Foreword

The Soil Survey of Kootenai County Area, Idaho contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to 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 kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

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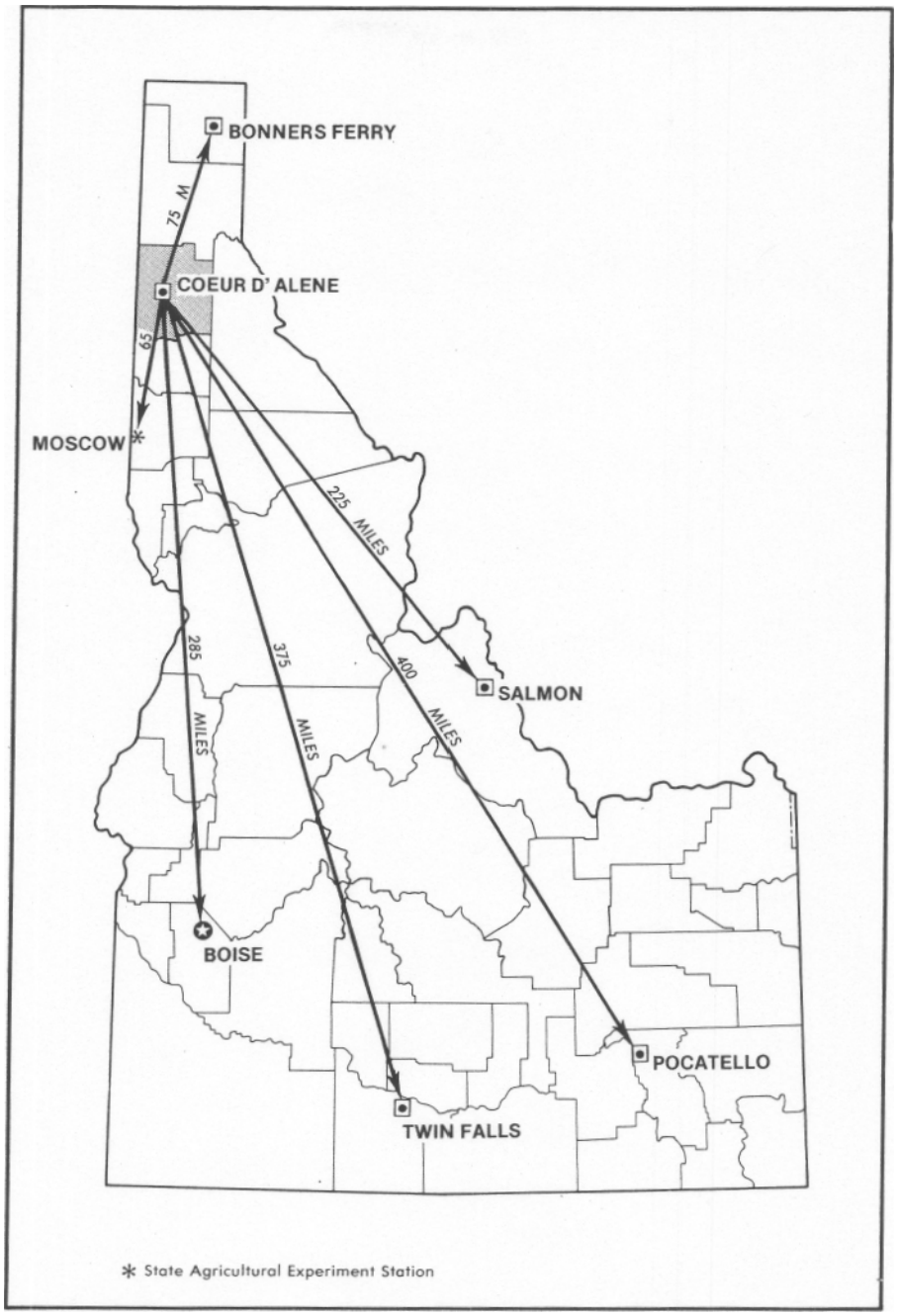

Location of Kootenai County, Idaho

SOIL SURVEY OF KOOTENAI COUNTY AREA, IDAHO

By Charles J. Weisel, Soil Conservation Service

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The Kootenai County Area is in the northern panhandle of Idaho. The survey area includes all of the county except for the contiguous portion of the Coeur d'Alene National Forest in the eastern part of the county. The Area has a total of 513,000 acres, or approximately 800 square miles. Coeur d'Alene, the county seat, has a population of 17,750 (1975 census).

