongly dissected areas of mountains. It has long, uniform slopes and very narrow ridgetops. Benches are present in some areas. Most areas of the unit are drained by small intermittent streams that have steep gradients. Elevation ranges from 100 to 2,500 feet. Slopes range from 30 to 80 percent. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the frost-free period is 110 to 200 days.

This unit makes up about 13 percent of the survey area. It is about 40 percent Milbury soils, 27 percent Bohannon soils, and 22 percent Umpcoos soils. The rest is components of minor extent.

Milbury soils are moderately deep. They are on midslopes and upper side slopes. These soils have a black very gravelly sandy loam surface layer and a very dark grayish brown and dark brown very cobbly loam subsoil.

Bohannon soils are moderately deep. They are on concave midslopes and lower side slopes. These soils have a very dark brown loam surface layer and a dark yellowish brown gravelly loam subsoil.

Umpcoos soils are shallow. They are on convex side slopes adjacent to areas of Rock outcrop and on narrow ridgetops. These soils have a dark grayish brown very gravelly sandy loam surface layer and a brown very gravelly sandy loam subsoil.

Of minor extent are deep Preacher and Blachly soils

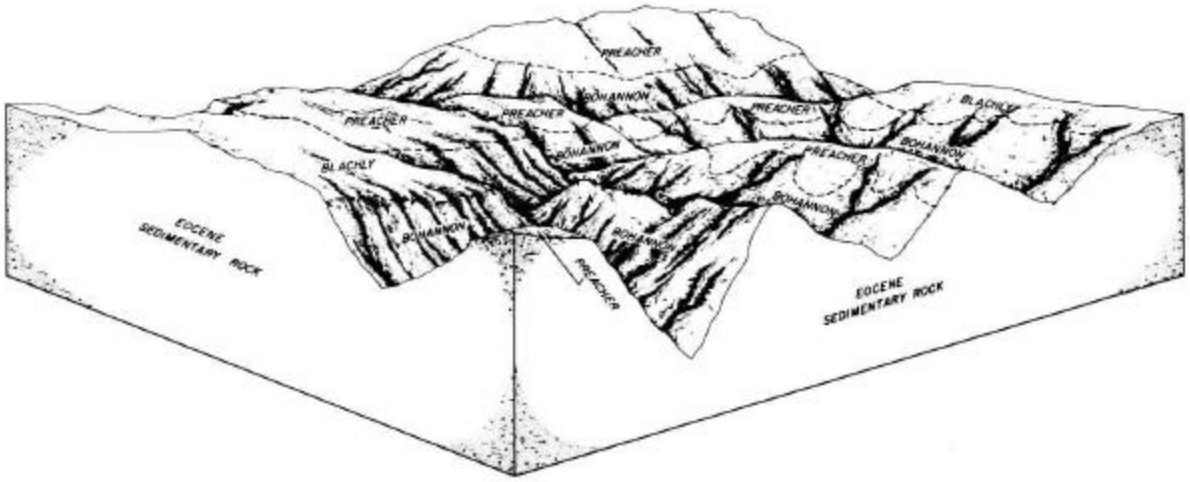


Figure 4.-Cross section of part of the deeply dissected Coast Range, showing relationship of soils, relief, and parent material in general soil map unit 10.

on slump benches, well drained Gardiner soils on flood plains, and Rock outcrop.

This unit is used for timber production and wildlife habitat.

The main limitations are steepness of slope and the hazard of erosion. Steepness of slope restricts the use of logging equipment. Erosion is a hazard along logging roads and skid trails. Productivity is moderately high. The dominant tree species are Douglas fir and western hemlock.

10. Preacher-Bohannon

Deep and moderately deep, moderately steep to very steep, gravelly and loamy soils that formed in colluvium and residuum derived from sedimentary rock

This unit consists of high mountains (fig. 4). The areas along major drainageways are very steep, and the ridgetops are broad and moderately steep. Slump benches are common in the steeper areas. Elevation ranges from 250 to 3,800 feet. Slopes range from 3 to 90 percent. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the frost-free period is 110 to 200 days.

This map unit makes up about 23 percent of the survey area. It is about 48 percent Preacher soils and 32 percent Bohannon soils. The rest is components of minor extent.

Preacher soils are deep. They are on side slopes and ridgetops. These soils have a very dark grayish brown and dark brown loam surface layer and a dark yellowish brown clay loam subsoil.

Bohannon soils are moderately deep. They are on the steep side slopes. These soils have a very dark brown and dark brown loam surface layer and a dark yellowish brown gravelly clay loam subsoil.

Of minor extent in this unit are the deep, well drained Blachly soils on ridgetops and slump benches, moderately deep Milbury soils on very steep side slopes, shallow Umpcoos soils on narrow ridgetops, and Rock outcrop.

This unit is used for timber production and wildlife habitat. The main limitations are steepness of slope, susceptibility of the surface layer to compaction, and the hazard of erosion. Steepness of slope restricts the use of logging equipment. Using standard wheeled and tracked equipment causes compaction of the surface layer. Cable yarding systems damage the soil less and are safer in the steeper areas. Erosion is a hazard along logging roads and skid trails. Productivity is high. The dominant tree species are Douglas fir, western hemlock, and western redcedar (fig. 5).

11. Digger-Preacher-Remote

Deep and moderately deep, moderately steep to very steep, gravelly and loamy soils that formed in colluvium and residuum derived from sedimentary rock

This map unit is on high mountains and ridges. The side slopes are long and uniform, and the ridgetops have shorter, more irregular slopes. Elevation ranges from 200 to 3,600 feet. Slopes range from 12 to 80 percent. The average annual precipitation ranges from 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the frost-free period is 110 to 200 days.

This map unit makes up about 16 percent of the survey area. It is about 20 percent Digger soils, 20 percent Preacher soils, and 18 percent Remote soils. The rest is soils of minor extent.

Digger soils are moderately deep. The are on the upper side slopes. These soils have a dark brown gravelly .loam surface layer and a dark yellowish brown and brown very gravelly loam and very cobbly loam subsoil.

Preacher soils are deep. They are on broad ridgetops. These soils have a very dark grayish brown and dark brown loam surface layer and a dark yellowish brown clay loam subsoil.

Remote soils are deep. They are on the lower side slopes and on some broad ridgetops. These soils have a very dark grayish brown loam surface layer and a brown to dark yellowish brown gravelly and very gravelly clay loam subsoil.

Of minor extent are well drained, red Blachly soils on ridgetops, shallow Umpcoos soils on steep side slopes, and moderately well drained Etelka soils on broad ridgetops.

This unit is used for timber production and wildlife habitat. The main limitations are steepness of slope, susceptibility of the surface layer to compaction, and the hazard of erosion. Steepness of slope restricts the use of logging equipment. Using standard wheeled and tracked equipment causes compaction of the surface layer. Cable yarding systems damage the soil less and are safer in the steep areas. Erosion is a hazard along logging roads and skid trails. Productivity is moderate. The dominant tree species are Douglas fir, western hemlock, western redcedar, and grand fir.

12. Serpentano-Digger

Deep and moderately deep, moderately steep to very steep, gravelly and loamy soils that formed in colluvium and residuum derived from metamorphic and sedimentary rock

This map unit is on high ridges in the Klamath Mountains. The ridges have long irregular slopes that are moderately dissected by intermittent streams. The ridgetops are somewhat rounded. Elevation ranges from 1,500 to 3,900 feet. Slopes range from 10 to 90 percent. The average annual precipitation is 90 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the frost-free period is 110 to 180 days.

This map unit makes up about 2 percent of the survey area. It is about 68 percent Serpentano soils and 15 percent Digger soils. The rest is components of minor extent.

Serpentano soils are deep. They are on ridgetops. These soils have a dark brown very stony loam surface layer and a dark brown gravelly loam and very cobbly loam subsoil.

Digger soils are moderately deep. They are on steep side slopes. These soils have a dark brown gravelly loam surface layer and a dark yellowish brown and brown very gravelly loam and very cobbly loam subsoil.

Of minor extent in this unit are deep, gravelly Remote soils on lower side slopes, deep Preacher soils on ridgetops, shallow Umpcoos soils on steep side slopes, and Rock outcrop.

This unit is used for timber production and wildlife habitat.

The main limitations are the hazard of erosion and steepness of slope. Proper design and placement of roads help to control erosion. Skid trails require water bars or plant cover. Steepness of slope restricts the use of logging equipment in some areas. Productivity is moderately low. The dominant tree species are Douglas fir and Port Orford cedar.

13. Umpcoos-Rock Outcrop-Digger

Rock outcrop and moderately deep and shallow, very steep, gravelly and loamy soils that formed in colluvium derived from sedimentary rock

This map unit is on mountains and ridges adjacent to major streams and their tributaries. Elevation ranges from 100 to 4,300 feet. Slopes range from 50 to 99 percent. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the frost-free period is 110 to 200 days.

This unit makes up about 7 percent of the survey area. It is about 36 percent Umpcoos soils, 29 percent Rock outcrop, and 19 percent Digger soils. The rest is soils of minor extent.

Umpcoos soils are shallow. They are on upper slopes adjacent to areas of Rock outcrop. These soils have a dark grayish brown very gravelly sandy loam surface layer and a brown very gravelly sandy loam subsoil.

Rock outcrop is mainly exposures of fractured, hard sandstone on ridgetops and steep side slopes along

Figure 5.-Stand of Douglas fir in an area of general soil map unit 10.

drainageways. In some areas the sandstone is fractured to stone-sized fragments, and talus commonly is present in these areas.

Digger soils are moderately deep. They are on midslopes and lower slopes. These soils have a dark brown gravelly loam surface layer and a dark yellowish brown and brown very gravelly loam and very cobbly loam subsoil.

Of minor extent in this unit are deep, gravelly Remote soils on lower slopes and deep Preacher and Blachly soils on slump benches.

This unit is used for timber production and wildlife habitat.

The main limitations are steepness of slope, the hazard of erosion, and the hazard of windthrow. Steepness of slope restricts the use of logging equipment. Rock outcrop may cause breakage of timber and hinder yarding. Proper design and location of roads

help to control erosion. Productivity is low. The dominant tree species are Douglas fir, western redcedar, and grand fir.

Broad Land Use Considerations

Coos County has a wide variety of soils that have potential for major various land uses. The soils in the county are used for timber production, pasture, urbanization, and cultivated crops.

Timber is produced on about 82 percent of the survey area. The productivity for Douglas fir is high in areas of general soil on map units 6, 7, 8, 9, and 10 (fig. 5). Productivity is moderate in areas of units 2, 5, and 11 because of low soil fertility and the susceptibility of unit 2 to severe damage by wind. Productivity is low in areas of units 1, 12, and 13 because of droughtiness and the toxicity of the soils in unit 12. The main limitation for timber management throughout the survey area is steepness of slope.

Pasture is grown extensively in areas of map units 3, 4. 5, and 6. Wetness is the main limitation. Hay is grown mainly on unit 4. The main limitation is the high humidity.

About 13,000 acres in the survey area is classified as urban, or built-up, land. Urban development has occurred mainly in areas of map units 2 and 4. Units 5 and 7 have fair suitability for urban development. The main limitation is slope. Unit 3 is poorly suited to urban development because of wetness and the hazard of flooding. The other map units are poorly suited because of steepness of slope, low soil strength, and wetness.

Although cultivated crops are grown on only a limited number of acres in the survey area, they produce a significant part of the agricultural income. Cranberries, blueberries, and nursery stock are the main crops. Map unit 2 has good suitability for cranberries and blueberries, and map unit 4 has good suitability for nursery stock. The other map units in the area have poor suitability because of slope, wetness, and the hazard of flooding.

Potential for wildlife habitat generally is high throughout the survey area. Soils in map unit 4 have fair potential for openland wildlife habitat. The soils on flood plains in units 1 and 3 have high potential for wetland wildlife habitat. The soils in units 5 through 13 have high potential for woodland wildlife habitat. The soils in map unit 2 have fair potential for woodland wildlife habitat.

The suitability for recreation areas ranges from poor to good, depending on the intensity of expected use. Suitability is good for intensive recreational development, such as playgrounds and camp areas, on units 1, 2, and 4. Suitability is good on all units for seasonal recreational activities such as hunting, hiking, and horseback riding.

Detailed Soil Map Units

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

Each map unit on the detailed maps represents an area on the landscape and consists of one or more soils or miscellaneous areas for which the unit is named.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a soil *series.* Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Bandon sandy loam, 0 to 7 percent slopes, is one of several phases in the Bandon series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes or associations.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Waldport-Dune land complex, 12 to 30 percent slopes, is an example.

An *association is* made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Preacher-Blachly association, 12 to 30 percent slopes, is an example.

Most map units include small scattered areas of soils or miscellaneous areas other than those for which the map unit is named. Some of these included areas have properties that differ substantially from those of the major soils or miscellaneous areas. Such differences could significantly affect use and management of the map unit. The included soils as well as miscellaneous areas are identified in each map unit description. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Dune land is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

1B-Bandon sandy loam, 0 to 7 percent slopes. This deep, well drained soil is on dissected marine terraces. It formed in sandy marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 25 to 300 feet. The average annual precipitation is 55 to 75 inches, the average

annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of decomposed organic litter 1 inch thick. The surface layer is dark grayish brown sandy loam 5 inches thick. The upper 25 inches of the subsoil is dark reddish brown sandy loam and loam, and the lower 13 inches is pale brown, cemented, sandy material. The substratum to a depth of 60 inches or more is yellowish brown loam.

Included in this unit are areas of Blacklock and Bullards soils. Included areas make up about 20 percent of the total acreage.

Permeability of this Bandon soil is moderate above the cemented layer, very slow through it, and moderately rapid below it. Available water capacity is about 2 to 6 inches. Effective rooting depth is 18 to 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used mainly for timber production, wildlife habitat, and homesite development. It is also used for pasture and recreation.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are Sitka spruce, western hemlock, red alder, and western redcedar. The understory vegetation is mainly salal, evergreen huckleberry, western brackenfern, and Pacific waxmyrtle.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 137. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 140 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are the hazard of windthrow and plant competition. Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, western hemlock, and Sitka spruce seedlings.

If this unit is used for homesite development, the main limitation is the very slow permeability, which limits use of septic tank absorption fields. Because of the very slow permeability of the cemented layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. The limitation of very slow permeability can be overcome by increasing the size of the absorption field.

If this unit is used for pasture, the main limitation is droughtiness in summer. Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for recreational development, the main limitation is the very slow permeability. The use of recreational facilities may be restricted during wet periods unless the cemented layer is ripped to permit more rapid internal drainage.

This map unit is in capability subclass IIIe.

1C--Bandon sandy loam, 7 to 12 percent slopes. This deep, well drained soil is on dissected marine terraces. It formed in sandy marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 25 to 300 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of decomposed organic litter 1 inch thick. The surface layer is dark grayish brown sandy loam 5 inches thick. The upper 25 inches of the subsoil is dark reddish brown sandy loam and loam, and the lower 13 inches is pale brown, cemented, sandy material. The substratum to a depth of 60 inches or more is yellowish brown loam.

Included in this unit are small areas of Bullards and Blacklock soils. Included areas make up about 20 percent of the total acreage.

Permeability of this Bandon soil is moderate above the cemented layer, very slow through it, and moderately rapid below it. Available water capacity is about 2 to 6 inches. Effective rooting depth is 18 to 36 inches. Runoff is medium, and the hazard of water

erosion is moderate. The hazard of soil blowing is severe.

This unit is used mainly for timber production, wildlife habitat, and homesite development. It is also used for pasture and recreation.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are Sitka spruce, western hemlock, red alder, and western redcedar. The understory vegetation is mainly salal, evergreen huckleberry, western brackenfern, and Pacific waxmyrtle.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 137. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 140 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are the hazard of windthrow and plant competition. Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, western hemlock, and Sitka spruce seedlings.

If this unit is used for homesite development, the main limitations are the very slow permeability and the hazard of erosion. Use of septic tank absorption fields is limited by the very slow permeability. Because of the very slow permeability of the cemented layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. The limitation of very slow permeability can be overcome by increasing the size of the absorption field.

Erosion is a hazard in the steeper areas of this unit. Only the part of the site that is used for construction should be disturbed. The risk of erosion is increased if the soil is left exposed during site development. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. Structures to divert runoff are needed if buildings and roads are constructed.

If this unit is used for pasture, the main limitation is droughtiness in summer. Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for recreational development, the main limitation is the very slow permeability. The use of recreational facilities may be restricted during wet periods unless the cemented layer is ripped to permit more rapid internal drainage.

This map unit is in capability subclass IIIe.

1D-Bandon sandy loam, 12 to 30 percent slopes. This deep, well drained soil is on dissected marine terraces. It formed in sandy marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 25 to 300 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of decomposed organic litter 1 inch thick. The surface layer is dark grayish brown sandy loam 5 inches thick. The upper 25 inches of the subsoil is dark reddish brown sandy loam and loam, and the lower 13 inches is pale brown, cemented, sandy material. The substratum to a depth of 60 inches or more is yellowish brown loam.

Included in this unit is about 15 percent Bullards soils. Also included are small areas of Blacklock soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Bandon soil is moderate above the cemented layer, very slow through it, and moderately rapid below it. Available water capacity is about 2 to 6 inches. Effective rooting depth is 18 to 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is severe.

This unit is used mainly for timber production, wildlife habitat, and pasture. It is also used for recreation.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are

Sitka spruce, western hemlock, red alder, and western redcedar. The understory vegetation is mainly salal, evergreen huckleberry, western brackenfern, and Pacific waxmyrtle.

Oh the basis of a 100-year site curve, the mean site index for Douglas fir is 137. At thin culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches In diameter or more at breast height is 140 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are the hazard of erosion, the hazard of windthrow, and plant competition. Excessive erosion can be avoided by carefully planning the construction and maintenance of logging roads, skid trails, and landings, properly designing road drainage systems, and carefully placing culverts. Seeding road cuts and fills to permanent plant cover also reduces the risk of erosion. Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, western hemlock, and Sitka spruce seedlings.

If this unit is used for pasture, the main limitation is droughtiness in summer. Supplemental irrigation is needed for maximum production. Sprinkler irrigation can be used in the less sloping areas of the unit. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion.

If this unit is used for recreational development, the main limitations are slope, the hazard of erosion, and the very slow permeability. Steepness of slope limits the type of recreational facilities that can be developed. The risk of erosion is increased if the soil is left exposed during site development. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. The use of recreational facilities may be restricted during wet periods unless the cemented layer is ripped to permit more rapid internal drainage.

This map unit is in capability subclass IVe.

2C-Bandon-Blacklock complex, 0 to 12 percent slopes. This map unit is on dissected marine terraces. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 25 to 300 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 60 percent Bandon sandy loam and 20 percent Blacklock fine sandy loam. The Bandon soil is in slightly convex areas where slope is 0 to 12 percent, and the Blacklock soil is in scattered depressional areas where slope is 0 to 3 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bullards, Heceta, and Yaquina soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Bandon soil is deep and well drained. It formed in sandy marine deposits. Typically, the surface is covered with a mat of decomposed organic litter 1 inch thick. The surface layer is dark grayish brown sandy loam 5 inches thick. The upper 25 inches of the subsoil is dark reddish brown sandy loam and loam, and the lower 13 inches is pale brown, cemented, sandy material. The substratum to a depth of 60 inches or more is yellowish brown loam.

Permeability of the Bandon soil is moderate above the cemented layer, very slow through it, and moderately rapid below it. Available water capacity is about 2 to 6 inches. Effective rooting depth is 18 to 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is severe.

The Blacklock soil is deep and poorly drained. It formed in sandy marine deposits. Typically, the surface is covered with a mat of organic litter 1 inch thick. The surface layer is black and very dark gray fine sandy loam 9 inches thick. The subsurface layer is gray loamy fine sand 4 inches thick. The upper 2 inches of the subsoil is black mucky loam, and the lower 37 inches is mottled, strong brown to yellowish brown, cemented sand. The substratum to a depth of 75 inches or more is mottled, light olive brown, red, and brown sand.

Permeability of the Blacklock soil is moderate above the cemented layer, very slow through it, and moderately rapid below it. Available water capacity is

about 1.5 to 3.5 inches. Effective rooting depth is 12 to 24 inches. Runoff is very slow, and the hazard of water erosion is slight. The water table fluctuates from 6 inches above the surface to 30 inches below the surface from October to May.

This unit is used mainly for timber production and wildlife habitat. Areas of the Bandon soil are also used for pasture, recreation, and homesite development.

The Bandon soil is suited to the production of Douglas fir. Among the other species that grow on this soil are Sitka spruce, western hemlock, red alder, and western redcedar. The understory vegetation is mainly salal, evergreen huckleberry, western brackenfern, and Pacific waxmyrtle.

The Blacklock soil is suited to the production of shore pine. Among the other species that grow on this soil are Sitka spruce, western hemlock, and Port Orford cedar. The understory vegetation is mainly salal, evergreen huckleberry, Pacific rhododendron, manzanita, and slough sedge.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 137 on the Bandon soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 140 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105.

On the basis of a 100-year site curve, the mean site index for shore pine is 90 on the Blacklock soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old shore pine trees 1.5 inches in diameter or more at breast height is 79 cubic feet per acre per year.

High winds from the Pacific Ocean may seriously limit the growth of trees on this unit unless the trees are in a protected area.

The main limitations for the management of timber on this unit are the hazard of windthrow, seasonal wetness on the Blacklock soil, and plant competition on the Bandon soil. Windthrow is a hazard when the soil is wet and winds are strong. Tree roots are restricted by the cemented layer in the soils. The seasonal high water table in the Blacklock soil limits the use of equipment during wet periods. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings on the Bandon soil and shore pine seedlings on the Blacklock soil. Tree seedlings on the Blacklock soil have only a moderate rate of survival because of the seasonal high water table.

If this unit is used for pasture, the main limitations are the droughtiness of the Bandon soil in summer and the wetness of the Blacklock soil. Supplemental irrigation is needed for maximum production on the Bandon soil. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Drainage is needed for maximum production. Water on or near the surface can be removed with open ditches or tile drains. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion.

If this unit is used for recreational development, the main limitations are the very slow permeability of the Bandon soil and the wetness and very slow permeability of the Blacklock soil. Water perched above the cemented layer may limit the use of recreational facilities to dry periods. Drainage should be provided for paths and trails. Wetness can be reduced by ripping the cemented layer in the Bandon soil and by installing open ditches or tile drains in the Blacklock soil.

If this unit is used for homesite development, the main limitations are the very slow permeability of the soils and the hazard of erosion. Use of septic tank absorption fields is limited by the very slow permeability. Because of the cemented layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. The limitation of very slow permeability may be overcome by increasing the size of the absorption field.

Erosion is a hazard in the steeper areas. Only the part of the site that is used for construction should be disturbed. The risk of erosion is increased if the soil is left exposed during site development. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. Structures to divert runoff are needed if buildings and roads are constructed.

This map unit is in capability subclass Vlw.

3-Beaches. Beaches consists of areas of loose sand and shell fragments that have been worked and

reworked by waves, tides, and wind and are still subject to such action. Most of these areas are along the shore of the Pacific Ocean, but small areas are along the estuaries of major streams that flow into the ocean. Slope is 1 to 8 percent. Areas of beaches are barren of vegetation. Elevation is 0 to 10 feet.

Typically, areas of Beaches are sand, but gravel may be exposed during storms in winter. A few areas of Beaches at the base of sea cliffs are covered with rounded cobbles and stones.

Included in this unit are small areas of Waldport and Bullards soils and Rock outcrop. Included areas make up about 15 percent of the total acreage.

This unit is used for recreation activities such as surf fishing. beachcombing, and clam digging.

This map unit is in capability subclass VIIIw.

4D-Blachly silty clay loam, 0 to 30 percent slopes. This deep, well drained soil is on broad ridgetops and benches of mountains. It formed in colluvium derived dominantly from sedimentary rock or basalt. The native vegetation is mainly conifers, shrubs, forbs. and hardwoods. Elevation is 250 to 2,500 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 140 to 220 days.

Typically, the surface layer is very dusky red and dark reddish brown silty clay loam 7 inches thick. The upper 45 inches of the subsoil is dark red and yellowish red silty clay, and the lower 8 inches is yellowish red silty clay loam.

Included in this unit are small areas of Dement, Honeygrove, and Preacher soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Blachly soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, red alder, and bigleaf maple. The understory vegetation is mainly vine maple, salal, red huckleberry, western swordfern, and oxalis.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 160. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 170 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut and fill areas are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are sticky when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants can reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIe.

4E-Blachly silty clay loam, 30 to 50 percent slopes. This deep, well drained soil is on broad ridgetops and benches of mountains. It formed in colluvium derived dominantly from sedimentary rock or basalt. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 250 to 2,500 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 140 to 220 days.

Typically, the surface layer is very dusky red and dark reddish brown silty clay loam 7 inches thick. The upper 45 inches of the subsoil is dark red and yellowish red silty clay, and the lower 8 inches is yellowish red silty clay loam.

Included in this unit are small areas of Preacher, Dement, Honeygrove, and Remote soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Blachly soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are

western hemlock, red alder, and bigleaf maple. The understory vegetation is mainly vine maple, salal, red huckleberry, western swordfern, and oxalis.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 160. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 170 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, steepness of slope, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut and fill areas are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are sticky when wet or moist, and they may be impassable during rainy periods. Rock for road construction is not readily available in this unit. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass Vle.

5A-Blacklock fine sandy loam, 0 to 3 percent slopes. This deep, poorly drained soil is in depressional areas of marine terraces. It formed in sandy marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and sedges. Elevation is 25 to 350 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat o' organic litter 1 inch thick. The surface layer is black and very dark gray fine sandy loam and loamy fine sand 9 inches thick. The subsurface layer is gray loamy fine sand 4 inches thick. The upper 2 inches of the subsoil is black mucky loam, and the lower 37 inches is mottled, strong brown to yellowish brown, cemented sand. The substratum to a depth of 75 inches or more is mottled, light olive brown, red, and brown sand (fig. 6).

Included in this unit are small areas of Bandon and Bullards soils. Also included are small areas of soils that are similar to this Blacklock soil but do not have a cemented layer and have a clayey substratum. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Blacklock soil is moderate above the cemented layer, very slow through it, and moderately rapid below it. Available water capacity is about 1.5 to 3.5 inches. Effective rooting depth is 12 to 24 inches. Runoff is very slow, and the hazard of water erosion is slight. The water table fluctuates from 6 inches above the surface to 30 inches below the surface from October to May.

This unit is used mainly for timber production and wildlife habitat. It is also used for cranberry production and recreation.

This unit is suited to the production of shore pine. Among the other species grown on the soil in this unit are Sitka spruce, western hemlock, and Port Orford cedar. The understory vegetation is mainly salal, evergreen huckleberry, Pacific rhododendron, manzanita, and slough sedge.

On the basis of a 100-year site curve, the mean site index for shore pine is 90. At the culmination of the mean annual increment (CMAI), the production of 60-year-old shore pine trees 1.5 inches in diameter or more at breast height is 79 cubic feet per acre per year. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are seasonal wetness and the hazard of windthrow. The seasonal high water table limits the use of equipment to dry periods. Because roots are restricted by the cemented layer, trees commonly are subject to windthrow.

Reforestation can be accomplished by planting shore pine, Sitka spruce, and western hemlock. Tree seedlings have only a moderate rate of survival because of the seasonal high water table.

Irrigation and drainage are needed if the soil in this unit is intensively managed for cranberry production. Fields are prepared by removing the soil material above the cemented layer and replacing it with about 10 inches of sandy soil material. The top of the cemented

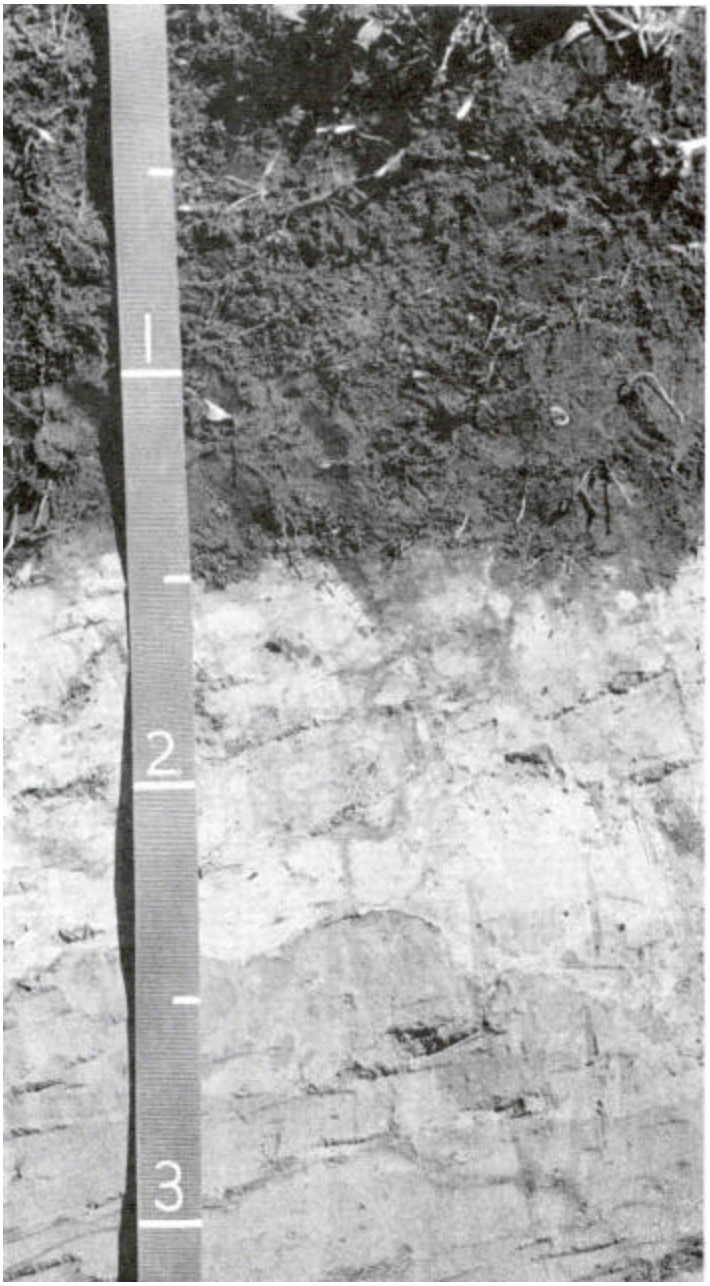


Figure 6.-Typical profile of Blacklock fine sandy loam, 0 to 3 percent slopes, showing cemented subsoil.

layer should be graded toward the edge of the field to provide internal drainage. Open ditches and dikes are needed around the edge of fields to provide drainage and to control the water level; however, open ditches should not extend into the cemented layer.

Sprinkler irrigation is an efficient method of applying water during the dry period in summer. Sprinklers can also be used to control the temperature during summer, to prevent frost damage during winter, and to apply fertilizer, pesticides, and herbicides.

The very slow permeability of the cemented layer facilitates water management by preventing excessive seepage and reduces losses of fertilizer and soil amendments. Excess seepage may occur in the sandy substratum. Yields vary greatly depending on the management practices used.

If this unit is used for recreational development, the main limitations are wetness and the very slow permeability. Water perched above the cemented layer may limit the use of recreational facilities to 3 or 4 months during the dry period. Drainage should be provided for paths and trails. Septic tank absorption fields do not function properly because of the seasonal high water table and the cemented layer. If sanitary facilities are constructed on this unit, holding tanks or effluent treatment systems should be used.

This map unit is in capability subclass Vlw.

5B-Blacklock fine sandy loam, 3 to 7 percent slopes. This deep, poorly drained soil is in depressional areas on marine terraces. It formed in sandy marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and sedges. Elevation is 25 to 350 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of organic litter 1 inch thick. The surface layer is black and very dark gray fine sandy loam 9 inches thick. The subsurface layer is gray fine sandy loam 4 inches thick. The upper 2 inches of the subsoil is black mucky loam, and the lower 37 inches is mottled, strong brown to yellowish brown, cemented sand. The substratum to a depth of 75 inches or more is mottled, light olive brown sand.

Included in this unit are small areas of Bandon, Bullards, and Heceta soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Blacklock soil is moderate above the cemented layer, very slow through it, and moderately rapid below it. Available water capacity is about 1.5 to 3.5 inches. Effective rooting depth is 12 to 24 inches. Runoff is very slow, and the hazard of water erosion is slight. The water table fluctuates from 6 inches above the surface to 30 inches below the surface from October to May.

This unit is used mainly for timber production and

wildlife habitat. It is also used for cranberry production and recreation.

This unit is suited to the production of shore pine. Among the other species that grow on this unit are Sitka spruce, western hemlock, and Port Orford cedar. The understory vegetation is mainly salal, evergreen huckleberry, Pacific rhododendron, manzanita, and slough sedge.

On the basis of a 100-year site curve, the mean site index for shore pine is 90. At the culmination of the mean annual increment (CMAI), the production of 60-year-old shore pine trees 1.5 inches in diameter or more at breast height is 79 cubic feet per acre per year. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are seasonal wetness and the hazard of windthrow. The seasonal high water table limits the use of equipment to dry periods. Because roots are restricted by the cemented layer, trees commonly are subject to windthrow.

Reforestation can be accomplished by planting shore pine. Sitka spruce, and western hemlock seedlings. Tree seedlings have only a moderate rate of survival because of the seasonal high water table.

Irrigation and drainage are needed if the soil in this unit is intensively managed for cranberry production. Fields are prepared by removing the soil material above the cemented layer and replacing it with about 10 inches of sandy soil material. The top of the cemented layer should be graded toward the edge of the field to provide internal drainage. Open ditches and dikes are needed around the edge of fields to provide drainage and to control the water level; however, open ditches should not extend into the cemented layer.

Sprinkler irrigation is an efficient method of applying water during the dry period in summer. Sprinklers can also be used to control the temperature in summer, to prevent frost damage during winter, and to apply fertilizer, pesticides, and herbicides.

The very slow permeability of the cemented layer facilitates water management by preventing excessive seepage and reduces losses of fertilizer and soil amendments. Excessive seepage may occur in the sandy substratum. Yields vary greatly depending on management practices used. Because of the steepness of slope, deep cuts and fills may be necessary to provide level fields. Excessive seepage may occur if cuts are made below the cemented layer.

If this unit is used for recreational development, the main limitations are wetness and the very slow permeability. Water perched above the cemented layer may limit the use of recreational facilities to 3 or 4 months during the dry period. Drainage should be provided for paths and trails. Septic tank absorption fields do not function properly because of the seasonal high water table and the cemented layer. If sanitary facilities are constructed on this unit, holding tanks or effluent treatment systems should be used.

This map unit is in capability subclass Vlw.

6E-Bohannon-Milbury complex, 30 to 50 percent slopes. This map unit is on side slopes and ridgetops of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 1,400 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 49 to 53 degrees F, and the average frost-free period is 140 to 200 days.

This unit is 60 percent Bohannon gravelly loam and 25 percent Milbury very gravelly sandy loam. The Bohannon soil is on side slopes and ridgetops, and the Milbury soil is on side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Preacher and Remote soils. Also included are small areas of deep, well drained soils that have a reddish brown silty clay loam subsoil. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Bohannon soil is moderately deep and well drained. It formed in colluvium derived dominantly from arkosic sandstone and siltstone. Typically, the surface layer is very dark brown and dark brown gravelly loam 11 inches thick. The subsoil is dark yellowish brown gravelly loam 20 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of this Bohannon soil is moderately rapid. Available water capacity is about 2.5 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Milbury soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of undecomposed needles, leaves, and twigs 1 inch thick. The surface layer is black very gravelly sandy loam 10 inches thick. The subsoil is very dark grayish brown and dark brown very cobbly loam 26 inches thick. Hard, consolidated sandstone is at a depth of 36 inches.

Permeability of this Milbury soil is moderately rapid. Available water capacity is about 2.0 to 5.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is

rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, red alder, and bigleaf maple. The understory vegetation is mainly creambush oceanspray, salmonberry, vine maple, salal, western swordfern, and cascade Oregon-grape.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Bohannon soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 122.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 165 on the Milbury soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 176 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 119.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer of the Bohannon soil to compaction, the hazard of erosion, steepness of slope, the hazard of windthrow, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut and fill areas are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Windthrow is a hazard when the soil is wet and winds are strong.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Reforestation is limited by the droughtiness of the soil. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass Vle.

7-Brallier mucky peat. This deep, very poorly drained soil is on coastal terraces and flood plains along major coastal streams. It formed in partially decomposed fibrous organic residue derived dominantly from water-tolerant plants. Slope is 0 to 1 percent. The native vegetation is mainly forbs, shrubs, and grasses. Elevation is 5 to 20 feet. The average annual precipitation is 55 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface tier is dark reddish brown, partially decomposed organic material 24 inches thick. The subsurface tier is dark reddish brown, decomposed organic material 21 inches thick. The underlying material to a depth of 60 inches or more is dark yellowish brown, decomposed organic material.

Included in this unit are small areas of Coquille, Langlois, and Chetco soils. Also included are small areas of organic soils that have mineral layers between depths of 36 and 51 inches and areas of Brallier soils at elevations of 20 to 40 feet that are not subject to flooding during high tides. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Brallier soil is moderate. Available water capacity is about 18 to 24 inches. Effective rooting depth is 60 inches or more. Runoff is ponded, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding during high tides. The water table fluctuates from 12 inches above the surface to 24 inches below the surface throughout the year.

This unit is used for wildlife habitat.

This map unit is in capability subclass Vw.

8B-Bullards sandy loam, 0 to 7 percent slopes. This deep, well drained soil is on dissected marine terraces. It formed in mixed eolian and marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 600 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of undecomposed organic matter 3 inches thick. The surface layer is very dark grayish brown sandy loam 7

inches thick. The subsoil is dark reddish brown, dark brown, and strong brown gravelly sandy loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown sand.

Included in this unit are small areas of Blacklock and Bandon soils. Also included are small areas of Templeton soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Bullards soil is moderate. Available water capacity is about 4.0 to 5.5 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used mainly for timber production, wildlife habitat, and homesite development. It is also used for pasture and recreation.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are Sitka spruce, western hemlock, western redcedar, shore pine, and red alder. The understory vegetation is mainly evergreen huckleberry, creambush oceanspray, salal, Pacific rhododendron, cascara, and western swordfern.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 132. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 133 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105.

The main limitations for the management of timber on this unit are the hazard of windthrow and plant competition. Careful use of wheeled and tracked equipment reduces the disturbance of the protective layer of duff. Maintaining the understory is essential in controlling erosion. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, Sitka spruce, and western hemlock seedlings.

If this unit is used for homesite development, the main limitation is droughtiness in summer. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for pasture, the main limitation is droughtiness in summer. Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is well suited to recreational development. It has few limitations.

This map unit is in capability subclass IIIe.

8C-Bullards sandy loam, 7 to 12 percent slopes. This deep, well drained soil is on dissected marine terraces. It formed in mixed eolian and marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 600 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of undecomposed organic matter 3 inches thick. The surface layer is very dark grayish brown sandy loam 7 inches thick. The subsoil is dark reddish brown, dark brown, and strong brown gravelly sandy loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown sand.

Included in this unit are small areas of Bandon and Templeton soils. Also included are small areas of Blacklock soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Bullards soil is moderate. Available water capacity is about 4.0 to 5.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is severe.

This unit is used mainly for timber production, wildlife habitat, and homesite development. It is also used for pasture and recreation.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are Sitka spruce, western hemlock, western redcedar, shore pine, and red alder. The understory vegetation is mainly evergreen huckleberry, creambush oceanspray, salal, Pacific rhododendron, cascara, and western swordfern.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 132. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 133 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105.

The main limitations for the management of timber on this unit are the hazard of windthrow and plant competition. Careful use of wheeled and tracked equipment reduces the disturbance of the protective layer of duff.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, Sitka spruce, and western hemlock seedlings.

If this unit is used for homesite development, the main limitations are slope and droughtiness in summer. Absorption lines should be installed on the contour. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for pasture, the main limitation is droughtiness in summer. Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for recreational development, the main limitation is steepness of slope. Slope may restrict some kinds of activities and increase the cost of constructing facilities.

This map unit is in capability subclass IIIe.

8D-Bullards sandy loam, 12 to 30 percent slopes. This deep, well drained soil is on dissected marine terraces. It formed in mixed eolian and marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 600 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of undecomposed organic matter 3 inches thick. The surface layer is very dark grayish brown sandy loam 7 inches thick. The subsoil is dark reddish brown, dark brown, and strong brown gravelly sandy loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown sand (fig. 7).

Included in this unit are small areas of Bandon and Templeton soils. Also included are small areas of Blacklock soils in depressional areas. Included areas make up about 25 percent of the total acreage.

Permeability of this Bullards soil is moderate. Available water capacity is about 4.0 to 5.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is severe.

This unit is used mainly for timber production, wildlife habitat, and pasture. It is also used for recreation.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are Sitka spruce, western hemlock, western redcedar, shore pine, and red alder. The understory vegetation is mainly evergreen huckleberry, creambush oceanspray, salal, Pacific rhododendron, cascara, and western swordfern.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 132. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 133 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105.

The main limitations for the management of timber on this unit are the hazard of erosion, the hazard of windthrow, and plant competition. Careful use of wheeled and tracked equipment reduces the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Logging roads require suitable surfacing for year-round use.

Figure 7.-Typical profile of Bullards sandy loam, 12 to 30 percent slopes, showing sand substratum. Tape is marked in 2.5-inch increments.

Rock for road construction is not readily available in this unit.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, Sitka spruce, and western hemlock seedlings.

If this unit is used for pasture, the main limitation is droughtiness in summer. Supplemental irrigation is needed for maximum production. Sprinkler irrigation can be used in the less sloping areas of the unit. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion.

If this unit is used for recreational development, the main limitations are steepness of slope and the hazard of erosion. Slope limits the type of recreational facilities that are suited to the unit. The risk of erosion is increased if the soil is left exposed during site development. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass IVe.

8E-Bullards sandy loam, 30 to 50 percent slopes. This deep, well drained soil is on dissected marine terraces. It formed in mixed eolian and marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 600 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of undecomposed organic matter 3 inches thick. The surface layer is very dark grayish brown sandy loam 7 inches thick. The subsoil is dark reddish brown, dark brown, and strong brown gravelly sandy loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown sand.

Included in this unit are small areas of Templeton soils. Included areas make up about 20 percent of the total acreage. The percentage varies from area to area.

Permeability of this Bullards soil is moderate. Available water capacity is about 4.0 to 5.5 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is severe.

This unit is used mainly for timber production and wildlife habitat. It is also used for recreation.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are Sitka spruce, western hemlock, western redcedar, shore pine, and red alder. The understory vegetation is mainly evergreen huckleberry, creambush oceanspray, salal, Pacific rhododendron, cascara, and western swordfern.

On the basis of a 100-year site. curve, the mean site index for Douglas fir is 132. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 133 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are steepness of slope, the hazard of erosion, the hazard of windthrow, and plant competition. Careful use of wheeled and tracked equipment reduces the disturbance of the protective layer of duff. Highlead or other logging systems that fully or partially suspend logs damage the soil less and generally are less costly than tractor systems.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut and fill areas are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, Sitka spruce, and western hemlock seedlings.

If this unit is used for recreational development, the main limitations are slope and the hazard of erosion. Slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. The risk of erosion is increased if the soil is left exposed during site development. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion.

This map unit is in capability subclass Vle.

9-Chetco silty clay loam. This deep, very poorly drained soil is on flood plains and deltas. It formed in alluvium. Slope is 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 0 to 40 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark grayish brown silty clay loam 10 inches thick. The subsoil is mottled, dark gray silty clay 14 inches thick. The substratum to a depth of 60 inches or more is mottled, dark gray clay.