With the exception of the Rathdrum Prairie in the northern part, the land surface is generally rough, consisting mostly of forested, mountainous, or hilly terrain that has comparatively narrow valleys opening out to the west. The mountainous areas are mostly metamorphic and metasedimentary rocks.

The Rathdrum Prairie is a glacial-outwash plain where soils were deposited by the waters from melting glaciers. It has level or gently sloping terraces with moderately steep or steep slopes on the terrace breaks, and is at an elevation of 2,200 feet. Part of the rolling and hilly loess-covered prairie region called the Palouse area is in the southwestern part of the county, and has an average elevation of about 2,700 feet. The Coeur d'Alene River flows through a broad flood plain from east to west across the southeastern part of the area and into Coeur d'Alene Lake. The lake's outlet is the Spokane River, which flows west from the central part of the county into Spokane County, Washington. The lowest point in the area is the level of the Spokane River at the Washington-Idaho State line at about 2,040 feet. The highest elevations are in the southeastern part of the county, where some mountain peaks are over 6,000 feet.

General nature of the county

This section gives general information concerning the county. It discusses history and development, natural resources, climate, farming, and recreation.

History and development

A Catholic missionary, Father Pierre Jean Desmet, began his work with the Coeur d'Alene Indians in 1842 near the present site of Fort Sherman. Trappers for the Hudson Bay Company had visited the area before that year but it was not until 1878, when Fort Sherman was established at the present site of Coeur d'Alene, that permanent settlement began.

In 1846 Father Desmet moved to the present site of the Cataldo Mission, which opened its doors in 1853. It is the oldest building in Idaho.

Kootenai County was organized in 1867. Its present boundaries were formed in 1915, when Benewah, Bonner, and Boundary Counties were formed.

In 1887, with the completion of the Northern Pacific Railway (now the Burlington Northern Railroad) and the development of the Coeur d'Alene mines at Wallace, the city of Coeur d'Alene was incorporated. Following this, the settlement of the Rathdrum Prairie area became very active, and within the next few years the most desirable land was settled.

Most of the southern half of the county was originally included within the Coeur d'Alene Indian Reservation, and the last of these lands were not opened for settlement until 1910.

Settlement of Kootenai County was rapid. By 1920, the principal communities of Coeur d'Alene, Post Falls, Athol, Bayview, Harrison, Rathdrum, Spirit Lake, and

Worley had been settled. By that time most of the farmland was also settled. Since then most of the population growth has been in the Coeur d'Alene area, including Post Falls, Dalton Gardens, and Hayden Village.

The Chicago, Milwaukee, St. Paul, and Pacific Railroad serves the northwestern and southwestern parts of the county. The northwestern part of Kootenai County is served by the Burlington Northern and Spokane International Railroads. The Union Pacific Railroad crosses the southeastern part of the county. Waterways were used mainly for towing logs on Coeur d'Alene Lake and the Spokane River to the forest products plants in Coeur d'Alene and Post Falls.

Many graded roads were built mainly for logging, and they extend into the forested section. Roads not being used for logging are generally not maintained. Two main highways in the area pass through Coeur d'Alene: Interstate 90 in an east-west direction and U.S. Highway 95 in a north-south direction. U.S. Highway 95A extends along the east side of Coeur d'Alene Lake. State Highways 41 and 53 run north through Rathdrum and Spirit Lake in the western part of the Rathdrum Prairie, and State Highway 54 extends from Spirit Lake to Bayview on Pend Oreille Lake.

Kootenai County has good school facilities. High schools are at Coeur d'Alene, Harrison Flats, Post Falls, Rathdrum, and Worley. Elementary schools are throughout the county. North Idaho College, a junior college and vocational school, is located in Coeur d'Alene.

The forest products industry, once important to the development of Kootenai County, continues to be an aid to the economy of the area. Several forest products plants are at Coeur d'Alene, and there are others at Post Falls, Chilco, and Cataldo.

Natural resources

Soil, water, and forests are the most important natural resources in the county. Livestock, crops, and timber are marketable products derived from the soil.

Lumbering and the processing of wood products are the primary activities in the area. Millions of board feet are cut annually from ponderosa pine, lodgepole pine, western white pine, grand fir, Douglas-fir, western larch, western redcedar, and western hemlock. A plywood mill, a wood chip plant, and several sawmills are in the area. In addition, specialty plants produce a wide variety of forest products.

Kootenai County has abundant water resources. The primary drainage is provided by Coeur d'Alene Lake. The Rathdrum Prairie has no surface drainage system because of the porous nature of the soils, but ground water supplies are good. A small area in the northwestern part, including Spirit Lake, drains into Bonner County and a small area in the northeast drains into Pend Oreille Lake. About 1,700 surface acres of water are in the survey area in addition to the Coeur d'Alene River, the Spokane River, and lakes larger than 40 acres.

The eastern part of Kootenai County has deposits of lead, copper, gold, silver, and other metals, but there is little production. Sand and gravel deposits are plentiful in the Rathdrum Prairie. Large reserves of limestone are near Bayview and adjacent to Pend Oreille Lake, but the quality is not uniform.

Climate

In Kootenai County, summers are warm or hot in most valleys and much cooler in the mountains. Winters are cold in the mountains. Valleys are colder than the lower slopes of adjacent mountains because of the cold air drainage. Precipitation occurs in the mountains throughout the year, and a deep snowpack accumulates during winter. Snowmelt usually supplies much more water than can be used for agriculture in the county. In valleys, precipitation in summer generally falls as showers, but some thunderstorms occur. In winter, snow covers the ground most of the time, though warm, dry Chinook winds often melt and evaporate the snow.

Table 1 shows temperature and precipitation data for the period 1951 to 1971, recorded at Kellogg, which is east of and outside of the area, but is representative of Kootenai County. Tables 2 and 3 show probable dates of the first and the last freeze and the length of the growing season.

In winter, the average temperature is 30.6 degrees F, and the average daily minimum is 23.4 degrees. The absolute lowest temperature during the entire climatic record was -36 degrees F, observed at Kellogg on December 30, 1968. In summer, the average temperature is 65.0 degrees F, and the average daily maximum is 81.5 degrees. The absolute highest temperature was 111 degrees F, recorded on August 5, 1961.

Growing degree days, shown in Table 1, are equivalent to "heat units." Starting in spring, they accumulate by the amount that the average temperature exceeds the base temperature each day. The normal monthly accumulation is used to schedule single or successive plantings of a crop within the seasonal limits of the last freeze in spring and the first freeze in fall.

As shown in Table 1, the total annual precipitation is about 30.16 inches. Of this total, 10.84 inches, or 36 percent, generally falls from April through September, which includes the growing season for most crops. Two years in 10, the April-September rainfall is less than 8.50 inches. The heaviest 1-day rainfall during the period of record was 1.88 inches at Kellogg on December 22, 1964. About 16 thunderstorms occur each year, 11 of which are in summer.

The average seasonal snowfall is 59.3 inches. The greatest snow depth on the ground at any one time was 35 inches. On the average, 22 days have at least 1 inch of snow on the ground, but the number of days varies greatly from year to year.

The average relative humidity in midafternoon is less than 44 percent in spring, and is about 50 percent during

the rest of the year. Humidity is higher at night in all seasons, and the average is about 75 percent at dawn. The percent of possible sunshine is 75 in summer and 42 in winter.

Farming

The Kootenai Soil Conservation District was formed on March 31, 1941. The northern part of Shoshone County was added to the District in March, 1972, and the name was changed to "Kootenai-Shoshone Soil Conservation District." Originally, the District's purpose was the conservation of the soil resources of Kootenai County, but it has expanded recently to include the conservation and development of all the resources.

There are about 121,000 (5) acres of cropland in Kootenai County. About 90,000 acres of this is dry cropland, mainly in the Palouse area in the southern part. The average annual precipitation of 20 to 26 inches is sufficient for annual cropping with moderate to high crop yields, depending on individual soil conditions. Most of the 31,000 acres of irrigated cropland are in the Rathdrum Prairie in the northern part of the county. The droughty soil conditions in this area result in very low crop yields unless sprinkler irrigation systems are used.