Included in this unit are small areas of Coquille and Nestucca soils. Also included are small areas of Langlois soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Chetco soil is very slow. Available water capacity is about 5.0 to 8.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding during prolonged periods of rainfall. Channeling and deposition are common along streambanks. The water table fluctuates between the surface and a depth of 18 inches in October to May.

This unit is used mainly for hay and pasture and wildlife habitat.

The, vegetation in areas not cultivated is mainly Sitka spruce, western redcedar, western hemlock, and red alder. The understory vegetation is mainly western swordfern, evergreen huckleberry, slough sedge, soft rush, and skunkcabbage.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, wetness, droughtiness in summer, the hazard of flooding, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Drainage and irrigation are needed for maximum

production of crops. Water on or near the surface can be removed by use of open ditches and tide gates. Supplemental irrigation is needed in summer.

Wetness and flooding restrict grazing in winter. Protection from flooding during the growing season can be provided only by the use of extensive dikes. The choice of plants is limited to those that withstand periodic inundation. High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. To improve the quality of grass for hay, increase the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses. Grasses respond to nitrogen. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IVw.

10A-Chismore silt loam, 0 to 3 percent slopes. This deep, moderately well drained soil is on terraces and fans. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 380 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is very dark grayish brown silt loam 14 inches thick. The upper 6 inches of the subsoil is mottled, dark brown silt loam, and the lower 40 inches or more is mottled, brown, dark yellowish brown, and yellowish brown silty clay loam.

Included in this unit are small areas of Dement soils and Chismore soils that have slopes of more than 3 percent. Also included are small areas of poorly drained soils and well drained soils that have a yellowish brown silty clay loam subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Chismore soil is slow. Available water capacity is about 3.5 to 7.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table is at a depth of 12 to 36 inches from November to March. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for hay and pasture. A few areas are used for homesite development.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, salmonberry, and western swordfern.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Soil compaction limits the movement of air and water in the soil and restricts the growth of roots. Compaction can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. To maintain the quality of grass for hay, increase the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for homesite development, the main limitations are the slow permeability of the soil and wetness. Septic tank absorption fields may not function properly during rainy periods. The limitation of slow permeability can be overcome by increasing the size of the septic tank absorption field. Using interceptor ditches that divert subsurface water improves the operation of septic tank absorption fields. Drains are needed around footings if dwellings with basements are constructed on this unit. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IIIw.

10B-Chismore silt loam, 3 to 7 percent slopes. This deep, moderately well drained soil is on terraces and fans. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 380 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is very dark grayish brown silt loam 14 inches thick. The upper 6 inches of the subsoil is mottled, dark brown silt loam, and the lower 40 inches or more is mottled, brown, dark yellowish brown, and yellowish brown silty clay loam.

Included in this unit are small areas of Dement soils. Also included are small areas of well drained soils that have a yellowish brown silty clay loam subsoil and Chismore soils that have slopes of 7 to 12 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Chismore soil is slow. Available water capacity is about 3.5 to 7.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table is at a depth of 12 to 36 inches from November to March. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for hay and pasture. A few areas are used for homesite development.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, salmonberry, and western swordfern.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for homesite development, the main limitations are the slow permeability of the soil and wetness, Septic tank absorption fields do not function properly during rainy periods. The limitation of slow permeability can be overcome by increasing the size of the septic tank absorption field. Using interceptor ditches that divert subsurface water improves the operation of septic tank absorption fields. Drains are needed around footings if dwellings with basements are constructed on this unit.

Preserving the existing plant cover during construction helps to control erosion. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IIIe.

10C-Chismore silt loam, 7 to 12 percent slopes. This deep, moderately well drained soil is on terraces and fans. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 380 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is very dark grayish brown silt loam 14 inches thick. The upper 6 inches of the subsoil is mottled, dark brown silt loam, and the lower 40 inches or more is mottled, brown, dark yellowish brown, and yellowish brown silty clay loam.

Included in this unit are small areas of Dement and Honeygrove soils. Also included are small areas of soils that are similar to this Chismore soil but are well drained and Chismore soils with slopes of 3 to 7 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from area to area.

Permeability of this Chismore soil is slow. Available water capacity is about 3.5 to 7.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table is at a depth of 12 to 36 inches from November to March. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for hay and pasture. A few areas are used for homesite development.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, salmonberry, and western swordfern.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for homesite development, the main limitations are the slow permeability of the soil, wetness, and slope. Septic tank absorption fields do not function properly during rainy periods. The limitation of slow permeability can be overcome by increasing the size of the septic tank absorption field. Absorption lines should be installed on the contour. Using interceptor ditches that divert subsurface water improves the operation of septic tank absorption fields. Drains are needed around footings if dwellings with basements are constructed on this unit.

The risk of erosion is increased if the soil is left exposed during site development. Careful planning of road location can minimize the amount of cutting and filling required. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. Plant cover can be established and maintained through proper fertilizing, seeding, mulching, and shaping of the slopes. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IVe.

11-Clatsop mucky peat. This deep, very poorly drained soil is on tidal flats. It formed in alluvium. Slope is 0 to 1 percent. The native vegetation is mainly sedges, rushes, forbs, and grasses. Elevation is 0 to 10 feet. The average annual precipitation is 50 to 65 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is dark brown, mucky, fibrous peat about 10 inches thick. The next layer is very dark grayish brown silty clay loam 7 inches thick. The upper 23 inches of the substratum is dark gray silty clay, and the lower part to a depth of 60 inches or more is very dark gray clay.

Included in this unit are small areas of Brallier, Chetco, and Langlois soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Clatsop soil is slow. Available water capacity is about 3 to 6 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is ponded, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding during high tides. The water table fluctuates between the surface and a depth of 24 inches from November to June.

This unit is used for wildlife habitat and recreation.

The vegetation on this unit commonly is slough sedge, American great bulrush, brown-headed rush, and hairgrass.

This map unit is in capability subclass IVw.

12-Coquille silt loam. This deep, very poorly drained soil is on flood plains. It formed in alluvium. Slope is 0 to 1 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 0 to 20 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark grayish brown and dark grayish brown silt loam 14 inches thick. The next 22 inches is dark grayish brown and olive gray silty clay loam, and the lower part to a depth of 60 inches or more is very dark gray silty clay loam. In some areas the surface layer is sand or is covered with a thin organic layer.

Included in this unit are small areas of Langlois, Clatsop, and Chetco soils. Also included are small areas of Nestucca soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Coquille soil is slow. Available water capacity is about 4.0 to 8.5 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is very slow, and the hazard of water erosion is slight. Most areas of this soil are protected from flooding as a result of high tides; however, the soil is subject to rare periods of flooding from streams and hillside runoff. The water table fluctuates between the surface and a depth of 24 inches from October to June.

This unit is used mainly for hay and pasture and wildlife habitat.

The vegetation in areas not cultivated is mainly Sitka spruce, western redcedar, western hemlock, and red alder. The understory vegetation is mainly slough sedge, soft rush, skunkcabbage, evergreen huckleberry, and western swordfern.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, wetness, droughtiness in summer, flooding, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Drainage and irrigation are needed for maximum production of crops. Water on or near the surface can be removed by open ditches or tile drains. Supplemental irrigation is needed in summer because of low rainfall. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Wetness and flooding restrict grazing in winter. Protection from flooding during the growing season can be provided only by the use of extensive dikes. The choice of plants is limited to those that withstand periodic inundation. High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses. Grasses respond to nitrogen. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IVw.

13C-Dement silt loam, 2 to 12 percent slopes. This deep, well drained soil is on side slopes and ridgetops of mountains. It formed in residuum and colluvium derived dominantly from siltstone and sandstone. The native vegetation is mainly conifers, hardwoods, shrubs, and forbs. Elevation is 20 to 600 feet. The average annual precipitation is 55 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface layer is very dark grayish brown silt loam 7 inches thick. The subsoil is reddish brown silty clay loam 38 inches thick. Weathered sedimentary rock is at a depth of 45 inches. In some areas the dark-colored surface layer is more than 10 inches thick.

Included in this unit are small areas of Blachly soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Dement soil is moderately slow. Available water capacity is about 6.5 to 11.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat. It is also used for homesite development and livestock grazing.

This unit is suited to the production of Douglas fir and western hemlock. Among the other species that grow on this unit are western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly creambush oceanspray, rose, snowberry, hairy brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 150. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 158 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

The main limitations for the management of timber on this soil are the susceptibility of the surface layer to compaction and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity. Highlead or other logging systems that fully or partially suspend logs damage the soil less and generally are less costly than tractor systems.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir and western hemlock seedlings.

If this unit is used for livestock grazing, the main limitation is the susceptibility of the surface layer to compaction. Grazing cattle when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for homesite development, the main limitations are the moderately slow permeability, slope, and depth to bedrock. Septic tank absorption fields may not function properly during rainy periods because of the moderately slow permeability. The limitation of moderately slow permeability can be overcome by increasing the size of the septic tank absorption field. Absorption lines should be installed on the contour.

Careful planning of road location can minimize the amount of cutting and filling required. The risk of erosion is increased if the soil is left exposed during site development. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. Plant cover can be established and maintained through proper fertilizing, seeding, mulching, and shaping of the slopes. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass life.

13D-Dement silt loam, 12 to 30 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in residuum and colluvium derived dominantly from siltstone and sandstone. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 20 to 600 feet. The average annual precipitation is 55 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface layer is very dark grayish brown silt loam 7 inches thick. The subsoil is reddish brown silty clay loam 38 inches thick. Weathered sedimentary rock is at a depth of 45 inches. In some areas the dark-colored surface layer is more than 10 inches thick.

Included in this unit are small areas of Blachly soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Dement soil is moderately slow. Available water capacity is about 6.5 to 11.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat. It is also used for homesite development and livestock grazing (fig. 8).

This unit is suited to the production of Douglas fir and western hemlock. Among the other species that

Figure 8.-Beef cattle and sheep grazing in an area of Dement silt loam, 12 to 30 percent slopes.

grow on this unit are western redcedar, red alder, and Oregon myrtle, The understory vegetation is mainly creambush oceanspray, rose, snowberry, hairy, brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 150. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 158 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet, Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity. Highlead or other logging systems that fully or partially suspend logs damage the soil less and generally are less costly than tractor systems.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut and fill areas are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Road location and maintenance costs are greater in the more steeply sloping areas. Unsurfaced roads and

skid trails are soft when wet or moist, and they may be impassable during rainy periods.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir and western hemlock seedlings.

If this unit is used for livestock grazing, the main limitation is the susceptibility of the surface layer to compaction. Grazing cattle when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

If this unit is used for homesite development, the main limitations are the moderately slow permeability, slope. and depth to bedrock. Absorption lines should either be placed in the more gently sloping areas of this unit or in adjoining, less sloping areas. Septic tank absorption fields may not function properly during rainy periods because of the moderately slow permeability of the subsoil. The limitation of moderately slow permeability can be overcome by increasing the size of the absorption field. Extensive cuts and fills generally are required to provide nearly level construction sites. Building roads in the less sloping areas of this unit reduces the amount of cutting and filling required. Roads should be provided with surface drainage. Cut and fill areas are susceptible to erosion. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IVe.

13E-Dement silt loam, 30 to 50 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in residuum and colluvium derived dominantly from siltstone and sandstone. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 20 to 900 feet. The average annual air temperature is 55 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface layer is very dark grayish brown silt loam 7 inches thick. The subsoil is reddish brown silty clay loam 38 inches thick. Weathered sedimentary rock is at a depth of 45 inches. In some areas the dark-colored surface layer is more than 10 inches thick.

Included in this unit are small areas of Blachly soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Dement soil is moderately slow. Available water capacity is about 6.5 to 11.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat. It is also used for livestock grazing.

This unit is suited to the production of Douglas fir and western hemlock. Among the other species that grow on this unit are western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly creambush oceanspray, rose, snowberry, hairy brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 150. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 158 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, steepness of slope, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut

and fill areas are subject to erosion unless treated. Seeding, mulching, benching, and compacting can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Locating roads on midslopes results in large cuts and fills and thus removes land from production. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir and western hemlock seedlings.

If this unit is used for livestock grazing, the main limitations are the susceptibility of the surface layer to compaction and slope. Grazing cattle when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

Slope limits access by livestock and results in overgrazing of the less sloping areas. If the pasture is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Livestock grazing, therefore, should be managed so that the desired balance of species is maintained in the plant community. Severe overgrazing reduces the plant cover and increases the risk of erosion. Weeds and brush can be controlled by aerial spraying. Rotation grazing increases the production of forage and helps to control weeds and brush.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

The map unit is in capability subclass VIe.

13F-Dement silt loam, 50 to 70 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium derived dominantly from siltstone and sandstone. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 20 to 900 feet. The average annual precipitation is 55 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface layer is very dark grayish brown silt loam 7 inches thick. The subsoil is reddish brown silty clay loam 38 inches thick. Weathered sedimentary rock is at a depth of 45 inches. In some areas the dark-colored surface layer is more than 10 inches thick.

Included in this unit are small areas of soils that are similar to this Dement soil but are 20 to 40 inches deep to bedrock. Included areas make up about 20 percent of the total acreage.

Permeability of this Dement soil is moderately slow. Available water capacity is about 6.5 to 11.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir and western hemlock. Among the other species that grow on this unit are western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly creambush oceanspray, rose, snowberry, hairy brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 150. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 158 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, steepness of slope, and plant competition. Compaction reduces the productivity of the soil. Highlead or other cable logging systems are most suitable.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut and fill areas are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails,

and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Locating roads on midslopes results in large cuts and fills and thus removes land from production. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir and western hemlock seedlings.

This map unit is in capability subclass Vlle.

14F-Digger-Preacher-Umpcoos association, 50 to 80 percent slopes. This map unit is on side slopes and ridges of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, and forbs. Elevation is 200 to 3,600 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 30 percent Digger gravelly loam, 30 percent Preacher loam, and 25 percent Umpcoos very gravelly sandy loam. The Digger soil is on side slopes, the Preacher soil is on ridgetops and side slopes, and the Umpcoos soil is on very narrow ridgetops and steep side slopes along drainageways.

Included in this unit are small areas of Remote and Bohannon soils and Rock outcrop. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Digger soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone and siltstone. Typically, the surface is covered with a mat of partially decomposed leaves, moss, and litter 1 inch thick. The surface layer is dark brown gravelly loam 6 inches thick. The upper 3 inches of the subsoil is dark yellowish brown gravelly loam, and the lower 18 inches is brown very gravelly loam and very cobbly loam. The substratum is brown extremely cobbly loam 4 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Digger soil is moderately rapid. Available water capacity is about 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

The Umpcoos soil is shallow and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of organic litter 2 inches thick. The surface layer is dark grayish brown very gravelly sandy loam 3 inches thick. The subsoil is brown very gravelly sandy loam 13 inches thick. Hard sandstone is at a depth of 16 inches.

Permeability of the Umpcoos soil is moderately rapid. Available water capacity is about 0.5 inch to 1.5 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, incense cedar, red alder, and Pacific madrone. The understory vegetation is mainly evergreen huckleberry, red huckleberry, cascade Oregon-grape, western swordfern, creambush oceanspray, Oregon oxalis, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Digger soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 79 on the Umpcoos soil. At the culmination of the mean annual increment (CMAI), the production of 70-year-old Douglas fir trees 1.5 inches or larger in diameter at breast height is 58 cubic feet per acre per year. On the basis of a 50-year site curve, the

mean site index for Douglas fir is 61.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer of the Preacher soil to compaction, steepness of slope, the hazard of erosion, the hazard of windthrow on the Digger and Umpcoos soils, and plant competition. Highlead or other cable logging systems are most suitable.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Because growth of roots is restricted by bedrock in the Umpcoos and Digger soils, trees commonly are subject to windthrow. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

15F-Digger-Umpcoos-Rock outcrop association, 50 to 90 percent slopes. This map unit is on side slopes and ridges of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, and forbs. Elevation is 300 to 3,800 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 30 percent Digger gravelly loam, 25 percent Umpcoos very gravelly sandy loam, and 25 percent Rock outcrop. The Digger soil is on concave side slopes, the Umpcoos soil is on convex side slopes above areas of Rock outcrop and on narrow ridgetops, and Rock outcrop is on precipitous side slopes along drainageways and on very narrow ridgetops.

Included in this unit are small areas of Bohannon, Preacher, and Remote soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Digger soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone and siltstone. Typically, the surface is covered with a mat of undecomposed leaves, moss, and litter 1 inch thick. The surface layer is dark brown gravelly loam 6 inches thick. The upper 3 inches of the subsoil is dark yellowish brown gravelly loam, and the lower 18 inches is brown very gravelly loam and very cobbly loam. The substratum is brown extremely cobbly loam 4 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Digger soil is moderately rapid. Available water capacity is about 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Umpcoos soil is shallow and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of organic litter 2 inches thick. The surface layer is dark grayish brown very gravelly sandy loam 3 inches thick. The subsoil is brown very gravelly sandy loam 13 inches thick. Hard sandstone is at a depth of 16 inches.

Permeability of the Umpcoos soil is moderately rapid. Available water capacity is about 0.5 inch to 1.5 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop commonly consists of exposures of hard, fractured sandstone.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, incense cedar, red alder, and Pacific madrone. The understory vegetation is mainly evergreen huckleberry, red huckleberry, tall Oregon-grape, western swordfern, creambush oceanspray, Oregon oxalis, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Digger soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 122.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 79 on the Umpcoos soil. At the culmination of the mean annual increment (CMAI), the production of 70-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 58 cubic feet per

acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 61.

The main limitations for the management of timber on this unit are steepness of slope, the hazard of erosion, the hazard of windthrow, and plant competition. Helicopter, balloon, or total-suspension cable systems are the most suitable methods for harvesting timber. Rock outcrop may cause breakage of timber and hinder yarding.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Because growth of roots is restricted by bedrock, trees commonly are subject to windthrow. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

16-Dune land. Dune land consists mainly of hills and ridges of shifting fine and medium textured sand. It formed in eolian deposits derived dominantly from deflation basins adjacent to coastal beaches. Slope is 0 to 30 percent. Areas of Dune land do not support vegetation. Elevation is 5 to 100 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees *F,* and the average frost-free period is 200 to 240 days.

Included in this unit are small areas of Waldport soils, some of which have a thin surface layer, and Heceta soils. Included areas make up about 20 percent of the total acreage.

Permeability of Dune land is very rapid. Runoff is slow. and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used for recreation. The hazard of soil blowing and the instability of the areas limit the unit for most kinds of recreational development. It is suitable for low-intensity uses such as hiking and horseback riding and for off-road vehicle traffic.

This map unit is in capability subclass VIIIe.

17B-Eilertsen silt loam, 0 to 7 percent slopes. This deep, well drained soil is on stream terraces. It formed in mixed alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 120 feet. The average annual precipitation is 60 to 70 inches, the average annual air temperature is 50 to 53 degrees *F,* and the average frost-free period is 180 to 220 days.

Typically, the surface layer is dark brown silt loam 11 inches thick. The subsoil is brown and dark yellowish brown silt loam 48 inches thick. The substratum to a depth of 60 inches or more is olive brown fine sandy loam.

Included in this unit are small areas of soils that are similar to this Eilertsen soil but are mottled to a depth of 40 inches or less. Also included are small areas of Kirkendall and Gardiner soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Eilertsen soil is moderate. Available water capacity is about 11 to 13 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for hay and pasture and for homesite development. It is also used for timber production.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, Oregon myrtle, and red alder. The understory vegetation is mainly evergreen huckleberry, western swordfern, cascade Oregon-grape, and Oregon oxalis.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 159. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 172 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of the surface layer occurs most readily when the soil is dry.

Puddling can occur when the soil is wet. Using low-pressure ground equipment damages the soil less and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Unsurfaced roads and skid trails are slippery when wet or moist. and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir and western hemlock seedlings.

If this unit is used for hay and pasture, the main limitations are susceptibility of the surface layer to compaction, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds and brush. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is well suited to homesite development. It has few limitations. Only the part of the site that is used for construction should be disturbed. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IIc.

18E-Etelka silt loam, 30 to 50 percent slopes. This deep, moderately well drained soil is on side slopes and ridgetops of mountains. It formed in colluvium and residuum derived dominantly from sandstone and siltstone. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 50 to 1,800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is dark grayish brown silt loam 13 inches thick. The upper 19 inches of the subsoil is dark brown and olive brown silt loam and silty clay loam, and the lower 28 inches is mottled, olive brown and dark grayish brown silty clay.

Included in this unit are small areas of Whobrey and Remote soils. Also included are small areas of Dement soils and Rock outcrop. Included areas make up about 25 percent of the total acreage.

Permeability of this Etelka soil is slow. Available water capacity is about 7.0 to 11.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is rapid, and the hazard of water erosion is high. The water table is at a depth of 24 to 36 inches from December to March.

This unit is used mainly for timber production, wildlife habitat, and livestock grazing.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are grand fir, Port Orford cedar, bigleaf maple, and canyon live oak. The understory vegetation is mainly creambush oceanspray, red huckleberry, western swordfern, tall Oregon-grape, hazelnut, and broadleaf starflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 155. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 164 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 120.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to

compaction, the susceptibility of the soil to landsliding, the hazard of erosion, steepness of slope, the hazard of windthrow, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity. Road failure and landslides are likely to occur after road construction and clearcutting.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

If this unit is used for livestock grazing, the main limitations are the susceptibility of the surface layer to compaction, slope, and the susceptibility of the soil to landsliding. Grazing cattle when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Slope limits access by livestock and results in overgrazing of the less sloping areas. If the pasture is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Livestock grazing, therefore, should be managed so that the desired balance of species is maintained in the plant community. Severe overgrazing reduces the plant cover and increases the risk of erosion. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

This unit is subject to severe slumping and landsliding in winter. Damage to fences, watering tanks, and other facilities can be minimized by providing soil drainage. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter.

This map unit is in capability subclass VIIe.

19F-Etelka-Remote complex, 50 to 70 percent slopes. This map unit is on side slopes and ridgetops of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 50 to 1,800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 55 percent Etelka silt loam and 25 percent Remote loam. The Etelka soil is on toe slopes, benches, and broad ridgetops, and the Remote soil is on narrow ridgetops and steep side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Rinearson and Whobrey soils. Also included are small areas of Dement and Digger soils. Included areas make up about 20 percent of the total acreage.

The Etelka soil is deep and moderately well drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface layer is dark grayish brown silt loam 13 inches thick. The upper 19 inches of the subsoil is dark brown and olive brown silt loam and silty clay loam, and the lower 28 inches is mottled, olive brown and dark grayish brown silty clay.

Permeability of the Etelka soil is slow. Available water capacity is about 7.0 to 11.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is rapid, and the hazard of water erosion is high. The water table is at a depth of 24 to 36 inches from December to March.

The Remote soil is deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is brown to yellowish brown gravelly and very gravelly clay loam 40 inches thick. The substratum to a depth of 60 inches or more is yellowish brown extremely gravelly loam.

Permeability of this Remote soil is moderate. Available water capacity is about 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on the unit are grand fir, Port Orford cedar, bigleaf maple, and canyon live oak. The understory vegetation is mainly crearnbush oceanspray, red huckleberry, western swordfern, tall Oregon-grape, evergreen huckleberry, and broadleaf starflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 155 on the Etelka soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 164 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 120.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 145 on the Remote soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 153 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111 .

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the susceptibility of the Etelka soil to landsliding, steepness of slope, the hazard of erosion, the hazard of windthrow, and plant competition. Highlead or other cable logging systems are most suitable. The Etelka soil is subject to severe slumping, especially where road cuts are made. If roads are located on this unit, surface and subsurface drainage, proper road location, and road base are needed.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation.. Maintaining the understory is essential in controlling erosion.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

20D-Etelka-Rinearson-Orford complex, 12 to 30 percent slopes. This map unit is on foot slopes, side slopes, and ridgetops of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 300 to 1,000 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 240 days.

This unit is 30 percent Etelka silt loam, 30 percent Rinearson silt loam, and 25 percent Orford silty clay loam. The Etelka soil is on foot slopes and slump benches, the Rinearson soil is on side slopes and narrow ridgetops, and the Orford soil is on broad ridgetops. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Remote soils. Also included are small areas of Rock outcrop. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Etelka soil is deep and moderately well drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface layer is dark grayish brown silt loam 13 inches thick. The upper 19 inches of the subsoil is dark brown and olive brown silt loam and silty clay loam, and the lower 28 inches is mottled, olive brown and dark grayish brown silty clay.

Permeability of this Etelka soil is slow. Available water capacity is about 7.0 to 11.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is medium, and the hazard of water erosion is moderate. The water table is at a depth of 24 to 36 inches from December to March.

The Rinearson soil is deep and well drained. It formed in residuum and colluvium derived dominantly from sedimentary rock. Typically, the surface layer is dark reddish brown silt loam 6 inches thick. The upper 12 inches of the subsoil is dark reddish brown silt loam, and the lower 24 inches is reddish brown and dark reddish brown silty clay loam. Weathered sandstone is at a depth of 42 inches.

Permeability of this Rinearson soil is moderate. Available water capacity is about 7.5 to 12.5 inches.

Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Orford soil is deep and well drained. It formed in residuum and colluvium derived dominantly from arkosic sandstone and siltstone. Typically, the surface is covered with a mat of fir needles, leaves, and twigs 1 inch thick. The surface layer is very dark grayish brown silty clay loam 11 inches thick. The upper 8 inches of the subsoil is dark brown silty clay loam, the next 29 inches is dark brown and yellowish brown silty clay, and the lower 7 inches is dark yellowish brown silty clay loam. The substratum to a depth of 60 inches or more is dark yellowish brown silty clay loam.

Permeability of the Orford soil is moderately slow. Available water capacity is about 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production, wildlife habitat, and livestock grazing.

This unit is well suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, Port Orford cedar, and red alder. The understory vegetation is mainly creambush oceanspray, vine maple, red huckleberry, western swordfern, salal, and broadleaf starflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 155 on the Etelka soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 164 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 120.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Rinearson soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 175 on the Orford soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 186 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the susceptibility of the Etelka soil to landsliding, the hazard of erosion, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity. The Etelka soil is subject to severe slumping, especially where road cuts are made. If roads are located on this unit, surface and subsurface drainage, proper road location, and road base are needed.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

If this unit is used for livestock grazing, the main limitations are the susceptibility of the surface layer to compaction, droughtiness of the Rinearson and Orford soils in summer, and the susceptibility of the Etelka soil to landsliding. Grazing when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness .limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

The Etelka soil is subject to slumping and landsliding in winter. Damage to fences, watering tanks, and other facilities can be minimized by providing soil drainage. Where feasible, facilities should be placed in areas of the Rinearson and Orford soils. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation

grazing increases the production of forage and helps to control weeds and brush.

This map unit is in capability subclass VIe.

20E-Etelka-Rinearson-Orford complex, 30 to 50 percent slopes. This map unit is on foot slopes, side slopes, and ridgetops of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 300 to 1,000 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 240 days.

This unit is 30 percent Etelka silt loam, 30 percent Rinearson silt loam, and 25 percent Orford silty clay loam. The Etelka soil is on foot slopes and slump benches, the Rinearson soil is on side slopes and narrow ridgetops, and the Orford soil is on broad ridgetops. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Remote soils. Also included are small areas of Rock outcrop. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Etelka soil is deep and moderately well drained. It formed in residuum and colluvium derived dominantly from sedimentary rock. Typically, the surface layer is dark grayish brown silt loam 13 inches thick. The upper 19 inches of the subsoil is dark brown and olive brown silt loam and silty clay loam, and the lower 28 inches is mottled, olive brown and dark grayish brown silty clay.

Permeability of this Etelka soil is slow. Available water capacity is about 7.0 to 11.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is rapid, and the hazard of water erosion is high. The water table is at a depth of 24 to 36 inches from December to March.

The Rinearson soil is deep and well drained. It formed in residuum and colluvium derived dominantly from sedimentary rock. Typically, the surface layer is dark reddish brown silt loam 6 inches thick. The upper 12 inches of the subsoil is dark reddish brown silt loam, and the lower 24 inches is reddish brown and dark reddish brown silty clay loam. Weathered sandstone is at a depth of 42 inches.

Permeability of this Rinearson soil is moderate. Available water capacity is about 7.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

The Orford soil is deep and well drained. It formed in residuum and colluvium derived dominantly from arkosic sandstone and siltstone. Typically, the surface is covered with a mat of fir needles, leaves, and twigs 1 inch thick. The surface layer is very dark grayish brown silty clay loam 11 inches thick. The upper 8 inches of the subsoil is dark brown silty clay loam, the next 29 inches is dark brown and yellowish brown silty clay, and the lower 7 inches is dark yellowish brown silty clay loam. The substratum to a depth of 60 inches or more is dark yellowish brown silty clay loam.

Permeability of this Orford soil is moderately slow. Available water capacity is about 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production, wildlife habitat, and livestock grazing.

This unit is well suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, Port Orford cedar, and red alder. The understory vegetation is mainly creambush oceanspray, vine maple, red huckleberry, western swordfern, salal, and broadleaf starflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 155 on the Etelka soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 164 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 120.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Rinearson soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 175 on the Orford soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 186 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the susceptibility of the Etelka soil to landsliding, steepness of slope, the hazard of erosion, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain

productivity. The Etelka soil is subject to severe slumping, especially where road cuts are made. If roads are located on this unit, surface and subsurface drainage, proper road location, and road base are needed.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

If this unit is used for livestock grazing, the main limitations are the susceptibility of the surface layer to compaction, droughtiness of the Rinearson and Orford soils in summer, slope, and the susceptibility of the Etelka soil to landsliding. Grazing when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

Slope limits access by livestock and results in overgrazing of the less sloping areas. If the pasture is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Livestock grazing, therefore, should be managed so that the desired balance of species is maintained in the plant community. Severe overgrazing reduces the plant cover and increases the risk of erosion.

The Etelka soil is subject to slumping and landsliding in winter. Damage to fences, watering tanks, and other facilities can be minimized by providing soil drainage. Where feasible, facilities should be placed in areas of the Rinearson or Orford soils. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

This map unit is in capability subclass VIIe.

21D-Etelka-Whobrey silt loams, 7 to 30 percent slopes. This map unit is on side slopes, slump benches, and broad ridgetops and in saddles of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 100 to 1,800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 45 percent Etelka silt loam and 30 percent Whobrey silt loam. The Etelka soil is on side slopes and broad ridgetops, and the Whobrey soils are on slump benches and in saddles. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Preacher, Digger, and Remote soils. Also included are small areas of Rock outcrop. Included areas make up about 25 percent of the total acreage.

The Etelka soil is deep and moderately well drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface layer is dark grayish brown silt loam 13 inches thick. The upper 19 inches of the subsoil is dark brown and olive brown silt loam and silty clay loam, and the lower 28 inches is mottled, olive brown and dark grayish brown silty clay.

Permeability of the Etelka soil is slow. Available water capacity is about 7.0 to 11.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is medium, and the hazard of water erosion is moderate. The water table is at a depth of 24 to 36 inches from December to March.

The Whobrey soil is deep and somewhat poorly

drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface is covered with a mat of undecomposed leaves, twigs, and needles 1 inch thick. The surface layer is dark brown and brown silt loam 11 inches thick. The subsoil is dark yellowish brown silt loam 9 inches thick. The substratum to a depth of 60 inches or more is mottled, very dark gray clay.

Permeability of the Whobrey soil is moderate to a depth of 20 inches and very slow below this depth. Available water capacity is about 4.0 to 6.5 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is rapid, and the hazard of water erosion is high. The water table is at a depth of 18 to 30 inches from December to March.

This unit is used mainly for timber production, wildlife habitat, and livestock grazing.

This unit is suited to the production of Douglas fir. Among the other species that grow on the unit are grand fir, Port Orford cedar, western hemlock, western redcedar, bigleaf maple, and red alder. The understory vegetation is mainly creambush oceanspray, red huckleberry, western swordfern, tall Oregon-grape, hazelnut, and Pacific rhododendron.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 155 on the Etelka soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 164 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 120.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 105 on the Whobrey soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 91 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 86.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the susceptibility of the soils to landsliding, the hazard of erosion, the hazard of windthrow, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity. Road failure and landslides are likely to occur after road construction and clearcutting. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Tree seedlings have only a moderate rate of survival because of the high water table in the Whobrey soil in spring. Reforestation can be accomplished by planting Douglas fir and Port Orford cedar seedlings.

If this unit is used for livestock grazing, the main limitations are the susceptibility of the surface layer to compaction, wetness of the Whobrey soil, and susceptibility of the soils to landsliding. Grazing when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Wetness in winter and spring limits grazing on the Whobrey soil. Drainage is impractical because of slope and a lack of suitable outlets.

This unit is subject to slumping and landsliding in winter. Damage to fences, watering tanks, and other facilities can be minimized by providing soil drainage. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

This map unit is in capability subclass VIe.

22E-Eteika-Whobrey-Remote complex, 30 to 60 percent slopes. This map unit is on mountains. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 200 to 1,600 feet. The

average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 40 percent Etelka silt loam, 25 percent Whobrey silt loam, and 15 percent Remote loam. The Etelka soil is on broad ridgetops, in saddles, and on benches. The Whobrey soil is on toe slopes in closed depressional areas on slump benches. The Remote soil is on narrow ridgetops and steep side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Digger and Preacher soils. Also included are small areas of Umpcoos soils and Rock outcrop. Included areas make up about 20 percent of the total acreage.

The Etelka soil is deep and moderately well drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface layer is dark grayish brown silt loam 13 inches thick. The upper 19 inches of the subsoil is dark brown and olive brown silt loam and silty clay loam, and the lower 28 inches is mottled, olive brown and dark grayish brown silty clay.

Permeability of the Etelka soil is slow. Available water capacity is about 7.0 to 11.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is rapid, and the hazard of water erosion is high. The water table is at a depth of 24 to 36 inches from December to March.

The Whobrey soil is deep and somewhat poorly drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface is covered with a mat of undecomposed needles, leaves, and twigs 1 inch thick. The surface layer is dark brown and brown silt loam 11 inches thick. The subsoil is dark yellowish brown silt loam 9 inches thick. The substratum to a depth of 60 inches or more is mottled, very dark gray clay.

Permeability of the Whobrey soil is moderate to a depth of 20 inches and very slow below this depth. Available water capacity is about 4.0 to 6.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is rapid, and the hazard of water erosion is high. The water table is at a depth of 18 to 30 inches from December to March.

The Remote soil is deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is brown to yellowish brown gravelly and very gravelly clay loam 40 inches thick. The substratum to a depth of 60 inches or more is yellowish brown extremely gravelly loam.

Permeability of the Remote soil is moderate. Available water capacity is about 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat. It is also used for livestock grazing.

This unit is suited to the production of Douglas fir. Among the other species that grow on the unit are western redcedar, western hemlock, Port Orford cedar, grand fir, bigleaf maple, and canyon live oak. The understory vegetation is mainly creambush oceanspray, red huckleberry, western swordfern, tall Oregon-grape, and broadleaf starflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 155 on the Etelka soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 164 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 120.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 105 on the Whobrey soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 91 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 86.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 145 on the Remote soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 152 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the susceptibility of the Etelka and Whobrey soils to landsliding, steepness of slope, the hazard of erosion, the hazard of windthrow, seedling mortality, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity. The soil is subject to severe slumping, especially where road cuts are made. If roads are located on this unit, surface and subsurface drainage, proper road location, and road base are needed.

Proper design of road drainage systems and care in

the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching. benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails. and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

If this unit is used for livestock grazing, the main limitations are the susceptibility of the surface layer of the Whobrey soil to compaction, droughtiness of the Remote soil in summer, slope, wetness of the Whobrey soil, and the susceptibility of the Etelka and Whobrey soils to landsliding. Grazing when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

Slope limits access by livestock and results in overgrazing of the less sloping areas. If the pasture is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Livestock grazing, therefore, should be managed so that the desired balance of species is maintained in the plant community. Severe overgrazing reduces the plant cover and increases the risk of erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

Wetness in winter and spring limits grazing on the Whobrey soil. Drainage is impractical because of slope and a lack of suitable outlets.

The Etelka and Whobrey soils are subject to severe slumping and landsliding in winter. Damage to fences, watering tanks, and other facilities can be minimized by providing soil drainage. Where feasible, facilities should be placed in areas of the more stable Remote soil.

This map unit is in capability subclass VIIe.

23-Fluvaquents-Histosols complex. This map unit is on tidelands of bays, inlets, and estuaries (fig. 9). Slope is 0 to 1 percent. The native vegetation is mainly salt-tolerant grasses, sedges, and rushes. Elevation is 0 to 3 feet. The average annual precipitation is 55 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 50 percent Fluvaquents and 40 percent Histosols. Fluvaquents are on the lower positions that normally are covered by average high tides and in surge channels at higher elevations, and Histosols are on the higher positions that are covered by extreme high tides. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that are above the high tide level. Included areas make up about 10 percent of the total acreage.

Fluvaquents are made up of alternating layers of mineral and organic material of varying thickness. The surface layer generally is mineral and is sandy, silty, or clayey, depending on the velocity of the tides in a given area.

Histosols are made up of a layer of organic material that is 16 inches thick or more and overlies alternating layers of mineral and organic material.

This unit is saturated with water that is high in content of soluble salts.

This unit is used for recreation and wildlife habitat.

Areas of this unit are used for clam digging, crabbing, and other forms of seashore recreation. It is also used extensively by ducks, herons, egrets, and other shore birds as feeding and resting areas. The typical vegetation on the Histosols is mainly eelgrass, seaside arrowgrass, Pacific bulrush, tufted hairgrass, and Baltic rush. The Fluvaquents are barren.

This map unit is in capability subclass VIIIw.

Figure 9.-Area of Fluvaquents-Histosols complex on east side of Coos Bay. Drift logs are deposited during high tides.

24-Gardiner sandy loam. This deep, well drained soil is on flood plains. It formed in mixed alluvium. Slopes are 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 20 to 100 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is dark brown sandy loam 9 inches thick. The upper 21 inches of the substratum is brown loamy fine sand, and the lower part to a depth of 60 inches or more is stratified, dark yellowish brown loam, fine sand, and loamy sand.

Included in this unit are small areas of Kirkendall soils and Quosatana soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Gardiner soil is rapid. Available water capacity is about 6.0 to 6.5 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding in winter during prolonged rainstorms.

This unit is used for hay and pasture.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, tall Oregon-grape, western swordfern, and Oregon oxalis.

If this unit is used for hay and pasture, the main limitations are droughtiness in summer, periods of flooding, and, for the curing of hay, high humidity.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Frequent, brief periods of flooding restrict the use of this unit in winter. Protection from flooding can be provided only by the use of extensive dikes.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. Excess forage in spring can be used as silage. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IVw.

25-Gauldy Variant loam. This deep, somewhat excessively drained soil is on high terraces. It formed in alluvium. Slope is 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 10 to 400 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is very dark grayish brown loam 10 inches thick. The subsoil is dark brown loam 7 inches thick. The upper 11 inches of the substratum is dark yellowish brown very gravelly sandy loam, and the lower part to a depth of 60 inches or more is yellowish brown very gravelly loamy coarse sand. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Chismore and Pyburn soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Gauldy Variant soil is moderate. Available water capacity is about 3 to 4 inches. Effective rooting depth is limited by the droughtiness of the subsoil. Runoff is very slow, and the hazard of water erosion is slight.

This unit is used mainly for hay and pasture. It is also used for homesite development.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, Oregon myrtle, and bigleaf maple. The understory vegetation is mainly western swordfern, hairy brackenfern, salmonberry, red huckleberry, and vine maple.

If this unit is used for hay and pasture, the main limitations are droughtiness in summer and, for the curing of hay, high humidity. Supplemental irrigation is needed for maximum production in summer. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Use of proper stocking rates and rotation grazing helps to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds and brush. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is well suited to homesite development. It has few limitations. If the soil in this unit is used for septic tank absorption fields, the rapid permeability of the gravelly substratum may result in contamination of ground water. Onsite investigation is needed to determine the possibility of ground water contamination. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IIs.

26C-Gelsel silt loam, 2 to 12 percent slopes. This deep, well drained soil is on side slopes and ridgetops of coastal mountains. It formed in residuum and colluvium derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 20 to 500 feet. The average annual precipitation is 55 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is dark reddish brown silt loam 4 inches thick. The upper 26 inches of the subsoil is dark reddish brown silt loam and silty clay loam, and the lower 24 inches is dark reddish brown silty clay.

Weathered siltstone is at a depth of 54 inches.

Included in this unit are small areas of Templeton soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Geisel soil is moderately slow. Available water capacity is about 6.5 to 11.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production, homesite development, wildlife habitat, and livestock grazing.

This unit is suited to the production of Douglas fir and western hemlock. Among the other species that grow on this unit are western redcedar, red alder, Sitka spruce, and Oregon myrtle. The understory vegetation is mainly salmonberry, rose, trailing blackberry, hairy brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 146. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 153 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 109.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity. Highlead or other logging systems that fully or partially suspend logs damage the soil less and generally are less costly than tractor systems.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir and western hemlock seedlings.

If this unit is used for livestock grazing, the main limitation is the susceptibility of the surface layer to compaction. Grazing cattle when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for homesite development, the main limitations are the moderately slow permeability, slope, and depth to bedrock. Septic tank absorption fields may not function properly during rainy periods because of the moderately slow permeability of the subsoil. This limitation can be overcome by increasing the size of the septic tank absorption field. Absorption lines should be installed on the contour.

Careful planning of road location can minimize the amount of cutting and filling required. The risk of erosion is increased if the soil is left exposed during site development. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. Plant cover can be established and maintained through proper fertilizing, seeding, mulching, and shaping of the slopes. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IIIe.

26D-Geisel silt loam, 12 to 30 percent slopes. This deep, well drained soil is on side slopes of coastal mountains. It formed in residuum and colluvium derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 20 to 500 feet. The average annual precipitation is 55 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is dark reddish brown silt loam 4 inches thick. The upper 26 inches of the subsoil is dark reddish brown silt loam and silty clay loam, and the lower 24 inches is dark reddish brown silty clay. Weathered siltstone is at a depth of 54 inches.

Included in this unit are small areas of Templeton soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Geisel soil is moderately slow. Available water capacity is about 6.5 to 11.5 inches.

Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production, wildlife habitat, and livestock grazing. It is also used for homesite development.

This unit is suited to the production of Douglas fir and western hemlock. Among the other species that grow on this unit are western redcedar, red alder, Sitka spruce, and Oregon myrtle. The understory vegetation is mainly salmonberry, rose, trailing blackberry, hairy brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 146. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 153 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 109.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces dam age to the soil and helps to maintain productivity. Highlead or other logging systems that fully or partially suspend logs damage the soil less and generally are less costly than tractor systems.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Road location and maintenance costs are greater in the more steeply sloping areas. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir and western hemlock seedlings.

If this unit is used for livestock grazing, the main limitation is the susceptibility of the surface layer to compaction. Grazing cattle when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion, Rotation grazing increases the production of forage and helps to control weeds and brush.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and slope. Absorption lines should either be placed in the less sloping areas of this unit or in adjoining areas of soils that are not so steep. Septic tank absorption fields may not function properly during rainy periods because of the moderately slow permeability of the subsoil. This limitation can be overcome by increasing the size of the septic tank absorption field. Extensive cutting and filling generally are required to provide nearly level construction sites. Building roads in the less sloping areas of this unit reduces the amount of cutting and filling required. Roads should be provided with surface drainage. Cuts and fills are susceptible to erosion. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IVe.