Approximately 55 percent of the total cropland is in the Palouse area and consists largely of cut-over lands that have a small amount of prairie soils. Winter wheat is the leading cash crop, accounting for over half of the gross income from all crops produced in this part of county. Barley, peas, and grass seed are other major crops; and lentils, oats, and hay are also grown. Liberal applications of commercial fertilizers, together with improved varieties and management, have substantially increased average overall yields.

Most of the remaining 45 percent of the cropland is in the Rathdrum Prairie. Grass seed, wheat, and barley are the leading cash crops, accounting for approximately three-fourths of the gross income from all crops produced in the area. About two-thirds of this cropland is under irrigation, and this percentage is steadily increasing.

A small percentage of the cropland is in bottom lands and benchlands near the lakes, major streams, and on mountain foot slopes. The bottom lands are mostly used for hay, oats, and other small grains. The benchlands and mountain foot slopes are largely cut-over timberland that is planted to grasses and legumes for hay, with a smaller acreage of small grain.

The survey area annually furnishes grazing for about 12,000 head of cattle. The cattle are pastured on small meadows and creek bottoms, some of the nonirrigated land on the Rathdrum Prairie, timberland, and cut-over timberland.

Recreation

Kootenai County has a variety of recreational activities. Opportunities for hunting and fishing are very good. Wildlife includes elk, deer, bear, grouse, pheasant, ducks, geese, rainbow and cutthroat trout, Kokanee salmon, bass, crappie, perch, and Kamloops trout. There are great opportunities for boating and water sports on the Coeur d'Alene and Spokane Rivers; the Coeur d'Alene, Hayden, and Pend Oreille Lakes; and the many smaller lakes in the county. Hiking, camping, canoeing, snowmobiling, cross-country skiing, and sightseeing are also popular in the county.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields

under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

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

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it 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 kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The soils in the survey area vary widely in their potential for major land uses. The descriptions give the extent of the map units shown on the general soil map and the soil limitations and the potential of each, in relation to the other map units, for major land uses. Soil properties that pose limitations to the use are indicated. The ratings of soil potential are based on the assumption that practices in common use in the survey area are being used to overcome soil limitations. These ratings reflect the ease of overcoming the soil limitations and the probability of soil problems persisting after such practices are used.

Each map unit is rated for *cultivated farm crops, woodland, urban uses,* and *recreation areas.* Cultivated farm crops are those grown extensively by farmers in the survey area. Woodland refers to land that is producing either trees native to the area or introduced species. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas include campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas include those used for nature study and as wilderness.

Undulating to steep, deep and very deep, well drained and moderately well drained soils on loess covered hills

These soils formed in loess mixed with volcanic ash. They are mainly in the southwestern and south-central part of the survey area. Some of the soils are interspersed on terraces along Lake Coeur d'Alene. Elevation is 2,300 to 3,000 feet, and the average annual precipitation is 22 to 28 inches. Average annual air temperature is 43 to 47 degrees F, and the average frost-free season is 100 to 130 days.

The map units in this group make up about 13 percent of the survey area. Most of the acreage is used for cultivated crops.

1. Larkin-Southwick

Undulating to hilly, very deep, well drained and moderately well drained soils that formed in deep loess and some volcanic ash

These soils are on the undulating to moderately steep loess hills in the southwestern part of the county, and are warmer than the surrounding mountainous soils.

This map unit makes up about 2 percent of the survey area. It is approximately 50 percent Larkin soils, 40 percent Southwick soils, and 10 percent soils of minor extent.

The Larkin soils are slightly higher than the Southwick soils and are well drained. Typically, they have a silt loam surface layer and a silty clay loam subsoil.

The Southwick soils are moderately well drained. Typically, they have a silt loam surface layer and subsurface layer. The subsoil is silty clay loam. The Southwick soils have a perched water table in spring.

Soils of minor extent in this map unit are the moderately well drained Taney soils and the somewhat poorly drained Latahco soils.

The soils in this map unit are used for dryfarmed cropland and woodland. Small grain, peas, lentils, hay, pasture, and grass seed are the main crops. Moderately steep slopes are the major limitation for farming because the soils are highly erosive.

The slow permeability of the subsoil and potential frost action are the main limitations for road construction and maintenance. These soils have good potential for the development of ponds. Runoff is a hazard, and accumulation of water in the drainageways is often great enough to cause damage to structures and stream channels. The silty clay loam subsoil and the slow permeability are concerns for urban and residential development. Septic tank absorption fields often do not function properly.

These soils have good potential for openland and woodland wildlife habitats.

2. Taney

Undulating to hilly, very deep, moderately well drained soils that formed in deep loess and some volcanic ash

These soils are on the loess covered hills in the southwestern part of the county.

This map unit makes up about 7 percent of the survey area. About 70 percent of the map unit is Taney soils, and 30 percent is soils of minor extent.

Taney soils have a silt loam surface layer and subsurface layer and a very firm silty clay loam subsoil. They have a perched water table during the rainy season.

Soils of minor extent are the moderately well drained Southwick and Santa soils, the well drained Larkin soils, and the somewhat poorly drained Cald soils.

The soils in this map unit are mainly used for dryfarmed crops and woodland. Small grain, peas, lentils, hay, pasture, and grass seed (fig. 1) are the main crops. These soils are highly erosive, and production-is decreased in areas that have been eroded.

The slow permeability and resultant perched water table during the wet season, and the potential for frost action are limitations for homesites, sanitary facilities, and roads.

Drainageways often accumulate enough water during high runoff to damage stream channels and structures.

These soils have good potential for the development of woodland wildlife habitat.

3. Santa

Undulating to steep, deep, moderately well drained soils that formed in deep loess and some volcanic ash

These soils are on loess covered hills. Areas are scattered throughout the southwestern and south-central part of the county.

This map unit makes up about 5 percent of the survey area. About 70 percent is Santa soils and 30 percent is soils of minor extent.

Santa soils have a silt loam surface layer, a silt subsurface layer, and a silt loam and silty clay loam fragipan subsoil. The fragipan causes very slow permeability and consequently a perched water table during the rainy season.

Soils of minor extent in this map unit are the moderately well drained Taney soils, the somewhat poorly drained Cald soils, and the very poorly drained Porrett soils.

The soils in this map unit are used for woodland and dryfarmed cropland (fig. 2). The main crops are small grain, pasture, hay, and grass seed. The main limitations for farming are the dense subsoil, which limits root growth, and the highly erosive nature of the soils.

Figure 1.-Taney soil on loess hills used for production of bluegrass seed.

Figure 2.-Cattle grazing on wheat stubble in an area of Santa soil on loess hills.

Limitations for urban or residential development are the perched water table late in winter and early in spring, frost heaving, and slopes over 15 percent.

These soils have good potential for development of woodland wildlife habitat.

Nearly level to moderately steep, very deep, well drained and somewhat excessively drained soils on outwash plains, terraces, and terrace slopes

These soils formed in glacial outwash mantled with loess and volcanic ash. They are mainly in the outwash plain on the Rathdrum Prairie, in the western and north-central part of the county. Elevation is 2,000 to 2,600 feet, and the average annual precipitation is 20 to 28 inches. Average annual air temperature is 43 to 48 degrees F, and the average frost-free season is 90 to 150 days.

The map units in this group make up about 25 percent of the survey area. Areas in the southern part of the Rathdrum Prairie are used for irrigated crops, mainly small grain and grass seed. The northern part is mostly forested, but some areas are used for hay and pasture.

4. Avonville-Garrison-McGuire

Nearly level to undulating, well drained and somewhat excessively drained soils that formed in glacial outwash under a loess and volcanic ash mantle

These soils are on the outwash terraces and terrace slopes in the west-central part of the county, north of the Spokane River, in the Rathdrum Prairie.

This map unit makes up about 11 percent of the survey area. About 40 percent is Avonville soils, 30 percent is Garrison soils, 15 percent is McGuire soils, and 15 percent is soils of minor extent.

The Avonville soils are well drained. Typically, they have a gravelly silt loam surface layer, a very gravelly silt loam subsoil, and a very gravelly sand substratum.

The Garrison soils are somewhat excessively drained. Typically, they have a gravelly silt loam surface layer and a very gravelly loam subsoil. The substratum is very gravelly sandy loam and very gravelly coarse sand.