26E-Gelsel silt loam, 30 to 50 percent slopes. This deep, well drained soil is on side slopes of coastal mountains. It formed in residuum and colluvium derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 20 to 750 feet. The average annual precipitation is 55 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is dark reddish brown silt

loam 4 inches thick. The upper 26 inches of the subsoil is dark reddish brown silt loam and silty clay loam, and the lower 24 inches is dark reddish brown silty clay. Weathered siltstone is at a depth of 54 inches.

Included in this unit are small areas of Templeton soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Geisel soil is moderately slow. Available water capacity is about 6.5 to 11.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat. It is also used for livestock grazing.

This unit is suited to the production of Douglas fir and western hemlock. Among the other species that grow on this unit are western redcedar, Sitka spruce, red alder, and Oregon myrtle. The understory vegetation is mainly salmonberry, rose, trailing blackberry, hairy brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 146. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 153 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 109.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, steepness of slope, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Locating roads on midslopes results in large cuts and fills and thus removes land from production. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir and western hemlock seedlings.

If this unit is used for livestock grazing, the main limitations are the susceptibility of the surface layer to compaction and slope. Grazing cattle when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

Slope limits access by livestock and results in overgrazing of the less sloping areas. If the pasture is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Livestock grazing, therefore, should be managed so that the desired balance of species is maintained in the plant community. Severe overgrazing reduces the plant cover and increases the risk of erosion. Weeds and brush can be controlled by aerial spraying. Rotation grazing increases the production of forage and helps to control weeds and brush.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

This map unit is in capability subclass VIe.

27E-Harrington very gravelly loam, 30 to 50 percent slopes. This moderately deep, well drained soil is on side slopes and ridgetops of mountains. It formed in colluvium derived dominantly from basalt. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 1,600 feet. The average annual precipitation is 60 to 75 inches, the average annual air temperature is 49 to 53 degrees F, and the average frost-free period is 160 to 240 days.

Typically, the surface layer is dark reddish brown very gravelly loam and extremely gravelly loam 13 inches thick. The upper 7 inches of the subsoil is dark reddish brown very gravelly clay loam, and the lower 6 inches is dark reddish brown extremely gravelly clay loam. Hard basalt is at a depth of 26 inches.

Included in this unit are small areas of Blachly, Preacher, and Bohannon soils. Also included are small areas of soils that are similar to this Harrington soil but have bedrock at a depth of less than 20 inches or more than 40 inches. Included areas make up about 25 percent of the total acreage.

Permeability of this Harrington soil is moderately rapid. Available water capacity is about 2.0 to 5.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat. It is also used for livestock grazing.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, grand fir, western redcedar, and Oregon myrtle. The understory vegetation is mainly creambush oceanspray, rose, snowberry, hair brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 140. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 145 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 102.

The main limitations for the management of timber on this unit are the hazards of erosion and windthrow, steepness of slope, seedling mortality, and plant competition. Steepness of slope restricts the use of wheeled and tracked equipment on skid trails. Cable yarding generally is safer and disturbs the soil less.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Road location and maintenance costs are greater in the more steeply sloping areas. Because roots are restricted by bedrock, trees are subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. The high content of rock fragments in the soil increases seedling mortality. To compensate for the higher mortality that can be expected, larger trees or more trees than normal can be planted. Reforestation can be accomplished by planting Douglas fir seedlings.

If this unit is used for livestock grazing, the main limitation is slope. Slope limits access by livestock and results in overgrazing of the less sloping areas. If the pasture is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Livestock grazing, therefore, should be managed so that the desired balance of species is maintained in the plant community. Severe overgrazing reduces the plant cover and increases the risk of erosion. Weeds and brush can be controlled by aerial spraying. Rotation grazing increases the production of forage and helps to control weeds and brush.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter.

This map unit is in capability subclass VIe.

27F-Harrington very gravelly loam, 50 to 70 percent slopes. This moderately deep, well drained soil is on side slopes and ridgetops of mountains. It formed in colluvium derived dominantly from basalt. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 1,600 feet. The average annual precipitation is 60 to 75 inches, the average annual air temperature is 49 to 53 degrees F, and the average frost-free period is 160 to 240 days.

Typically, the surface layer is dark reddish brown very gravelly loam and extremely gravelly loam 13 inches thick. The upper 7 inches of the subsoil is dark reddish brown very gravelly clay loam, and the lower 6 inches is dark reddish brown extremely gravelly clay loam. Hard basalt is at a depth of 26 inches.

Included in this unit are small areas of Blachly, Preacher, and Bohannon soils. Also included are small areas of soils that are similar to this Harrington soil but have bedrock at a depth of less than 20 inches or more than 40 inches. Included areas make up about 25 percent of the total acreage.

Permeability of this Harrington soil is moderately rapid. Available water capacity is about 2.0 to 5.5

inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, grand fir, western redcedar, and Oregon myrtle. The understory vegetation is mainly creambush oceanspray, rose, snowberry, hairy brackenfern, western swordfern, and northern twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 140. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees is 1.5 inches in diameter or more at breast height is 145 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 102.

The main limitations for the management of timber on this unit are the hazard of erosion, steepness of slope, seedling mortality, and plant competition. Highlead or other cable logging systems are most suitable.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Because roots are restricted by bedrock, trees are subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. The high content of rock fragments in the soil increases seedling mortality. To compensate for the higher mortality that can be expected, larger trees or more trees than normal can be planted. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

28-Heceta fine sand. This deep, poorly drained soil is in deflation basins and depressional areas between dunes. It formed in eolian material. Slopes are 0 to 3 percent. The native vegetation is mainly sedges, rushes, water-tolerant grasses, and shrubs. Elevation is 0 to 80 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark grayish brown fine sand 4 inches thick. The substratum to a depth of 60 inches or more is mottled, grayish brown sand.

Included in this unit are small areas of Waldport and Netarts soils and Dune land, Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Heceta soil is rapid. Available water capacity is about 1 to 2 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is ponded, and the hazard of water erosion is slight. The water table fluctuates from 12 inches above the surface to 6 inches below the surface from October to May.

This unit is used for recreation and wildlife habitat.

If this unit is used for recreational development, the main limitation is wetness. Use of paths and trails may be limited to 2 or 3 months in summer.

This map unit is in capability subclass IVw.

29B-Heceta-Waldport fine sands, 0 to 7 percent slopes. This map unit is on deflation plains and small dunes (fig. 10). The native vegetation is mainly rushes, sedges, and shrubs on the Heceta soil and grasses and shrubs on the Waldport soil. Elevation is 0 to 40 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 55 percent Heceta fine sand and 25 percent Waldport fine sand. The Heceta soil is on nearly level deflation plains, and the Waldport soil is on small, stabilized sand dunes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Dune land. Also included are small areas of Yaquina soils. Included areas make up about 20 percent of the total acreage.

The Heceta soil is deep and poorly drained. It formed in eolian material. Slope is 0 to 3 percent. Typically, the surface layer is very dark grayish brown fine sand 4

Figure 10.-Area of Heceta-Waldport fine sands, 0 to 7 percent slopes, on a deflation plain in foreground.

inches thick. The substratum to a depth of 60 inches or more is mottled, grayish brown sand.

Permeability of the Heceta soil is rapid. Available water capacity is about 1 to 2 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is ponded, and the hazard of water erosion is slight. The water table fluctuates from 12 inches above the surface to 6 inches below the surface from October to May.

The Waldport soil is deep and excessively drained. It formed in eolian deposits. Slope is 0 to 7 percent. Typically, the surface layer is very dark grayish brown fine sand 4 inches thick. The substratum to a depth of

60 inches or more is dark yellowish brown fine sand.

Permeability of the Waldport soil is very rapid. Available water capacity is about 3 to 4 inches. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used for recreation and wildlife habitat.

If this unit is used for recreational development, the main limitations are wetness of the Heceta soil and the hazard of soil blowing on the Waldport soil. Use of this unit is restricted mainly to low-intensity types of recreation, such as hiking and horseback riding. The unit can also be used for other kinds of recreational activities that require a minimum of construction and soil disturbance. The Heceta soil is ponded in winter; therefore, use of paths and trails constructed on this soil is limited to summer. Areas used for recreation can be protected from soil blowing by maintaining plant cover.

This map unit is in capability subclass VIIe.

30D-Honeygrove silty clay loam, 3 to 30 percent slopes. This deep, well drained soil is on broad ridgetops, benches, and hillsides. It formed in residuum and colluvium derived dominantly from sandstone, siltstone, and basalt. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 200 to 1,000 feet. The average annual precipitation is 60 to 85 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface is covered with a mat of decomposing organic litter 2 inches thick. The surface layer is dark reddish brown silty clay loam 5 inches thick. The subsoil to a depth of 60 inches or more is dominantly dark red clay. In some areas the surface layer is more than 10 inches thick.

Included in this unit are small areas of Blachly and Dement soils and soils that are similar to this Honeygrove soil but have bedrock at a depth of 30 to 40 inches. Included areas make up about 25 percent of the total acreage.

Permeability of this Honeygrove soil is moderately slow. Available water capacity is about 8.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, Port Orford cedar, and red alder. The understory vegetation is mainly salal, vine maple, evergreen huckleberry, creambush oceanspray, western swordfern, and western brackenfern.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 165. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 176 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 122.

The main limitations for the management of timber on this unit are the hazard of erosion and plant competition. Highlead or other logging systems that fully or partially suspend logs damage the soil less and generally are less costly than tractor systems.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills erode slightly unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIe.

30E-Honeygrove silty clay loam, 30 to 50 percent slopes. This deep, well drained soil is on hillsides. It formed in residuum and colluvium derived dominantly from sandstone, siltstone, and basalt. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 200 to 1,000 feet. The average annual precipitation is 60 to 85 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface is covered with a mat of decomposing organic litter 2 inches thick. The surface layer is dark reddish brown silty clay loam 5 inches thick. The subsoil to a depth of 60 inches or more is dominantly dark red clay.

Included in this unit are small areas of Blachly, Rinearson, and Dement soils. Also included are soils

that are similar to this Honeygrove soil but have bedrock at a depth of 30 to 40 inches. Included areas make up about 25 percent of the total acreage.

Permeability of this Honeygrove soil is moderately slow. Available water capacity is about 8.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, Port Orford cedar, and red alder. The understory vegetation is mainly salal, vine maple, evergreen huckleberry, creambush oceanspray, western swordfern, and western brackenfern.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 165. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 176 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 122.

The main limitations for the management of timber on this unit are the hazard of erosion, steepness of slope, and plant competition. Steepness of slope restricts the use of wheeled and tracked equipment on skid trails. Cable yarding generally is safer and disturbs the soil less.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Unsurfaced roads and skid trails are slippery when moist or wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass Vle.

31B-Joeney very fine sandy loam, 0 to 7 percent slopes. This deep, poorly drained soil is on marine terraces. It formed in marine deposits. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 150 to 550 feet. The average annual precipitation is 60 to 65 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of leaves and needles 1 inch thick. The surface layer is light gray and gray very fine sandy loam 10 inches thick. The upper 2 inches of the subsoil is dark reddish brown very fine sandy loam, and the lower 12 inches is mottled, reddish yellow and brownish yellow loam and silt loam. The substratum to a depth of 41 inches or more is mottled, brownish yellow and light gray silty clay loam.

Included in this unit are small areas of Templeton soils. Also included are small areas of soils that are similar to this Joeney soil but have a sandy substratum. Included areas make up about 25 percent of the total acreage.

Permeability of this Joeney soil is moderately slow. Available water capacity is about 2 to 4 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is very slow, and the hazard of water erosion is slight. The water table fluctuates between the surface and a depth of 18 inches below the surface from November to March.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Sitka spruce. Among the other species that grow on this unit are western redcedar and western hemlock. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, salal, sedges, and rushes.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 120. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 156 cubic feet per acre per year.

The main limitations for the management of timber on this unit are the hazard of windthrow, seedling mortality, and plant competition. The seasonal high water table limits the use of equipment to dry periods.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

Windthrow is a hazard when the soil is wet and winds are strong. Tree seedlings have only a moderate rate of survival because of the seasonal high water table. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, Sitka spruce, and western redcedar seedlings.

This map unit is in capability subclass IVw.

32B-Joeney-Templeton complex, 0 to 7 percent slopes. This map unit is in undulating areas of dissected marine terraces. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 150 to 550 feet. The average annual precipitation is 60 to 65 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 40 percent Joeney very fine sandy loam and 30 percent Templeton silt loam. The Joeney soil is in concave, nearly level depressional areas, and the Templeton soil is in convex, gently sloping areas on marine terrace escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that are similar to this Joeney soil but have a thin cemented pan. In the vicinity of Beaver Hill are small areas of soils that are similar to the Templeton soil but that formed in marine sediment, have mottles in the subsoil, and have a sandy substratum. These soils are less productive than the Templeton soils. Included areas make up about 30 percent of the total acreage.

The Joeney soil is deep and poorly drained. It formed in marine deposits. Typically, the surface is covered with a mat of leaves and needles 1 inch thick. The surface layer is light gray and gray very fine sandy loam 10 inches thick. The upper 2 inches of the subsoil is dark reddish brown very fine sandy loam, and the lower 12 inches is mottled, reddish yellow and brownish yellow loam and silt loam. The substratum to a depth of 41 inches or more is mottled, brownish yellow and light gray silty clay loam.

Permeability of the Joeney soil is moderately slow. Available water capacity is about 2 to 4 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it may be limited by the water table for non-water-tolerant plants. Runoff is very slow, and the hazard of water erosion is slight. The water table fluctuates between the surface and a depth of 18 inches below the surface from November to March.

The Templeton soil is deep and well drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered, fractured siltstone is at a depth of 42 inches. In some areas the dark-colored surface layer is less than 10 inches thick.

Permeability of the Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Sitka spruce. Among the other species that grow on the unit are western redcedar, western hemlock, red alder, and Douglas fir. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, salal, sedges, and rushes.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 120 on the Joeney soil. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 156 cubic feet per acre per year.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 169 on the Templeton soil. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 255 cubic feet per acre per year.

High winds from the Pacific Ocean may seriously limit the growth of trees on this unit unless they are in a protected area.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer of the Templeton soil to compaction, the hazard of windthrow and seedling mortality on the Joeney soil, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of the surface layer occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Using low-pressure ground equipment damages the soil less and helps to maintain productivity. The seasonal high water table in the Joeney soil limits the use of equipment to dry periods.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Unsurfaced roads and skid trails are soft and slippery

Figure 11.-Hay in an area of Kirkendall silt loam.

when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

Because roots are restricted by the seasonal high water table in the Joeney soil, trees commonly are subject to windthrow. Tree seedlings have only a moderate rate of survival because of the seasonal high water table. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, western hemlock, or Douglas fir seedlings.

This map unit is in capability subclass IVw.

33-Kirkendall silt loam. This deep, well drained soil is on flood plains. It formed in mixed alluvium. Slopes are 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 20 to 750 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is dark brown silt loam 7 inches thick. The subsoil is dark brown and brown silt loam 35 inches thick. The substratum to a depth of 60 inches or more is mottled, brown silt loam.

Included in this unit are small areas of poorly drained and very poorly drained soils. Also included are small areas of soils that are similar to this Kirkendall soil but have a sandy loam subsoil and soils, in Eden Valley, that are similar to this Kirkendall soil but are at an elevation of 2,300 feet. Included areas make up about 20 percent of the total acreage.

Permeability of this Kirkendall soil is moderately slow. Available water capacity is about 7.5 to 12.5 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil

is subject to frequent periods of flooding in winter during prolonged rainstorms. The water table is at a depth of 30 to 60 inches from November to April.

This unit is used for hay and pasture (fig. 11).

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, tall Oregongrape, western swordfern, and Oregon oxalis.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, droughtiness in summer, the hazard of flooding, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Frequent, brief periods of flooding restrict the use of this unit in winter. Protection from flooding can be provided only by the use of extensive dikes.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. Excess forage in spring can be used as silage. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rtes, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and td protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IIIw.

34-Langlois silty clay loam. This deep, very poorly drained soil is in depressional areas of flood plains and on old tidal flats. It formed in recent alluvium. Slope is 0 to 1 percent. The native vegetation is mainly hardwoods, shrubs, forbs, and conifers. Elevation is 0 to 20 feet. The average annual precipitation is 50 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is mottled, dark grayish brown silty clay loam 10 inches thick. The upper 20 inches of the substratum is dark grayish brown and dark gray silty clay, and the lower part to a depth of 60 inches or more is dark gray clay. In some areas the surface layer is peaty.

Included in this unit are small areas of Chetco and Nestucca soils. Also included are small areas of Coquille soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Langlois soil is slow. Available water capacity is about 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table fluctuates between the surface and a depth of 36 inches below the surface from. November to March. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding in winter.

This unit is used mainly for hay and pasture and for wildlife habitat.

The vegetation in areas not cultivated is mainly Pacific willow, red alder, black cottonwood, and Sitka spruce. The understory vegetation is mainly slough sedge, soft rush, brown-headed rush, and skunkcabbage.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, droughtiness in summer, the hazard of flooding, wetness, and, for the curing of hay, high humidity. Grazing when the soil is wet results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Frequent, long periods of flooding restrict the use of this unit in winter. Protection from flooding is impractical.

Drainage is needed to lower the water table. Water on or near the surface can be removed by use of open ditches and tide gates. Wetness and flooding restrict grazing in winter. The choice of plants is limited to those that withstand periodic inundation.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses. Grasses respond to nitrogen. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IVw.

35-Langlois peaty silty clay loam. This deep, very poorly drained soil is in depressional areas of flood plains and on old tidal flats. It formed in recent alluvium. Slope is 0 to 1 percent. The native vegetation is mainly hardwoods, shrubs, forbs, and conifers. Elevation is 0 to 20 feet. The average annual precipitation is 50 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 220 days.

Typically, the surface is covered with a mat of very dark grayish brown peat about 5 inches thick. The surface layer is mottled, dark grayish brown silty clay loam 10 inches thick. The upper 20 inches of the substratum is dark grayish brown and dark gray silty clay, and the lower part to a depth of 60 inches or more is dark gray clay.

Included in this unit are small areas of Coquille, Chetco, and Nestucca soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Langlois soil is slow. Available water capacity is about 3.5 to 5.0 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table fluctuates between the surface and a depth of 36 inches below the surface from November to March. Runoff is ponded, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding in winter.

This unit is used mainly for pasture in areas where drainage is provided and for wildlife habitat.

The vegetation in areas not cultivated is mainly Pacific willow, red alder, black cottonwood, and Sitka spruce. The understory vegetation is mainly slough sedge, soft rush, brown-headed rush, and skunkcabbage.

If this unit is used for pasture, the main limitations are droughtiness in summer, the hazard of flooding, and wetness. Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Frequent, long periods of flooding restrict the use of this unit in winter. Protection from flooding is impractical.

Drainage is needed to lower the water table. Water on or near the surface can be removed by use of open ditches and tide gates. Wetness and flooding restrict grazing in winter. The choice of plants is limited to those that withstand periodic inundation.

Fertilizer is needed to ensure optimum growth of grasses. Grasses respond to nitrogen. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IVw.

36C-McCurdy silt loam, 3 to 15 percent slopes. This deep, moderately well drained soil is on high terraces. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 150 to 420 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is dark brown silt loam 7 inches thick. The upper 13 inches of the subsoil is dark brown and dark yellowish brown silty clay loam, and the lower 28 inches is mottled, yellowish brown silty clay loam. The substratum to a depth of 60 inches or more is mottled, brownish yellow silty clay loam. In some areas the dark-colored surface layer is 10 inches thick or more.

Included in this unit are small areas of soils that are similar to this McCurdy soil but are poorly drained. Also included are small areas of Wintley soils. Included

areas make up about 20 percent of the total acreage.

Permeability of this McCurdy loam is moderately slow. Available water capacity is about 7.5 to 12.0 inches. Effective rooting depth is 40 to 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is medium, and the hazard of water erosion is moderate. The water table is at a depth of 24 to 36 inches from November to April.

This unit is used mainly for pasture. It also has potential for use as homesites.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, trailing blackberry, western swordfern, and Oregon oxalis.

If this unit is used for pasture, the main limitations are the susceptibility of the surface layer to compaction and droughtiness in summer. Grazing when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness of areas on south-facing slopes limits the choice of forage plants and limits production. Irrigation generally is impractical because of an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and wetness. Septic tank absorption fields may not function properly during rainy periods. Absorption lines should be installed on the contour.

Careful planning of road location can minimize the amount of cutting and filling required. The risk of erosion is increased if the soil is left exposed during site development. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. Plant cover can be established and maintained through proper fertilizing, seeding, mulching, and shaping of the slopes. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IIIe.

36D-McCurdy silt loam, 15 to 30 percent slopes. This deep, moderately well drained soil is on high terraces. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 150 to 420 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is dark brown silt loam 7 inches thick. The upper 13 inches of the subsoil is dark brown and dark yellowish brown silty clay loam, and the lower 28 inches is mottled, yellowish brown silty clay loam. The substratum to a depth of 60 inches or more is mottled, brownish yellow silty clay loam. In some areas the dark-colored surface layer is 10 inches thick or more.

Included in this unit are small areas of soils that are similar to this McCurdy soil but have a gravelly subsoil. Also included are small areas of deep, moderately well drained soils that have a gravelly loam subsoil, soils on steep terrace escarpments, and Wintley soils. Included areas make up about 25 percent of the total acreage.

Permeability of this McCurdy loam is moderately slow. Available water capacity is about 7.5 to 12.0 inches. Effective rooting depth is 40 to 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is medium, and the hazard of water erosion is moderate. The water table is at a depth of 24 to 36 inches from November to April.

This unit is used for pasture.

The vegetation in areas not cultivated is mainly Douglas fir, Port Orford cedar, western hemlock, grand fir, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, trailing blackberry, western swordfern, and Oregon oxalis.

If this unit is used for pasture, the main limitations are the susceptibility of the surface layer to compaction and droughtiness in summer. Grazing when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity

of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness on south-facing slopes limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

This map unit is in capability subclass IVe.

37C-Meda loam, 3 to 15 percent slopes. This deep, well drained soil is on alluvial fans. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 380 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is dark brown loam 10 inches thick. The subsoil is dark yellowish brown gravelly clay loam 22 inches thick. The substratum to a depth of 60 inches or more is yellowish brown very gravelly loam.

Included in this unit are small areas of soils that are similar to this Meda soil but have a very gravelly subsoil. Also included are small areas of Gauldy Variant, Pyburn, and Chismore soils. Included areas make up about 15 percent of the total acreage.

Permeability of this Meda soil is moderate to a depth of 32 inches and rapid below this depth. Available water capacity is about 5.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for hay and pasture.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, Oregon myrtle, and red alder. The understory vegetation is mainly vine maple, salal, trailing blackberry, red huckleberry, and western swordfern.

If this unit is used for hay and pasture, the main limitations are droughtiness in summer and, for the curing of hay, high humidity. Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. Excess forage can be used as silage in spring. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates and pasture rotation help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IIIe.

38F-Milbury-Bohannon-Umpcoos association, 50 to 80 percent slopes This map unit is on side slopes of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 2,500 feet. The average annual precipitation is 80 to 100 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 40 percent Milbury very gravelly sandy loam, 25 percent Bohannon gravelly loam, and 15 percent Umpcoos very gravelly sandy loam. The Milbury soil is on convex midslopes and upper side slopes, the Bohannon soil is on concave midslopes and lower side slopes, and the Umpcoos soil is on convex side slopes adjacent to areas of Rock outcrop.

Included in this unit are small areas of Rock outcrop and soils that are similar to the Bohannon soil but are very gravelly. Also included are small areas of Preacher soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Milbury soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of undecomposed twigs, leaves, and fir needles 1 inch thick. The surface layer is black very gravelly sandy loam 10 inches thick. The subsoil is very dark grayish brown and dark brown very cobbly loam 26 inches thick. Hard, consolidated sandstone is at a depth of 36 inches.

Permeability of the Milbury soil is moderately rapid. Available water capacity is about 2.0 to 5.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is

rapid, and the hazard of water erosion is high.

The Bohannon soil is moderately deep and well drained. It formed in colluvium derived dominantly from arkosic sandstone and siltstone. Typically, the surface layer is very dark brown and dark brown gravelly loam 11 inches thick. The subsoil is dark yellowish brown gravelly loam 20 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Bohannon soil is moderately rapid. Available water capacity is about 2.5 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Umpcoos soil is shallow and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of organic litter 2 inches thick. The surface layer is dark grayish brown very gravelly sandy loam 3 inches thick. The subsoil is brown very gravelly sandy loam 13 inches thick. Hard sandstone is at a depth of 16 inches.

Permeability of the Umpcoos soil is moderately rapid. Available water capacity is about 0.5 inch to 1.5 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, grand fir, and red alder. The understory vegetation is mainly creambush oceanspray, salal, salmonberry, cascade Oregongrape, western swordfern, and vine maple.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 160 on the Milbury soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 170 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 115.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Bohannon soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 117.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 79 on the Umpcoos soil. At the culmination of the mean annual increment (CMAI), the production of 70-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 58 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 61.

The main limitations for the management of timber on this unit are steepness of slope, the hazard of erosion, the hazard of windthrow, seedling mortality, and plant competition. Helicopter, balloon, or total-suspension cable systems are the most suitable methods for harvesting timber.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rifling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Because roots are restricted by bedrock, trees commonly are subject to windthrow. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. The high content of rock fragments in the soil increases seedling mortality. To compensate for the higher mortality that can be expected, larger trees or more trees than normal can be planted. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

39F-Millicoma-Templeton complex, 50 to 75 percent slopes. This map unit is on side slopes and ridgetops of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 55 percent Millicoma gravelly loam and 25 percent Templeton silt loam. The Millicoma soil is on narrow ridgetops and steeper side slopes, and the Templeton soil is on broad ridgetops and less sloping side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Salander soils. Also included are small areas of deep soils that have a clay loam subsoil and moderately deep soils that average less than 35 percent rock fragments. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Millicoma soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of undecomposed needles, leaves, and twigs 3 inches thick. The surface layer is very dark brown and very dark grayish brown gravelly loam 18 inches thick. The subsoil is dark brown very gravelly loam 17 inches thick. Partially weathered sandstone is at a depth of 35 inches.

Permeability of the Millicoma soil is moderately rapid. Available water capacity is about 3 to 6 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Templeton soil is deep and well drained. It formed in colluvium derived dominantly from sedimentary rock. Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered, fractured siltstone is at a depth of 42 inches.

Permeability of the Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Sitka spruce and Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, and red alder. The understory vegetation is mainly salal, salmonberry, cascade Oregongrape, western swordfern, and vine maple.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Millicoma soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 184 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 120.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180 on the Templeton soil. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 270 cubic feet per acre per year.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer of the Templeton soil to compaction, steepness of slope, the hazards of erosion and windthrow, and plant competition. Highlead or other cable logging systems are most suitable.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Sitka spruce, a shallow rooted tree, commonly is subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, Douglas fir, and western hemlock seedlings.

This map unit is in capability subclass VIIe.

40-Nehalem silt loam. This deep, well drained soil is on flood plains. It formed in alluvium. Slopes are 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 10 to 40 feet. The average annual precipitation is 50 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is dark brown silt loam 12 inches thick. The subsoil is brown silt loam 17 inches thick. The substratum to a depth of 60 inches or more is brown silty clay loam.

Included in this unit are small areas of Nestucca, Coquille, and Langlois soils. Also included are small areas of soils that are similar to this Nehalem soil but have a sandy loam subsoil. Included areas make up about 20 percent of the total acreage.

Permeability of this Nehalem soil is moderately slow.

Available water capacity is about 7.5 to 12.5 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding in winter during prolonged rainstorms. The water table is at a depth of 36 to 60 inches from December to April.

This unit is used for hay and pasture.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, Sitka spruce, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, tall Oregongrape, western swordfern, and Oregon oxalis.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, droughtiness in summer, the hazard of flooding, and, for the curing of hay, high humidity. Grazing when the soil is wet results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Frequent, brief periods of flooding restrict the use of this unit in winter. Protection from flooding is impractical (fig. 12).

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IIIw.

41-Nestucca silt loam. This deep, somewhat poorly drained soil is on flood plains. It formed in alluvium. Slopes are 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 10 to 40 feet. The average annual precipitation is 50 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is mottled, dark brown and very dark grayish brown silt loam 14 inches thick. The subsoil is mottled, dark grayish brown silty clay loam 26 inches thick. The substratum to a depth of 60 inches or more is mottled, olive brown silty clay.

Included in this unit are small areas of soils that are similar to this Nestucca soil but have a dark-colored surface layer less than 10 inches thick and Langlois, Coquille, and Chetco soils. Also included are small areas of Nehalem soils. Included areas make up about 20 percent of the total acreage.

Permeability of this Nestucca soil is moderately slow to a depth of 40 inches and slow below this depth. Available water capacity is about 4.0 to 8.5 inches. Effective rooting depth is 60 inches or more but is limited by the water table. The water table is 12 to 24 inches below the surface from December to April. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding in winter.

This unit is used mainly for hay and pasture.

The vegetation in areas not cultivated is mainly western hemlock, western redcedar, Douglas fir, red alder, and black cottonwood. The understory vegetation is mainly evergreen huckleberry, western swordfern, hairy brackenfern, soft rush, and skunkcabbage.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, wetness, flooding, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Drainage and irrigation are needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

Frequent, brief periods of flooding restrict the use of this unit in winter. Protection from flooding is impractical.

Supplemental irrigation is needed in summer because of low rainfall. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water needs to be applied at a slow rate over a long period to

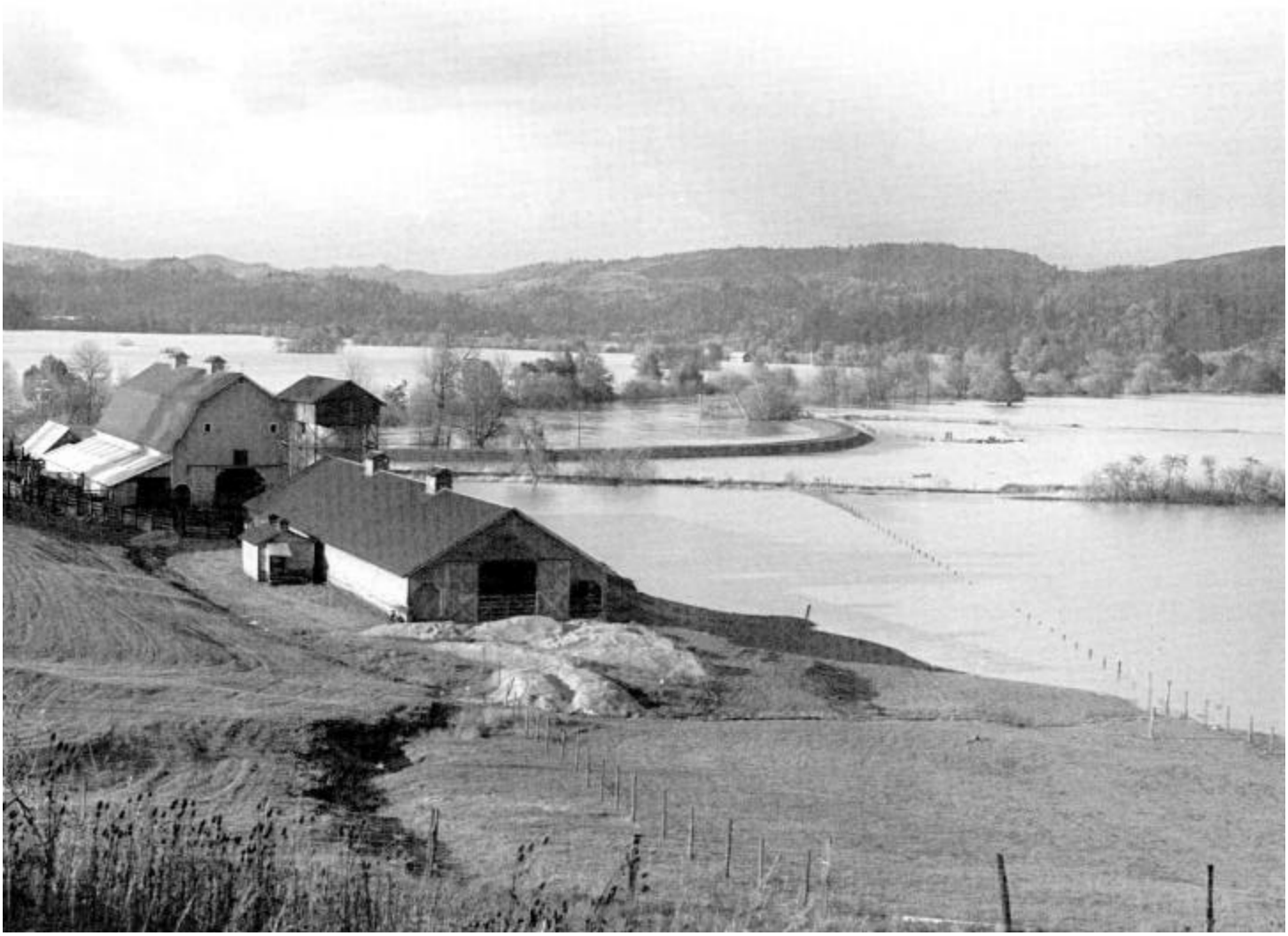


Figure 12.-Frequent periods of flooding restrict use of pastures on Nehalem silt loam in winter.

ensure that the root zone is properly wetted. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds and brush. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IIIw.

42-Nestucca-Willanch complex. This map unit is in depressional areas of flood plains. Slope is 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 10 to 40 feet. The average annual precipitation is 50 to 80

inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 45 percent Nestucca silt loam and 40 percent Willanch fine sandy loam. The Willanch soil generally is along old stream channels, and the Nestucca soil is in areas further away from the old channels. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of well drained sandy soils and Nehalem and Coquille soils. Included areas make up about 15 percent of the total acreage.

The Nestucca soil is deep and somewhat poorly drained. It formed in alluvium. Typically, the surface layer is mottled, dark brown and very dark grayish brown silt loam 14 inches thick. The subsoil is mottled, dark grayish brown silty clay loam 26 inches thick. The substratum to a depth of 60 inches or more is mottled, olive brown silty clay.

Permeability of the Nestucca soil is moderately slow to a depth of 40 inches and slow below this depth. Available water capacity is about 4.0 to 8.5 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table is at a depth of 12 to 24 inches from December to April. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding in winter.

The Willanch soil is deep and poorly drained. It formed in alluvium. Typically, the surface layer is mottled, very dark grayish brown and dark brown fine sandy loam 13 inches thick. The upper 22 inches of the substratum is mottled, dark grayish brown sandy loam, and the lower part to a depth of 60 inches or more is mottled, dark grayish brown loamy fine sand and loamy sand.

Permeability of the Willanch soil is moderately rapid. Available water capacity is about 2.5 to 4.5 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is very slow, and the hazard of water erosion is slight. The water table fluctuates between the surface and a depth of 24 inches below the surface from November to March. This soil is subject to frequent periods of flooding in winter.

This unit is used mainly for hay and pasture.

The vegetation in areas not cultivated is mainly Sitka spruce, western hemlock, red alder, and black cottonwood. The understory vegetation is mainly Pacific dogwood, Pacific willow, slough sedge, soft rush, and skunkcabbage.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer of the Nestucca soil to compaction, wetness, the hazard of flooding, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Drainage and irrigation are needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

Frequent periods of flooding restrict the use of this unit in winter. Protection from flooding is impractical.

Supplemental irrigation is needed in summer because of low rainfall. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water needs to be applied at a slow rate over a long period to ensure that the root zone is properly wetted. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds and brush. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IIIw.

43D-Netarts loamy fine sand, 2 to 30 percent slopes. This deep, well drained soil is on old stabilized sand dunes. It formed in eolian sand derived dominantly from beaches and deflation basins. The native vegetation is mainly conifers, shrubs, grasses, and forbs. Elevation is 50 to 200 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of leaves

and partially decomposed roots 1 inch thick. The surface layer is light brownish gray loamy fine sand 4 inches thick. The subsoil is dark brown and yellowish brown fine sand 26 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown fine sand.

Included in this unit are small areas of Waldport, Heceta, and Bullards soils and Dune land. Included areas make up about 25 percent of the total acreage.

Permeability of this Netarts soil is moderately rapid. Available water capacity is about 3 to 6 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for timber production and wildlife habitat. It is also used for recreation and homesite development.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are shore pine, Sitka spruce, and western hemlock. The understory vegetation is mainly evergreen huckleberry, salal. manzanita, and Pacific madrone.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 124. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 122 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 100.

The main limitations for the management of timber on this unit are the hazard of erosion, the hazard of windthrow, seedling mortality, and plant competition. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area. The risk of soil blowing increases if the timber is harvested or the understory is removed. Conventional methods can be used for harvesting timber, but use of skid trails can accelerate erosion.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Tree seedlings have only a moderate rate of survival because of droughtiness late in summer. Reforestation can be accomplished by planting Sitka spruce or shore pine seedlings.

If this unit is used for recreational development, the main limitations are the hazard of soil blowing, the instability of the soil, and slope. These limitations restrict the use of the soil in this unit mainly to low-intensity types of recreation, such as hiking and horseback riding. The lower lying areas can be used for other kinds of recreational facilities that require a minimum of construction and soil disturbance. Areas used for recreation can be protected from soil blowing by maintaining plant cover. Plant cover can be maintained by limiting traffic.

Roads, paths, and trails are difficult to maintain on this unit because of the loose sand. Cutbanks are not stable and are subject to slumping. Access roads should be designed to provide low cut-slope grades. The steeper areas of the unit generally are not suitable for most kinds of recreational facilities.

If this unit is used for homesite development, the main limitations are the hazard of ground water pollution and slope. The moderately rapid permeability of the substratum may permit untreated effluent to enter the ground water. Special designs may be needed to prevent contamination of water supplies. If density of housing is moderate to high, community sewage treatment systems may be needed. Some areas of this unit are too steep for installation of absorption fields.

In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability subclass Vle.

44D-Preacher-Blachly association, 12 to 30 percent slopes. This map unit is on broad ridgetops and benches of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 250 to 3,000 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 50 percent Preacher loam and 35 percent Blachly silty clay loam.

Included in this unit are small areas of Bohannon soils. Also included are small areas of Digger soils in the southern part of the survey area. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of

60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Blachly soil is deep and well drained. It formed in colluvium derived dominantly from sedimentary rock or basalt. Typically, the surface layer is very dusky red and dark reddish brown silty clay loam 7 inches thick. The upper 45 inches of the subsoil is dark red and yellowish red silty clay, and the lower 8 inches or more is yellowish red silty clay loam.

Permeability of the Blachly soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, red alder, and bigleaf maple. The understory vegetation is mainly vine maple, salal, red huckleberry, western swordfern, Oregon oxalis, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 160 on the Blachly soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 170 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery and soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass Vle.

44E-Preacher-Blachly association, 30 to 60 percent slopes. This map unit is on broad ridgetops and benches of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 250 to 3,000 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 60 percent Preacher loam and 25 percent Blachly silty clay loam.

Included in this unit are small areas of Bohannon soils. Also included are small areas of Digger soils in the southern part of the survey area. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Blachly soil is deep and well drained. It formed in colluvium derived dominantly from sedimentary rock or basalt. Typically, the surface layer is very dusky red and dark reddish brown silty clay loam 7 inches thick. The upper 45 inches of the subsoil is dark red and yellowish red silty clay, and the lower 8 inches or more is yellowish red silty clay loam.

Permeability of the Blachly soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Runoff is

rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, red alder, and bigleaf maple. The understory vegetation is mainly vine maple, salal, red huckleberry, western swordfern, Oregon oxalis, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 160 on the Blachly soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 170 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery and soft when wet or moist, and they may be impassable during rainy periods. Rock for road construction is not readily available in this unit. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Road location and maintenance costs are greater in the more steeply sloping areas.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIe.

45D-Preacher-Blachly-Digger association, 12 to 30 percent slopes. This map unit is on broad ridgetops, benches, and side slopes of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, and forbs. Elevation is 250 to 3,000 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 40 percent Preacher loam, 25 percent Blachly silty clay loam, and 20 percent Digger gravelly loam. The Preacher and Blachly soils are on broad ridgetops and benches, and the Digger soil is on side slopes.

Included in this unit are small areas of Bohannon soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Blachly soil is deep and well drained. It formed in colluvium derived dominantly from sedimentary rock or basalt. Typically, the surface layer is very dusky red and dark reddish brown silty clay loam 7 inches thick. The upper 45 inches of the subsoil is dark red and yellowish red silty clay, and the lower 8 inches or more is yellowish red silty clay loam.

Permeability of the Blachly soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Digger soil is moderately deep and well drained. It formed in colluvium derived dominantly from sedimentary rock. Typically, the surface is covered with a mat of undecomposed leaves, moss, and twigs 1 inch

thick. The surface layer is dark brown gravelly loam 6 inches thick. The upper 3 inches of the subsoil is dark yellowish brown gravelly loam, and the lower 18 inches is brown very gravelly loam and very cobbly loam. The substratum is brown extremely cobbly loam 4 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Digger soil is moderately rapid. Available water capacity is about 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, red alder, and bigleaf maple. The understory vegetation is mainly vine maple, salal, red huckleberry, western swordfern, Oregon oxalis, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 160 on the Blachly soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 170 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Digger soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 122.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of windthrow on the Digger soil, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery and soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Because roots are restricted by bedrock, trees on the Blachly soil commonly are subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIe.

45E-Preacher-Blachly-Digger association, 30 to 60 percent slopes. This map unit is on broad ridgetops, benches, and side slopes of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, and forbs. Elevation is 250 to 3,000 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 35 percent Preacher loam, 25 percent Blachly silty clay loam, and 25 percent Digger gravelly loam. The Preacher and Blachly soils are on broad ridgetops and benches, and the Digger soil is on side slopes.

Included in this unit are small areas of Bohannon soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Blachly soil is deep and well drained. It formed in colluvium derived dominantly from sedimentary rock or basalt. Typically, the surface layer is very dusky red and dark reddish brown silty clay loam 7 inches thick. The upper 45 inches of the subsoil is dark red and

yellowish red silty clay, and the lower 8 inches or more is yellowish red silty clay loam.

Permeability of the Blachly soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Digger soil is moderately deep and well drained. It formed in colluvium derived dominantly from sedimentary rock. Typically, the surface is covered with a mat of undecomposed leaves, moss, and twigs 1 inch thick. The surface layer is dark brown gravelly loam 6 inches thick. The upper 3 inches of the subsoil is dark yellowish brown gravelly loam, and the lower 18 inches is brown very gravelly loam and very cobbly loam. The substratum is brown extremely cobbly loam 4 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Digger soil is moderately rapid. Available water capacity is about 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, red alder, and bigleaf maple. The understory vegetation is mainly vine maple, salal, red huckleberry, western swordfern, Oregon oxalis, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 160 on the Blachly soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 170 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Digger soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 122.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, the hazard of windthrow on the Digger soil, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery and soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Road location and maintenance costs are greater in the more steeply sloping areas. Because roots are restricted by bedrock, trees on the Blachly soil commonly are subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIe.

46D-Preacher-Bohannon loams, 3 to 30 percent slopes. This map unit is on broad ridgetops, benches, and side slopes of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 250 to 3,600 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 50 percent Preacher loam and 30 percent Bohannon loam. The Preacher soil is in concave areas on benches, side slopes, and broad ridgetops, and the Bohannon soil is on convex side slopes.

Included in this unit are small areas of Milbury, Digger, and Blachly soils. Included areas make up about 20 percent of the total acreage. The

percentage varies from one area to another.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Bohannon soil is moderately deep and well drained. It formed in colluvium derived dominantly from arkosic sandstone and siltstone. Typically, the surface layer is very dark brown and dark brown loam and gravelly loam 11 inches thick. The subsoil is dark yellowish brown gravelly loam 20 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Bohannon soil is moderately rapid. Available water capacity is about 2.5 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, red alder, bigleaf maple, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, red huckleberry, salal, western swordfern, Pacific trillium, and vine maple.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Bohannon soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 115.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIe.