The McGuire soils are somewhat excessively drained. Typically, they have a gravelly sandy loam surface layer. The subsoil is very gravelly sandy loam and very gravelly coarse sandy loam. The substratum is very gravelly coarse sandy loam and very gravelly coarse sand.

Soils of minor extent in this map unit are the excessively drained Marble soils, the moderately well drained Narcisse soils, and the well drained Bonner and Kootenai soils.

These soils are used for irrigated crops, mainly small grain and grass seed; for woodland; and for urban development. The main limitations for farming are the high percentage of coarse fragments, the rapid permeability of the subsoil, and the droughtiness in all of these soils.

These soils have good potential for residential or urban development (fig. 3). The rapid permeability of the substratum and the large amount of coarse fragments are the main limitations for sanitary facilities. Community sewage systems are indicated because of the potential of ground water pollution in areas of high population density. Frost action is a limitation in the construction and maintenance of roads.

These soils have fair potential for openland or woodland wildlife habitat.

5. Kootenai-Bonner

Nearly level to moderately steep, well drained soils that formed in glacial outwash mantled with loess and volcanic ash

These soils are on the nearly level outwash terraces or moderately steep terrace slopes and glacial moraine positions in the north-central part of the county in the Rathdrum Prairie.

This map unit makes up about 14 percent of the survey area. About 55 percent is Kootenai soils, 25 percent is Bonner soils, and 20 percent is soils of minor extent.

Typically, the Kootenai soils have a gravelly silt loam surface layer, a gravelly silt loam and very gravelly loam subsoil, and a very gravelly coarse sand substratum.

Typically, the Bonner soils have a silt loam surface layer, a gravelly silt loam subsoil, and a very gravelly loamy sand substratum.

The Kootenai soils have less influence from volcanic ash and are drier than the Bonner soils..

Soils of minor extent are the very deep, well drained Rathdrum soils, the well drained Avonville soils, and the somewhat excessively drained Garrison and McGuire soils.

The soils in this map unit are mainly used for woodland. Some cleared areas are used for small grain, hay, and pasture. The main limitations for farming are the large amount of coarse fragments in the soil profile and the very rapid permeability of the substratum, which makes the soils droughty.

These soils have good potential for residential or urban development. The rapid permeability and coarse fragments limit the function of sanitary facilities. Community sewage systems are often necessary because of the potential for ground water pollution in areas of high population density. Frost action is a limitation for dwelling and road construction.

These soils have fair to good potential for woodland wildlife habitat.

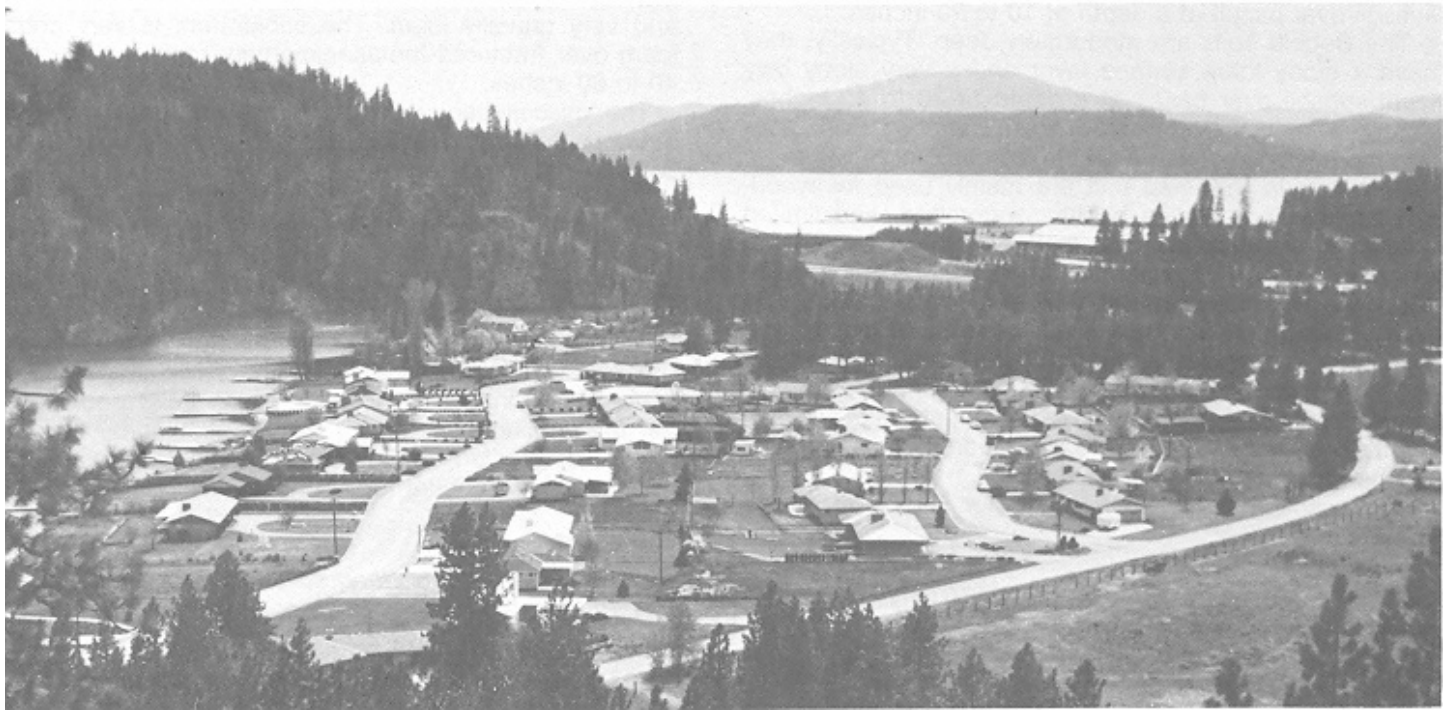

Figure 3.-Urban development on Avonville-Garrison-McGuire soils on glacial outwash terraces.

Sloping to very steep, shallow and moderately deep, well drained soils on basalt terrace escarpments and in canyons

These soils formed in loess and volcanic ash that overlies basaltic lava flows. They are scattered throughout the county. Elevation is 2,100 to 3,000 feet. The average annual precipitation is about 22 to 30 inches. The average annual air temperature is 42 to 48 degrees F, and the average frost-free season is 90 to 140 days.

The soils in this map unit make up about 6 percent of the survey area. Most of the acreage is forested.

6. Blinn-Lacy-Bobbitt

Sloping to very steep soils that formed in loess and volcanic ash over basalt

Areas of these soils are scattered throughout the county wherever basalt flows are located.

The map unit makes up about 6 percent of the survey area. About 40 percent is Blinn soils, 25 percent is Lacy soils, 15 percent is Bobbitt soils, and 20 percent is soils of minor extent and miscellaneous areas.

The Bobbitt and Lacy soils have southern exposures and are the warmest.

The Blinn soils are moderately deep. Typically, they have a stony loam surface layer and subsoil. The substratum is very stony loam over basalt at a depth of 20 to 40 inches.

The Lacy soils are shallow. Typically, they have a stony loam surface layer and a very stony clay loam subsoil over basalt at a depth of 10 to 20 inches.

The Bobbitt soils are moderately deep. Typically, they have a stony loam surface layer and a very stony clay loam subsoil over basalt at a depth of 20 to 40 inches.

Soils of minor extent are the well drained Dorb soils and the miscellaneous areas of Rock outcrop.

The soils in this map unit are mainly used for woodland, recreation, wildlife habitat, watershed, and limited grazing in some areas. The main limitations for farming are slope and a large amount of rock fragments on the surface and in the soil profile. Most of these soils are on steep escarpments or near Rock outcrop, which are limitations for timber production and harvesting.

These soils have poor potential for urban or residential development because of slope, large stones, and the depth to bedrock. The hard basalt bedrock is a limitation for the installation of sanitary facilities.

These soils have good potential for woodland wildlife habitat.

Sloping to very steep, moderately deep to very deep, well drained soils on mountains and mountain foot slopes

These soils formed in loess mixed with large amounts of volcanic ash over metasedimentary, granitic, schist, and gneissic rocks. These soils are scattered throughout the county at an elevation of 2,200 to 6,400 feet. The average annual precipitation is 25 to 50 inches. The average annual air temperature is 40 to 47 degrees F, and the average frost-free season is 45 to 120 days.