46E-Preacher-Bohannon loams, 30 to 60 percent slopes. This map unit is on ridgetops and side slopes of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 250 to 3,400 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 40 percent Preacher loam and 30 percent Bohannon loam. The Preacher soil is on concave side slopes, and the Bohannon soil is on ridgetops and convex side slopes.

Included in this unit are small areas of Milbury, Digger, and Blachly soils. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more.

Runoff is rapid, and the hazard of water erosion is high.

The Bohannon soil is moderately deep and well drained. It formed in colluvium derived dominantly from arkosic sandstone and siltstone. Typically, the surface layer is very dark brown and dark brown loam and gravelly loam 11 inches thick. The subsoil is dark yellowish brown gravelly loam 20 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Bohannon soil is moderately rapid. Available water capacity is about 2.5 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, red alder, bigleaf maple, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, red huckleberry, salal, western swordfern, Pacific trillium, and vine maple.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Bohannon soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 115.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass Vle.

46F-Preacher-Bohannon loams, 60 to 90 percent slopes. This map unit is on narrow ridgetops and on side slopes of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 500 to 3,800 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 45 percent Preacher loam and 40 percent Bohannon loam. The Preacher soil is on concave side slopes, and the Bohannon soil is on narrow ridgetops and convex side slopes.

Included in this unit are small areas of Milbury and Digger soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Bohannon soil is moderately deep and well drained. It formed in colluvium derived dominantly from arkosic sandstone and siltstone. Typically, the surface layer is very dark brown and dark brown loam and gravelly loam 11 inches thick. The subsoil is dark

yellowish brown gravelly loam 20 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Bohannon soil is moderately rapid. Available water capacity is about 2.5 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, bigleaf maple, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, red huckleberry, salal, western swordfern, trillium, and vine maple.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Bohannon soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 115.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, and plant competition. Highlead or other cable logging systems are most suitable.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

47B-Pyburn silty clay, 0 to 8 percent slopes. This deep, poorly drained soil is on high terraces. It formed in mixed alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 100 to 380 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is black silty clay 7 inches thick. The upper 21 inches of the subsoil is mottled, dark gray and black clay, and the lower 10 inches is mottled, dark brown silty clay. The substratum to a depth of 60 inches or more is mottled, grayish brown clay loam.

Included in this unit are small areas of Pyburn soils that have slopes of 8 to 15 percent. Also included are small areas of Chismore soils and soils that are similar to this Pyburn soil but are somewhat poorly drained. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Pyburn soil is very slow. Available water capacity is about 4 to 7 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table is at a depth of 15 to 36 inches from October to May. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for pasture.

The vegetation in areas not cultivated is mainly Douglas fir, western redcedar, red alder, and willows. The understory vegetation is mainly evergreen huckleberry, salmonberry, soft rush, and slough sedge.

If this unit is used for pasture, the main limitations are the susceptibility of the surface layer to compaction, wetness, and droughtiness in summer. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Drainage and irrigation are needed for maximum

production of crops. Water on or near the surface can be removed by use of open ditches. Wetness may restrict grazing in winter.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IVw.

48-Quosatana silt loam. This deep, poorly drained soil is on flood plains. It formed in alluvium. Slope is 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 30 to 750 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is mottled, very dark grayish brown silt loam 13 inches thick. The subsoil is dark grayish brown and dark gray silt loam and silty clay loam 35 inches thick. The substratum to a depth of 60 inches or more is mottled, gray silty clay loam. In some areas the dark-colored surface layer is less than 10 inches thick.

Included in this unit are small areas of very poorly drained soils. Also included are small areas of well drained soils and soils, in Eden Valley, that are similar to this Quosatana soil but are at an elevation of 2,300 feet. Included areas make up about 20 percent of the total acreage.

Permeability of this Quosatana soil is slow. Available water capacity is about 4.0 to 8.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table fluctuates between the surface and a depth of 18 inches below the surface from November to April. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to frequent periods of flooding in winter.

This unit is used mainly for hay and pasture.

The vegetation in areas not cultivated is mainly western hemlock, western redcedar, Douglas fir, red alder, and black cottonwood. The understory vegetation is mainly evergreen huckleberry, western swordfern, hairy brackenfern, soft rush, and skunkcabbage.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, wetness, the hazard of flooding, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Drainage and irrigation are needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

Frequent, brief periods of flooding restrict the use of this unit in winter. Protection from flooding can be provided only by the use of extensive dikes.

Supplemental irrigation is needed in summer because of the low rainfall. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water needs to be applied at a slow rate over a long period to ensure that the root zone is properly wetted. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds and brush. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IIIw.

49E-Remote loam, 30 to 50 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium derived dominantly from sandstone. The native vegetation is mainly conifers, hardwoods,

shrubs, and forbs. Elevation is 50 to 1,800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is brown to yellowish brown gravelly and very gravelly clay loam 40 inches thick. The substratum to a depth of 60 inches or more is yellowish brown extremely gravelly loam.

Included in this unit are small areas of Digger and Preacher soils. Also included are small areas of Etelka and Rinearson soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Remote soil is moderate. Available water capacity is about 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat. It is also used for livestock grazing.

This unit is suited to the production of Douglas fir. Among the other species that grow on the soil in the unit is grand fir. The understory vegetation is mainly vine maple, red huckleberry, evergreen huckleberry, Oregongrape, western swordfern, and broadleaf starflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 145. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 152 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, the hazard of windthrow, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce adequate natural or artificial reforestation. Intensive site preparation and maintenance generally are not needed. Reforestation can be accomplished by planting Douglas fir seedlings.

If this unit is used for livestock grazing, the main limitations are slope and droughtiness in summer. Slope limits access by livestock and results in overgrazing of the less sloping areas. If the pasture is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Livestock grazing, therefore, should be managed so that the desired balance of species is maintained in the plant community. Severe overgrazing reduces the plant cover and increases the risk of erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope and an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter.

This map unit is in capability subclass VIe.

49F-Remote loam, 50 to 75 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium derived dominantly from sandstone. The native vegetation is mainly conifers, hardwoods, shrubs, and forbs. Elevation is 50 to 1,800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is brown to yellowish brown gravelly and very gravelly clay loam 40 inches thick. The substratum to a depth of 60 inches or more is yellowish brown extremely gravelly loam.

Included in this unit are small areas of Preacher and Digger soils. Also included are small areas of Etelka soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Remote soil is moderate. Available water capacity is about 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on the soil in the unit is grand fir. The understory vegetation is mainly vine maple, red huckleberry, evergreen huckleberry, tall Oregongrape, western swordfern, and broadleaf starflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 145. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 152 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, the hazard of windthrow, and seedling mortality. Compaction reduces the productivity of the soil. Steepness of slope restricts the use of wheeled and tracked equipment on skid trails. Cable yarding generally is safer and disturbs the soil less.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce adequate natural or artificial reforestation. Intensive site preparation and maintenance generally are not needed. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

50D-Remote-Digger-Preacher complex, 12 to 30 percent slopes. This map unit is on ridgetops and side slopes of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 250 to 3,600 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 35 percent Remote loam, 30 percent Digger gravelly loam, and 25 percent Preacher loam. The Remote and Digger soils are on narrow ridgetops and on the steeper side slopes, and the Preacher soil is on broad ridgetops and the less sloping side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Blachly, Bohannon, and Umpcoos soils. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

The Remote soil is deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is brown to yellowish brown gravelly and very gravelly clay loam 40 inches thick. The substratum to a depth of 60 inches or more is yellowish brown extremely gravelly loam.

Permeability of the Remote soil is moderate. Available water capacity is about 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Digger soil is moderately deep and well drained. It formed in colluvium derived dominantly from sedimentary rock. Typically, the surface is covered with a mat of undecomposed leaves, moss, and twigs 1 inch thick. The surface layer is dark brown gravelly loam 6 inches thick. The upper 3 inches of the subsoil is dark yellowish brown gravelly loam, and the lower 18 inches is brown very gravelly loam and very cobbly loam. The substratum is brown extremely cobbly loam 4 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Digger soil is moderately rapid. Available water capacity is about 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Runoff is

medium, and the hazard of water erosion is moderate.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, red alder, bigleaf maple, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, red huckleberry, cascade Oregongrape, salal, western swordfern, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 145 on the Remote soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 152 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Digger soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 122.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, the hazard of windthrow on the Remote and Digger soils, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Because the growth of roots is restricted by bedrock, trees on the Remote and Digger soils commonly are subject to windthrow. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass Vle.

50E-Remote-Digger-Preacher complex, 30 to 50 percent slopes. This map unit is on narrow ridgetops and side slopes of mountains. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 250 to 3,600 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 35 percent Remote loam, 25 percent Digger gravelly loam, and 20 percent Preacher loam. The Remote and Digger soils are on convex side slopes and narrow ridgetops, and the Preacher soil is in concave, less sloping areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Umpcoos, Bohannon, and Blachly soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Remote soil is deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is brown to yellowish brown gravelly and very gravelly clay loam 40 inches thick. The substratum to a depth of 60 inches or more is yellowish brown extremely gravelly loam.

Permeability of the Remote soil is moderate. Available water capacity is about 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is

rapid, and the hazard of water erosion is high.

The Digger soil is moderately deep and well drained. It formed in colluvium derived dominantly from sedimentary rock. Typically, the surface is covered with a mat of undecomposed leaves, moss, and twigs 1 inch thick. The surface layer is dark brown gravelly loam 6 inches thick. The upper 3 inches of the subsoil is dark yellowish brown gravelly loam, and the lower 18 inches is brown very gravelly loam and very cobbly loam. The substratum is brown extremely cobbly loam 4 inches thick. Weathered, fractured sandstone is at a depth of 31 inches.

Permeability of the Digger soil is moderately rapid. Available water capacity is about 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Preacher soil is deep and well drained. It formed in colluvium and residuum derived dominantly from arkosic sandstone. Typically, the surface is covered with a mat of organic litter 4 inches thick. The surface layer is very dark grayish brown and dark brown loam 14 inches thick. The subsoil is dark yellowish brown clay loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown clay loam.

Permeability of the Preacher soil is moderate. Available water capacity is about 6.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, red alder, bigleaf maple, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, red huckleberry, cascade Oregongrape, salal, western swordfern, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 145 on the Remote soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 152 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 111.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 154 on the Digger soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 163 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 122.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170 on the Preacher soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, the hazard of windthrow on the Remote and Digger soils, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads. can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Because the growth of roots is restricted by bedrock, trees on the Remote and Digger soils commonly are subject to windthrow. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIe.

51D-Rinearson silt loam, 0 to 30 percent slopes. This deep, well drained soil is on ridgetops and side slopes of mountains. It formed in residuum and colluvium derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 300 to 1,000 feet. The average annual precipitation is 60 to 85 inches, the

average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface layer is dark reddish brown silt loam 6 inches thick. The upper 12 inches of the subsoil is dark reddish brown silt loam, and the lower 24 inches is reddish brown and dark reddish brown silty clay loam. Weathered sandstone is at a depth of 42 inches.

Included in this unit are small areas of Dement and Remote soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Rinearson soil is moderate. Available water capacity is about 7.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat. It is also used for homesite development and livestock grazing.

This unit is suited to the production of Douglas fir. Among the other species that grow on the soil in the unit are western hemlock, western redcedar, and red alder. The understory vegetation is mainly salal, evergreen huckleberry, trailing blackberry, western swordfern, and Oregon oxalis.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of the surface layer occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Using low-pressure ground equipment damages the soil less and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting western hemlock and Douglas fir seedlings.

If this unit is used for livestock grazing, the main limitation is the susceptibility of the surface layer to compaction. Grazing cattle when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of slope in the steeper areas and an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

If this unit is used for homesite development, the main limitations are slope in the steeper areas and depth to bedrock. Some areas of the soil in this unit generally are too steep for proper operation of septic tank absorption fields. Absorption lines should either be placed in the more gently sloping areas of this unit or in adjoining areas of soils that are not so steep. Because of the depth to bedrock, onsite investigation is needed so that the absorption fields can be located where the soil depth is greatest.

Extensive cutting and filling generally are required to provide nearly level construction sites. Building roads in the less sloping areas of this unit reduces the amount of cutting and filling required. Roads should be provided with surface drainage. Cuts and fills are susceptible to erosion. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. In summer, supplemental irrigation is needed

for lawn grasses and vegetable gardens.

This map unit is in capability subclass Vle.

51E-Rinearson silt loam, 30 to 50 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium and residuum derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 300 to 1,000 feet. The average annual precipitation is 60 to 85 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface layer is dark reddish brown silt loam 6 inches thick. The upper 12 inches of the subsoil is dark reddish brown silt loam, and the lower 24 inches is reddish brown and dark reddish brown silty clay loam. Weathered sandstone is at a depth of 42 inches.

Included in this unit are small areas of Dement and Remote soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Rinearson soil is moderate. Available water capacity is about 7.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, and red alder. The understory vegetation is mainly salal, evergreen huckleberry, trailing blackberry, western swordfern, and Oregon oxalis.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of topsoil occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting western hemlock and Douglas fir seedlings.

This map unit is in capability subclass Vle.

51F-Rinearson silt loam, 50 to 70 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 300 to 1,000 feet. The average annual precipitation is 60 to 85 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 240 days.

Typically, the surface layer is dark reddish brown silt loam 6 inches thick. The upper 12 inches of the subsoil is dark reddish brown silt loam, and the lower 24 inches is reddish brown and dark reddish brown silty clay loam. Weathered sandstone is at a depth of 42 inches.

Included in this unit are small areas of Preacher and Remote soils. Also included are small areas of Milbury soils in the central and northwestern parts of the survey area. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Rinearson soil is moderate. Available water capacity is about 7.5 to 12.5 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, and red alder. The understory vegetation is mainly creambush oceanspray, evergreen huckleberry, red huckleberry, salal, western swordfern, and vine maple.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 170. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 181 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 127.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, and plant competition. Highllead or other cable logging systems are most suitable.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting western hemlock and Douglas fir seedlings.

This map unit is in capability subclass Vlle.

52D-Salander silt loam, 2 to 30 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is dark reddish brown silt loam 26 inches thick. The upper 14 inches of the subsoil is dark reddish brown silt loam, and the lower 25 inches is dark reddish brown and reddish brown silty clay loam. In some areas the dark-colored surface layer is less than 20 inches thick.

Included in this unit are small areas of Millicoma and Templeton soils. Included areas make up about 20 percent of the total acreage.

Permeability of this Salander soil is moderate. Available water capacity is about 15.5 to 21.0 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Sitka spruce (fig. 13). Among the other species that grow on this unit are Douglas fir, western hemlock, and western redcedar. The understory vegetation is mainly western swordfern, evergreen huckleberry, salmonberry, thimbleberry, and vine maple.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180. At the culmination of the mean annual increment (CMAI), the production of 70-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 271 cubic feet per acre per year.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of the surface layer occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Using low-pressure ground equipment damages the soil less and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading

Figure 13.-Young stand of Sitka spruce in an area of Salander silt loam, 2 to 30 percent slopes.

brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, Sitka spruce, and western hemlock seedlings.

This map unit is in capability subclass VIe.

52E-Salander silt loam, 30 to 50 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is dark reddish brown silt loam 26 inches thick. The upper 14 inches of the subsoil is dark reddish brown silt loam, and the lower 25 inches is dark reddish brown and reddish brown silty clay loam. In some areas the dark-colored surface layer is less than 20 inches thick.

Included in this unit are small areas of Millicoma soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Salander soil is moderate. Available water capacity is about 15.5 to 21.0 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on this unit are Sitka spruce, western hemlock, and western redcedar. The understory vegetation is mainly western swordfern, evergreen huckleberry, salmonberry, thimbleberry, and vine maple.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180. At the culmination of the mean annual increment (CMAI), the production of 70-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 271 cubic feet per acre per year.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of topsoil occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Road location and maintenance costs are greater in the more steeply sloping areas.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, Sitka spruce, and western hemlock seedlings.

This map unit is in capability subclass VIe.

52F-Salander silt loam, 50 to 75 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is dark reddish brown silt loam 26 inches thick. The upper 14 inches of the subsoil is dark reddish brown silt loam, and the lower 25 inches is dark reddish brown and reddish brown silty clay loam. In some areas the dark-colored surface layer is less than 20 inches thick.

Included in this unit are small areas of Millicoma soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Salander soil is moderate. Available water capacity is about 15.5 to 21.0 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is well suited to the production of Douglas fir. Among the other species that grow on this unit are Sitka spruce, western hemlock, and western redcedar. The understory vegetation is mainly western swordfern, evergreen huckleberry, salmonberry, thimbleberry, and vine maple.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180. At the culmination of the mean annual increment (CMAI), the production of 70-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 271 cubic feet per acre per year.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of topsoil occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are soft when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir, Sitka spruce, and western hemlock seedlings.

This map unit is in capability subclass VIIe.

53D-Serpentano very stony loam, 10 to 35 percent slopes. This deep, well drained soil is on side slopes and ridgetops of mountains. It formed in colluvium and residuum derived dominantly from serpentinite and peridotite. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 1,500 to 3,900 feet. The average annual precipitation is 90 to 100 inches, the average annual air temperature is 45 to 51 degrees F, and the average frost-free period is 110 to 180 days.

Typically, the surface is covered with a mat of partially decomposed needles and leaves 3 inches thick. The surface layer is dark brown very stony loam 5 inches thick. The subsoil is dark brown gravelly and very cobbly loam 13 inches thick. The substratum is dark yellowish brown very gravelly and extremely gravelly loam 28 inches thick. Partially weathered serpentinite is at a depth of 46 inches.

Included in this unit are small areas of Umpcoos and Remote soils. Also included are small areas of Preacher soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Serpentano soil is moderate. Available water capacity is about 4 to 7 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are Port Orford cedar, western redcedar, tanoak, and Pacific madrone. The understory vegetation is mainly Pacific rhododendron, manzanita, salal, western swordfern, low Oregongrape, and red huckleberry.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 120. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 115 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 97.

The main limitations for the management of timber on this unit are the hazard of erosion, the hazard of windthrow, and seedling mortality. Careful use of wheeled and tracked equipment reduces the disturbance of the protective layer of duff. Stones on the surface cause breakage of timber and hinder yarding.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless

they are provided with adequate water bars or are protected by plant cover, or both.

Windthrow is a hazard when the soil is wet and winds are strong. The high content of rock fragments in the soil increases seedling mortality. To compensate for the higher mortality that can be expected, larger trees or more trees than normal can be planted. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIe.

53E-Serpentano very stony loam, 35 to 70 percent slopes. This deep, well drained soil is on side slopes and ridgetops of mountains. It formed in colluvium and residuum derived dominantly from serpentinite and peridotite. The native vegetation is mainly conifers, hardwoods, shrubs, forbs, and grasses. Elevation is 1,500 to 3,900 feet. The average annual precipitation is 90 to 100 inches, the average annual air temperature is 45 to 51 degrees F, and the average frost-free period is 110 to 180 days.

Typically, the surface is covered with a mat of partially decomposed needles and leaves 3 inches thick. The surface layer is dark brown very stony loam 5 inches thick. The subsoil is dark brown gravelly and very cobbly loam 13 inches thick. The substratum is dark yellowish brown very gravelly and extremely gravelly loam 28 inches thick. Partially weathered serpentinite is at a depth of 46 inches.

Included in this unit are small areas of Umpcoos and Remote soils. Also included are small areas of Preacher soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Serpentano soil is moderate. Available water capacity is about 4 to 7 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are Port Orford cedar, western redcedar, tanoak, and Pacific madrone. The understory vegetation is mainly Pacific rhododendron, manzanita, salal, western swordfern, low Oregongrape, and red huckleberry.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 120. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 115 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 97.

The main limitations for the management of timber on this unit are the hazard of erosion, steepness of slope, the hazard of windthrow, and seedling mortality. Highlead or other cable logging systems are most suitable. Stones on the surface cause breakage of timber and hinder yarding.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Windthrow is a hazard when the soil is wet and winds are strong. The high content of rock fragments in the soil increases seedling mortality. To compensate for the higher mortality that can be expected, larger trees or more trees than normal can be planted. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

54B-Templeton silt loam, 0 to 7 percent slopes. This deep, well drained soil is on ridgetops and benches of mountains. It formed in colluvium and residuum derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 450 feet. The average annual precipitation is 60 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered and fractured siltstone is at a depth of 42 inches. In some areas the dark-colored surface layer is less than 10 inches thick.

Included in this unit are small areas of Geisel soils and deep gravelly loam. Also included are areas of

soils, mainly between Beaver Hill and south slough, that are similar to this Templeton soil but formed in marine sediment on coastal terraces. In some areas these soils have mottles in the subsoil and have a sandy substratum. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for timber production and wildlife habitat. It has potential for homesite development and livestock grazing.

This unit is suited to the production of Sitka spruce. Among the other species that grow on this unit are western hemlock, Douglas fir, Port Orford cedar, western redcedar, and red alder. The understory vegetation is mainly salal, evergreen huckleberry, Pacific rhododendron, western swordfern, and Oregon oxalis.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 169. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 255 cubic feet per acre per year. On the basis of a 100-year site curve, the mean site index for Douglas fir is 170. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the production of timber on this unit are the susceptibility of the surface layer to compaction. plant competition, and the hazard of windthrow. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of the surface layer occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Using low-pressure ground equipment damages the soil less and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Sitka spruce, a shallow rooted species, commonly is subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, western hemlock, and Douglas fir seedlings.

This unit is well suited to livestock grazing. In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates and pasture rotation help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for homesite development, absorption lines should be installed on the contour. Preserving the existing plant cover during construction helps to controls erosion. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This unit is in capability subclass IIIe.

54D-Templeton silt loam, 7 to 30 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium and residuum derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered and fractured siltstone is at a depth of 42 inches. In some areas the dark-colored surface layer is less than 10 inches thick.

Included in this unit are small areas of Salander soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat. It is also used for livestock grazing and homesite development.

This unit is well suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, Sitka spruce, grand fir, and red alder. The understory vegetation is mainly vine maple, thimbleberry, creambush oceanspray, red huckleberry, western swordfern, and Pacific trillium.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 270 cubic feet per acre per year. On the basis of a 100-year site curve, the mean site index for Douglas fir is 170.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, the hazard of erosion, plant competition, and the hazard of windthrow. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of the surface layer occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Using low-pressure ground equipment reduces damage to the soil arid helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Sitka spruce, a shallow rooted species, commonly is subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, Douglas fir, and western hemlock seedlings.

This unit is well suited to livestock grazing. In summer, droughtiness limits the choice of forage plants and limits production. Irrigation generally is impractical because of an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

If this unit is used for homesite development, the main limitations are slope and depth to bedrock. Absorption lines should either be placed in the more gently sloping areas of this unit or in adjoining areas of soils that are not so steep.

Extensive cutting and filling generally are required to provide nearly level construction sites. Building roads in the less sloping areas of this unit reduces the amount of cutting and filling required. Roads should be provided with surface drainage. Cuts and fills are susceptible to erosion. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass Vle.

54E-Templeton silt loam, 30 to 50 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium and residuum derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered and fractured siltstone is at a depth of 42 inches. In some areas the dark-colored surface layer is less than 10 inches thick.

Included in this unit are small areas of Geisel soils and deep gravelly loam. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Sitka spruce. Among the other species that grow on this unit are western hemlock, Douglas fir, Port Orford cedar, western redcedar, and red alder. The understory vegetation is mainly salal, evergreen huckleberry,

Pacific rhododendron, western swordfern, and Oregon oxalis.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 270 cubic feet per acre per year. On the basis of a 100-year site curve, the mean site index for Douglas fir is 170. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, plant competition, and the hazard of windthrow. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of topsoil occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Sitka spruce, a shallow rooted species, is subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, western hemlock, and Douglas fir seedlings.

This map unit is in capability subclass VIe.

54F-Templeton silt loam, 50 to 70 percent slopes. This deep, well drained soil is on side slopes of mountains. It formed in colluvium and residuum derived dominantly from sedimentary rock. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered and fractured siltstone is at a depth of 42 inches. In some areas the dark-colored surface layer is less than 10 inches thick.

Included in this unit are small areas of Millicoma and Salander soils in the northwestern part of the survey area. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, and red alder. The understory vegetation is mainly creambush oceanspray, evergreen huckleberry, red huckleberry, salal, western swordfern, and vine maple.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 270 cubic feet per acre per year. On the basis of a 100-year site curve, the mean site index for Douglas fir is 170.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction, steepness of slope, the hazard of erosion, plant competition, and the hazard of windthrow. Highlead or other cable logging systems are most suitable.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not

readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Sitka spruce, a shallow rooted species, is subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings.

This map unit is in capability subclass VIIe.

55D-Templeton-Bullards complex, 3 to 30 percent slopes. This map unit is on ridgetops and side slopes of mountains and strongly dissected marine terraces. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 600 feet. The average annual precipitation is 60 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 45 percent Templeton silt loam and 30 percent Bullards sandy loam. The Templeton soil is in convex areas on side slopes where recent marine and eolian deposits have been eroded away, and the Bullards soil is in convex areas on ridgetops and on west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of deep, well drained, gravelly soils and moderately deep, loamy soils. Also included are small areas of deep, poorly drained, loamy soils. Included areas make up about 25 percent of the total acreage.

The Templeton soil is deep and well drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered and fractured siltstone is at a depth of 42 inches. In some areas the dark-colored surface layer is less than 10 inches thick.

Permeability of the Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Bullards soil is deep and well drained. It formed in mixed eolian and marine deposits. Typically, the surface is covered with a mat of undecomposed organic litter 3 inches thick. The surface layer is very dark grayish brown sandy loam 7 inches thick. The subsoil is dark reddish brown, dark brown, and strong brown gravelly sandy loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown sand.

Permeability of the Bullards soil is moderate. Available water capacity is about 4.0 to 5.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Sitka spruce and Douglas fir. Among the other species that grow on the unit are western hemlock, Port Orford cedar, western redcedar, shore pine, and red alder. The understory vegetation is mainly salal, evergreen huckleberry, creambush oceanspray, Pacific rhododendron; cascara, western swordfern, and oxalis.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180 on the Templeton soil. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 255 cubic feet per acre per year. On the basis of a 100-year site curve, the mean site index for Douglas fir is 170.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 132 on the Bullards soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 133 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105.

High winds from the Pacific Ocean may seriously limit the growth of trees on this unit unless they are in a protected area.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer of the Templeton soil to compaction, the hazard of erosion, the hazard of windthrow, and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of the surface layer occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Using low-pressure ground equipment damages the soil less and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts

and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Road location and maintenance costs are greater in the more steeply sloping areas.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, western hemlock, and Douglas fir seedlings.

This map unit is in capability subclass Vle.

55E-Templeton-Bullards complex, 30 to 50 percent slopes. This map unit is on ridgetops and side slopes of mountains and strongly dissected marine terraces. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 500 feet. The average annual precipitation is 60 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 55 percent Templeton silt loam and 25 percent Bullards sandy loam. The Templeton soil is in convex areas on side slopes where recent marine and eolian deposits have been eroded away, and the Bullards soil is in convex areas on ridgetops and in the more gently sloping areas on west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of deep, well drained, gravelly soils. Included areas make up about 20 percent of the total acreage.

The Templeton soil is deep and well drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered and fractured siltstone is at a depth of 42 inches. In some areas the dark-colored surface layer is less than 10 inches thick.

Permeability of the Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

The Bullards soil is deep and well drained. It formed in mixed eolian and marine deposits. Typically, the , surface is covered with a mat of undecomposed organic litter 3 inches thick. The surface layer is very dark grayish brown sandy loam 7 inches thick. The subsoil is dark reddish brown, dark brown, and strong brown gravelly sandy loam 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown sand.

Permeability of the Bullards soil is moderate. Available water capacity is about 4.0 to 5.5 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Sitka spruce and Douglas fir. Among the other species that grow on this unit are western hemlock, Port Orford cedar, western redcedar, shore pine, and red alder. The understory vegetation is mainly salal, evergreen huckleberry, creambush oceanspray, Pacific rhododendron, cascara, western swordfern, and oxalis.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180 on the Templeton soil. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 255 cubic feet per acre per year. On the basis of a 100-year site curve, the mean site index for Douglas fir is 170.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 132 on the Bullards soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 133 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 105.

High winds from the Pacific Ocean may seriously limit the growth of trees on this unit unless they are in a protected area,

The main limitations for the management of timber on this unit are the susceptibility of the surface layer of the Templeton soil to compaction, steepness of slope, the hazard of erosion, the hazard of windthrow, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of topsoil occurs most readily when the soil is dry. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion, Cuts

and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Windthrow is a hazard when the soil is wet and winds are strong. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, western hemlock, and Douglas fir seedlings.

This map unit is in capability subclass VIe.

56E-Templeton-Millicoma complex, 12 to 50 percent slopes. This map unit is on ridgetops and side slopes of mountains. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 800 feet. The average annual precipitation is 70 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 55 percent Templeton silt loam and 30 percent Millicoma gravelly loam. The Templeton soil is in convex areas on ridgetops and on the more gently sloping side slopes, and the Millicoma soil is on side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Salander soils. Also included are small areas of soils that are similar to the Millicoma soil but have less than 35 percent rock fragments in the subsoil. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Templeton soil is deep and well drained. It formed in colluvium and residuum derived dominantly from sedimentary rock. Typically, the surface layer is very dark brown and dark brown silt loam 16 inches thick. The subsoil is reddish brown, yellowish red, and strong brown silty clay loam 26 inches thick. Soft, weathered and fractured siltstone is at a depth of 42 inches.

Permeability of the Templeton soil is moderate. Available water capacity is about 8.0 to 17.5 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

The Millicoma soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of undecomposed needles, leaves, and twigs 3 inches thick. The surface layer is very dark brown and very dark grayish brown gravelly loam 18 inches thick. The subsoil is dark brown very gravelly loam 17 inches thick. Partially weathered sandstone is at a depth of 35 inches.

Permeability of the Millicoma soil is moderately rapid. Available water capacity is about 3 to 6 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and wildlife habitat.

This unit is suited to the production of Sitka spruce and Douglas fir. Among the other species that grow on the unit are western hemlock, western redcedar, and red alder. The understory vegetation is mainly salal, salmonberry, cascade Oregongrape, western swordfern, and vine maple.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 180 on the Templeton soil. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 270 cubic feet per acre per year. On the basis of a 100-year site curve, the mean site index for Douglas fir is 170.

On the basis of a 100-year site curve, the mean site index for Sitka spruce is 169 on the Millicoma soil. At the culmination of the mean annual increment (CMAI), the production of 50-year-old Sitka spruce trees 1.5 inches in diameter or more at breast height is 255 cubic feet per acre per, year. On the basis of a 100-year site curve, the mean site index for Douglas fir is 145.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer of the Templeton soil to compaction, steepness of slope, the hazards of erosion and windthrow, and plant competition. The main limitation for the harvesting of timber is steepness of slope. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Cable yarding systems are safer, damage the soil less, and help to maintain productivity. Low-pressure ground equipment can be used in the more gently sloping areas of this unit.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding,

mulching, benching, and compacting the soil can reduce erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Sitka spruce, a shallow rooted species, is subject to windthrow.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, western hemlock, and Douglas fir seedlings.

This map unit is in capability subclass VIe.

57-Udorthents, level. This map unit is on flood plains, marshes, and tidal flats along major streams, bays, and estuaries. It consists of areas that have been filled and leveled for commercial and industrial uses. Slopes are 0 to 1 percent.

The areas of this unit on flood plains are made up of sandy, silty, or clayey material. The areas on marsh and tidal flats are made up of dredging spoil, dune sand, and wood chips. Drainage, permeability, and other physical properties vary considerably.

Onsite investigation is needed to determine suitability of areas of this unit for the intended use.

This unit is not placed in a capability subclass.

58F-Umpcoos-Rock outcrop association, 70 to 99 percent slopes. This map unit is on precipitous mountainsides, narrow ridgetops, and headwalls of mountains. The native vegetation on the Umpcoos soil is mainly conifers, shrubs, forbs, and hardwoods. The areas of Rock outcrop support mosses, lichens, and occasional shrubs in fractures. Elevation is 100 to 4,300 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is 45 to 53 degrees F, and the average frost-free period is 110 to 200 days.

This unit is 40 percent Umpcoos very gravelly sandy loam and 35 percent Rock outcrop. The Umpcoos soil is on ridgetops and in the more gently sloping areas, and the Rock outcrop is in the steeper areas along drainageways and on the upper slopes of mountains (fig. 14).

Included in this unit are small areas of Digger soils in the southern part of the survey area and Milbury soils in the northern part. Also included are small areas of Bohannon soils. Included areas make up about 25 percent of the total acreage.

The Umpcoos soil is shallow and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of organic litter 2 inches thick. The surface layer is dark grayish brown very gravelly sandy loam 3 inches thick. The subsoil is brown very gravelly sandy loam 13 inches thick. Hard sandstone is at a depth of 16 inches.

Permeability of the Umpcoos soil is moderately rapid. Available water capacity is about 0.5 inch to 1.5 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists mainly of exposures of fractured, hard sandstone. In some areas the sandstone is fractured to stone-sized fragments, and talus is common at the base of these areas.

This unit is used for timber production and wildlife habitat.

The Umpcoos soil is suited to the production of Douglas fir. Among the other species that grow on this soil are incense cedar, Pacific madrone, Oregon myrtle, and canyon live oak. The understory vegetation is mainly red huckleberry, evergreen huckleberry, creambush oceanspray, cascade Oregongrape, and longtube twinflower.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 79. At the culmination of the mean annual increment (CMAI), the production of 70-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 58 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 61.

The main limitations for the management of timber on this soil are steepness of slope, the hazard of erosion, seedling mortality, the hazard of windthrow, and plant competition. Harvesting of timber is limited mainly by steepness of slope. Rock outcrop may cause breakage of timber and hinder yarding. Helicopter, balloon, or total-suspension cable systems are the most suitable methods for harvesting timber.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cuts and fills are subject to erosion unless treated. Seeding, mulching, benching, and compacting the soil can reduce

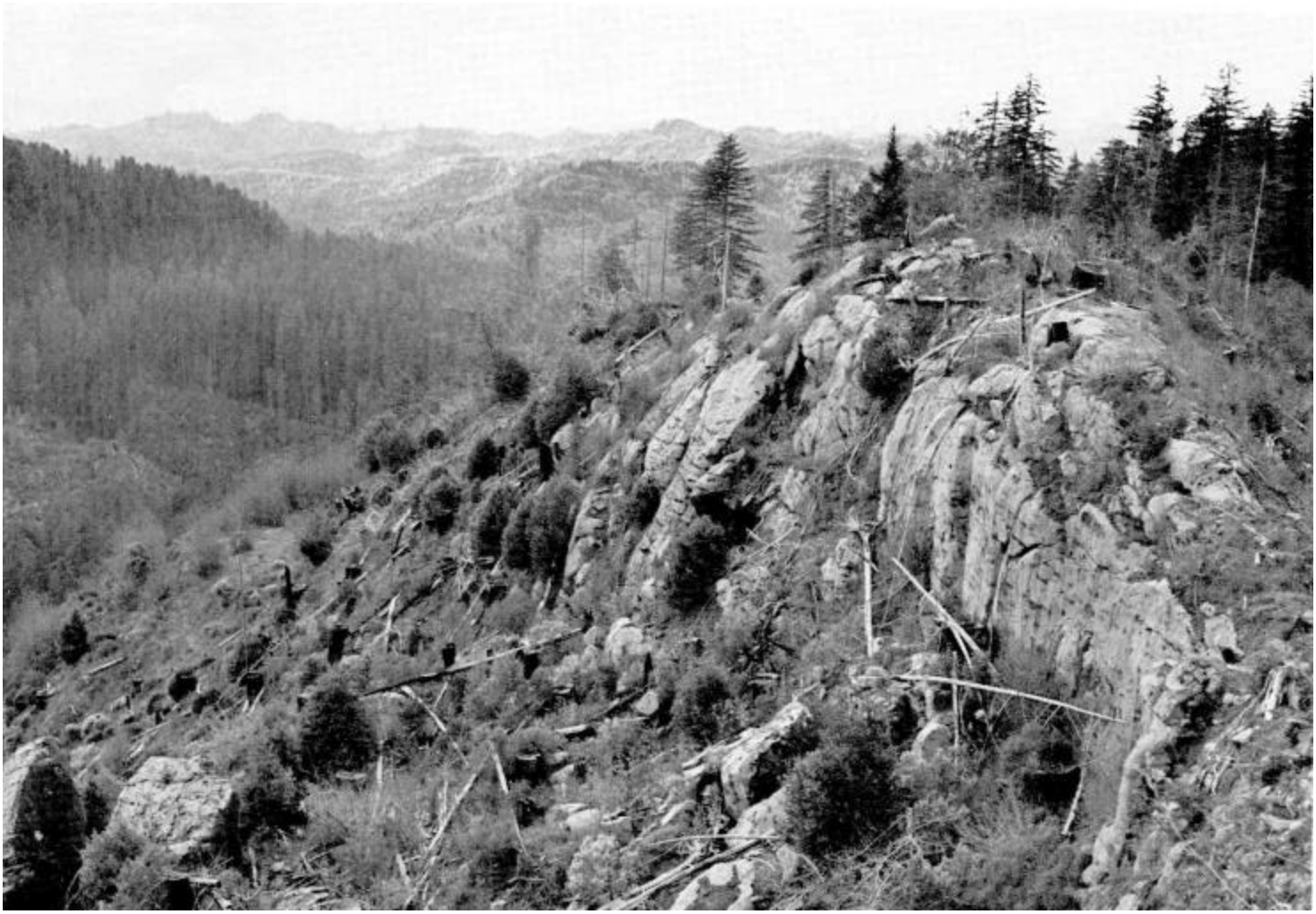


Figure 14.-Area of Umpcoos -Rock outcrop association, 70 to 99 percent slopes.

erosion. Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation.

Because roots are restricted by bedrock, trees commonly are subject to windthrow. When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Douglas fir seedlings. The high content of rock fragments in the soil increases seedling mortality. To compensate for the higher mortality that can be expected, larger trees or more trees than normal can be planted.

This map unit is in capability subclass VIIe.

59D-Waldport fine sand, 0 to 30 percent slopes. This deep, excessively drained soil is on stabilized sand dunes. It formed in eolian deposits. The native vegetation is mainly conifers, shrubs, grasses, and forbs. Elevation is 10 to 120 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark grayish brown and brown fine sand 7 inches thick. The

underlying material to a depth of 60 inches or more is dark yellowish brown fine sand.

Included in this unit are small areas of Heceta soils and Dune land. Also included are small areas of Netarts soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Waldport soil is very rapid. Available water capacity is about 3 to 4 inches. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used mainly for timber production, wildlife habitat, and recreation. It is also used for homesite development.

This unit is suited to the production of shore pine. Among the other species that grow on this unit are western hemlock, Sitka spruce, and Douglas fir. The understory vegetation is mainly Pacific rhododendron, salal, red huckleberry, evergreen huckleberry, and European beachgrass.

On the basis of a 100-year site curve, the mean site index for shore pine is 90. At the culmination of the mean annual increment (CMAI), the production of 60-year-old shore pine trees 1.5 inches in diameter or more at breast height is 79 cubic feet per acre per year. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are seedling mortality and plant competition. Careful use of wheeled and tracked equipment reduces the disturbance of the protective layer of duff. The risk of soil blowing increases if the timber is harvested or the understory is removed. Conventional methods can be used for harvesting timber, but use of skid trails can accelerate erosion.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Seeding road cuts and fills helps to stabilize the soil and reduces the risk of soil blowing. Windthrow is a hazard when the soil is wet and winds are strong.

When openings are made in the canopy, invading brushy plants delay natural reforestation. Undesirable plants reduce adequate natural or artificial reforestation. Intensive site preparation and maintenance generally are not needed. Reforestation can be accomplished by planting shore pine and Sitka spruce seedlings. Droughtiness increases seedling mortality.

If this unit is used for recreational development, the main limitations are the hazard of soil blowing, the instability of the soil, and slope. Use of the unit is restricted to low-intensity types of recreation, such as hiking and horseback riding. Areas used for recreation can be protected from soil blowing by maintaining plant cover. Plant cover can be maintained by limiting traffic.

Roads, paths, and trails are difficult to maintain because of the loose sand. Cutbanks are not stable and are subject to slumping. Access roads should be placed on lower slopes and designed to provide low cut-slope grades.

If this unit is used for homesite development, the main limitations are the hazard of ground water pollution, slope, the hazard of soil blowing, and droughtiness in summer. The very rapid permeability of the subsoil may permit untreated effluent to enter the ground water. Special designs may be needed to prevent contamination of water supplies. The steeper areas of this unit acre not suitable for installation of absorption fields. Community sewage treatment systems may be n6eded..

Extensive cutting and. filling are required to provide level building sites. Excavation for houses and access roads exposes material that is highly susceptible to soil blowing. Revegetating disturbed areas around construction sites as soon as feasible helps to control soil blowing. It is difficult to establish plants in areas where the surface layer has been removed. Mulching and fertilizing cut areas help to establish plants. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability subclass VIIe.

59E-Waldport fine sand, 30 to 70 percent slopes. This deep, excessively drained soil is on stabilized sand dunes. It formed in eolian deposits. The native vegetation is mainly conifers, shrubs, grasses, and forbs. Elevation is 10 to 160 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is very dark grayish brown and brown fine sand 7 inches thick. The underlying material to a depth of 60 inches or more is dark yellowish brown fine sand.

Included in this unit are small areas of Dune land. Also included are small areas of Netarts and Heceta soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Waldport soil is very rapid. Available water capacity is about 3 to 4 inches. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is moderate. The hazard of soil blowing is severe.

This unit is used for timber production and wildlife habitat.

This unit is suited to the production of shore pine. Among the other species that grow on this unit are western hemlock, Sitka spruce, and Douglas fir. The understory vegetation is mainly Pacific rhododendron, salal, red huckleberry, evergreen huckleberry, and European beachgrass.

On the basis of a 100-year site curve, the mean site index for shore pine is 90. At the culmination of the mean annual increment (CMAI), the production of 60-year-old shore pine trees 1.5 inches in diameter or more at breast height is 79 cubic feet per acre per year. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this unit are the hazard of erosion, seedling mortality, and plant competition. Careful use of wheeled and tracked equipment reduces the disturbance of the protective layer of duff. The risk of soil blowing increases if the timber is harvested or the understory is removed. Conventional methods can be used for harvesting timber, but use of skid trails can accelerate erosion. Steepness of slope restricts the use of wheeled and tracked equipment on skid trails. Cable yarding generally is safer and disturbs the soil less.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Seeding cuts and fills helps to stabilize the soil and reduces soil blowing. Road location and maintenance costs are greater in the more steeply sloping areas. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. End hauling of waste material minimizes damage to the vegetation downslope and reduces the potential for sedimentation. Windthrow is a hazard when the soil is wet and winds are strong.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce adequate natural or artificial reforestation. Intensive site preparation and maintenance generally are not needed. Reforestation can be accomplished by planting shore pine and Sitka spruce seedlings. Droughtiness increases seedling mortality.

This map unit is in capability subclass VIIe.

60D-Waldport-Dune land complex, 12 to 30 percent slopes. This map unit is on stabilized and active foredunes. The vegetation on the Waldport soil is mainly European beachgrass. Dune land does not support vegetation. Elevation is 10 to 80 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 60 percent Waldport fine sand and 30 percent Dune land. The Waldport soil is in areas that have been stabilized with vegetation. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Heceta soils. Included areas make up about 10 percent of the total acreage.

The Waldport soil is deep and excessively drained. It formed in eolian deposits. Typically, the surface layer is very dark grayish brown fine sand 4 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown fine sand.

Permeability of the Waldport soil is very rapid. Available water capacity is about 3 to 4 inches. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of erosion is slight. The hazard of soil blowing is severe.

Dune land is deep and excessively drained. It formed in eolian deposits. Typically, the areas of Dune land are fine and medium sand to a depth of 60 inches or more.

Permeability of Dune land is very rapid. Available water capacity is about 3 to 4 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used for recreation and wildlife habitat.

If this unit is used for recreational development, the main limitations are soil blowing and the instability of the soil. Use of this unit is limited to low-intensity types of recreation, such as hiking, horseback riding, and operating off-road vehicles. Areas used for recreation can be protected from soil blowing by establishing plant cover. Plant cover can be maintained by limiting traffic. Excavation for roads and buildings exposes material that is highly susceptible to soil blowing. Establishing vegetation on disturbed areas around construction sites as soon as possible helps to control soil blowing. Roads and trails are difficult to maintain because of the loose sand. Roads must be surfaced for use by conventional vehicles.

This map unit is in capability subclass VIIe.

61D-Waldport-Heceta fine sands, 0 to 30 percent slopes. This map unit is mainly on stabilized sand dunes and in depressional areas between sand dunes. Some areas are on deflation basins. The native vegetation is mainly conifers, shrubs, grasses, and forbs on the Waldport soil and sedges, rushes, water-tolerant grasses, and shrubs on the Heceta soil. Elevation is 0 to 80 feet. The average annual precipitation is 50 to 70 inches, the average annual air

temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 50 percent Waldport fine sand and 30 percent Heceta fine sand. The Waldport soil is on stabilized sand dunes, and the Heceta soil is in interdunal swales and depressional areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Netarts and Yaquina soils and Dune land. Included areas make up about 20 percent of the total acreage.

The Waldport soil is deep and excessively drained. It formed in eolian deposits. Slope is 7 to 30 percent. Typically, the surface layer is very dark grayish brown and brown fine sand 7 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown fine sand.

Permeability of the Waldport soil is very rapid. Available water capacity is about 3 to 4 inches. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

The Heceta soil is deep and poorly drained. It formed in eolian material. Slope is 0 to 3 percent. Typically, the surface layer is very dark grayish brown fine sand 4 inches thick. The substratum to a depth of 60 inches or more is mottled, grayish brown sand.

Permeability of the Heceta soil is rapid. Available water capacity is about 1 inch to 2 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is ponded, and the hazard of water erosion is slight. The water table fluctuates from 12 inches above the surface to 6 inches below the surface from October to May.

The Waldport soil in this unit is used mainly for timber production, and the Heceta soil is used mainly for wildlife habitat. The unit is also used for recreation.

The Waldport soil is suited to the production of shore pine. Other species that grow on this soil include western hemlock, Sitka spruce, and Douglas fir. The understory vegetation is mainly Pacific rhododendron, salal, red huckleberry, evergreen huckleberry, and European beachgrass. The Heceta soil is poorly suited to the production of timber. The vegetation on this soil is mainly slough sedge, salt rush, coast willow, waxmyrtle, evergreen huckleberry, and salal.

On the basis of a 100-year site curve, the mean site index for shore pine is 90 on the Waldport soil. At the culmination of the mean annual increment (CMAI), the production of 60-year-old shore pine trees 1.5 inches in diameter or more at breast height is 79 cubic feet per acre per year. High winds from the Pacific Ocean may seriously limit the growth of trees unless they are in a protected area.

The main limitations for the management of timber on this soil are seedling mortality and plant competition. Careful use of wheeled and tracked equipment reduces the disturbance of the protective layer of duff. The risk of soil blowing increases if the timber is harvested or the understory is removed. Conventional methods can be used for harvesting timber, but use of skid trails can accelerate erosion.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Seeding cuts and fills helps to stabilize the soil and reduce soil blowing. Windthrow is a hazard when the soil is wet and winds are strong.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants reduce adequate natural or artificial reforestation. Intensive site preparation and maintenance generally are not needed. Reforestation can be accomplished by planting shore pine and Sitka spruce seedlings. Droughtiness increases seedling mortality.

If this unit is used for recreational development, the main limitations are the hazard of soil blowing, the instability of the Waldport soil, and the wetness of the Heceta soil. These limitations restrict the use of this unit mainly to low-intensity types of recreation, such as hiking and horseback riding. The unit can be used for other kinds of recreational activities that require a minimum of construction and soil disturbance. Areas used for recreation can be protected from soil blowing by maintaining plant cover. Plant cover can be maintained by limiting traffic. Excavation for houses and access roads exposes material that is highly susceptible to soil blowing. Revegetating disturbed areas around construction sites as soon as feasible helps to control soil blowing.

Roads, paths, and trails are difficult to maintain because of the loose sand. Cutbanks are not stable and are subject to slumping.

Wetness limits most recreational development on the Heceta soil. Use of paths and trails may be limited to 2 to 3 months in summer. Drainage is impractical because of the lack of suitable outlets.

This map unit is in capability subclass VIIe.

62-Willanch fine sandy loam. This deep, poorly drained soil is in depressional areas on flood plains. It formed in alluvium. Slope is 0 to 3 percent. The native

vegetation is mainly sedges, rushes, grasses, and hardwoods. Elevation is 10 to 40 feet. The average annual precipitation is 50 to 80 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface layer is mottled, very dark grayish brown and dark brown fine sandy loam 13 inches thick. The upper 22 inches of the substratum is mottled, dark grayish brown sandy loam, and the lower part to a depth of 60 inches or more is mottled, dark grayish brown loamy fine sand and loamy sand.

Included in this unit are small areas of Nehalem and Nestucca soils. Included areas make up about 25 percent of the total acreage.

Permeability of this Willanch soil is moderately rapid. Available water capacity is about 2.5 to 4.5 inches. Effective rooting depth is 60 inches for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. Runoff is very slow, and the hazard of water erosion is slight. The water table fluctuates between the surface and a depth of 24 inches below the surface from November to March. This soil is subject to frequent periods of flooding in winter.

This unit is used mainly for hay and pasture.

The vegetation in areas not cultivated is mainly red alder, black cottonwood, and Pacific willow. The understory vegetation is mainly soft rush, slough sedge, skunkcabbage, brown-headed rush, sickle-leaved rush, and large-headed sedge.

If this unit is used for hay and pasture, the main limitations are droughtiness in summer, the hazard of flooding, wetness, and, for the curing of hay, high humidity. Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Frequent, brief periods of flooding restrict the use of this unit in winter. Protection from flooding can be provided only by the use of extensive dikes.

Drainage is needed to lower the water table. Tile drainage can be used to lower the water table if a suitable outlet is available. Wetness and flooding restrict grazing in winter. The choice of plants is limited to those that can withstand periodic inundation.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in winter.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds and brush. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IIIw.

63B-Wintley silt loam, 0 to 8 percent slopes. This deep, well drained soil is on high terraces. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 420 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs 1 inch thick. The surface layer is dark brown silt loam 4 inches thick. The upper 12 inches of the subsoil is dark brown silty clay loam, and the lower 31 inches is strong brown silty clay and silty clay loam. The substratum to a depth of 60 inches or more is dark yellowish brown very gravelly loam. In some areas the dark-colored surface layer is 10 inches thick or more.

Included in this unit are small areas of McCurdy soils and soils on steep terrace escarpments. Also included are small areas of soils that are similar to this Wintley soil but have a gravelly substratum at a depth of 20 to 40 inches. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Wintley loam is moderately slow. Available water capacity is about 8.0 to 9.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for hay and pasture and homesite development. It is also used for timber production.

This unit is suited to the production of Douglas fir. Among the other species that grow on this unit are western hemlock, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, trailing blackberry, western swordfern, and Oregon oxalis.

On the basis of a 100-year site curve, the mean site

index for Douglas fir is 160. At the culmination of the mean annual increment (CMAI), the production of 60-year-old Douglas fir trees 1.5 inches in diameter or more at breast height is 170 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for Douglas fir is 126.

The main limitations for the management of timber on this unit are the susceptibility of the surface layer to compaction and plant competition. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Displacement of the surface layer occurs most readily when the soil is wet. Using low-pressure ground equipment damages the soil less and helps to maintain productivity.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Unsurfaced roads and skid trails are slippery when wet or moist, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in this unit.

When openings are made in the canopy, invading brushy plants can delay natural reforestation. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are provided. Reforestation can be accomplished by planting Sitka spruce, western hemlock, and Douglas fir seedlings.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. Septic tank absorption fields do not function properly during rainy periods. Larger absorption fields help to compensate for the moderately slow permeability.

Preserving the existing plant cover during construction helps to control erosion. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IIIe.

63C-Wintley silt loam, 8 to 15 percent slopes. This deep, well drained soil is on high terraces. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 420 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs 1 inch thick. The surface layer is dark brown silt loam 4 inches thick. The upper 12 inches of the subsoil is dark brown silty clay loam, and the lower 31 inches is strong brown silty clay and silty clay loam. The substratum to a depth of 60 inches or more is dark yellowish brown very gravelly loam. In some areas the dark-colored surface layer is 10 inches thick or more.

Included in this unit are small areas of McCurdy soils and soils on steep terrace escarpments. Also included are small areas of soils that are similar to this Wintley soil but have a gravelly subsoil and a gravelly substratum at a depth of 20 to 40 inches. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Wintley soil is moderately slow. Available water capacity is about 8.0 to 9.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for hay and pasture and homesite development.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, western redcedar, red

alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, trailing blackberry, western swordfern, and Oregon oxalis.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Supplemental irrigation is needed for maximum production. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. Septic tank absorption fields do not function properly during rainy periods. The limitation of moderately slow permeability may be overcome by increasing the size of the septic tank absorption field. Absorption lines should be installed on the contour.

The risk of erosion is increased if the soil is left exposed during site development. Careful planning of road location can minimize the amount of cutting and filling required. Revegetating disturbed areas around construction sites as soon as feasible helps to control erosion. Plant cover can be established and maintained through proper fertilizing, seeding, mulching, and shaping of the slopes. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, supplemental irrigation is needed for lawn grasses and vegetable gardens.

This map unit is in capability subclass IIIe.

63D-Wintley silt loam, 15 to 30 percent slopes. This deep, well drained soil is on high terraces. It formed in alluvium. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 420 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is 50 to 53 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs 1 inch thick. The surface layer is dark brown silt loam 4 inches thick. The upper 12 inches of the subsoil is dark brown silty clay loam, and the lower 31 inches is strong brown silty clay and silty clay loam. The substratum to a depth of 60 inches or more is dark yellowish brown very gravelly loam. In some areas the dark-colored surface layer is 10 inches thick or more.

Included in this unit are small areas of soils that are similar to this Wintley soil but have a gravelly substratum at a depth of 20 to 40 inches. Also included are small areas of Dement soils that have slopes of 15 to 60 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Wintley, soil is moderately slow. Available water capacity is about 8.0 to 9.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for pasture and wildlife habitat.

The vegetation in areas not cultivated is mainly Douglas fir, western hemlock, western redcedar, red alder, and Oregon myrtle. The understory vegetation is mainly evergreen huckleberry, Pacific rhododendron, trailing blackberry, western swordfern, and Oregon oxalis.

If this unit is used for pasture, the main limitations are the susceptibility of the surface layer to compaction and droughtiness in summer. Grazing when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

In summer, droughtiness on south-facing slopes limits the choice of forage plants and limits production.

Irrigation generally is impractical because of slope and an inadequate water supply.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grass-legume pastures respond to sulfur, phosphorus, and molybdenum. Using a good fertilization program increases the production of forage in winter. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Rotation grazing increases the production of forage and helps to control weeds and brush.

This map unit is in capability subclass IVe.

64-Yaquina loamy fine sand. This deep, somewhat poorly drained soil is on low terraces. It formed in mixed alluvium. Slope is 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, sedges, and rushes. Elevation is 10 to 50 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 200 to 240 days.

Typically, the surface is covered with a mat of organic litter 2 inches thick. The surface layer is dark gray loamy fine sand 5 inches thick. The upper 7 inches of the subsoil is yellowish brown sand, the next 15 inches is mottled, reddish brown and dark reddish brown sand, and the lower 8 inches is pale brown sand. The substratum to a depth of 60 inches or more is pale brown sand.

Included in this unit are small areas of Heceta soils. Included areas make up about 15 percent of the total acreage.

Permeability of this Yaquina soil is moderately rapid. Available water capacity is about 1 inch to 3 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table fluctuates between the surface and a depth of 24 inches below the surface from November to April. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for recreation and wildlife habitat.

The native vegetation is mainly shore pine, scattered Sitka spruce, Pacific rhododendron, salal, evergreen huckleberry, Pacific waxmyrtle, slough sedge, and soft rush.

If this unit is used for recreational development, the main limitation is wetness. Septic tank absorption fields do not function properly because of the seasonal high water table. Use of paths and trails may be limited to 3 to 4 months during the dry period.

This map unit is in capability subclass IVw.

65-Zyzzug silt loam. This deep, poorly drained soil is on stream terraces. It formed in mixed alluvium. Slope is 0 to 3 percent. The native vegetation is mainly conifers, shrubs, forbs, and hardwoods. Elevation is 50 to 120 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is 160 to 220 days.

Typically, the surface layer is very dark grayish brown and dark brown silt loam 12 inches thick. The upper 18 inches of the subsoil is mottled, very dark gray and dark gray silty clay loam, and the lower 15 inches is mottled, dark yellowish brown silty clay and silty clay loam. The substratum to a depth of 60 inches or more is mottled, dark yellowish brown silt loam.

Included in this unit are small areas of soils that are similar to this Zyzzug soil but are moderately well drained or somewhat poorly drained. Also included are small areas of somewhat poorly drained soils that have a gravelly loam surface layer. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Zyzzug soil is moderately slow. Available water capacity is about 5.0 to 8.5 inches. Effective rooting depth is 60 inches or more for water-tolerant plants, but it is limited by the water table for non-water-tolerant plants. The water table fluctuates between the surface and a depth of 18 inches below the surface from November to April. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for hay and pasture.

The vegetation in areas not cultivated is mainly western redcedar, red alder, and willow. The understory vegetation is mainly evergreen huckleberry, western swordfern, hairy brackenfern, soft rush, and skunkcabbage.

If this unit is used for hay and pasture, the main limitations are the susceptibility of the surface layer to compaction, wetness, droughtiness in summer, and, for the curing of hay, high humidity. Grazing when the soil is moist results in compaction of the surface layer and poor tilth. Compaction limits the movement of air and water in the soil and restricts the growth of roots; it can seriously reduce the productivity of the soil. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Drainage and irrigation are needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available. Supplemental irrigation is needed in summer because of low rainfall. Sprinkler irrigation is a suitable method of

applying water. Use of this method permits the even, controlled application of water. Water needs to be applied at a slow rate over a long period to ensure that the root zone is properly wetted. Applications of water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

High humidity and frequent periods of rainfall late in spring prevent the production of high-quality hay. The quality of grass for hay can be maintained by increasing the stocking rate in spring. Excess forage in spring can be used as silage.

Fertilizer is needed to ensure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Rotation grazing increases the production of forage and helps to control weeds and brush. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclass IIIw.

Use and Management of the Soils

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

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Lynn Cannon, agricultural extension agent, Oregon State University, and Calvin H. Gregg, soil conservationist, Soil Conservation Service, assisted in preparing this section.

General management needed for crops and for hay and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified. The system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants commonly grown are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

According to the 1978 Census of Agriculture, Coos County had 100,000 acres of permanent pasture 40,000 acres on flood plains and 60,000 acres on upland hillsides. In 1980, 688 acres of cranberries was harvested and approximately 200 acres was in horticultural and related crops.

The soils and climate of Coos County are not well suited to the production of most row crops. In most areas of the county, soils warm up slowly in spring because of wetness and a high percentage of cloud cover. Fog and high humidity in coastal areas prevent the accumulation of sufficient growing degree days to allow most row crops and small grain to mature. Some interior valleys do receive enough sunlight and have temperatures high enough for corn to mature; however, it generally is used for silage. The climate of the inland valleys is suitable for cool-season crops such as pole beans and lettuce; however, lack of suitable markets make production of such crops uneconomical.

The soils and climate of the survey area are excellent for forage production. The growing season is long, and the soils receive sufficient moisture, except for several months in summer. Rainfall during July and August seldom exceeds 0.5 inch per month, and irrigation is needed for maximum production.

Hayland and pastureland in Coos County can be divided into three types based on management: (1) very poorly drained flood plains; (2) well drained to poorly

drained flood plains and terraces, and (3) upland pastures.

The very poorly drained areas consist of soils such as those in the Coquille, Chetco, and Langlois series. These soils make up about 13,000 acres, or 13 percent, of the pastureland in the county. They are mainly in the Coquille and Coos River Valleys. Frequent, prolonged periods of flooding in winter restrict the choice of pasture grasses to those that can withstand inundation, such as reed canarygrass. Soil drainage is required. Open ditches are most effective because of the clayey subsoil. Tide gates are needed in some areas to prevent inundation during high tides.

These soils generally are too wet to permit more than one cutting of hay. The quality of hay generally is very poor because these soils do not dry out enough to permit cutting until after the grass has reached maturity, and the high soil moisture and high humidity prevent rapid drying of the hay. The quality of hay can be improved by grazing hayfields until early in June to delay cutting until the weather conditions are more favorable.

Soils on flood plains and terraces are suited to grass-legume pasture. The Nehalem, Nestucca, Kirkendall, Quosatana, and Gardiner soils are on flood plains and are subject to frequent periods of flooding in winter. As a result, the use of pastures is restricted to brief periods. Drainage is needed for maximum production on the Nestucca and Quosatana soils. These soils have a loamy subsoil and can be drained by subsurface tiles.

The Eilertsen, Zyzzug, Meda, Gauldy Variant, Chismore, McCurdy, and Wintley soils are on terraces. Drainage is needed on the Zyzzug, McCurdy, and Chismore soils. McCurdy and Chismore soils can be drained by subsurface tiles; however, because of the clayey subsoil, open ditches are needed on the Zyzzug soils.

Irrigation is needed on all of these soils in summer. Sprinkler irrigation is an efficient method of applying water. Application rates should be adjusted according to the permeability and water intake rate of the soils to prevent excessive runoff and leaching of plant nutrients. In some areas irrigation of the McCurdy and Wintley soils may be impractical because of the steepness of slope and lack of an adequate water supply.

Most of the hay harvested in the county is grown on soils on flood plains and terraces. The well drained Nehalem, Kirkendall, Gardiner, and Meda soils dry out early enough to permit harvesting of hay at the optimum growth stage; however, the quality of the hay generally is poor because of heavy dew, fog, and frequent rain showers. In most years it is possible to harvest two cuttings of hay.

Upland soils are suited to grass-legume pasture. Upland pastures are mainly on soils of the Dement, Etelka, Remote, Templeton, and Geisel series. These soils commonly are seeded to subterranean clover to provide forage in winter. Forage production is low in summer because of droughtiness. Irrigation generally is not practical because of the steepness of slope and lack of an adequate water supply.

Most of the soils used for hay and pasture are strongly acid or very strongly acid unless lime is applied. Some of the poorly drained soils on flood plains are slightly acid or medium acid. Application of ground limestone is needed to raise the reaction of the soils. The levels of available phosphorus and molybdenum are low in the upland soils. Pasture grasses and legumes on the soils on flood plains and terraces respond to phosphorus and sulfur. Canarygrass pastures respond to nitrogen.

Additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop grown, and on the expected yields. The Cooperative Extension Service and the Soil Conservation Service can help in determining the kinds and amounts of fertilizer and lime to apply. The latest information on adapted varieties and seeding recommendations can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service. Information for the design of drainage and irrigation systems for each kind of soil is available at local offices of the Soil Conservation Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of

weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (24). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils generally are grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s, or c*, to the class numeral, for example, IIe. The letter a shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s, or c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

James F. McClinton, forester, Soil Conservation Service, helped to prepare this section.

This survey area is recognized as one of the best timber growing regions in North America. Favorable climate, fertile soils, and well suited timber species account for the high productive capacity of the forest land.

About 82 percent of the survey area is classified as commercial forest land. About 65 percent is privately owned, and the rest is publicly owned. Of this, 26 percent is administered by the Federal Government, 8 percent by the State, and 1 percent by the county.

The town of Coos Bay is recognized as the center of the forest products industry on the southern coast of Oregon. Its excellent deep water port makes possible the shipment of raw logs and finished lumber to both overseas and domestic markets.

The county has several large sawmills that produce plywood, veneer, lumber, and wood chips suitable for pulp. Wood chips suitable for use in making both high grade and low grade paper products are processed within the survey area and are shipped to paper mills outside the area. There are several smaller sawmills, as well as various specialty mills. The specialty mills process hardwoods such as red alder and produce arrow shafts from Port Orford cedar and shakes from western redcedar. Novelty wood products are produced from the highly prized Oregon myrtle.

The main conifer species are Douglas fir, western hemlock, Sitka spruce, western redcedar, and Port Orford cedar. The main hardwood species are red alder, Oregon myrtle, bigleaf maple, and tanoak.

Sawmill capacity in the area exceeds current growth rates; however, growth rates can be increased significantly by applying intensive management practices. Thinning overstocked stands and applying nitrogen fertilizer to stands growing on soils that will respond can greatly increase timber yields.

The forest land in the survey area is protected from fire by the State Department of Forestry, by the Forest Service, and by local fire districts. The increasing population and increased recreational activities in the area make accidental fires a constant threat, especially during dry summers.

Many diseases and insects are present in the forest, and they can be a serious problem in individual stands of trees. Damage varies from year to year. The principal insect that attacks Douglas fir is the Douglas fir beetle *(Dendroctonus pseudotsugae).* Laminated root rot *(Phylinius weirii)* is the most serious fungus enemy of Douglas fir. The Sitka spruce weevil *(Dissodes sitchensis)* kills the terminal shoots of spruce and, along with the spruce aphid *(Aphis abientina),* causes the greatest amount of damage to Sitka spruce. Cedar root rot *(Phytophthora lateralis),* a serious root disease, has infected Port Orford cedar, endangering the species in this survey area.

The principal forest cover type is the Pacific Douglas fir type (22), which typically includes small amounts of western hemlock and western redcedar. The other dominant forest cover types are the Sitka spruce and Sitka spruce-western hemlock types, which are associated with the Pacific coast fog belt. Other small forest types include shore pine along the coastal areas and Port Orford cedar-Douglas fir.

Most of the forest land in the survey area does not provide suitable forage for livestock grazing, but it does provide forage for many species of wildlife. Elk and deer commonly use the forage available in recently harvested areas, and they use dense stands of timber for cover.

Soils vary in their ability to produce trees. Depth, fertility, texture, and the available water capacity influence tree growth. Elevation, aspect, soils, and climate determine the kinds of trees that can be expected to grow on any site. Available water capacity and the depth of the root zone are of major importance. Elevation and aspect are of particular importance in mountainous areas. The forested soils in the survey area range from shallow to deep, from nongravelly to extremely gravelly, and from fine textured to coarse textured. Because of differences among the soils, as well as differences in climate, topography, and geology, the forests vary in composition and productivity.

Soil surveys are important to forest land managers as they seek ways to increase the productivity of forest land. Some soils respond better to fertilizer than do others, some are more susceptible to landsliding and erosion after roads are built and timber is harvested, and some require special effort when harvesting timber and reforesting. Each map unit in this survey suitable for producing timber presents information concerning forest land productivity and limitations for harvesting timber and names common forest understory plants. Table 6 summarizes the forestry information given in the detailed map unit descriptions. The soils are rated for a number of factors to be considered in management. In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Equipment limitation ratings refer to the limits placed upon the use of equipment, year-round or seasonally, as a result of soil characteristics. A rating of slight indicates that use of equipment is not normally restricted in kind or time of year because of soil factors; moderate indicates a seasonal limitation (usually less than 4 months) because of soil wetness, a fluctuating water table, susceptibility to compaction, or some other factor, and severe indicates a seasonal limitation, a need for special equipment (such as a cable-yarding logging system), or a hazard in the use of equipment. Steepness of slope, wetness, and susceptibility of the soil to compaction are the main factors that cause equipment limitations. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. Where slopes are even steeper, tracked

equipment cannot be operated safely and more sophisticated systems must be used. Soil wetness, especially in combination with fine soil texture, can severely limit the use of equipment, making harvesting practical only during dry periods.

Seedling mortality ratings refer to the probability of mortality of naturally occurring or planted tree seedlings as influenced by kinds of soil or topography. Plant competition is not considered in this rating. The ratings apply to seedlings from good stock that is planted properly during a period of sufficient soil moisture. *Slight* indicates that no problem is expected under usual conditions; *moderate* indicates that some problems of mortality can be expected and that extra precautions are advisable; and *severe* indicates that mortality will be high and extra precautions are essential for successful reforestation. Wetness of the soil, droughtiness of the surface layer (especially on south- and southwest-facing side slopes), or position on ridgetops account for seedling mortality problems. To offset these limitations, larger than usual planting stock, special site preparation, surface drainage, or reinforcement plantings may be needed.

Ratings of *windthrow hazard* consider the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees normally are not blown down by wind (strong winds may break trees but not uproot them); *moderate* indicates that an occasional tree may blow down during periods of excessive wetness combined with strong winds; and *severe* indicates that many trees may be expected to be blown down during periods of soil wetness and moderate or strong winds.

Restricted rooting depth as a result of a high water table, underlying bedrock, an impervious layer, and poor anchoring of roots because the surface layer and subsoil are loose makes trees more subject to windthrow or tipover. *Moderate* and *severe* ratings indicate the need for more care in thinning the edges of timber stands, a plan calling for periodic salvage of windthrown trees, and an adequate road and trail system to allow for salvage operations.

Ratings of *plant competition* refer to the likelihood of invasion of brushy plants when openings are made in the tree canopy. A rating of *slight* indicates that unwanted brushy plants are not likely to delay the establishment of natural reforestation and that planted seedlings have good prospects for development without undue competition; *moderate* indicates that competition can be expected to reduce the establishment of natural or planted seedlings in the absence of intensive site preparation and maintenance; and *severe* indicates that competition can be expected to prevent establishment of adequate natural or planted seedlings unless intensive site preparation and maintenance are provided. Favorable climate and productive soils encourage plant competition. Generally, brush invades less as elevation increases. The key to predicting brush competition problems commonly is the quantity and proximity of seed sources of undesirable plants. Moderate and severe ratings indicate the need for careful and thorough post-harvest cleanup in preparation for reforestation and the possibility of mechanically or chemically treating brush to retard the growth and allow seedlings to develop.

The *potential productivity* of important trees on a soil is expressed as a *site index (14).* This index is determined by taking height and age measurements on selected trees within stands of a given species. The procedure and technique for doing this are given in the site index tables used for the survey area *(1, 6, 13, 14,* 15). The site index is given for a fully stocked, even-aged, unmanaged stand of trees. Yield at various ages can be estimated from the site index by using the appropriate yield table (6, 14, 15, *16).* Important trees are listed in the same order as that of their general occurrence, as observed on the soil. Usually, only one or two tree species are dominant.

Trees to plant are those that are used for reforestation or, if suitable conditions exist, natural regeneration. Species listed are suited to the soils and will produce a commercial wood crop. Desired product, topographic position, and personal preference are three factors of many that can influence the choice of trees to use for reforestation.

Recreation

Coos County provides a wide variety of outdoor recreational opportunities. It has a rugged, scenic coastline that attracts many tourists throughout the year. Numerous lakes and rivers provide excellent fishing and other water-oriented activities. Boating and fishing are common on Coos Bay and the Pacific Ocean. The Coast Range offers excellent opportunities for hunting, hiking, and camping.

Public lands available for recreation include Elliott State Forest, Siskiyou National Forest, Siuslaw National Forest, Oregon Dunes National Recreation Area, and land administered by the Bureau of Land Management. There are 19 Oregon State parks and 28 county parks scattered throughout the county. Major timber companies in the county also permit access to their lands for hunting, fishing, and camping. In addition,

there are a number of private and commercial campgrounds, resorts, trailer parks, city parks, and other public recreational facilities.

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered: Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties generally are favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey; for example, interpretations for dwellings without basements and for local roads and streets in table 8 and interpretations for septic tank absorption fields in table 9.

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

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

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

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

Wildlife Habitat

Clyde A. Scott, biologist, Soil Conservation Service, helped to prepare this section.

The soils in the survey area provide habitat for many kinds of fish and wildlife. It includes extensive areas of sand dunes; large freshwater lakes; marine estuaries; broad, nearly level flood plains of the Coos and Coquille Rivers; and steep hills of the Coast Range and Klamath Mountains. The mild, seasonally wet marine climate produces a wide variety of trees, shrubs, grasses, and forbs that provide habitat for many species of wildlife. The wildlife habitat can be improved by use of agricultural and herbaceous plantings and proper management of existing vegetation.

The map units shown on the general soil map in the back of this survey have been grouped according to their potential to provide similar kinds of wildlife habitat. The five groups are described in the following paragraphs, along with the kinds of fish and wildlife in them.

Group 1 (general soil map unit 1).-This group consists of Dune land and of well drained and poorly drained, nearly level to steep soils on sand dunes. The native vegetation is shore pine, Sitka spruce, western hemlock, Douglas fir, salal, evergreen huckleberry, coast willow, waxmyrtle, and European beachgrass.

This group has very low productivity; consequently, wildlife populations generally are low. In areas where suitable cover exists, black-tailed deer are common as well as some bobcat, coyote, rabbit, skunk, raccoon, and tree squirrel. Birdlife includes shore birds, gulls, and several species of ducks. Waterfowl and shore birds use the ponded deflation basin and sand dune lakes as resting and feeding areas. Endangered species

including Aleutian Canada goose, brown pelican, northern bald eagle, peregrine falcon, and western snowy pluver inhabit the group either as residents or during migration.

Sand dune lakes provide marginal habitat for native cutthroat trout and several warmwater species. These lakes generally are sterile, and fish populations are low.

The potential for improvement of habitat is limited. Seed and grain crops are not suited to this group. Some cover can be provided by establishing European beachgrass in areas of Dune land.

Group 2 (general soil map unit 2).-This group consists of well drained and poorly drained, nearly level to gently sloping soils on dissected marine terraces. The native vegetation is Douglas fir, western hemlock, Sitka spruce, red alder, western redcedar, salal, evergreen huckleberry, Pacific rhododendron, and western swordfern.

These dominantly woodland soils are only moderately productive. Big game species present include black-tailed deer and black bear. The soils are also inhabited by raccoon, bobcat, coyote, skunk, squirrel, mink, weasel, and several kinds of rodents. Birds include band-tailed pigeon, crow, hawk, jay, owl, woodpecker, turkey vulture, and several kinds of songbirds.

Major streams have fair populations of Chinook salmon, coho salmon, chum salmon, steelhead trout, shad, and striped bass. Small lakes in this group have small populations of rainbow trout.

The potential for improvement of habitat by proper management of existing vegetation is fair.

Group 3 (general soil map unit 3).-This group consists of poorly drained and very poorly drained, nearly level soils on flood plains and in tidal areas along the lower reaches of major rivers and coastal streams. The tidal areas are subject to flooding during high tides, and the flood plains at higher elevations are subject to frequent, prolonged periods of flooding in winter. The soils in this group provide important winter habitat for many species of ducks and shore birds. Great blue heron are year-round residents. Other birds common to this group include the kingfisher, grebe, jay, hawk, owl, band-tailed pigeon, blackbird, and swallow. The vegetation on this group provides food for black-tailed deer; however, it provides very little cover since most areas are cleared for pasture. Raccoon, mink, beaver, otter, skunk, coyote, and tree squirrel commonly inhabit this group.

The estuaries are spawning and rearing areas for many kinds of fish, including shad, striped bass, herring, and smelt. Rainbow trout, Chinook salmon, coho salmon, steelhead trout, and cutthroat trout are common in the major rivers.

The potential for improvement of habitat by use of agricultural and herbaceous plantings is good.

Group 4 (general soil map units 4, 5, 6, 7, 8, *and 9).* This group consists of well drained to poorly drained, nearly level to steep soils on uplands and associated bottom lands in the western half of the survey area. The native vegetation is mainly Douglas fir, western hemlock, western redcedar, creambush oceanspray, evergreen huckleberry, Oregongrape, and western swordfern. The soils in this group are used for agriculture, timber production, and homesite development. Many areas of this group have been cleared for pasture, and the edge effect produced provides important habitat for black-tailed deer. A few Roosevelt elk and black bear find suitable habitat in the more remote areas. Small animals present include raccoon, bobcat, coyote, beaver, mink, weasel, otter, martin, squirrel, and many kinds of rodents. The group provides habitat for California quail, band-tailed pigeon, hawk, owl, merganser, kingfisher, jay, crow, raven, turkey vulture, woodpecker, and many kinds of small birds.

Nearly all streams provide important habitat for rainbow trout, brook trout, Chinook salmon, coho salmon, steelhead trout, and cutthroat trout.

The potential for improvement of habitat by use of agricultural and herbaceous plantings and by proper management of existing vegetation is good.

Group 5 (general soil map units 10, 11, 12, and 13).-This group consists of well drained, moderately steep to very steep soils on uplands in the eastern half of the survey area. The native vegetation is mainly Douglas fir, western hemlock, western redcedar, vine maple, red alder, evergreen huckleberry, Oregongrape, and western swordfern. The soils in' this group are used for timber production. The habitat changes in this group rapidly because of logging and fire in areas of old growth timber. Reforestation is fairly rapid in most areas. As the trees grow, the habitat for deer and elk becomes poorer. Areas that have a good balance of old growth timber, young trees, and clearcuts provide excellent habitat for black-tailed deer, Roosevelt elk (fig. 15), and black bear. Small animals present include bobcat, coyote, raccoon, beaver, mink, weasel, martin, squirrel, and many kinds of rodents. Birds include hawk, owl, kingfisher, woodpecker, jay, crow, raven, turkey vulture, band-tailed pigeon, blue and ruffed grouse, mountain quail, and several species of small birds. Old growth timber also provides habitat for the endangered northern spotted owl.

Figure 15.-Timbered upland soils and associated bottom lands provide excellent habitat for Roosevelt elk.

Nearly all streams provide important spawning and rearing habitat for Chinook salmon, coho salmon, steelhead trout, and cutthroat trout. Rainbow trout and brook trout are also common in these streams.

The potential for improvement of habitat by proper management of existing vegetation is very good.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building Site Development, Sanitary Facilities, Construction Materials, and Water Management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use

planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils (2, 3).

The information in the tables, along with the soil maps and soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 8 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a

flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet (2, 3). The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields (28), sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials.

Table 9 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 9 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and poor indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 9 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic

activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill-trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 9 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 10 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place (2). In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated poor have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 10, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for

specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the taxonomic unit descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a *probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 11 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to

bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas (27). Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 12 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 to 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each taxonomic unit under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture (23). These terms are defined according to percentages of sand, sift, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added; for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (2, 21) and the Unified soil classification system (3, 21).

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

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance, In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dryweight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The

sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties of the Soils

Table 13 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each taxonomic unit under "Soil Series and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

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

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

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

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are low, a change of less than 3 percent; moderate, 3 to 6 percent; and *high,* more than 6 percent. *Very high,* more than 9 percent, is sometimes used.

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

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the amount of stable aggregates 0.84 millimeters in size. These are represented idealistically by USDA textural classes. Soils containing rock fragments can occur in any group.

1. Sand, fine sand, and very fine sand. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish on them.

2. Loamy sand, loamy fine sand, and loamy very fine sand. These soils are very highly erodible, Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loam, coarse sandy loam, fine sandy loam, and very fine sandy loam. These soils are highly erodible, Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clay, silty clay, clay loam, and silty clay loam that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loam and sandy clay that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loam. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loam that is less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 13, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Water and Soil Features

Table 14 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sand or gravelly sand. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or

soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay that has high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered to be flooding. Standing water in swamps and marshes or in closed depressional areas is considered to be ponding.

Table 14 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable period of flooding are estimated. Frequency is expressed as *none, rare, occasional,* and *frequent. None* means that flooding is not probable, *rare* that it is unlikely but is possible under unusual weather conditions (chance of flooding in any year is 0 to 5 percent), *occasional* that it occurs infrequently under normal weather conditions (chance of flooding in any year is 5 to 50 percent), and *frequent* that it occurs often under normal weather conditions (chance of flooding in any year is more than 50 percent).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that flooding is most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through May. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic flood. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 14 are the depth to the seasonal high water table; the kind of water table-that is, *perched, artesian,* or *apparent;* and the months of the year that the water table usually is highest. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower water table by a dry zone.

The two numbers in the column "High water table" indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

Table 15 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

A cemented pan is a cemented or indurated subsurface layer at a depth of 5 feet or less. Such a pan causes difficulty in excavation. Pans are classified as thin or thick. A *thin* pan is one that is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A *thick* pan is one that is more than 3

inches thick if continuously indurated or more than 18 inches thick if it is discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as low, *moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as low, *moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (26). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 16 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil--forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent *(Aqu,* meaning water, plus *ent,* from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Psammaquent *(Psamm,* meaning sandy horizons, plus *aquent,* the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Psammaquent.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is mixed, mesic Typic Psammaquent.

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

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (23). Many of the technical terms used in the descriptions are defined in Soil *Taxonomy* (26). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Bandon Series

The Bandon series consists of deep, well drained soils on dissected marine terraces. These soils formed in sandy marine deposits. Slope is 0 to 30 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Bandon sandy loam, 0 to 7 percent slopes, 8 miles northeast of Bandon; 1,300 feet north and 260 feet east of the southwest corner of sec. 22, T. 27 S., R. 14 W.

O-1 inch to 0; decomposed litter of leaves, moss, and needles.

A2-0 to 5 inches; dark grayish brown (10YR 4/2) sandy loam, yellowish brown (10YR 5/4) dry; random dark gray (10YR 4/1) uncoated sand grains, light gray (10YR 6/1) dry; black (10YR 2/1) worm casts, very dark gray (10YR 3/1) dry; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium and coarse roots; many very fine and fine tubular pores; extremely acid; abrupt wavy boundary.

B21ir-5 to 12 inches; dark reddish brown (5YR 3/4) sandy loam, reddish brown (5YR 4/4) dry; dark reddish brown (5YR 3/2) stains, dark reddish brown (5YR 3/4) dry; flecks of black (5YR 2/1) charcoal; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and nonplastic; brittle; common very fine and fine roots; common very fine tubular pores and few very fine irregular pores; strongly acid; clear wavy boundary.

B22ir-12 to 22 inches; dark reddish brown (5YR 3/4) loam, reddish brown (5YR 4/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common very fine and fine tubular pores; about 5 percent nodules and hardpan fragments 2 to 20 millimeters in diameter; strongly acid; gradual wavy boundary.

B23ir-22 to 30 inches; dark reddish brown (5YR 3/4) and reddish brown (5YR 4/4) loam, brown (7.5YR 4/4) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine tubular pores; strongly acid; clear wavy boundary.

B24irm-30 to 43 inches; pale brown (10YR 6/3), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) cemented sandy material; brown (7.5YR 4/4) coatings in pores and fractures; massive; very hard, extremely firm, nonsticky and nonplastic; few very fine roots; few very fine and fine tubular pores; strongly acid; abrupt wavy boundary.

C-43 to 60 inches; yellowish brown (10YR 5/6) loam; massive; slightly hard, very friable, slightly sticky and nonplastic; few very fine and fine tubular pores; strongly acid.

Depth to the cemented Bir horizon is 18 to 36 inches. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 1 or 2 when moist and 1 to 4 when dry.

The upper part of the Bir horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. It has layers that are 0 to 30 percent fine gravel that is 2 to 20 millimeters in diameter. The B24irm horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 6. It is weakly cemented to strongly cemented sandy material.

The C horizon has hue of 7.5YR to 10YR, value of 4 or 5 when moist and 6 to 8 when dry, and chroma of 2 to 6. It is fine sand or loam. It commonly is massive and compacted, but it is single grain and loose and has weakly cemented horizontal layers 5 to 15 millimeters thick in some areas. These layers are strong brown, brown, or light yellowish brown.

Blachly Series

The Blachly series consists of deep, well drained soils on mountains. These soils formed in colluvium derived from sedimentary rock and basalt. Slope is 0 to 60 percent. The average annual precipitation is about 80 inches, and the average annual air temperature is about 51 degrees F.

Typical pedon of Blachly silty clay loam, 0 to 30 percent slopes, south of the Blue Ridge Lookout; 1,000 feet north and 1,500 feet west of the southeast corner of sec. 35, T. 26 S., R. 12 W.

A1-0 to 3 inches; very dusky red (2.5YR 2/2) silty clay loam, dark reddish brown (5YR 3/3) dry; strong fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine and very fine irregular pores; medium acid; abrupt smooth boundary.

A3-3 to 7 inches; dark reddish brown (2.5YR 2/4) light silty clay loam, dark reddish brown (5YR 3/4) dry; strong fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and

slightly plastic; many very fine, fine, and medium roots; many very fine tubular pores; medium acid; abrupt smooth boundary.

B1-7 to 14 inches; dark reddish brown (2.5YR 3/4) silty clay, reddish brown (5YR 4/4) dry; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and medium roots; many fine tubular pores; medium acid; clear smooth boundary.

B21-14 to 27 inches; dark red (2.5YR 3/6) silty clay, yellowish red (5YR 4/6) dry; moderate medium subangular blocky structure parting to strong fine subangular blocky; hard, friable, sticky and plastic; common fine and medium roots and few very fine roots; many very fine tubular pores; strongly acid; gradual smooth boundary.

B22-27 to 39 inches; dark red (2.5YR 3/6) silty clay, yellowish red (5YR 4/6) dry; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; common fine and medium roots and few coarse roots; many very fine tubular pores; 5 percent fine gravel; strongly acid; clear smooth boundary.

B23-39 to 52 inches; yellowish red (5YR 4/6) silty clay, yellowish red (5YR 5/6) dry; moderate medium subangular blocky structure parting to moderate fine subangular blocky; very hard, firm, slightly sticky and plastic; few very fine, fine, medium, and coarse roots; many very fine tubular pores; 5 percent fine gravel; strongly acid; gradual smooth boundary.

B3-52 to 60 inches; yellowish red (5YR 4/6) silty clay loam, yellowish red (5YR 5/8) dry; weak medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; medium acid.

The content of rock fragments ranges from 0 to 20 percent in the upper part of the profile and increases to 20 to 50 percent below a depth of 40 inches.

The A horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 2 or 3 when moist and 3 or 4 when dry, and chroma of 2 to 4 when moist. It has moderate or strong, granular structure or very fine to medium, subangular blocky structure.

The B2 horizon has hue of 5YR or 2.5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 4 to 6 when moist and 4 to 8 when dry. It is silty clay or clay. This horizon has moderate or weak, very fine to medium, subangular blocky structure.

The B3 horizon has hue of 7.5YR or 5YR, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 4 to 8 when moist or dry. It is silty clay loam or clay. This horizon has weak, very fine to medium, subangular blocky structure.

Blacklock Series

The Blacklock series consists of deep, poorly drained soils on marine terraces. These soils formed in sandy deposits. Slope is 0 to 7 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Blacklock fine sandy loam, 3 to 7 percent slopes, on the west side of Seven Devils Road; 260 feet north and 1,750 feet east of the southwest corner of sec. 33, T. 27 S., R. 14 W.

O-1 inch to 0; litter of leaves, twigs, roots, and moss.

A11-0 to 3 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common very fine and fine tubular pores; very strongly acid; abrupt smooth boundary.

A12-3 to 9 inches; very dark gray (10YR 3/1) loamy fine sand, gray (10YR 6/1) dry; massive; hard, friable, nonsticky and nonplastic; many very fine, fine, and medium roots; few very fine and fine tubular pores; very strongly acid; abrupt smooth boundary.

A2-9 to 13 inches; gray (10YR 6/1) loamy fine sand, white (N 8/0) dry; dark grayish brown (10YR 4/2) stains, gray (10YR 6/1) dry; massive; hard, friable, nonsticky and nonplastic; many very fine, fine, and medium roots; few very fine and fine tubular pores; very strongly acid; abrupt wavy boundary.

B21h-13 to 15 inches; black (5YR 2/1) mucky loam, dark reddish gray (5YR 4/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; common very fine and fine tubular pores; very strongly acid; abrupt wavy boundary.

B22irm-15 to 21 inches; strong brown (7.5YR 5/6), strongly cemented sand, yellowish brown (10YR 5/6) dry; massive; extremely hard, extremely firm, nonsticky and nonplastic; very few very fine flattened roots; very few very fine tubular pores; medium acid; clear wavy boundary.

B23irm-21 to 33 inches; yellowish brown (10YR 5/4), strongly cemented sand, yellowish brown (10YR 5/6) dry; reddish brown (5YR 4/4) and dark red (2.5YR 3/6) stains and seams, brown (7.5YR 4/4) and yellowish red (5YR 5/6) dry; massive; extremely

hard, extremely firm, nonsticky and nonplastic; very few very fine roots; very few very fine tubular pores; medium acid; clear wavy boundary.

B3irm -33 to 52 inches; yellowis h brown (10YR 5/6), strongly cemented sand, very pale brown (10YR 7/4) dry; strong brown (7.5YR 5/6) streaks; massive; very hard, very firm, nonsticky and nonplastic; very few very fine roots; very few very fine tubular pores; medium acid; clear wavy boundary.

C-52 to 75 inches; light olive brown (2.5Y 5/6) sand; red (2.5YR 4/6) and brown (7.5YR 4/4) stains; massive; friable, nonsticky and nonplastic; medium acid.

Depth to the ortstein layer and effective rooting depth range from 12 to 20 inches. The solum is medium acid to very strongly acid; acidity commonly decreases as depth increases. The substratum is slightly acid or medium acid. The difference between the. mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A1 horizon has value of 2 or 3 when moist, and it has chroma of 1 or 2 when moist or dry. The A2 horizon has hue of 10YR or neutral, value of 5 to 7 when moist and 6 to 8 when dry, and chroma of 0 to 2. This horizon is loamy fine sand to fine sandy loam and is massive or single grain.

The Bh horizon has hue of 10YR or 5YR, and it has chroma of 1 or 2 when moist or dry. It is loam or fine sandy loam. The Birm horizon has hue of 5YR or 10YR, value of 3 to 5 when moist, and chroma of 4 to 6. Mottles have chroma of 0 to 6. The B22irm and B23irm horizons are loamy sand or sand. Cementation ranges from weak to strong. The B3irm horizon is loamy sand or loamy fine sand and is weakly cemented in some pedons. The ratio of free iron to carbon in the Birm horizon ranges from 0.2 to 2.0.

The C horizon is variegated loamy fine sand, loamy sand, or sand and has lenses cemented with iron or aluminum.

Bohannon Series

The Bohannon series consists of moderately deep, well drained soils on mountains. These soils formed in colluvium derived from arkosic sandstone and siltstone. Slope is 12 to 90 percent. The average annual precipitation is about 80 inches, and the average annual air temperature is about 51 degrees F.

Typical pedon of a Bohannon loam in an area of Preacher-Bohannon loams, 30 to 60 percent slopes, 11 miles east of Lakeside; 3,000 feet south and 200 feet east of the northwest corner of sec. 12, T. 24 S., R. 11 W.

A11-0 to 6 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine irregular pores; very strongly acid; clear smooth boundary.

A12-6 to 11 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and very fine roots; common very fine and fine irregular pores; about 15 percent sandstone gravel and 5 percent sandstone cobbles; very strongly acid; clear wavy boundary.

B2-11 to 17 inches; dark yellowish brown (10YR 3/4) gravelly loam, yellowish brown (10YR 5/4) dry; weak medium and fine subangular blocky structure; slightly Hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; common very fine and fine tubular pores; about 20 percent sandstone gravel and 10 percent sandstone cobbles; very strongly acid; clear smooth boundary

B3-17 to 31 inches; dark yellowish brown (10YR 4/6) gravelly loam, yellowish brown (10YR 5/6) dry; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; very few very fine tubular pores; about 25 percent sandstone gravel an d 10 percent sandstone cobbles; very strongly acid; clear wavy boundary.

IICr-31 inches; brownish yellow (10YR 6/8), fractured, partially weathered sandstone.

The thickness of the solum and depth to fractured, partially weathered bedrock range from 20 to 40 inches The content of rock fragments in the solum ranges from 15 to 35 percent, of which 15 to 25 percent is gravel and 0 to 30 percent is cobbles. The profile is medium acid to very strongly acid.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry. It is gravelly loam or loam. Structure is dominantly moderate, fine or very fine, and granular or subangular blocky. The B2 horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 3 or 4 when moist or dry. It is loam, gravelly loam, or light gravelly clay loam and has 18 to 30 percent clay. Structure is weak or moderate, very fine or fine, and subangular blocky. The B3 horizon has value of 5 or 6 when dry.

Brallier Series

The Brallier series consists of deep, very poorly drained, organic soils on coastal terraces and flood plains along major coastal streams. These soils formed in organic residue of water-tolerant plants. Slope is 0 to 1 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Brallier mucky peat, 100 feet east of Kellogg Road, above the Shutter Arm of Tenmile Lake; 2,890 feet south and 2,950 feet east of the northwest corner of sec. 29, T. 23 S., R. 12 W.

Oe1-0 to 24 inches; dark reddish brown (5YR 3/3) hemic material, broken; about 70 percent fibers, 10 percent rubbed; many fine and very fine roots; very strongly acid.

Oe2-24 to 45 inches; dark reddish brown (5YR 3/3) hemic material, broken; about 40 percent fibers, 15 percent rubbed; few fine and very fine roots; strongly acid; clear smooth boundary.

Oe3-45 to 60 inches; dark yellowish brown (10YR 3/4) hemic material, broken; about 45 percent fibers, 15 percent rubbed; 5 percent coarse fragments; very strongly acid.

These soils are saturated with water throughout the year unless artificially drained. They are affected by the tide and have a fluctuating water table. The thickness of the organic material ranges from 53 inches to more than 10 feet. These soils are strongly acid to extremely acid. The difference between the mean summer and mean winter soil temperatures ranges from 3 to 6 degrees F. Fibers are primarily herbaceous, but fibers from roots, limbs, and logs are scattered throughout the control section in some pedons.

The surface tier has hue of 10YR to 5YR, value of 2 or 3 when moist, and chroma of 1 to 3 when moist. Fiber content ranges from 25 to 75 percent if undisturbed to less than 10 percent if rubbed.

The subsurface tier has hue of 10YR or 5YR. If undisturbed it has value of 3 and chroma of 3 or 4 when moist; if rubbed it has value of 2 or 3 and chroma of 2. Fiber content ranges from 35 to 100 percent if undisturbed and from 15 to 40 percent if rubbed.

The bottom tier has hue of 10YR to 5YR. If undisturbed it has value of 3 or 4 when moist and chroma of 3 or 4; if rubbed it has value of 3 when moist and chroma of 2 to 4. The organic material ranges from hemic to fibric.

Bullards Series

The Bullards series consists of deep, well drained soils on deeply dissected marine terraces. These soils formed in mixed eolian and marine deposits. Slope is 0 to 50 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Bullards sandy loam, 0 to 7 percent slopes, 5 miles north of Bandon on Round Lake Road; 2,950 feet south and 3,900 feet east of the northwest corner of sec. 32, T. 27 S., R. 14 W.

O-3 inches to 0; litter of leaves, twigs, and stems in various stages of decomposition.

A1-0 to 7 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium granular and subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; about 10 percent hard nodules 2 to 5 millimeters in diameter; very strongly acid; abrupt wavy boundary.

B21ir-7 to 16 inches; dark reddish brown (5YR 3/4) gravelly sandy loam, reddish brown (5YR 4/4) dry; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; about 20 percent hard nodules 2 to 10 millimeters in diameter; dark coatings on peds in upper part of horizon; very strongly acid; abrupt irregular boundary.

B22ir-16 to 27 inches; dark brown (7.5YR 3/4) gravelly sandy loam, reddish brown (5YR 4/4) dry; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; about 20 percent nodules 2 to 10 millimeters in diameter; strongly acid; gradual wavy boundary.

B23ir-27 to 41 inches; strong brown (7.5YR 4/6) gravelly sandy loam, strong brown (7.5YR 5/6) dry; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; about 25 percent hard nodules and cemented fragments 2 to 20 millimeters in diameter; strongly acid; gradual wavy boundary.

C-41 to 60 inches; yellowish brown (10YR 5/6) sand, brownish yellow (10YR 6/6) and yellow (10YR 7/6) dry; massive; soft, very friable, nonsticky and nonplastic; medium acid.

The solum is 10 to 35 percent rounded iron nodules

2 to 20 millimeters in diameter. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 when moist and 5 or 6 when dry, and chroma of 1 to 3 when moist or dry. Some pedons have an A2 horizon.

The B horizon has hue of 7.5YR, 5YR, or 10YR, value of 3 to 5 when moist and 4 to 7 when dry, and chroma of 4 to 8. It is loam, gravelly sandy loam, or sandy loam and is less than 18 percent clay.

The C horizon has hue of 5YR to 2.5Y, value of 4 to 6 when moist and 6 or 7 when dry, and chroma of 3 to 8. It is loamy fine sand or sand and has thin, weakly cemented lenses in some pedons.

Chetco Series

The Chetco series consists of deep, very poorly drained soils on flood plains and deltas. These soils formed in alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Chetco silty clay loam, 2 miles south of Coos Bay; 1,000 feet north and 1,950 feet west of the southeast corner of sec. 3, T. 26 S., R. 13 W.

A1-0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and few fine irregular pores; common charcoal flecks 0.5 to 2.0 millimeters in diameter; slightly acid; abrupt smooth boundary.

B2-10 to 24 inches; dark gray (10YR 4/1) silty clay, light gray (10YR 6/1) dry; common fine distinct dark red (2.5YR 3/6) and yellowish brown (10YR 5/6) mottles below a depth of 18 inches; weak coarse prismatic structure; hard, firm, sticky and very plastic; common very fine and fine roots; few very fine, fine, and coarse tubular pores; medium acid; gradual smooth boundary.

C-24 to 60 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; common fine distinct light olive brown (2.5Y 5/4) and yellowish red (5YR 4/6) mottles; massive; hard, firm, very sticky and plastic; very few very fine roots; many very fine and fine tubular pores; slightly acid.

The umbric epipedon is 10 to 24 inches thick. Mottles range from few to many and faint to prominent. The difference between the mean summer and mean winter soil temperatures is 5 to 9 degrees F.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 1 or 2 when moist or dry.

The B horizon has hue of 10YR to 5Y, value of 2 to 4 when moist and 4 or 5 when dry, and chroma of 1 or less when moist or dry. It is silty clay or silty clay loam and is 35 to 50 percent clay.

The C horizon has hue of 10YR to 2.5Y, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 1 or 2. It is clay loam or clay. Thin lenses of sandy material are below a depth of 40 inches in some pedons.

Chismore Series

The Chismore series consists of deep, moderately well drained soils on terraces and fans. These soils formed in alluvium. Slope is 0 to 12 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is 52 degrees F.

Typical pedon of Chismore silt loam, 0 to 3 percent slopes, 0.5 mile southwest of Broadbent; 2,360 feet east and 720 feet south of the northwest corner of sec. 5, T. 30 S., R. 12 W.

A1-0 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 4/3) dry; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine irregular pores; very strongly acid; clear smooth boundary.

B1-14 to 20 inches; dark brown (10YR 3/3) heavy silt loam, pale brown (10YR 6/3) dry; common fine faint dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common fine and medium roots; common fine irregular pores; common black manganese coatings; very strongly acid; clear wavy boundary.

B21t-20 to 27 inches; brown (10YR 5/3) heavy silty clay loam, pale brown (10YR 6/3) dry; common medium distinct dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common very fine and fine tubular pores; common moderately thick clay films on faces of peds; many black manganese coatings; very strongly acid; gradual wavy boundary.

B22t-27 to 39 inches; dark yellowish brown (10YR 4/6)

silty clay loam, yellowish brown (10YR 5/6) dry; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; hard, slightly firm, sticky and plastic; common fine tubular pores and common medium vesicular pores; common moderately thick clay films on faces of peds; very strongly acid; gradual wavy boundary.

B3-39 to 60 inches; yellowish brown (10YR 5/8) silty clay loam, brownish yellow (10YR 6/8) dry; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few fine tubular pores; very strongly acid.

The profile is saturated with water during winter unless artificially drained. The umbric epipedon is 10 to 20 inches thick.

The A horizon has chroma of 2 or 3 when moist or dry. The Bt horizon has value of 3 to 5 when moist and 4 to 6 when dry, and it has chroma of 3 to 6 when moist or dry. Mottles in the horizon have value of 4 or 5 when moist, and they have chroma of 2 to 8. The Bt horizon is silty clay loam or silty clay and is 35 to 45 percent clay.

Clatsop Series

The Clatsop series consists of deep, very poorly drained soils on tidal flats. These soils formed in alluvium. Slope is 0 to 1 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Clatsop mucky peat, 200 feet south of Coalbank Slough, 1,650 feet east and 260 feet north of the southwest corner of sec. 35, T. 25 S., R. 13 W.

O1-0 to 1 inch; undecomposed rush and sedge leaves and root mat. 02-1 to 10 inches; dark brown (10YR 3/3) mucky fibrous peat, broken; abrupt smooth boundary.

A1-10 to 17 inches; very dark grayish brown (2.5Y 3/2) silty clay loam, dark grayish brown (2.5Y 4/2) dry; massive; slightly hard, friable, sticky and plastic; common fine and very fine roots; many very fine tubular pores; neutral; abrupt smooth boundary.

C1g-17 to 40 inches; dark gray (5Y 4/1) silty clay, gray (5Y 5/1) dry; massive; hard, friable, sticky and plastic; few fine roots; few fine tubular pores; neutral; clear wavy boundary.

IIC2g-40 to 60 inches; very dark gray (5Y 3/1) clay, dark gray (5Y 4/1) dry; massive; hard, firm, very sticky and very plastic; few fine tubular pores; neutral.

These soils are usually saturated and may be flooded during high tide unless protected by dikes or levees. Depth to the C horizon is less than 20 inches. Thickness of the surface peat layer ranges from 5 to 15 inches. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3 when moist. It is gleyed and has mottles in some pedons.

The C1g horizon has hue of 1 OYR to 5Y, value of 3 or 4 when moist, and chroma of 1 or less. It is gleyed and has mottles in some pedons. It is silty clay loam or silty clay and is 35 to 45 percent clay. Some pedons have thin lenses of muck, peat, or sand.

The IIC2g horizon has hue of 5Y or neutral, value of 3 or 4 when moist, and chroma of 1 or less. It commonly is silty clay or clay but ranges to silty clay loam and is more than 35 percent clay. Some pedons have thin lenses of fine to medium sand. Buried logs, branches, and fragments of aquatic vegetation are in some pedons.

Coquille Series

The Coquille series consists of deep, very poorly drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 1 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Coquille silt loam, 4 miles east of Coos Bay, south of Coos River Road; 980 feet south and 2,890 feet west of the northeast corner of sec. 32, T. 25 S., R. 12 W.

Ap-0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; many medium prominent yellowish red (5YR 5/6) mottles; moderate fine and medium granular structure; friable, slightly sticky and slightly plastic; many fine roots; many very fine irregular pores; very strongly acid; clear smooth boundary.

A1-8 to 14 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; many medium prominent yellowish red (5YR 5/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; many fine roots; many very fine and fine tubular and irregular pores; very strongly acid; clear smooth boundary.

C1-14 to 20 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; many medium prominent yellowish red (5YR 5/6) mottles; massive; friable, sticky and plastic; few very fine roots; few very fine tubular and irregular pores; very strongly acid; clear smooth boundary.

C2g-20 to 36 inches; olive gray (5Y 4/2) silty clay loam, light olive gray (5Y 6/2) dry; few fine and medium distinct yellowish red (5YR 5/6) mottles; massive; sticky and plastic; very few very fine root remnants; very few very fine tubular pores; oxidation stains mainly around root channels; about 5 percent partially decomposed wood fragments and other organic debris in lower part of horizon; very strongly acid; abrupt smooth boundary.

IIC3g-36 to 60 inches; very dark gray (5Y 3/1) silty clay loam; massive; sticky and plastic; 5 to 10 percent partially decomposed wood fragments scattered throughout; very strongly acid.

Unless diked and drained, these soils have a permanent water table at or near the surface that fluctuates with the tides. Depth to stratified, medium - to fine-textured, dark gray marine sediment ranges from 30 to 40 inches. The control section ranges from 25 to 35 percent clay and has less than 15 percent material that is coarser textured than very fine sand. The soils commonly are very strongly acid, but in some pedons the upper part of the profile ranges to strongly acid and the IIC horizon is extremely acid when dry. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has hue of 2.5Y or 10YR, value of 3 or 4 when moist and 5 or 6 when dry, and chroma of 1 or 2. It has few to many, distinct to prominent mottles.

The C horizon has hue of 10YR to 5Y, value of 3 or 4 when moist and 6 or 7 when dry, and chroma of 2. Chroma of 1 is mainly in the matrix but is below a depth of 30 inches in some pedons. Mottles have hue of 5YR or 7.5YR and are few to many and distinct to prominent. The C horizon is silt loam or silty clay loam. Some pedons have thin lenses of fibrous peat less than 4 inches thick or have thin layers of sand.

The IIC horizon has hue of 2.5Y or 5Y, value of 3 or 4 when moist, and chroma of 0 or 1. It is stratified with coarse- to fine-textured material and thin lenses of peat in some pedons.

Dement Series

The Dement series consists of deep, well drained soils on mountains. These soils formed in residuum and colluvium derived from sedimentary rock. Slope is 2 to 70 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Dement silt loam, 2 to 12 percent slopes, 2 miles northeast of Coquille, on the north side of the Coquille-Fairview Road; 2,000 feet east and 390 feet north of the southwest corner of sec. 30, T. 27 S., R. 12 W.

A1-0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine irregular pores; slightly acid; abrupt smooth boundary.

B21-7 to 23 inches; reddish brown (5YR 4/3) silty clay loam, brown (7.5YR 5/4) dry; moderate medium and fine subangular blocky structure; very hard, firm, sticky and plastic; common very fine, fine, and medium roots; many very fine, fine, and medium tubular pores; common thin reddish brown (5YR 4/4) coatings on peds; very strongly acid; clear smooth boundary.

B22-23 to 36 inches; reddish brown (5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; weak medium subangular blocky structure; very hard, firm, sticky and plastic; common fine and medium roots; common very fine and fine tubular pores; few thin reddish brown (5YR 4/4) coatings on peds; strongly acid; clear smooth boundary.

B3-36 to 45 inches; reddish brown (5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few very fine tubular pores; very few thin reddish brown coatings on peds; strongly acid; clear smooth boundary.

IICr-45 inches; multicolored, partially weathered sedimentary rock; common fine and medium red (2.5YR 5/6) iron stains along fracture planes in upper part.

Depth to partially weathered sedimentary rock ranges from 40 to 60 inches. The lower part of the solum is 0 to 15 percent gravel. Forested areas typically have an O horizon 1 to 4 inches thick.

The A horizon has hue of 5YR to 10YR, and it has chroma of 2 to 4 when moist or dry. It has moderate or strong, fine and medium, and granular structure or very fine or fine and subangular blocky structure.

The B horizon has hue of 5YR or 7.5YR, value of 4

or 5 when moist and 5 or 6 when dry, and chroma of 3 or 4 when moist or dry. The B2 horizon is silty clay loam or silty clay and averages 35 to 45 percent clay. The B3 horizon is silty clay loam or silt loam.

The IICr horizon is siltstone or sandstone in various stages of weathering.

Digger Series

The Digger series consists of moderately deep, well drained soils on mountains. These soils formed in colluvium derived from sedimentary rock. Slope is 12 to 90 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 50 degrees F.

Typical pedon of a Digger gravelly loam in an area of Remote-Digger-Preacher complex, 30 to 50 percent slopes, south of Powers, on the Powers Ranch Road; 2,260 feet west of the northeast corner of sec. 24, T. 31 S., R. 12 W.

O-1 inch to 0; partially decomposed leaves, moss, and litter.
A1-0 to 6 inches; dark brown (10YR 3/3) gravelly loam, pale brown (10YR 6/3) dry; moderate very fine and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine irregular pores; 20 percent small gravel; medium acid; clear wavy boundary.
B21-6 to 9 inches; dark yellowish brown (10YR 3/4) gravelly loam, light brown (7.5YR 6/4) dry; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine and fine roots; many fine and medium irregular pores; 30 percent small gravel; medium acid; clear wavy boundary.
B22-9 to 19 inches; brown (7.5YR 4/4) very gravelly loam, light brown (7.5YR 6/4) dry; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many fine and very fine roots; many fine and medium irregular pores; 45 percent gravel; strongly acid; clear wavy boundary.
B23-19 to 27 inches; brown (7.5YR 4/4) very cobbly loam, light brown (7.5YR 6/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots; many fine irregular pores; 30 percent gravel and 30 percent cobbles; strongly acid; abrupt smooth boundary.
C1-27 to 31 inches; brown (7.5YR 4/4) extremely cobbly loam, light brown (7.5YR 6/4) dry; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many fine irregular pores; 30 percent gravel and 40 percent cobbles; strongly acid; clear wavy boundary.
IICr-31 inches; weathered, fractured sandstone.

Depth to weathered sedimentary rock ranges from 20 to 40 inches. Hue of the solum is 10YR or 7.5YR. The control section averages about 50 percent rock fragments.

The A horizon has value of 5 or 6 when dry and chroma of 2 or 3. Content of rock fragments ranges from 15 to 30 percent. The horizon is slightly acid to strongly acid.

The B horizon has value of 3 or 4 when moist and 4 to 6 when dry, and it has chroma of 3 or 4. It is loam or silt loam and is 18 to 25 percent clay, more than 15 percent material that is coarser textured than very fine sand; and 35 to 60 percent rock fragments. It is strongly acid or very strongly acid.

The IIC horizon, where present, is below a depth of 30 inches.

Eilertsen Series

The Eilertsen series consists of deep, well drained soils on stream terraces. These soils formed in mixed alluvium. Slope is 0 to 7 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees *F.*

Typical pedon of Eilertsen silt loam, 0 to 7 percent slopes, about 0.25 mile northwest of Gaylord, west of the Powers highway; 2,200 feet west and 1,500 feet south of the northeast corner of sec. 22, T. 30 S., R. 12 W.

A1-0 to 11 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate coarse subangular blocky structure parting to moderate medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and very fine tubular pores; strongly acid; clear smooth boundary.
B21t-11 to 23 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common moderately thick clay films in pores; common fine and very fine tubular pores; medium acid; clear wavy boundary.
B22t-23 to 35 inches; brown (10YR 4/3) silt loam, yellowish brown (10YR 5/4) dry; strong coarse

prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common moderately thick clay films on faces of peds and in pores; few fine and very fine roots; common fine and very fine tubular pores; medium acid; clear wavy boundary.

B23t-35 to 59 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common moderately thick clay films in pores; few fine and very fine roots; common fine and very fine tubular pores; medium acid; clear smooth boundary.

IIC-59 to 65 inches; olive brown (2.5Y 4/4) fine sandy loam, light yellowish brown (10YR 6/4) dry; massive; soft, very friable, nonsticky and nonplastic; common fine and very fine tubular pores; medium acid.

The umbric epipedon is 10 to 20 inches thick.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry.

The Bt horizon has value of 4 or 5 when moist and 5 to 7 when dry, and it has chroma of 3 to 6 when moist or dry. Grayish brown or dark brown mottles are below a depth of 40 inches in some pedons. The Bt horizon is silt loam, clay loam, or silty clay loam and is 18 to 35 percent clay and less than 15 percent fine sand or coarser textured material. The horizon has few to common clay films.

The IIC horizon has value of 4 or 5 when moist and 5 or 6 when dry, and it has chroma of 3 or 4 when moist or dry. It is fine sandy loam, loam, or silt loam and is 10 to 20 percent clay.

Etelka Series

The Etelka series consists of deep, moderately well drained soils on mountains. These soils formed in colluvium and residuum derived from sedimentary rock. Slope is 7 to 70 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of an Etelka silt loam in an area of Etelka-Whobrey silt loams, 7 to 30 percent slopes, 4 miles west of Powers; 900 feet north and 2,500 feet west of the southeast corner of sec. 17, T. 31 S., R. 12 W.

A1-0 to 13 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine and fine tubular and irregular pores; about 2 percent gravel; strongly acid; clear wavy boundary.

B1-13 to 24 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) and pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and medium roots; many very fine and fine tubular and irregular pores; about 4 percent gravel; strongly acid; gradual smooth boundary.

B21-24 to 32 inches; olive brown (2.5Y 4/4) silty clay loam, light olive brown (2.5Y 5/4) dry; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; many fine and medium roots; common very fine and fine tubular and irregular pores; about 6 percent gravel; few fine faint mottles below a depth of 28 inches; strongly acid; gradual smooth boundary.

B22-32 to 45 inches; olive brown (2.5Y 4/4) and dark grayish brown (2.5Y 4/2) silty clay, light olive brown (2.5Y 5/4) and light brownish gray (2.5Y 6/2) dry; common fine distinct yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; extremely hard, firm, very sticky and very plastic; common fine and medium roots; common very fine and fine irregular pores; about 8 percent gravel; strongly acid; clear wavy boundary.

B3-45 to 60 inches; olive brown (2.5Y 4/4) and dark grayish brown (2.5Y 4/2) silty clay, light olive brown (2.5Y 5/4) and light brownish gray (2.5Y 6/2) dry; many medium distinct yellowish brown (10YR 5/8), gray (10YR 6/1), and strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; extremely hard, firm, very sticky and very plastic; few very fine and medium roots; few very fine and fine irregular pores; medium acid.

Content of rock fragments in the solum ranges from 0 to 15 percent, of which as much as 5 percent is cobbles.

The A horizon has hue of 2.5Y to 7.5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 1 to 3.

The B horizon has hue of 10YR or 2.5Y, value of 3 to 5 when moist and 5 to 7 when dry, and chroma of 1 to 4. It is silty clay, silty clay loam, or silt loam. Distinct to prominent mottles are below a depth of 24 to 40 inches.

The C horizon, where present, has hue of 10YR or 2.5Y, value of 3 to 7 when moist and 5 to 7 when dry, and chroma of 1 to 4. It is silty clay loam, silty clay, or

clay. Mottles have hue of 7.5YR or 5YR, value of 4 to 7, and chroma of 1 to 8.

Gardiner Series

The Gardiner series consists of deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 75 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Gardiner sandy loam, 2.5 miles east of Gravelford; 1,080 feet north and 1,080 feet east of the southwest corner of sec. 29, T. 28 S., R. 11 W.

Ap-0 to 9 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; many fine and very fine roots and common medium roots; many medium irregular pores; medium acid; clear wavy boundary.

C1-9 to 30 inches; brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; single grain; loose; common fine and very fine roots; common fine and medium irregular pores in upper 10 inches; medium acid; clear wavy boundary.

C2-30 to 60 inches; dark yellowish brown (10YR 4/4) loamy sand, light yellowish brown (10YR 6/4) dry; single grain; loose; few fine and very fine roots; few thin lenses of loam and fine sand; few fine and medium irregular pores; strongly acid.

Thickness of the umbric epipedon is 7 to 10 inches. The profile is strongly acid or medium acid.

The A horizon has value of 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry.

The C horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 3 or 4 when moist or dry. It is loamy fine sand, fine sand, or loamy sand. Some pedons have thin strata of loam or silt loam.

Gauldy Variant

The Gauldy Variant consists of deep, somewhat excessively drained soils on high terraces. These soils formed in alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Gauldy Variant loam, 150 feet north of the South Fork Coquille River; 1,100 feet south and 3,200 feet east of the northwest corner of sec. 34, T. 30 S., R. 12 W.

Ap-0 to 10 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many fine and very fine roots; many fine irregular pores; 10 percent gravel and 5 percent cobbles; medium acid; abrupt smooth boundary.

B2-10 to 17 inches; dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and very fine roots; 10 percent gravel and 5 percent cobbles; medium acid; abrupt wavy boundary.

IIC1-17 to 28 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam, yellowish brown (10YR 5/4) dry; massive; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; 35 percent gravel and 15 percent cobbles; strongly acid; clear wavy boundary.

IIC2-28 to 60 inches; yellowish brown (10YR 5/4) very gravelly loamy coarse sand, light yellowish brown (10YR 6/4) dry; single grain; loose; nonsticky and nonplastic; few fine and very fine roots; 45 percent gravel, 10 percent cobbles, and 10 percent stones; strongly acid.

Thickness of the solum and depth to the IIC horizon range from 15 to 30 inches. The profile typically has hue of 10YR, but it ranges to 7.5YR in some pedons.

The A horizon has value of 3 when moist and 5 when dry, and it has chroma of 2 or 3 when moist or dry. It is 0 to 15 percent gravel.

The B horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 3 or 4 when moist or dry. It is loam or sandy loam and is less than 15 percent clay and more than 15 percent material that is coarser textured than very fine sand. The horizon is 10 to 45 percent gravel and 5 to 15 percent cobbles.

The C horizon is variegated. It is stratified very gravelly sandy loam, very gravelly loamy sand, extremely gravelly loamy coarse sand, and extremely gravelly sand with lenses of finer textured material. It is 30 to 50 percent gravel and 10 to 15 percent cobbles and stones.

Giesel Series

The Giesel series consists of deep, well drained soils on coastal mountains. These soils formed in residuum and colluvium derived from sedimentary rock. Slope is 2 to 50 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Giesel silt loam, 2 to 12 percent slopes, 0.5 mile south of Eastside; 390 feet west and 650 feet south of the northeast corner of sec. 1, T. 26mS., R. 13 W.

A1-0 to 4 inches; dark reddish brown (5YR 2.5/2) silt loam, dark reddish brown (5YR 3/2) dry; strong fine and medium granular structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine, fine, and medium roots; many very fine irregular pores; slightly acid; abrupt smooth boundary.

B1-4 to 10 inches; dark reddish brown (5YR 3/3) silt loam, dark reddish gray (5YR 4/2) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; common very fine irregular pores; medium acid; abrupt smooth boundary.

B21-10 to 30 inches; dark reddish brown (5YR 3/4) silty clay loam, reddish brown (5YR 5/4) dry; moderate medium and coarse subangular blocky structure parting to strong fine granular; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine irregular and tubular pores; medium acid; clear smooth boundary.

B22-30 to 49 inches; dark reddish brown (5YR 3/4) silty clay, reddish brown (5YR 5/4) dry; moderate medium and coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; medium acid; clear smooth boundary.

B3-49 to 54 inches; dark reddish brown (5YR 3/4) silty clay, reddish brown (5YR 5/3) dry; massive; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; strongly acid; clear wavy boundary.

IICr-54 inches; variegated, partially weathered siltstone.

Depth to the paralithic contact ranges from 40 to 60 inches or more. The lower part of the solum is 0 to 15 percent gravel. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F. The umbric epipedon is 7 to 10 inches thick. Organic matter content ranges from 6 to 10 percent. The profile is slightly acid to very strongly acid. Forested areas commonly have an 0 horizon 1 to 4 inches thick.

The A horizon has hue of 5YR to 10YR, value of 2 or 3 when moist and 2 to 4 when dry, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 5YR or 7.5YR, value of 3 to 5 when moist and 4 to 6 when dry, and chroma of 3 or 4 when moist or dry. It is silty clay loam or silty clay and averages 35 to 45 percent clay.

The IICr horizon is variegated siltstone or sandstone in various stages of weathering.

Harrington Series

The Harrington series consists of moderately deep, well drained soils on mountains. These soils formed in colluvium derived from basalt. Slope is 30 to 70 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 51 degrees F.

Typical pedon of Harrington very gravelly loam, 50 to 70 percent slopes, 1.25 miles north of Fairview on the west bank of Bureau of Land Management Road 27-12-14.2; 3,080 feet north and 980 feet east of the southwest corner of sec. 11, T. 27 S., R. 12 W.

A11-0 to 7 inches; dark reddish brown (5YR 3/3) very gravelly loam, reddish brown (5YR 4/4) dry; strong very fine and fine granular structure; soft, very friable, nonsticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine and fine irregular pores and few very fine, fine, and medium tubular pores; about 45 percent gravel and 5 percent cobbles; slightly acid; clear wavy boundary.

A12-7 to 13 inches; dark reddish brown (5YR 3/3) extremely gravelly loam, reddish brown (5YR 4/3) dry; strong very fine and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many very fine, fine, and medium irregular and tubular pores; about 60 percent gravel and 10 percent cobbles; medium acid; abrupt wavy boundary.

B21-13 to 20 inches; dark reddish brown (2.5YR 3/4) very gravelly clay loam, reddish brown (5YR 4/4) dry; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; few very fine and fine irregular pores and common very fine and fine tubular pores; about 35 percent gravel and 15 percent cobbles; medium acid; clear wavy boundary.

B22-20 to 26 inches; dark reddish brown (2.5YR 3/4)

extremely gravelly clay loam, reddish brown (5YR 4/4) dry; moderate medium and coarse subangular blocky structure; slightly hard, very friable, sticky and slightly plastic; many very fine, fine, and medium roots; few very fine irregular pores and common very fine and fine tubular pores; about 45 percent gravel and 20 percent cobbles; medium acid; abrupt wavy boundary.

IIR-26 inches; hard marine basalt with few widely spaced vertical fractures; massive.

Depth to bedrock ranges from 20 to 40 inches. The profile has hue of 5YR or 2.5YR. Content of hard rock fragments ranges from 35 to 80 percent, of which an average of 20 to 35 percent is gravel and 15 to 45 percent is cobbles.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 3 or 4. Gravel content ranges from 35 to 50 percent, and angular cobble content ranges from 0 to 10 percent.

The B horizon has value of 3 or 4 when moist and 4 to 6 when dry, and it has chroma of 4 or 5. It is very gravelly clay loam, extremely gravelly clay loam, very gravelly loam, or very cobbly loam. The horizon averages 25 to 35 percent clay and 50 to 75 percent rock fragments, of which 15 to 45 percent is cobbles and the remaining percentage is gravel.

Heceta Series

The Heceta series consists of deep, poorly drained soils in depressional areas between sand dunes and in deflation basins. These soils formed in eolian material derived from beach sand. Slope is 0 to 3 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Heceta fine sand on the north side of a cranberry bog road; 800 feet south and 3,280 feet west of the northeast corner of sec. 15, T. 24 S., R. 13 W.

A1-0 to 4 inches; very dark grayish brown (10YR 3/2) fine sand, grayish brown (10YR 5/2) dry; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; slightly acid; abrupt smooth boundary.

C-4 to 60 inches; grayish brown (2.5Y 5/2) sand, light gray (10YR 7/2) dry; common fine distinct brown (10YR 4/3) mottles along root channels; single grain; loose, nonsticky and nonplastic; few very fine, fine, and medium roots to a depth of 18 inches; slightly acid.

The profile is slightly acid or medium acid throughout. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F. An O horizon 0.5 to 1.0 inch thick is present in areas that have a dense stand of plants.

The A horizon has value of 2 to 5 when moist and 4 to 6 when dry, and it has chroma of 1 or 2. It is single grain or has weak granular structure.

The C horizon has hue of 2.5Y or 10YR, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 1 to 3. It has none to common, fine, faint to distinct mottles, mainly along root channels. It is single grain or massive. The horizon is sand, fine sand, or loamy sand.

Honeygrove Series

The Honeygrove series consists of deep, well drained soils on mountains. These soils formed in residuum and colluvium derived from sedimentary rock and basalt. Slope is 3 to 50 percent. The average annual precipitation is about 75 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Honeygrove silty clay loam, 30 to 50 percent slopes, on the south side of the Old Coos Bay Wagon Road, northeast of Fairview; 700 feet south and 2,000 feet east of the northwest corner of sec. 15, T. 27 S., R. 12 W.

O-2 inches to 0; litter of decaying leaves, needles, and twigs.

A1-0 to 5 inches; dark reddish brown (5YR 2/2) silty clay loam, dark reddish gray (5YR 4/2) dry; strong fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots and few coarse roots; many very fine and fine irregular pores; about 5 percent soft silt nodules or burnt peds 1 to 3 millimeters in diameter; medium acid; abrupt smooth boundary.

B1-5 to 13 inches; dark reddish brown (5YR 3/4) silty clay loam, reddish brown (5YR 5/4) dry; strong fine subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; common very fine and few coarse tubular pores and common very fine irregular pores; about 5 percent soft silt nodules; medium acid; clear smooth boundary.

B21t-13 to 23 inches; dark reddish brown (2.5YR 3/4) clay, reddish brown (2.5YR 4/4) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and few medium and coarse roots; common very fine and fine tubular pores and few very fine irregular pores;

very few thin clay films on faces of peds; about 1 percent gravel 2 to 4 millimeters in diameter; strongly acid; gradual wavy boundary.

B22t-23 to 37 inches; dark red (2.5YR 3/6) clay, red (2.5YR 4/6) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and coarse roots; common very fine and fine and few coarse tubular pores and few very fine irregular pores; few thin clay films on faces of peds and in pores; about 1 percent gravel 2 to 4 millimeters in diameter; strongly acid; gradual wavy boundary.

B23t-37 to 52 inches; red (2.5YR 4/6) gravelly clay, red (2.5YR 4/6) dry; moderate coarse and medium subangular blocky structure; hard, friable, sticky and plastic; very few fine roots; few very fine and fine irregular and tubular pores; many thin and few moderately thick clay films on faces of peds and in pores; about 30 percent gravel; strongly acid; gradual smooth boundary.

B3t-52 to 62 inches; dark red (2.5YR 3/6) gravelly silty clay, red (2.5YR 4/6) dry; weak coarse subangular blocky structure; hard, firm, sticky and plastic; common thin clay films on faces of peds; about 30 percent sandstone gravel; strongly acid.

Depth to weathered or hard sedimentary bedrock or basalt is more than 40 inches.

The A horizon has hue of 5YR or 7.5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 to 4.

The Bt horizon has hue of 2.5YR or 5YR, value of 3 or 4 when moist and 4 or 5 when dry, and chroma of 4 to 6. It is clay or silty clay. The B2t horizon is 0 to 35 percent rock fragments.

Joeney Series

The Joeney series consists of deep, poorly drained soils on old marine terraces. These soils formed in marine deposits. Slope is 0 to 7 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Joeney very fine sandy loam, 0 to 7 percent slopes, 3 miles south of Charleston; 2,560 feet south and 1,580 feet west of the northeast corner of sec. 22, T. 26 S., R. 14 W.

O-1 inch to 0; loose litter of leaves and needles.

A21-0 to 6 inches; light gray (10YR 6/1) very fine sandy loam, light gray (10YR 7/1) dry; dark gray (1 OYR 4/1) streaks; weak thick platy structure; hard, firm, nonsticky and nonplastic; few medium and coarse roots; common very fine tubular and irregular pores; extremely acid; clear wavy boundary.

A22-6 to 10 inches; gray (10YR 5/1) very fine sandy loam, light gray (10YR 7/1) dry; very dark brown (10YR 2/2) horizontal streaks; massive; hard, firm, nonsticky and nonplastic; common fine, medium, and coarse roots; common very fine tubular and irregular pores; extremely acid; abrupt wavy boundary.

B21h-10 to 12 inches; dark reddish brown (5YR 2.5/2) very fine sandy loam, dark gray (10YR 4/1) dry; massive; hard, firm, nonsticky and nonplastic; few very fine and medium roots; few very fine and fine tubular pores; very strongly acid; abrupt irregular boundary.

B22ir-12 to 17 inches; reddish yellow (7.5YR 6/8) and light gray (2.5Y 7/2) loam, reddish yellow (7.5YR 7/8) dry; moderate medium and thick platy structure; very hard, very firm, slightly sticky and slightly plastic; weakly cemented; few very fine roots; few very fine and fine tubular and irregular pores; few fine dark reddish brown (5YR 3/3) coatings on faces of peds; very strongly acid; clear wavy boundary.

B23irm-17 to 24 inches; brownish yellow (10YR 6/6) and light gray (2.5Y 7/2) silt loam, yellow (10YR 7/6) dry; moderate thin and medium platy structure; extremely hard, very firm, nonsticky and slightly plastic; 1- to 5-millimeter-thick ortstein plate at top of horizon; weakly cemented below plate; few very fine roots; few very fine and fine tubular and irregular pores; common medium distinct reddish brown (2.5YR 4/4) concretions and mottles; strongly acid; gradual wavy boundary.

IIC1-24 to 34 inches; brownish yellow (10YR 6/6) and yellow (2.5Y 7/8) silty clay loam, yellow (10YR 7/6) dry; massive; very hard, very firm, sticky and plastic; few very fine pores; very strongly acid; gradual wavy boundary.

IIC2-34 to 60 inches; light gray (5Y 7/2) silty clay loam, white (5Y 8/2) dry; common medium and coarse distinct brownish yellow (10YR.6/6) mottles; massive; very hard, very firm, sticky and plastic; few very fine tubular pores; extremely acid.

The control section is stratified. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A1 horizon, where present, has hue of 10YR or 7.5YR, value of 2 or 3 when moist, and chroma of 2 or 3. It is as much as 4 inches thick. The A2 horizon has

value of 5 to 7 when moist and 6 to 8 when dry, and it has chroma of 0 to 2. It is fine sandy loam, silt loam, very fine sandy loam, or loam.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 1 or 2. It is loam, fine sandy loam, or sandy loam. The Bir horizon has hue of 5YR to 2.5Y, value of 4 to 6 when moist and 5 to 7 when dry, and chroma of 4 to 8. The ratio of free iron to carbon ranges from 1 to 4. The Bir horizon is massive or has platy structure and is weakly cemented to strongly cemented.

The IIC horizon has hue of 7.5YR to 5Y, value of 4 to 7, and chroma of 2 to 8.

Kirkendall Series

The Kirkendall series consists of deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 75 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Kirkendall silt loam, 250 feet south and 2,000 feet east of the northwest corner of sec. 31, T. 27 S., R. 12 W.

Ap-0 to 7 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate very fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; medium acid; abrupt smooth boundary.

B21-7 to 16 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; medium acid; clear smooth boundary.

B22-16 to 26 inches; brown (10YR 4/3) heavy silt loam, yellowish brown (10YR 5/4) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; medium acid; clear smooth boundary.

B3-26 to 42 inches; brown (10YR 4/3) silt loam; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and slightly plastic; common very fine and fine roots; many very fine tubular pores; few fine faint brown (10YR 5/3) mottles; slightly acid; gradual wavy boundary.

C-42 to 60 inches; brown (10YR 4/3) heavy silt loam; common fine and medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; slightly acid.

Thickness of the umbric epipedon is 10 to 20 inches. Faint mottles are below a depth of 20 inches in some pedons. Thin lenses of sandy loam or silty clay are present in some pedons. The profile is medium acid to slightly acid.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3.

The B horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 3 or 4. It is silt loam or silty clay loam.

The C horizon is silt loam, loam, or silty clay loam.

Langlois Series

The Langlois series consists of deep, very poorly drained soils on flood plains and old tidal flats. These soils formed in alluvium. Slope is 0 to 1 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Langlois silty clay loam, 1,300 feet west of the Coquille River; 400 feet south and 2,160 feet east of the northwest corner of sec. 12, T. 28 S., R. 13 W.

Ap-0 to 10 inches; dark grayish brown (2.5Y 4/2) silty clay loam, light brownish gray (2.5Y 6/2) dry; many fine and medium distinct strong brown (7.5YR 4/6) mottles along root channels; weak medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; many very fine irregular pores; medium acid; clear wavy boundary.

C1g-10 to 22 inches; dark grayish brown (2.5Y 4/2) silty clay, light brownish gray (2.5Y 6/2) dry; many fine and medium distinct strong brown (7.5YR 4/6) mottles; massive; hard, friable, sticky and plastic; few very fine and fine roots; many very fine tubular pores; medium acid; clear smooth boundary.

C2g-22 to 28 inches; dark gray (5Y 4/1) silty clay, light brownish gray (2.5Y 6/2) dry; many fine and medium distinct strong brown (7.5YR 4/6) mottles; massive; hard, firm, sticky and plastic; few very fine and fine roots; common very fine tubular pores; medium acid; clear smooth boundary.

IIC3g-28 to 60 inches; dark gray (5Y 4/1) clay, light brownish gray (2.5Y 6/2) dry; many fine and medium prominent strong brown (7.5YR 4/6) and greenish gray (5G 5/1) mottles; massive; hard, firm,

very sticky and plastic; few fine tubular pores; slightly acid.

Mottles are distinct or prominent. Depth to the IICg horizon ranges from 20 to 36 inches. The 10- to 40-inch control section averages 35 to 50 percent clay. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has hue of 2.5Y or 10YR, value of 3 or 4 when moist and 5 or 6 when dry, and chroma of 1 or 2 when moist or dry. Layers of peat as much as 5 inches thick are in some pedons. The A horizon is medium acid or strongly acid.

The Cg horizon has hue of 10YR to 5Y, value of 4 or 5 when moist, and chroma of 1 or less when moist or dry. It is slightly acid or medium acid. The horizon is silty clay or silty clay loam. Thin layers of peat, pieces of charcoal, or tree limbs and roots are in some pedons.

The IICg horizon has hue of 2.5Y or 5Y, value of 4 or 5 when moist, and chroma of 1 or less. It is clay or silty clay.

McCurdy Series

The McCurdy series consists of deep, moderately well drained soils on high terraces. These soils formed in alluvium. Slope is 3 to 30 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is 52 degrees F.

Typical pedon of McCurdy silt loam, 3 to 15 percent slopes, 1 mile southwest of Gaylord; 2,600 feet south and 600 feet east of the northwest corner of sec. 27, T. 30 S., R. 12 W.

Ap-0 to 7 inches; dark brown (7.5YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine irregular pores; strongly acid; clear wavy boundary.

B1-7 to 12 inches; dark brown (7.5YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine irregular pores; very strongly acid; clear wavy boundary.

B21t-12 to 20 inches; dark yellowish brown (10YR 4/6) silty clay loam, yellowish brown (10YR 5/6) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine and medium irregular and tubular pores; common moderately thick clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.

B22t-20 to 34 inches; yellowish brown (10YR 5/8) silty clay loam, brownish yellow (10YR 6/8) dry; few medium distinct light olive brown (2.5Y 5/4) mottles, pale yellow (2.5Y 7/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; few medium tubular pores; common moderately thick clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.

B3-34 to 48 inches; yellowish brown (10YR 5/8) silty clay loam, yellow (10YR 7/8) dry; many medium prominent light brownish gray (2.5Y 6/2) mottles, light gray (2.5Y 7/2) dry; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; few medium tubular pores; very strongly acid; clear wavy boundary.

C-48 to 60 inches; brownish yellow (10YR 6/8) silty clay loam, yellow (10YR 7/8) dry; many medium prominent light gray (N 6/0) and light brownish gray (2.5Y 6/2) mottles, light gray (N 7/0) dry; massive; very hard, firm, sticky and plastic; very strongly acid.

The profile is strongly acid or very strongly acid. Stratified gravelly material is below a depth of 40 inches in some pedons. The profile is 0 to 15 percent gravel.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 or 4 when moist and 4 or 5 when dry, and chroma of 2 to 4 when moist or dry.

The B1 horizon has hue of 10YR to 5YR, and it has value of 3 or 4 when moist and 4 or 5 when dry. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 6 to 8 when moist or dry. Mottles have hue of 10YR or 2.5Y, value of 5 or 6 when moist and 6 or 7 when dry, and chroma of 3 to 6. The Bt horizon is silty clay loam or silty clay.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6 when moist and 4 to 7 when dry, and chroma of 4 to 8. Mottles have hue of 2.5Y or 10YR, value of 5 to 7, and chroma of 0 to 2. The horizon is silty clay loam, silty clay, or clay.

Meda Series

The Meda series consists of deep, well drained soils on alluvial fans. These soils formed in alluvium. Slope is 3 to 15 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is 52 degrees F.

Typical pedon of Meda loam, 3 to 15 percent slopes,

1.5 miles south of Powers; 1,040 feet north and 520 feet east of the southwest corner of sec. 19, T. 31 S., R. 11 W.

A1-0 to 10 inches; dark brown (10YR 3/3) loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and nonplastic; many fine and very fine roots; common fine tubular pores; 10 percent gravel; strongly acid; clear smooth boundary.

B1-10 to 16 inches; dark yellowish brown (10YR 3/4) gravelly clay loam, yellowish brown (10YR 5/4) dry; weak medium subangular blocky structure; soft, friable, slightly sticky and nonplastic; common very fine roots; many fine tubular pores; 20 percent gravel; strongly acid; clear smooth boundary.

B2-16 to 32 inches; dark yellowish brown (10YR 4/4) gravelly clay loam, yellowish brown (10YR 5/4) dry; weak medium subangular blocky structure; soft, friable, sticky and plastic; few very fine roots; common very fine and few fine tubular pores; 25 percent gravel; strongly acid; clear wavy boundary.

IIC-32 to 60 inches; yellowish brown (10YR 5/4) very gravelly loam, light yellowish brown (10YR 6/4) dry; massive; soft, firm, nonsticky and nonplastic; many fine irregular pores; 45 percent gravel; strongly acid.

The umbric epipedon ranges from 10 to 20 inches in thickness. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry.

The B2 horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 3 or 4 when moist and 2 to 4 when dry.

The IIC horizon is clay loam, loam, or sandy loam and is 15 to 50 percent gravel.

Milbury Series

The Milbury series consists of moderately deep, well drained soils on mountains. These soils formed in colluvium derived from sandstone. Slope is 30 to 80 percent. The average annual precipitation is about 85 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of a Milbury very gravelly sandy loam in an area of Milbury-Bohannon-Umpcoos association, 50 to 80 percent slopes, 2 miles west of Loon Lake; 3,400 feet north and 4,460 feet east of the southwest corner of sec. 9, T. 23 S., R. 10 W.

O-1 inch to 0; undecomposed duff consisting of branches, twigs, leaves, and fir needles.

A1-0 to 10 inches; black (10YR 2/1) very gravelly sandy loam, dark gray (10YR 4/1) dry; weak fine and very fine granular structure; soft, very friable, nonsticky and nonplastic; many medium and fine roots; 50 percent gravel and 5 percent cobbles; strongly acid; clear smooth boundary.

B1-10 to 18 inches; very dark grayish brown (10YR 3/2) very cobbly loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many medium and fine roots and common very fine roots; 25 percent gravel and 20 percent cobbles; strongly acid; clear smooth boundary.

B2-18 to 36 inches; dark brown (10YR 4/3) very cobbly loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; 20 percent gravel and 35 percent cobbles; strongly acid; abrupt wavy boundary.

IIR-36 inches; hard, consolidated sandstone.

Depth to bedrock ranges from 20 to 40 inches. The particle-size control section is 35 to 60 percent rock fragments. The solum is 20 to 45 percent gravel.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 to 3 when moist or dry. The horizon is 0 to 10 percent cobbles.

The B horizon has value of 3 to 5 when moist and 5 or 6 when dry, and it has chroma of 3 or 4 when moist or dry. It is very gravelly loam, very gravelly sandy loam, or very cobbly loam. The horizon is 10 to 35 percent cobbles.

Millicoma Series

The Millicoma series consists of moderately deep, well drained soils on mountains. These soils formed in colluvium derived from sandstone. Slope is 12 to 75 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of a Millicoma gravelly loam in an area of Millicoma-Templeton complex, 50 to 75 percent slopes, 2 miles east of Lakeside, on the north side of the ridge road; 2,400 feet south and 2,160 feet east of the northwest corner of sec. 16, T. 23 S., R. 12 W.

O-3 inches to 0; undecomposed litter of needles, leaves, and twigs.

A11-0 to 7 inches; very dark brown (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) dry;

moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine and fine irregular pores; 15 percent gravel; very strongly acid; clear smooth boundary.

A12-7 to 18 inches; very dark grayish brown (10YR 3/2) gravelly loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; common very fine and fine irregular pores; 25 percent gravel and 5 percent cobbles; strongly acid; abrupt wavy boundary.

B2-18 to 35 inches; dark brown (10YR 4/3) very gravelly loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; few very fine, fine, and medium irregular and tubular pores; about 40 percent gravel and 15 percent cobbles; strongly acid; abrupt wavy boundary.

IICr-35 inches; grayish brown (2.5Y 5/2) and light yellowish brown (2.5Y 6/4) partially weathered sandstone.

The textural control section is 35 to 65 percent rock fragments. It is loam or sandy loam and is less than 18 percent clay. The umbric epipedon is 10 to 20 inches thick. Depth to the paralithic contact is 20 to 40 inches. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry. It is 8 to 15 percent organic matter and 5 to 30 percent rock fragments.

The B2 horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 5 or 6 when dry, and chroma of 2 or 3 when moist. It is very gravelly loam or very gravelly sandy loam.

Nehalem Series

The Nehalem series consists of deep, well drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 55 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Nehalem silt loam, 3.5 miles south of Coquille; 3,080 feet east and 300 feet north of the southwest corner of sec. 24, T. 28 S., R. 13 W.

Ap-0 to 5 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine and very fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine tubular pores; strongly acid; clear smooth boundary.

A1 -5 to 12 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and very fine tubular pores; strongly acid; clear wavy boundary.

B2-12 to 29 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and very fine tubular pores; strongly acid; clear wavy boundary.

C-29 to 60 inches; brown (10YR 4/3) silty clay loam, pale brown (1 OYR 6/3) dry; massive; hard, firm, sticky and plastic; few fine and very fine roots; few fine and very fine tubular pores; strongly acid.

Thickness of the umbric epipedon ranges from 10 to 20 inches. Faint, high-chroma mottles are below a depth of 20 inches in some pedons. The profile is medium acid to very strongly acid. Thin discontinuous lenses of sandy loam and loam are in some pedons. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F. Hue of the profile is 10YR or 7.5YR.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry.

The B2 horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 3 or 4 when moist or dry. It is silt loam or silty clay loam.

The C horizon is silty clay loam, silt loam, or loam.

Nestucca Series

The Nestucca series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Nestucca silt loam, 2.5 miles south of Coquille; 2,430 feet east and 300 feet north of the southwest corner of sec. 13, T. 28 S., R. 13 W.

Ap-0 to 6 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; common medium distinct dark grayish brown (10YR 4/2) and yellowish brown

(10YR 5/8) mottles; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine tubular pores; strongly acid; clear smooth boundary.

A1-6 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; many medium distinct dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine tubular pores; strongly acid; clear wavy boundary.

B2g-14 to 40 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; many medium prominent dark grayish brown (2.5Y 4/2) and strong brown (7.5YR 4/6) mottles; moderate medium and fine subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; common fine and very fine tubular pores; strongly acid; clear wavy boundary.

Cg-40 to 60 inches; olive brown (2.5Y 4/4) silty clay, light olive brown (2.5Y 5/4) dry; many medium prominent dark grayish brown (2.5Y 4/2) and yellowish brown (10YR 5/8) mottles; massive; hard, firm, very sticky and very plastic; few fine and very fine roots; few very fine tubular pores; strongly acid.

These soils have a high water table during winter unless they are artificially drained. The umbric epipedon is 10 to 24 inches thick. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 to 3 when moist or dry.

The B2g horizon has hue of 10YR to 5Y, value of 3 to 5 when moist and 5 to 7 when dry, and chroma of 1 or 2 when moist or dry. It is silt loam or silty clay loam. Thin lenses of coarser textured material are present in some pedons.

Netarts Series

The Netarts series consists of deep, well drained soils on old stabilized sand dunes. These soils formed in eolian deposits. Slopes are 2 to 30 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Netarts loamy fine sand, 2 to 30 percent slopes, at the end of Crocker Street in Coos Bay; 1,200 feet north and 100 feet east of the southwest corner of sec. 16, T. 25 S., R. 13 W.

O-1 inch to 0; dark reddish brown (5YR 2/2) litter of leaves on a partially decomposed root mat.

A2-0 to 4 inches; light brownish gray (10YR 6/2) loamy fine sand, light gray (10YR 7/2) dry; few strong brown (7.5YR 4/6) stains on sand grains, reddish yellow (7.5YR 6/6) dry; massive; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine and common fine tubular and irregular pores; very strongly acid; clear irregular boundary.

B21ir-4 to 13 inches; dark brown (7.5YR 4/4) fine sand, reddish yellow (7.5YR 6/6) dry; brown (10YR 5/3) tongues of A2 material, white (10YR 8/2) dry; massive; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine and common fine tubular and irregular pores; about 10 percent concretions 0.5 to 2.0 centimeters in diameter; strongly acid; clear wavy boundary.

B22ir-13 to 22 inches; yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) fine sand, very pale brown (10YR 8/3) and yellow (10YR 7/6) dry; massive; very friable, nonsticky and nonplastic; common very fine and medium roots; common very fine and fine irregular pores; medium acid; clear wavy boundary.

B3ir-22 to 30 inches; yellowish brown (10YR 5/4, 5/6) fine sand, very pale brown (10YR 7/4) dry; massive; very friable, nonsticky and nonplastic; few very fine and medium roots; common very fine and fine irregular pores; medium acid; clear wavy boundary.

C1-30 to 37 inches; light yellowish brown (10YR 6/4) fine sand, very pale brown (10YR 7/4) dry; single grain; loose; many very fine irregular pores; about 5 percent weakly cemented fine concretions; medium acid; gradual wavy boundary.

C2-37 to 60 inches; pale brown (10YR 6/3) fine sand, very pale brown (10YR 7/3) dry; single grain; loose; many very fine irregular pores; medium acid.

The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A2 horizon commonly has hue of 10YR, but it ranges to 2.5Y. The horizon has value of 4 to 6 when moist and chroma of 1 or 2. It is fine sand or loamy fine sand.

The Bir horizon has hue of 2.5Y to 5YR, value of 3 to 6 when moist and 4 to 8 when dry, and chroma of 2 to

8. The horizon consists of thin to thick strata that are weakly cemented to strongly cemented. It is loamy fine sand to fine sand. The Bir horizon is single grain or massive. The estimated organic matter content is less than 2 percent in the upper 4 inche6s.

The C horizon has value of 4 to 6, when moist and 5 to 7 when dry, and it has chroma of 3 or 4. It is fine sand or loamy fine sand and is stratified in some pedons. Thin, weakly cemented, iron-organic lenses are present in some pedons.

Orford Series

The Orford series consists of deep, well drained soils on mountains. These soils formed in residuum and colluvium derived from arkosic sandstone and siltstone. Slope is 12 to 50 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Orford silty clay loam in an area of Etelka-Rinearson-Orford complex, 30 to 50 percent slopes, 5 miles southwest of Myrtle Point; 1,320 feet west and 790 feet north of the southeast corner of sec. 35, T. 29 S., R. 13 W.

O-1 inch to 0; fir needles, leaves, and twigs.

A1-0 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark brown (10YR 4/3) dry; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots and common medium roots; common fine irregular pores; 5 percent gravel; strongly acid; clear wavy boundary.

B1-11 to 19 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and common medium roots; common fine and medium irregular pores; 5 percent gravel; strongly acid; clear wavy boundary.

B21t-19 to 28 inches; dark brown (10YR 4/3) silty clay, brown (10YR 5/3) dry; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and medium roots; common fine and medium tubular pores; few thin clay films on faces of peds; 2 percent gravel; strongly acid; gradual wavy boundary.

B22t-28 to 42 inches; yellowish brown (10YR 5/4) silty clay, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common medium tubular pores; common thin clay films on faces of peds; strongly acid; gradual wavy boundary.

B23t-42 to 48 inches; yellowish brown (10YR 5/6) silty clay, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; few medium tubular pores; common thin clay films on faces of peds; 10 percent gravel; strongly acid; gradual wavy boundary**.**

B3-48 to 55 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; hard, firm, sticky and slightly plastic; few fine roots; few fine irregular pores; 15 percent gravel; strongly acid; gradual wavy boundary.

C-55 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; massive; hard, firm, sticky and slightly plastic; very strongly acid.

Content of rock fragments ranges from 0 to 15 percent in the upper 60 inches and as much as 60 percent below this depth. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 when moist and 3 to 5 when dry. It is medium acid or strongly acid. Structure is moderate to strong and granular or fine and subangular blocky.

The B1 horizon has color similar to that of the A horizon. The B2t horizon has value of 3 to 5 when moist and 4 to 7 when dry, and it has chroma of 3 to 6 when moist and 3 or 4 when dry. It is clay, silty clay, or silty clay loam and is 35 to 45 percent clay. Thin clay films range from few to common. The B2t horizon is strongly acid or very strongly acid.

The C horizon has value of 4 to 6 when moist and 6 or 7 when dry, and it has chroma of 2 to 4 when moist or dry. It is silt loam, silty clay loam, or silty clay.

Preacher Series

The Preacher series consists of deep, well drained soils on mountains. These soils formed in colluvium and residuum derived from arkosic sandstone. Slope is 3 to 90 percent. The average annual precipitation is about 80 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Preacher loam in an area of Preacher-Bohannon loams, 60 to 90 percent slopes, on the east side of Bureau of Land Management Road 26-9-32.OA; 2,000 feet south and 1,875 feet east of the

northwest corner of sec. 32, T. 26 S., R. 9 W.

O-4 inches to 0; undecomposed needles, leaves, and twigs.

A1-0 to 2 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 4/3) dry; moderate very fine subangular blocky structure parting to moderate very fine granular; soft, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine and very fine tubular and irregular pores; 10 percent pebbles; strongly acid; clear smooth boundary.

A3-2 to 14 inches; dark brown (10YR 3/3) loam, brown (1 OYR 5/3) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and common medium and coarse roots; common fine and very fine tubular and irregular pores; 15 percent gravel; very strongly acid; clear wavy boundary.

B21-14 to 27 inches; dark yellowish brown (10YR 4/4) clay loam, yellowish brown (10YR 5/4) dry; moderate medium and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine and very fine tubular and irregular pores; 10 percent gravel and 5 percent cobbles; very strongly acid; gradual smooth boundary.

B22-27 to 48 inches; dark yellowish brown (10YR 4/4) clay loam, yellowish brown (10YR 5/4) dry; moderate medium and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and common medium roots; few fine and very fine tubular and irregular pores; 15 percent gravel; very strongly acid; gradual smooth boundary.

C-48 to 60 inches; yellowish brown (10YR 5/4) clay loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine and very fine tubular and irregular pores; 30 percent soft weathered gravel and 10 percent soft weathered cobbles; very strongly acid.

Depth to bedrock is 40 to 60 inches or more. The profile has hue of 10YR or 7.5YR. Content of rock fragments is 5 to 20 percent, of which 5 to 10 percent is soft weathered gravel and 0 to 15 percent is soft weathered cobbles. The umbric epipedon is 10 to 20 inches thick.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist and 2 to 4 when dry.

The B horizon has value of 3 or 4 when moist and 4 or 5 when dry, and it has chroma of 3 or 4. It is clay loam, but it ranges to loam in the lower part of some pedons.

The C horizon is clay loam, loam, or sandy loam and is 10 to 80 percent soft weathered rock fragments.

Pyburn Series

The Pyburn series consists of deep, poorly drained soils on high terraces. These soils formed in mixed alluvium. Slope is 0 to 8 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is 51 degrees F.

Typical pedon of Pyburn silty clay, 0 to 8 percent slopes, 0.5 mile south of Powers; 3,670 feet north and 300 feet east of the southwest corner of sec. 19, T. 31 S., R. 11 W.

Ap-0 to 7 inches; black (10YR 2/1) silty clay, dark brown (10YR 3/3) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine roots and common medium roots; few fine irregular pores; strongly acid; clear smooth boundary.

B1-7 to 14 inches; black (N 2/0) clay, very dark grayish brown (10YR 3/2) dry; few medium distinct dark brown (7.5YR 3/2) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common fine and medium roots; common fine irregular pores; strongly acid; gradual wavy boundary.

B2t-14 to 28 inches; dark gray (N 4/0) clay, very dark grayish brown (10YR 3/2) dry; many fine distinct dark brown (10YR 3/3) and dark yellowish brown (10YR 4/6) mottles; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and very plastic; common fine and medium roots; few fine irregular pores; common moderately thick clay films on faces of peds; common slickensides; medium acid; clear wavy boundary.

B3-28 to 38 inches; dark brown (10YR 4/3) silty clay, olive brown (2.5Y 4/4) dry; many fine and medium distinct strong brown (7.5YR 4/6) and reddish yellow (7.5YR 6/6) mottles; moderate medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots; common fine tubular pores; few slickensides; medium acid; clear wavy boundary.

C-38 to 60 inches; grayish brown (10YR 5/2) clay loam, light brownish gray (2.5Y 6/2) dry; many fine and medium prominent dark gray (10YR 4/1), strong brown (7.5YR 5/6), and yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very hard, friable, sticky and plastic; few very fine roots; few fine tubular pores; medium acid.

These soils are saturated most of the year unless artificially drained. They are medium acid to very strongly acid. Hue is 10YR to 2.5Y.

The A horizon has value of 2 to 5 when moist and 3 to 6 when dry, and it has chroma of 1 or 2 when moist and 2 or 3 when dry.

The Bt horizon has value of 3 to 5 when moist or dry, and it has chroma of 0 to 2 when moist and 2 to 4 when dry. Mottles that have hue of 10YR or 7.5YR range from common to many and distinct to prominent. The Bt horizon is clay or silty clay. The 61 and B3 horizons, where present, are silty clay loam to clay.

The C horizon has value of 5 to 7 when dry, and it has chroma of 0 to 3 when moist or dry. It is clay loam, silty clay, or clay. Thin lenses of sand and gravel are in the lower part of the B and C horizons in some pedons.

Quosatana Series

The Quosatana series consists of deep, poorly drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Quosatana silt loam, 2 miles southwest of Myrtle Point; 950 feet east and 20 feet south of the northwest corner of sec. 20, T. 29 S., R. 12 W.

Ap-0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; common fine distinct gray (10YR 6/1) and strong brown (7.5YR 5/6) mottles; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine tubular pores; medium acid; clear smooth boundary.

A1-9 to 13 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; many medium distinct gray (10YR 6/1) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; medium acid; clear wavy boundary.

B21g-13 to 22 inches; dark grayish brown (10YR 4/2) silt loam; many coarse distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine tubular pores; medium acid; clear wavy boundary.

B22g-22 to 34 inches; dark gray (10YR 4/1) silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; very few very fine roots; medium acid; clear wavy boundary.

B3g-34 to 48 inches; dark gray (10YR 4/1) silty clay loam, common medium prominent reddish brown (5YR 4/4) and gray (5Y 5/1) mottles; weak medium subangular blocky structure; slightly hard, firm, sticky and plastic; medium acid; clear wavy boundary.

Cg-48 to 60 inches; gray (10YR 5/1) and yellowish red (5YR 5/6), stratified silty clay loam, clay loam, and loam; medium acid.

The umbric epipedon is 10 to 24 inches thick. The profile is medium acid or slightly acid.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 to 3 when moist or dry.

The B horizon has hue of 10YR to 5Y, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 1 or 2 when moist or dry. Chroma of 1 is below a depth of 30 inches when the soil is moist. The horizon is silt loam or silty clay loam. Thin lenses of coarser textured material are present in some pedons.

The C horizon is stratified silty clay, clay loam, loam, or silty clay loam.

Remote Series

The Remote series consists of deep, well drained soils on mountains. These soils formed in colluvium derived from sandstone. Slope is 12 to 75 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 51 degrees F.

Typical pedon of Remote loam in an area of Etelka-Whobrey-Remote complex, 30 to 60 percent slopes, 4 miles south of Myrtle Point, on Catching Creek Road; 2,360 feet south and 1,700 feet west of the northeast corner of sec. 15, T. 30 S., R. 13 W.

A1-0 to 5 inches; very dark grayish brown (10YR 3/2)

loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; many very fine irregular pores; 10 percent angular sandstone gravel; slightly acid; abrupt smooth boundary.

B21-5 to 14 inches; brown (7.5YR 4/4) gravelly clay loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common very fine, fine, and medium roots and few coarse and very coarse roots; many very fine tubular pores; 20 percent sandstone gravel; very strongly acid; abrupt smooth boundary.

B22-14 to 22 inches; dark yellowish brown (10YR 4/4) very gravelly clay loam, very pale brown (10YR 7/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common fine, medium, coarse, and very coarse roots; many fine tubular pores; 35 percent sandstone gravel; very strongly acid; clear wavy boundary.

B23-22 to 45 inches; yellowish brown (10YR 5/4) very gravelly clay loam, light brown (7.5YR 6/4) dry; moderate fine and medium subangular blocky structure; common fine, medium, and coarse roots; common fine and medium tubular pores; 60 percent sandstone gravel; strongly acid; clear wavy boundary.

C1-45 to 68 inches; yellowish brown (10YR 5/4) extremely gravelly loam, light brown (7.5YR 6/4) dry; massive; few medium and coarse roots; common fine and medium tubular pores; 70 percent sandstone gravel; very strongly acid; abrupt wavy boundary.

IICr-68 inches; highly fractured sandstone.

The solum is 15 to 80 percent rock fragments, of which 10 to 60 percent is gravel and 5 to 20 percent is cobbles.

The A horizon has value of 3 or 4 when moist and 6 or 7 when dry. It is slightly acid to strongly acid.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 3 or 4. It is dominantly very gravelly clay loam, but it ranges to gravelly clay loam or gravelly loam in the upper part. The horizon is 22 to 33 percent clay.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist or dry.

Rinearson Series

The Rinearson series consists of deep, well drained soils on mountains. These soils formed in residuum and colluvium derived from sedimentary rock. Slope is 0 to 70 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Rinearson silt loam, 30 to 50 percent slopes, 3 miles southwest of Coquille, 2,400 feet south and 2,400 feet west of the northeast corner of sec. 15, T. 28 S., R. 13 W.

A-0 to 6 inches; dark reddish brown (5YR 3/2) silt loam, dark reddish gray (5YR 4/2) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; few fine and medium irregular pores; very strongly acid; clear wavy boundary.

B1-6 to 18 inches; dark reddish brown (5YR 3/3) silt loam, reddish brown (5YR 5/3) dry; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few fine and medium irregular pores; very strongly acid; clear wavy boundary.

B2-18 to 33 inches; reddish brown (5YR 4/4) silty clay loam, reddish brown (5YR 5/4) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common medium roots; few medium tubular pores; very strongly acid; clear wavy boundary.

B3-33 to 42 inches; dark reddish brown (5YR 3/4) silty clay loam, reddish brown (5YR 4/4) dry; weak medium and coarse subangular blocky structure; hard, friable, sticky and plastic; few medium roots; few medium tubular pores; very strongly acid; clear wavy boundary.

IICr-42 inches; weathered sandstone.

Depth to paralithic contact is 40 to 60 inches, The control section is silty clay loam, heavy silt loam, or light silty clay and is 25 to 35 percent clay. Reaction is very strongly acid or strongly acid. The umbric epipedon is 10 to 20 inches thick.

The A horizon has hue of 7.5YR or 5YR when moist, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 7.5YR or 5YR, value of 3 to 5 when moist and 4 to 6 when dry, and chroma of 3 to 6 when moist and 3 to 8 when dry. Content of highly

weathered sandstone and siltstone gravel ranges from 0 to 20 percent.

Salander Series

The Salander series consists of deep, well drained soils on mountains. These soils formed in colluvium derived from sedimentary rock. Slope is 2 to 75 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Salander silt loam, 2 to 30 percent slopes, 2 miles east of Lakeside; 3,000 feet south and 720 feet east of the northwest corner of sec. 16, T. 23 S., R. 12 W.

A11-0 to 7 inches; dark reddish brown (5YR 3/2) silt loam, dark reddish gray (5YR 4/2) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; many very fine and fine irregular pores; very strongly acid; clear smooth boundary.

A12-7 to 15 inches; dark reddish brown (5YR 3/2) silt loam, dark reddish gray (5YR 4/2) dry; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; many very fine and fine irregular pores; very strongly acid; clear wavy boundary.

A3-15 to 26 inches; dark reddish brown (5YR 3/3) silt loam, reddish brown (5YR 4/3) dry; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; many very fine and fine irregular pores and few coarse tubular pores; strongly acid; clear wavy boundary.

B21-26 to 40 inches; dark reddish brown (5YR 3/3) silt loam, reddish brown (5YR 4/3) dry; moderate very fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; many very fine and fine irregular and tubular pores and few coarse tubular pores; strongly acid; clear wavy boundary.

B22-40 to 55 inches; dark reddish brown (5YR 3/4) silty clay loam, reddish brown (5YR 5/4) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular and irregular pores; very strongly acid; gradual smooth boundary.

B3-55 to 65 inches; reddish brown (5YR 4/4) silty clay loam, reddish brown (5YR 5/4) dry; weak fine subangular blocky structure; hard, friable, slightly sticky and plastic; few fine and medium roots; many very fine tubular and irregular pores; very strongly acid.

The profile is silt loam or silty clay loam. The solum is 0 to 20 percent weathered sandstone gravel in the lower part. The umbric epipedon is more than 20 inches thick. The profile is slightly smeary in the upper 20 to 36 inches. The profile has hue of 5YR to 7.5YR. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3.

The B horizon has value of 3 or 4 when moist and 4 or 5 when dry, and it has chroma of 3 or 4. It has weak or moderate and subangular blocky structure.

A C horizon is below a depth of 40 inches in some pedons.

Serpentano Series

The Serpentano series consists of deep, well drained soils on mountains. These soils formed in colluvium and residuum derived from serpentinite and peridotite. Slope is 10 to 70 percent. The average annual precipitation is about 95 inches, and the average annual air temperature is about 50 degrees F.

Typical pedon of Serpentano very stony loam, 35 to 70 percent slopes, on Forest Service Road 3260, about 0.1 mile north of the intersection with Road 3260A; 4,600 feet north and 260 feet west of the southeast corner of sec. 3, T. 32 S., R. 12 W.

O-3 inches to 0; partially decomposed needles and leaves.

A-0 to 5 inches; dark brown (7.5YR 3/4) very stony loam, brown (7.5YR 5/4) dry; moderate fine subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine and fine roots; few fine tubular pores and common fine irregular pores; 20 percent peridotite gravel and 10 percent cobbles; 10 percent of surface covered with stones; slightly acid; clear wavy boundary.

B21-5 to 8 inches; dark brown (7.5YR 4/4) gravelly loam, brown (7.5YR 5/4) dry; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; few

fine tubular pores; 20 percent peridotite gravel and 10 percent cobbles; neutral; clear wavy boundary.

B22-8 to 18 inches; dark brown (7.5YR 4/4) very cobbly loam, brown (7.5YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common medium and few coarse roots; few very fine and fine tubular pores; 25 percent gravel and 15 percent cobbles; neutral; gradual wavy boundary.

C1-18 to 24 inches; dark yellowish brown (10YR 4/4) very gravelly loam, brown (7.5YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few very fine and fine tubular pores; 45 percent gravel and 15 percent cobbles; neutral; clear wavy boundary.

C2-24 to 46 inches; dark yellowish brown (10YR 4/4) extremely gravelly loam, 60 percent brown (7.5YR 5/4) and 40 percent light brownish gray (2.5Y 6/2) dry; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine irregular pores; 55 percent gravel and 20 percent cobbles; neutral; abrupt wavy boundary.

Cr-46 inches; partially weathered serpentinitic bedrock.

Depth to bedrock is 40 to 60 inches or more. Content of rock fragments is 25 to 75 percent, of which 15 to 65 percent is gravel and 10 to 60 percent is cobbles. The solum is slightly acid or neutral.

An O horizon as much as 3 inches thick is in most pedons. As much as 55 percent of the surface is covered with peridotite stones, cobbles, and gravel.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 to 4 when moist and 3 or 4 when dry.

The B2 horizon has chroma of 4 to 6 when dry. It is gravelly, very gravelly, or very cobbly loam or clay loam and is 22 to 32 percent clay.

The C horizon has hue of 10YR to 2.5Y, value of 5 or 6 when dry, and chroma of 2 to 6 when dry. It is very gravelly, extremely gravelly, very cobbly, or extremely cobbly and is 22 to 32 percent clay.

Templeton Series

The Templeton series consists of deep, well drained soils on mountains. These soils formed in colluvium and residuum derived from sedimentary rock. Slope is 0 to 75 percent. The average annual precipitation is about 65 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Templeton silt loam in an area of Millicoma-Templeton complex, 50 to 75 percent slopes, 2 miles east of Lakeside; 2,200 feet east and 3,480 feet south of the northwest corner of sec. 16, T. 23 S., R. 12 W

A11-0 to 6 inches; very dark brown (7.5YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; weakly smeary; many very fine roots and few fine and medium roots; many very fine and few fine and medium irregular pores; about 15 percent partially weathered gravel 2 to 15 millimeters in diameter; strongly acid; clear smooth boundary.

A12-6 to 16 inches; dark brown (7.5YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; many very fine roots and few fine and medium roots; many very fine and few fine and medium irregular pores; about 10 percent partially weathered gravel 2 to 10 millimeters in diameter; strongly acid; clear wavy boundary.

B21-16 to 23 inches; reddish brown (5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine irregular pores and common very fine and fine tubular pores; about 10 percent gravel 2 to 10 millimeters in diameter; very strongly acid; clear wavy boundary.

B22-23 to 30 inches; yellowish red (5YR 5/6) silty clay loam, light brown (7.5YR 6/4) dry; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular and irregular pores; about 10 percent gravel 2 to 10 millimeters in diameter; very strongly acid; clear wavy boundary.

B3-30 to 42 inches; strong brown (7.5YR 5/6, 5/8) silty clay loam, light brown (7.5YR 6/4) dry; weak medium subangular blocky structure; hard, firm, sticky and plastic; few very fine, medium, and coarse roots; few very fine irregular pores and few fine and medium tubular pores; about 15 percent gravel 2 to 15 millimeters in diameter; very strongly acid; clear wavy boundary.

IICr-42 inches; multicolored (5YR to 10YR), partially weathered, fractured siltstone; few very fine and fine roots in fractures.

An O horizon 1 to 3 inches thick is in forested areas. The solum is as much as 5 to 15 percent partially weathered gravel. The profile is 40 to 60 inches deep or more to weathered siltstone and sandstone. The 10- to 40-inch control section is silty clay loam, heavy silt loam, or light silty clay and is 25 to 35 percent clay. Reaction is very strongly acid or strongly acid. The umbric epipedon is 10 to 18 inches thick. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 7.5YR or 5YR, value of 5 or 6 when dry, and chroma of 3 to 8 when moist and 3 to 6 when dry. It has weak or moderate and subangular blocky structure.

The IICr horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 4 to 8.

Umpcoos Series

The Umpcoos series consists of shallow, well drained soils on mountains. These soils formed in colluvium derived from sandstone. Slope is 50 to 99 percent. The average annual precipitation is about 80 inches, and the average annual air temperature is about 50 degrees F.

Typical pedon of Umpcoos very gravelly sandy loam in an area of Umpcoos-Rock outcrop association, 70 to 99 percent slopes, 8 miles east of Fairview, on the north side of the Burnt Ridge Access Road; 1,900 feet south and 1,000 feet west of the northeast corner of sec. 17, T. 27 S., R. 10 W.

O-2 inches to 0; litter of leaves, twigs, roots, and partially decomposed material.

A1-0 to 3 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and irregular pores; 50 percent gravel; medium acid; clear smooth boundary.

B-3 to 16 inches; brown (10YR 4/3) very gravelly sandy loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and irregular pores; 40 percent gravel and 20 percent cobbles; medium acid; abrupt wavy boundary.

IIR-16 inches; consolidated sandstone of the Tyee Formation.

Depth to bedrock and thickness of the solum range from 10 to 20 inches. Content of rock fragments ranges from 35 to 75 percent, of which 35 to 50 percent is gravel and 0 to 25 percent is cobbles.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 when moist and 5 or 6 when dry, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 2 or 3 when moist or dry. It is very gravelly sandy loam, very gravelly loam, or very cobbly loam and is less than 18 percent clay.

The IIR horizon is hard or slightly weathered sandstone or siltstone.

Waldport Series

The Waldport series consists of deep, excessively drained soils on stabilized sand dunes. These soils formed in eolian deposits. Slope is 0 to 70 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Waldport fine sand, 0 to 30 percent slopes, 50 feet west of North Bank Road, north of Bandon; 330 feet south and 1,180 feet east of the northwest corner of sec. 17, T. 28 S., R. 14 W.

A1-0 to 7 inches; very dark grayish brown (10YR 3/2) fine sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; medium acid; abrupt smooth boundary.

AC-7 to 10 inches; brown (7.5YR 4/4) fine sand, yellowish brown (10YR 5/4) dry; single grain; loose, nonsticky and nonplastic; common very fine and fine roots and few medium and coarse roots; many very fine irregular pores; medium acid; clear smooth boundary.

C-10 to 60 inches; dark yellowish brown (10YR 4/4) fine sand, pale brown (10YR 6/3) dry; single grain; loose, nonsticky and nonplastic; common medium and coarse roots; many very fine irregular pores; medium acid.

Thickness of the solum ranges from 6 to 17 inches. The profile is fine sand or loamy fine sand. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has hue of 10YR or 2.5Y, value of 2 to

4 when moist and 5 or 6 when dry, and chroma of 1 or 2 when moist or dry.

The AC horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 3 to 5 when moist and 4 to 6 when dry, and chroma of 2 to 4 when moist or dry.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5 when moist and 5 to 7 when dry, and chroma of 1 to 4 when moist or dry. It is strongly acid to slightly acid.

Whobrey Series

The Whobrey series consists of deep, somewhat poorly drained soils on mountains. These soils formed in colluvium and residuum derived from sedimentary rock. Slope is 7 to 60 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Whobrey silt loam in a unit of Etelka-Whobrey silt loams, 7 to 30 percent slopes, 3 miles east of Broadbent; 500 feet north and 2,160 feet east of the southwest corner of sec. 35, T. 29 S., R. 12 W.

O-1 inch to 0; litter of undecomposed fern leaves, twigs, needles, and grass.

A11-0 to 2 inches; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and irregular pores; medium acid; clear wavy boundary.

A12-2 to 11 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; common very fine and fine tubular and irregular pores; medium acid; gradual wavy boundary.

B2-11 to 20 inches; dark yellowish brown (10YR 4/4) silt loam, pale brown (10YR 6/3) dry; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine tubular and irregular pores; medium acid; clear wavy boundary.

IIC1-20 to 26 inches; very dark gray (5Y 3/1) clay, gray (5Y 5/1) dry; few fine distinct dark yellowish brown (10YR 4/6) and brown (7.5YR 5/4) mottles; moderate coarse and very coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; slickensides; few very fine and fine flattened roots; few very fine irregular pores; about 1 percent gravel; neutral; gradual wavy boundary.

IIC2-26 to 60 inches; very dark gray (5Y 3/1) clay, gray (5Y 5/1) dry; massive; extremely hard, very firm, very sticky and very plastic; slickensides; few very fine flattened roots; few very fine irregular pores; 2 to 5 percent gravel; moderately alkaline.

Estimated base saturation is more than 60 percent between depths of 10 and 30 inches.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 or 4 when moist and 5 or 6 when dry, and chroma of 2 to 4 when moist or dry.

The B horizon has value of 4 or 5 when moist and 5 to 7 when dry, and it has chroma of 3 or 4. Low- and high-chroma mottles range from none to many, fine to medium, and faint to prominent. The horizon is silt loam or silty clay loam and is 20 to 30 percent clay.

The IIC horizon has hue of 5Y or 2.5Y, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 0 to 2. It has few to common slickensides. The horizon is clay or silty clay and is 0 to 15 percent gravel and 50 to 65 percent clay.

Willanch Series

The Willanch series consists of deep, poorly drained soils in depressional areas on flood plains. These soils formed in alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 70 inches, and the average annual air temperature is about 52 degrees F.

Typical pedon of Willanch fine sandy loam, 2 miles east of North Tenmile Lake, along Big Creek; 1,600 feet north and 950 feet east of the southwest corner of sec. 1, T. 23 S., R. 12 W.

Ap-0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine irregular pores; slightly acid; clear smooth boundary.

AC-8 to 13 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure and moderate fine granular; slightly hard, very friable, slightly sticky

and nonplastic; few fine and very fine roots; many fine irregular pores; medium acid; clear smooth boundary.

C1-13 to 35 inches; dark grayish brown (2.5Y 4/2) sandy loam, light brownish gray (2.5Y 6/2) dry; many medium distinct yellowish brown (10YR 5/4) mottles; massive; soft, very friable, slightly sticky and nonplastic; few fine roots; many fine tubular pores; layer of brown (10YR 5/3) fine sand 1 inch thick; 10 percent fine gravel; medium acid; gradual smooth boundary.

C2-35 to 40 inches; dark grayish brown (10YR 4/2) loamy fine sand; many medium distinct yellowish brown (10YR 5/4) mottles; massive; very friable, nonsticky and nonplastic; many very fine tubular pores; layer of dark grayish brown (2.5Y 4/2) silt loam 1 inch thick; medium acid; gradual smooth boundary.

C3g-40 to 60 inches; dark grayish brown (2.5Y 4/2) and dark gray (N 4/0) loamy sand; many medium distinct yellowish brown (10YR 5/4) mottles; massive; very friable, nonsticky and nonplastic; many very fine tubular pores; discontinuous strata of sand and silt loam; 10 percent fine gravel; medium acid.

Unless drained, these soils are saturated during winter and have a seasonal high water table during stormy periods. The profile is more than 60 inches deep, but rooting depth may be limited by the seasonal high water table. The umbric epipedon is 10 to 24 inches thick. The profile is sandy loam or fine sandy loam and is 0 to 10 percent gravel. Mottles that range from faint to prominent and have value of 5 and chroma of 4 to 6 when moist are throughout the profile. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry.

The C horizon has hue of 2.5Y to 10YR, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 1 or 2 when moist or dry. It is sandy loam, loamy fine sand, or loamy sand. The coarser textured material is at a greater depth. Thin strata of finer textured material are below a depth of 35 inches in some pedons.

Wintley Series

The Wintley series consists of deep, well drained soils on high terraces. These soils formed in alluvium. Slope is 0 to 30 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is 52 degrees F.

Typical pedon of Wintley silt loam, 15 to 30 percent slopes, 0.5 mile southwest of Myrtle Point; 600 feet north and 100 feet west of the southeast corner of sec. 18, T. 29 S., R. 12 W.

O-1 inch to 0; undecomposed leaves, needles, and twigs.

A1-0 to 4 inches; dark brown (7.5YR 3/4) silt loam, brown (7.5YR 5/4) dry; moderate very fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine irregular pores; very strongly acid; clear wavy boundary.

B1-4 to 16 inches; dark brown (7.5YR 4/4) silty clay loam, light brown (7.5YR 6/4) dry; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; common fine irregular pores; 5 percent gravel; very strongly acid; clear wavy boundary.

B2t-16 to 31 inches; strong brown (7.5YR 4/6) silty clay, reddish yellow (7.5YR 6/6) dry; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and common medium and coarse roots; common fine irregular pores and few medium tubular pores; common moderately thick clay films on faces of peds and in pores; 10 percent gravel; very strongly acid; clear wavy boundary.

B3t-31 to 47 inches; strong brown (7.5YR 4/6) silty clay loam, reddish yellow (7.5YR 6/6) dry; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; many medium irregular and tubular pores; common moderately thick clay films on faces of peds; 15 percent gravel; very strongly acid; clear smooth boundary.

IIC-47 to 60 inches; dark yellowish brown (10YR 4/6) very gravelly loam, brownish yellow (10YR 6/6) dry; massive; very friable, nonsticky and nonplastic; few fine irregular pores; 50 percent gravel; very strongly acid.

Depth to the IIC horizon is 40 inches or more. The solum is 0 to 15 percent gravel. The profile is strongly acid or very strongly acid.

The A horizon has hue of 10YR to 5YR, value of 4 or 5 when dry, and chroma of 3 or 4 when moist or dry.

The B1 horizon has hue of 7.5YR or 5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 4 to 6 when moist or dry. The B2t horizon has hue of

7.5YR or 5YR, value of 4 or 5 when moist and 4 to 6 when dry, and chroma of 4 to 6 when moist or dry. It is silty clay or clay and is 45 to 60 percent clay. The Bat horizon has hue of 5YR to 10YR, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 6 to 8 when moist or dry. It is silty clay loam, clay loam, loam, or heavy silt loam.

The IIC horizon has hue of 10YR to 5YR. It is stratified in some pedons and commonly is gravelly or very gravelly. Faint mottles are present in some pedons.

Yaquina Series

The Yaquina series consists of deep, somewhat poorly drained soils on low terraces. These soils formed in mixed alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 60 inches, and the average annual air temperature is about 52 degrees F,

Typical pedon of Yaquina loamy fine sand, 0.5 mile west of Lakeside; 1,450 feet south and 700 feet west of the northeast corner of sec. 13, T. 23 S., R. 13 W.

O-2 inches to 0; organic litter that is 20 percent sand grains; many very fine and medium roots.

A2-0 to 5 inches; dark gray (10YR 4/1) loamy fine sand, gray (10YR 6/1) dry; massive; very friable, nonsticky and nonplastic; many very fine and medium roots; common very fine and fine tubular pores; very strongly acid; abrupt wavy boundary.

B1-5 to 12 inches; yellowish brown (10YR 5/6) sand with light gray (N 7/0) tongues of A2-like material, brownish yellow (10YR 6/6) with white (N 8/0) and light gray (10YR 7/2) dry; massive; very friable, nonsticky and nonplastic; many very fine and coarse roots; common very fine and fine tubular pores; 5 percent soft nodules 5 to 20 millimeters in diameter; medium acid; clear wavy boundary.

B21ir-12 to 21 inches; reddish brown (5YR 4/4) and pinkish gray (7.5YR 6/2) sand, strong brown (7.5YR 5/6) and light gray (10YR 7/1) dry; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and medium roots; many very fine irregular pores and few very fine tubular pores; medium acid; gradual wavy boundary.

B22ir-21 to 27 inches; dark reddish brown (5YR 3/4) sand, reddish brown (5YR 5/4) dry; common medium and coarse distinct light brownish gray (10YR 6/2) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and medium roots; many very fine irregular pores; medium acid; gradual wavy boundary.

B3-27 to 35 inches; pale brown (10YR 6/3) sand; massive; very friable, nonsticky and nonplastic; very few very fine and fine roots; many very fine irregular pores; medium acid; gradual wavy boundary.

C-35 to 60 inches; pale brown (10YR 6/3) sand; single grain; loose; medium acid.

Depth to the Bir horizon ranges from 12 to 18 inches. The difference between the mean summer and mean winter soil temperatures ranges from 5 to 9 degrees F.

The A2 horizon has value of 2 to 4 when moist and chroma of 1 or 2.

The Bir horizon has hue of 5Y to 5YR, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 2 or 3. It is find sand or sand. Firm or very firm, reddish, weakly cemented nodules and thin, very firm lenses are present in some pedons.

The C horizon is variegated sand or fine sand. It has thin, weakly cemented lenses in some pedons.

Zyzzug Series

The Zyzzug series consists of deep, poorly drained soils on stream terraces. These soils formed in mixed alluvium. Slope is 0 to 3 percent. The average annual precipitation is about 60 inches. The average annual air temperature is 52 degrees F.

Typical pedon of Zyzzug silt loam, 2 miles southwest of Gaylord; 1,320 feet east and 2,400 feet north of the southwest corner of sec. 34, T. 30 S., R. 12 W.

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

A1-8 to 12 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; common fine faint very dark grayish brown (10YR 3/2), dark gray (10YR 4/1), and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine irregular pores; medium acid; clear wavy boundary.

B21g-12 to 21 inches; very dark gray (1 OYR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; common fine distinct dark brown (10YR 3/3) and brown (10YR 5/3) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few very fine

roots; many fine tubular pores; medium acid; clear wavy boundary.

B22g-21 to 30 inches; dark gray (10YR 4/1) silty clay loam, pale brown (10YR 6/3) dry; many fine prominent dark yellowish brown (10YR 4/6) and brownish yellow (10YR 6/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many fine and very fine tubular pores; medium acid; clear wavy boundary.

B23-30 to 38 inches; dark yellowish brown (10YR 4/6) silty clay, brownish yellow (10YR 6/6) dry; many fine prominent grayish brown (10YR 5/2), dark gray (10YR 4/1), and pale brown (10YR 6/3) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, sticky and plastic; common fine and few medium tubular pores; strongly acid; clear wavy boundary.

B3-38 to 45 inches; dark yellowish brown (10YR 4/6) silty clay loam, brownish yellow (10YR 6/6) dry; many fine and medium prominent grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; moderate coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; strongly acid; clear wavy boundary.

C-45 to 60 inches; dark yellowish brown (10YR 4/6) silt loam, brownish yellow (10YR 6/6) dry; many fine and medium prominent grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; massive; hard, friable, slightly sticky and slightly plastic; strongly acid.

The umbric epipedon is 10 to 20 inches thick. The profile is medium acid or strongly acid.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 to 3 when moist or dry.

The B horizon has hue of 10YR to 5Y, value of 3 to 5 when moist and 5 to 7 when dry, and chroma of 1 to 6 when moist and 2 to 6 when dry. It is silt loam, silty clay loam, or silty clay.

The C horizon is silty clay loam, silt loam, clay loam, or loam. Thin discontinuous lenses of coarse-textured material are present in the lower part of the B and C horizons in some pedons.

Formation of the Soils

Soil is a natural, three-dimensional body on the Earth's surface that supports plants. Its characteristics and properties are determined by physical and chemical processes that result from the interaction of five factors--climate, living organisms, time, topography, and parent material (5). The influence of any one of these factors varies from place to place, but the interaction of all the factors determines the kind of soil that forms.

Soils in Coos County have been greatly influenced by factors such as the warm, moist, and long growing season in the fog belt along the Pacific coast and the warm, dry, and short growing season in the interior valleys of the Coast Range. The age and type of parent material have greatly influenced soil development in the areas of recent alluvium on flood plains and old alluvium on terraces along the Coquille River. In the higher mountains in the southern part of the county, the soils formed in materials weathered from serpentinite.

In this section the soil-forming factors of climate and living organisms are discussed together. Time, topography, and parent material are grouped and discussed under the heading "Geomorphic Surfaces and Soil Development."

Climate and Living Organisms

Climate has a strong influence on soil formation. Temperature and moisture greatly influence the kind of vegetation that grows and the rate at which organic matter decomposes and minerals weather. Temperature and moisture also influence the rate of removal of material from some soil horizons and the rate of accumulation in others.

Living organisms, especially the higher plants, are an active factor in soil formation. The changes they bring about depend mainly on the life processes peculiar to each kind of organism. The kinds of organisms that live on and in the soil are determined in turn by climate and by the parent material, topography and relief, and age of the soil.

Plants provide a cover that helps to reduce erosion and stabilize the soil surface. Leaves, twigs, roots, and remains of entire plants accumulate on the surface of forested soils and are decomposed by micro-organisms, earthworms, and other soil fauna. Plant roots widen cracks in the underlying rock, permitting water to penetrate. The uprooting of trees by wind also mixes soil layers and loosens the underlying material.

In this survey area there are three major soil-climatic areas that influence soil genesis: (1) areas that have cool, moist summers and cool, moist winters; (2) areas that have cool, moist summers and cool, wet winters; and (3) areas that have warm, dry summers and cool, wet winters. Along the coastal fog belt area the summers and winters are cool and moist, which results in soils that have an udic moisture regime and isomesic temperature (26).

The native vegetation in this area is within the *Picea sitchensis* zone described by Franklin and Dyrness (9).

The plant community is mainly conifers such as Sitka spruce, Douglas fir, and western hemlock. The long growing season and moist soil conditions result in the accumulation of high amounts of organic matter. Humitropepts, such as Templeton and Millicoma soils, and Dystrandepts, such as Salander soils, have formed in this area. These soils have as much as 15 percent organic matter in the surface layer. The soils are strongly leached; base saturation commonly is less than 20 percent in the subsoil. Dystropepts, such as Geisel soils, have formed in some areas where sufficient organic matter has not accumulated to produce an umbric epipedon.

In the northeastern part of the survey area, the summers are cool and moist and the growing season is medium to long. The winters are cool and wet, and there are short periods of snow cover at the higher elevations. The soil temperature is mesic, and the moisture regime is udic (26). The native vegetation in this area is within the *Tsuga heterophylla* zone (9). The plant community is mainly conifers such as western hemlock, Douglas fir, and western redcedar. Rainfall is

higher than in the isomesic zone; however, the soils in this area are drier in summer. This results in oxidation of the organic matter, and although the epipedon of the soils is thick enough to qualify as umbric, it generally is not so thick as that of soils in the isomesic zone. The soils are strongly leached; base saturation generally is low. There are not sufficient accumulations of aluminum, iron, and organic carbon to form a spodic horizon. Haplumbrepts, such as Milbury, Preacher, and Bohannon soils, have formed in this area. Dystrochrepts, such as Blachly soils, have formed in some areas that have a high content of iron. These soils have a reddish hue and high chroma.

In the southern part of the survey area, summers are warm and dry and the growing season is short to medium. Winters are cool and wet, and there are periods of snow cover that may last 3 to 4 weeks at higher elevations. The soil temperature is mesic except in small areas at the top of higher mountains, where it is frigid. The soil moisture regime generally is udic; however, some areas on steep, south-facing side slopes approach xeric conditions. The native vegetation in this area is within the Tsuga heterophylla zone (9). The plant community is mainly the Douglas fir-tanoak-Pacific madrone forest cover type. There is also a considerable amount of the western hemlock-Douglas fir-western redcedar type. The amount of rainfall is similar to that in the northern part of the survey area; however, the average annual air temperature is slightly warmer and the soils are more gravelly and tend to dry out faster. This results in more rapid oxidation of the organic matter. Ochrepts are more common in this area; Dystochrepts, such as Etelka and Remote soils, have formed. Eutrochrepts, such as Digger, Serpentano, Umpcoos, and Whobrey soils, have formed in areas where less leaching has occurred. Haplumbrepts, such as Rinearson, Preacher, and Bohannon soils, have formed in areas where the accumulations of organic matter are high enough to produce an umbric epipedon.

Geomorphic Surfaces and Soil Development

The sediment that underlies the geomorphic surfaces in this survey area was deposited in two ways. The sediment along the coast was deposited in a marine environment. This sediment is discussed in this section under the heading "Coastal marine surfaces." The sediment in the inland valleys was deposited by freshwater streams. This sediment is discussed under the heading "Inland alluvial valley surfaces."

Coastal marine terraces.-Geomorphic surfaces of the southwestern Oregon and northern California coastal marine terraces have been studied by Nettleton, et al. (17), Gardner and Bradshaw (10), and Jenny, et al. (12); however, no extensive mapping of these surfaces has been done. The topography of the coastal area of Coos County consists of sand dunes and marine terraces. The dune area includes both active and vegetated dunes of late Holocene age. Adjacent to the dunes is a series of marine terraces that range in age from early Holocene to middle early Pleistocene, with remnants at elevations of as much as 1,600 feet on Blue Ridge. The sediment that makes up these terraces has been deposited on wave-cut platforms of soft sandstone and siltstone. Relief of these abrasion platforms is quite irregular, which is reflected on the surface of the terraces.

It is believed that long-term tectonic uplift of the coastal area and progressive eustatic lowering of the sea level have elevated each successive terrace (18). Studies of regional tectonic deformation of marine terraces by Palmer indicate that northern Oregon has been relatively stable since the early Pleistocene; however, displacement increases in areas southward toward northern California. Most of the marine terraces in Coos County appear to have been relatively stable; however, in the vicinity of Cape Arago the northern end of the Whiskey Run surface grades into the Pioneer surface.

Only minor remnants on Blue Ridge remain, but lower terraces occupy areas that are as much as 4 miles wide and in some areas are relatively undissected. The time sequence of geomorphic surfaces along the coast correspond to surfaces at similar elevations along the inland valleys of Coos County and in the Willamette Valley (19). A sequence of marine surfaces recognized in Coos County in order of increasing age are Horseshoe, Ingram, Tenmile, Whiskey Run, Pioneer, and Seven Devils; the corresponding inland surfaces are Horseshoe, Ingram, Winkle, Senecal, Dolph, and Eola.

Steep areas of the Looney geomorphic unit (5) connect the Whiskey Run, Pioneer, Seven Devils, Senecal, Dolph, and Eola terraces, which were studied and named by Griggs (11) and Parsons (19). Because of the variable stability of the landscape, the soils and surfaces of the Looney unit fit no particular span of time. The Tenmile surface was named by Nettleton, et al. (17).

Horseshoe surface (marine).-This surface (17, 19) consists of active and stabilized dunes. Elevation ranges from 10 to 50 feet. In some areas dune sand has been deposited on older geomorphic surfaces. Many areas of the Horseshoe surface are not

vegetated; other areas support stands of shore pine, Sitka spruce, European beachgrass, coast willow, and waxmyrtle.

Adjacent to the beach is a foredune constructed of windblown fine sand. Many areas of the foredune are vegetated by a sparse stand of European beachgrass, and other areas are active dune sand. Waldport soils (Typic Tropopsamments) formed in the vegetated areas. The A1 horizon is thin (4 inches thick) because of the small amount of organic matter produced by the beachgrass and the young age of the soils. Sand in the deflation basin has been eroded to the water table by strong winter winds. Heceta soils (Typic Psammaquents) formed in these areas. These soils have a thin surface layer and are mottled as a result of the segregation of iron.

The fine sand that has eroded from areas of deflation basins is deposited further inland in a series of active transverse dunes that are oriented from west-northwest to east-southeast. Waldport soils formed in areas of those dunes that have become stabilized with shore pine, Sitka spruce, and Douglas fir. Because these vegetated dunes are much older and larger amounts of organic matter have been added to the soils, the surface layer of these Waldport soils is much thicker than those that formed on foredunes.

Ingram surface (marine).-Soils that formed in the alluvial sediment of the Ingram surface include those of the Brallier, Chetco, Clatsop, Coquille, Langlois, Nehalem, Nestucca, and Willanch Series. Tropic Fluvaquents, such as Coquille and Langlois soils are very young in the wettest areas on flood plains and are inundated during high tides. They have not been in place long enough to form diagnostic horizons and typically have an ochric epipedon overlying parent material. Organic carbon is presumed to decrease irregularly because of the irregular addition of sediment during high tides. These soils are gleyed and mottled, indicating the mobility of ferrous iron. Organic soils, such as those of the Brallier series (Typic Tropohemists), formed in depressional areas that have a permanent high water table. Typic Tropaquents, such as Chetco soils, formed in areas where the parent material has been in place long enough to develop diagnostic horizons such as an umbric epipedon and a cambic horizon. A histic epipedon has developed in soils in concave areas that are inundated during high tides. An example is those of the Clatsop series. In higher lying areas where drainage is better, Aeric Tropaquents, such as Nestucca and Willanch soils, have formed in concave areas and in channels. The bars and convex areas of flood plains are well drained; Fluvaquentic Humitropepts, such as Nehalem soils, formed in these areas.

Tenmile surface.-This surface is of minor extent in Coos County. It occurs mainly in the northern part of the county, in the vicinity of Tenmile Lake. This surface is thought to be equivalent in age to the Winkle surface mapped in the Willamette Valley (17). Elevation is about 10 to 50 feet. The most prominent example of this surface is in the vicinity of Lakeside. Yaquina soils (Aquic Haplorthods) formed in the early Holocene sediment underlying this surface. These soils have been stable long enough to develop a spodic horizon. Two pedons sampled by Nettleton, et al. (17) show that these soils meet both the chemical and morphological requirements of Spodosols. Yaquina soils have an A2 horizon overlying a Bir horizon that has weakly cemented nodules and low-chroma mottles below the spodic horizon.

Whiskey Run surface.-This late Pleistocene surface is underlain by old, stabilized sand dunes and sandy marine sediment adjacent to areas of the Horseshoe surface. The sediment underlying the Whiskey Run surface has been deposited on a very irregular wave cut platform. This surface occurs between North Bend and South Slough, north of the Coquille River, and south of Cape Arago, between Twomile and Cut Creeks. In these areas the Whiskey Run surface is distinct and well defined. Elevation ranges from 50 to 100 feet. The ancient sea cliff at the back edge of this terrace is 20 to 50 feet high.

South of the Coquille River, this surface is a pediment that slopes gently toward the sea and gradually descends toward the Horseshoe surface. Elevation ranges from 80 to 140 feet.

Soils on this surface include those of the Netarts series (Entic Haplorthods) and the Bullards series (Typic Haplorthods). The Netarts soils formed in stabilized dune sand and are mainly in areas north of the Coquille River. These soils have a distinct A2 horizon and a weakly developed spodic horizon. Lab data collected by Nettleton, et al. (17), indicate that these soils have less than 1 percent organic carbon in the spodic horizon. The Bullards soils formed in sandy marine sediment. These soils have a much higher clay content and show stronger development in the spodic horizon. Organic carbon content of the spodic horizon is 1 to 2 percent.

Pioneer surface.-This middle Pleistocene surface is a narrow remnant between Cape Arago and Threemile Creek, north of the Coquille River. South of Threemile Creek, the Pioneer surface is 2 miles wide. Elevation ranges from 125 to 250 feet; it is 100 to 150 feet lower

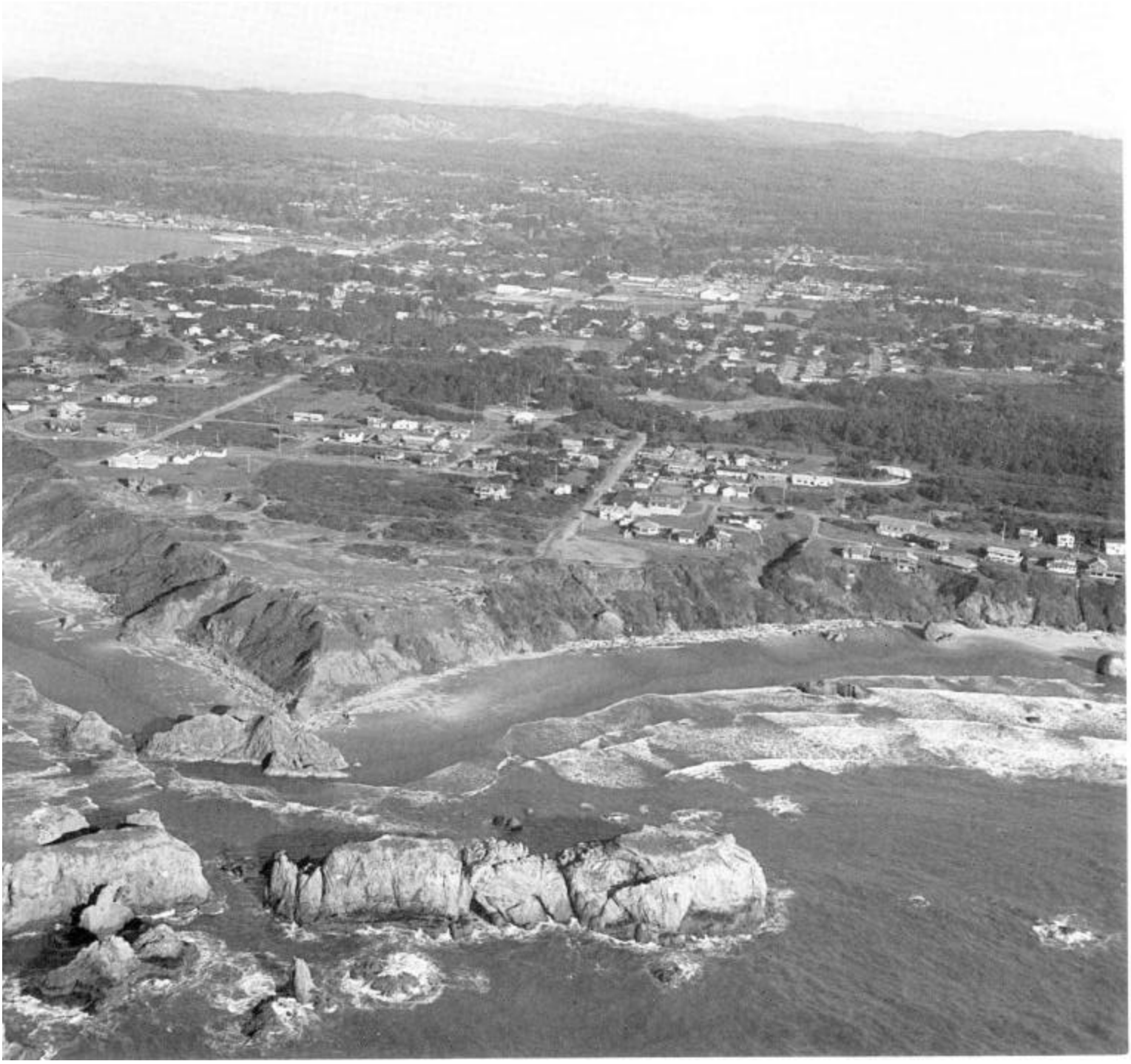


Figure 16. -Bandon is on the Pioneer geomorphic surface; higher Seven Devils surface is at left in background.

than the Seven Devils terrace. South of the Coquille River, the Pioneer surface is a dissected pediment that slopes gently toward the ocean (fig. 16). The pioneer surface extends from the Coquille River to Twomile Creek, where it is pinched out by a steep ridge. It is bounded on the west side by a fairly distinct ancient sea cliff that parallels Rosay Road at an elevation of 160 feet. Elevation gradually increases eastward to about 360 feet and then drops sharply into Bill and Bear Creeks.

Soils on the Pioneer surface include those of the Bandon, Blacklock, and Bullards series. The Bandon

soils (Typic Haplorthods) are well drained and have a thick, strongly developed spodic horizon at a depth of 18 to 36 inches. These soils formed in the convex areas of the microrelief. The Blacklock soils (Typic Tropaquods) formed in the concave areas. These soils have a distinct A2 horizon and a strongly developed spodic horizon at a depth of 12 to 30 inches. The Bullards soils formed on the steeper side slopes of gullies and drainageways.

Seven Devils surface.-This surface occurs only on the top of the ridge that runs from Cape Arago southeast to the Coquille River, at Lampa Creek. It has been eroded over a long period of time so that only remnants remain, and much of the sediment has been removed. It is highly dissected; however, some large areas remain intact. The Seven Devils surface is from 0.5 to 1.5 miles wide and ranges in elevation from 300 to 500 feet. The sediment that underlies this early Pleistocene surface consists of strata of sand, silt, and clay.

The Joeney soils (Typic Tropaquods) have developed in sediment associated with the Seven Devils surface. These soils are the oldest ones mapped in the county that formed in marine sediment. The Joeney soils have a thin Bh horizon overlying a strongly cemented spodic horizon. Structure of the Bir horizon is moderate, thin to thick, and platy, and consistence is very hard-and very firm. The profile is strongly leached so that base saturation in the subsoil commonly is less than 10 percent.

Looney geomorphic mapping unit.-The Looney unit has no particular age connotation and is not considered to be a geomorphic surface (5). The terrain of the Looney unit is completely dissected and is dominantly steep. The Looney unit joins the Whiskey Run, Pioneer, and Seven Devils surfaces in some places and in areas of mountainous terrain in other places.

Soils of the Geisel, Millicoma, Templeton, and Salander series are on the Looney unit. These soils formed in sandstone and siltstone of the Bastendorff and Coaledo (4) Formations (see "Climate and Living Organisms").

Inland alluvial valley surfaces.-Geomorphic surfaces of the Willamette Valley have been studied extensively and mapped by Parsons and others (5, 19). The studies extended down the Columbia River (20) and south along the Oregon Coast. Although only reconnaissance geomorphic studies have been done on the inland valleys of Coos County, it is apparent that surfaces in some positions are equivalent to those in similar positions in the Willamette Valley; therefore, the same names have been assigned to these surfaces (fig. 17) (17).

Horseshoe surface.-The Horseshoe surface is the lower of the two flood plains in the survey area. It includes the stream channel, point bar deposits, filled channels, and abandoned meanders. Most areas of the Horseshoe surface are not vegetated. Areas of the Horseshoe surface in the inland valleys are too small to be mapped at the scale used; therefore, they are included with areas of the Ingram surface.

Ingram surface.-The Ingram surface is the higher of the two flood plains in the survey area. The topography of the Ingram surface typically is undulating. Relief is as much as 10 feet because of overbank channeling during flood stage (19). The bars and channels have an orientation approximately parallel to the stream. In some valleys the bars seldom, if ever, are flooded. The expression of microrelief on the surface is related to the competence of the stream that flowed through the area. Longitudinal stream profiles with segmented gradients also add to the complexity of the Ingram surface. Elevation generally is 20 to 750 feet, but it is as much as 2,300 feet in the vicinity of Eden Valley. Texture generally is sandy loam, silt loam, or silty clay loam, but sandy strata are common.

Radiocarbon dating in the Willamette Valley indicates ages of 550 to 3,290 years (19) for the sediment associated with the Ingram surface. Therefore, the change in the stream system that caused abandonment of the Winkle surface as a flood plain occurred 3,290 to 5,250 years ago (5), the latter date of which is the minimum age for the Winkle surface.

The partial abandonment of the Ingram surface as a flood plain occurred less than 550 years ago, which indicates the dynamic nature of the soil landscape.

Soils that formed in the alluvial sediment of the Ingram surface include those of the Kirkendall and Quosatana series (fig. 18).

The stream gradient is greater and the flood plain exhibits more bar and channel topography in areas of the Ingram surface in the inland valleys than in areas of its marine equivalent. The bars are 0.5 to 3.0 feet higher than the channels, and the soils on the bars are well drained. Fluventic Haplumbrepts such as Kirkendall soils formed in these areas. Narrow stream valleys characteristically have a well drained natural levee adjacent to the stream and a poorly drained backswamp at the edge of the flood plain. The Kirkendall soils formed on the natural levees in valleys, where the bedrock in the watershed is soft sandstone and siltstone. These soils are silt loam and silty clay loam in

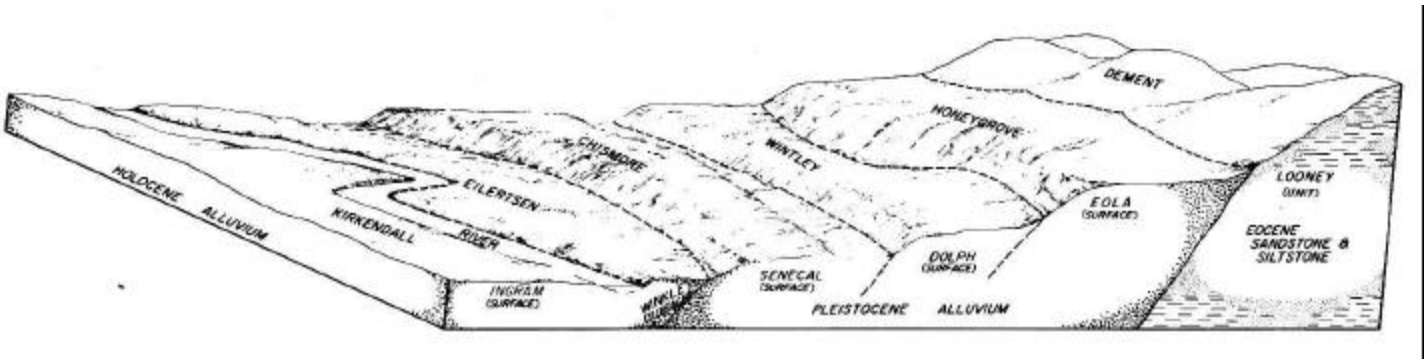


Figure 17.-Cross section of Coquille Valley showing relationship of soils to ge omorphic surfaces.

the control section and have an umbric epipedon. In the northern part of the county; the bedrock is hard sandstone. Fluventic Umbric Dystrochrepts such as Gardiner soils formed on the natural levees and bars and have a sandy control section.

Fluvaquentic Humaquepts such as Quosatana soils formed in channels and other concave areas of the flood plains. These soils have an umbric epipedon, a Iambic horizon, and a presumed irregular decrease in organic carbon as depth increases.

Winkle surface.-The middle to early Holocene Winkle surface is the oldest surface related to the present drainage systems of western Oregon (19). Most of the Winkle surface has the morphology typical of abandoned flood plains of aggrading streams. The elevation difference between the bar and channel is largely the result of the competence of the stream. The braided, overloaded stream channel that deposited sediment associated with the Winkle surface indicates the size of the stream responsible for the formation of the bars and channels. Along the North Fork of the Coquille River, the stream channel is deeply incised into the Winkle surface and only small, scattered areas of the Ingram surface are present. Elevation differences between the Ingram and Winkle surfaces in this area are about 20 to 25 feet. Along the South Fork of the Coquille River, the Winkle surface is more prominent and lies about 10 to 20 feet higher than the Ingram surface. Elevation of the Winkle surface generally is 50 to 120 feet. Texture of the sediment dominantly is silt and clay.

Carbon-14 dating of sediment beneath the Winkle surface in the Willamette Valley indicates ages of 5,250 to 12,240 years (5). Sediment on similar landscape positions at similar elevations in Coos County is assumed to be of the same age and thus is the same surface.

The well drained Eilertsen soils and poorly drained Zyzzug soils are typical of soils that formed in sediment associated with the Winkle surface. Because the Winkle surface is no longer susceptible to periodic flooding, it has been stable for a sufficient period of time for the Eilertsen soils (Ultic Hapludalfs) to have developed a weakly expressed argillic horizon. These are the youngest soils in the survey area that have sufficient clay illuviation to have an argillic horizon. They have a base saturation of less than 60 percent. These soils are in the convex areas of bars and channels and on natural levees adjacent to the streams.

Zyzzug soils (Typic Humaquepts) are in concave channels and backswamps at the edge of the terrace. These soils have a dark-colored umbric epipedon and a Iambic horizon. They are gleyed and are mottled, which is evidence of the mobility of ferrous iron. These soils have remained saturated long enough during the year to prevent illuviation of clay and formation of an argillic horizon.

In some areas the Winkle surface is overlain by gravelly sediment of the Ingram surface. These areas are alluvial fans that have formed where steep ephemeral second or third order streams enter the less sloping terraces. Meda soils (Typic Haplumbrepts) formed in these areas. These soils have a dark colored umbric epipedon and a Iambic horizon.

Senecal surface.-The Senecal surface is the most extensive lowland geomorphic surface in Coos County. The terraces of this surface are most strongly expressed along the South Fork of the Coquille River and as far downstream as the city of Coquille. The Senecal surface is present only in a few areas along

other major streams in the county. Minor eroded remnants of this surface occur along streams in the northern part of the county. Elevation of the Senecal surface is about 100 to 380 feet. This surface lies about 100 to 150 feet above the Winkle surface in the southern part of the county and decreases to about 50 feet in the vicinity of Coquille. The increasing prominence of the geomorphic surfaces toward the southern part of the county appears to be the result of greater tectonic uplift in the Klamath Mountains. This theory is consistent with the conclusions of Palmer in his study of the tectonic displacement of marine terraces (18). Slopes of the Senecal surface are dominantly 0 to 3 percent, but they are as much as 15 percent in eroded areas. Texture of the underlying sediment is dominantly clayey.

Most areas of the Senecal surface are moderately well drained to poorly drained. Soils that formed in material of this surface include Chismore soils (Aquic Haplohumults) and Pyburn soils (Typic Umbraquults). The Senecal surface has been stable long enough for the formation of a well developed argillic horizon. The

Figure 18.-Microrelief of the Ingram surface. Kirkendall soils are at slightly higher elevations; Quosatana soils are in depressional areas.

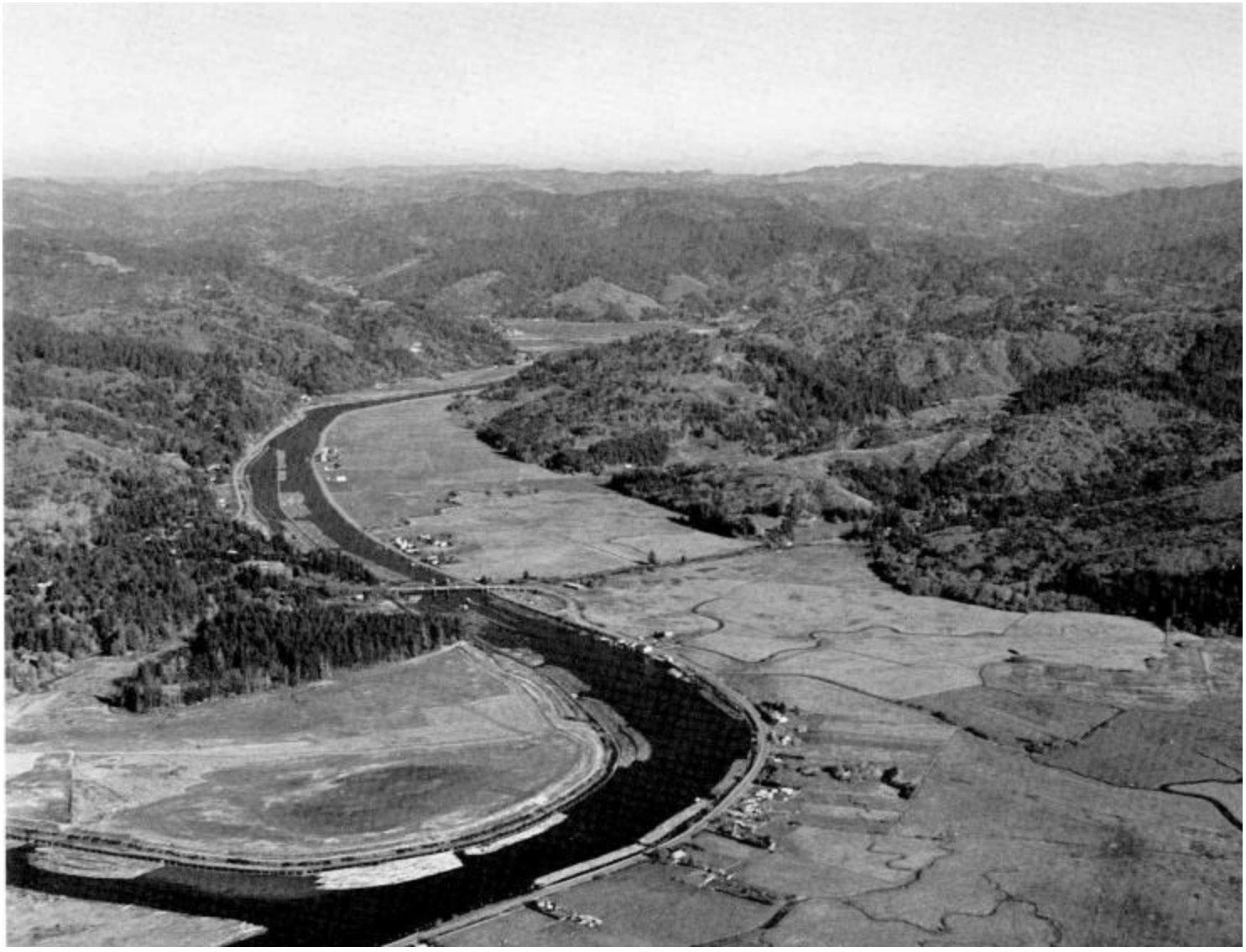


Figure 19.-Steep, broken topography of the Looney unit is in background. Coquille and Langlois soils underlie the Ingram surface along the Coos River.

Chismore soils have an umbric epipedon, moderate and subangular blocky structure, an argillic horizon, and low chroma mottles in the lower part of the argillic horizon. The Pyburn soils have an umbric epipedon, moderate and subangular blocky structure, an argillic horizon, and evidence of gleying.

Gauldy Variant soils (Typic Haplumbrepts) formed in the old stream channels where coarse textured sediment was deposited. These soils are loam over a very gravelly 2C horizon. Permeability of the 2C horizon commonly is rapid or very rapid, and illuvial clay has been washed out of the profile.

Meda soils formed on small alluvial fans where steep ephemeral streams enter the Senecal surface. These soils are discussed under the heading "Winkle surface."

Dolph Surface.-The Dolph surface in Coos County consists of nearly level to sloping, dissected topography of middle Pleistocene age. Evidence of this geomorphic episode occurs mainly along the South Fork of the Coquille River and along the Coquille River to the

vicinity of Riverton. Elevation commonly is 150 to 420 feet along the South Fork of the Coquille River; however, along the Coquille River terraces as low as 50 feet have been included in the Dolph surface because of the similarity of the soils in these areas. The terraces on which the city of Coquille is built are a prominent example. Further study is needed to determine whether these terraces included in the Dolph surface are of the same geomorphic episode.

Wintley and McCurdy soils (Typic Haplohumults) are extensive on the Dolph surface. These soils have an umbric epipedon and an argillic horizon. The Wintley soils have redder hue and a higher content of clay than the McCurdy soils. The McCurdy soils have low chroma mottles in the lower part of the subsoil.

Eola surface.-The Eola surface consists of erosional remnants of the oldest stable geomorphic surface in the county and has tentatively been correlated to the marine Seven Devils surface (17). Relief of the Eola surface is moderate; topography of the remnants typically is rounded hills and valleys, with as much as 300 feet of local relief. Slope ranges from 3 to 50 percent, and elevation ranges from 200 to 1,000 feet.

The Eola surface is considered to be early Pleistocene. Erosion during Pleistocene and Holocene times has removed much of this surface. The surface occurs only in the central part of the county. Landforms of the Looney unit generally adjoin the Eola surface and join it to lower-lying, younger surfaces.

Honeygrove soils (Typic Haplohumults) formed in material of the Eola surface. These are deep, red soils that have a prominent argillic horizon that extends to a depth of more than 60 inches. These soils exhibit the most advanced stages of weathering and leaching of bases in the survey area. Base saturation commonly is less than 10 percent in the subsoil.

Looney unit.-The Looney geomorphic unit has no particular age connotation and is not considered to be a geomorphic surface. The terrain of the Looney unit is completely dissected, is dominantly steeply sloping, and has narrow ridges. Slope gradients are more than 100 percent in some areas. The Looney unit on the uplands has component landforms primarily of the Horseshoe, Ingram, and Winkle surfaces, although areas of older surfaces are present in places. The Looney unit may join other surfaces or it may make up large areas of mountainous terrain so thoroughly dissected that it contains no mappable geomorphic surfaces (fig. 19). Erosion is active on much of the Looney unit; mass movement has occurred in some areas (7).

The variability in age makes the Looney unit useful in mapping areas of mountainous terrain. The unit could be divided into several geomorphic surfaces if it were mapped at a larger scale. Three significant gradient breaks are apparent-stable, metastable, and active slopes. Narrow valley floors and small alluvial cones are inclusions of the Ingram surface in the Looney unit. Soils of the Looney unit formed in material derived mainly from sandstone, siltstone, basalt, and serpentinite.

Orford soils (Typic Haplohumults) are on the most stable positions of the Looney unit. They have an umbric epipedon, moderate structure, and an argillic horizon. Typical soils on metastable slopes include those of the Dement, Etelka, Preacher, Rinearson, and Whobrey series. Dement soils formed in clayey sediment of the Roseburg Formation; Etelka and Whobrey soils formed in clay of the Otter Point Formation; Preacher soils formed in loamy sediments of the Tyee and Flournoy Formations; and Rinearson soils formed in loamy sediment of the Coaledo Formation (4). These soils are discussed in the section "Climate and Living Organisms."

Typical soils on active slopes include Dystrochrepts such as Remote soils, Eutrochrepts such as Digger, Umpcoos, and Serpentano soils, and Haplumbrepts such as Harrington and Milbury soils. These soils formed dominantly in material of the Tyee and Flournoy Formations and in minor areas of material derived from basalt and serpentinite.

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Glossary

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

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

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

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

Arkosic material. Material that has a high percentage of weatherable minerals derived from granitic rock (e.g., arkosic sandstone).

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

Backswamp. Extensive, marshy, depressional areas of flood plains between the natural levee borders of channel belts and the valley sides or terraces.

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

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

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Breast height. An average height of 41/2 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. Mineral or rock particles 2 to 250 millimeters in diameter.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Compaction, soil. An alteration of soil structure that

ultimately can affect the biological and chemical properties of soil. Soil compaction decreases voids and increases bulk density.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are-

Loose.-Noncoherent when dry or moist; does not hold together in a mass.

Friable.-When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.-When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.-When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.-When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.-When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger. Soft rock.-When dry, breaks into powder or individual grains under very slight pressure.

Cemented.-Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural): Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.-Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.-Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well *drained.*-Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.-Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.-Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.-Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.-Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature; for example, fire that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (or 300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the Soil Survey Manual. The major horizons of mineral soil are as follows:

O horizon.-An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.-The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.-The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons generally are called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.-The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.-Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

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

Less than 0.2	Very low
0.2 to 0.4	Low
0.4 to 0.75	Moderately low
0.75 to 1.25	Moderate
1.25 to 1.75	Moderately high
1.75 to 2.5	High
More than 2.5	Very high

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

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

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

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

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

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

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

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

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

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage.

Descriptive terms are as follows: abundance-few, *common,* and *many;* size-fine, medium, and coarse; and contrast-faint, *distinct, and* prominent. The size measurements are of the diameter along the greatest dimension. *Fine indicates* less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables-hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

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

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity Index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Puddling, soil. A condition that occurs in certain wet soils as a result of compression and shearing. Puddling generally is accompanied by compaction. The mechanical force rearranges soil particles and destroys soil structure.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as-

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

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated,

weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles,

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Skid trail. Trail or furrow made by log skidding over ground surface.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are-platy (laminated), prismatic (vertical axis of aggregates

longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless soils* are either *single grained (each* grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep, rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

Yarding. A logging term meaning to move a log from the area it was cut to a landing or loading area.

Yarding, cable. Yarding a log by a suspended cable rather than behind a wheeled or trucked vehicle.