The map units in this group make up about 50 percent of the survey area. Most of the acreage is forested.

7. Huckleberry-McCrosket-Ardenvoir

Sloping to very steep, moderately deep to deep soils that formed in volcanic ash and loess over metasedimentary rock

These soils are scattered throughout the eastern half of the county and are on mountain slopes.

This map unit makes up about 19 percent of the survey area. About 35 percent is Huckleberry soils, 25 percent is McCrosket soils, 25 percent is Ardenvoir soils, and 15 percent is miscellaneous areas and soils of minor extent.

The Huckleberry soils are on northern aspects, where there is more effective moisture.

The Huckleberry soils are moderately deep. Typically, they have a silt loam surface layer and a gravelly silt loam subsoil. The substratum is very gravelly loam over fractured metasedimentary bedrock at a depth of 20 to 40 inches.

The McCrosket soils are deep. Typically, they have a gravelly silt loam surface layer and a very gravelly silt loam subsoil and substratum. Fractured metasedimentary rock is at a depth of 40 to 60 inches.

The Ardenvoir soils are deep. Typically, they have a gravelly loam surface layer. The subsoil is gravelly loam and very gravelly loam. The substratum is very cobbly loam over fractured metasedimentary rock at a depth of 40 to 60 inches.

The miscellaneous areas in this map unit are Rock outcrop. Soils of minor extent are the well drained Tekoa soils and the moderately well drained Santa soils.

The soils in this map unit are mainly used for woodland, grazing, wildlife habitat, and recreation. The steep slopes, high percentage of coarse fragments, and the high hazard of erosion are the main limitations for timber production and logging operations.

These soils have poor potential for residential and urban development because of the steep slopes, depth to rock, and inaccessibility. They also have poor potential for farming because of the steep slopes, the high hazard of erosion, and depth to bedrock. These areas provide a good habitat for woodland wildlife.

8. Vassar

Sloping to very steep, deep soils that formed in volcanic ash and loess over weathered granitic rock

These soils are on mountain slopes and foot slopes, and are mostly in the northwestern and northeastern part of the county. Some are in the west-central mountainous areas.

This map unit makes up about 14 percent of the survey area. About 80 percent is Vassar soils, and 20 percent is soils of minor extent and miscellaneous areas. The soils of minor extent are the well drained Lenz, Moscow, Spokane, and Ulricher soils, and the miscellaneous areas are Rock outcrop.

The Vassar soils have a silt loam surface layer and subsoil and a sandy loam substratum.

These soils are used mainly for woodland. Some areas are cleared for grazing. The steep slopes and high hazard of erosion are the main limitations for timber production and harvesting.

These soils have poor potential for residential or urban development because of inaccessibility and steep slopes, but they provide good woodland wildlife habitat.

9. Lenz-Schumacher-Skalan

Sloping to very steep, moderately deep and deep soils that formed in loess and some volcanic ash over gneiss and schist

These soils are on mountain slopes and foot slopes in the west-central part of the county.

This map unit makes up about 8 percent of the survey area. About 40 percent is Lenz soils, 15 percent is Schumacher soils, 15 percent is Skalan soils, and 30 percent is miscellaneous areas and soils of minor extent.

The Lenz soils are moderately deep. Typically, they have a loam surface layer and a very gravelly sandy loam subsoil. The substratum is very stony sandy loam over fractured gneiss at a depth of 20 to 40 inches.

The Schumacher soils are deep. Typically, they have a silt loam surface layer. The subsoil is gravelly silty clay loam over fractured metasedimentary bedrock at a depth of 40 to 60 inches.

The Skalan soils are moderately deep. Typically, they have a gravelly loam surface layer and a very gravelly clay loam subsoil. The substratum is very gravelly loam over fractured gneiss at a depth of 20 to 40 inches.

The miscellaneous areas in this map unit are Rock outcrop, and the soils of minor extent are the well drained Spokane, Kruse, Vassar, and Ulricher soils.

The soils in this map unit are mainly used for woodland, grazing, recreation, and wildlife habitat. Some areas of the Schumacher soils are used for small grain, peas, grass, or hay. Slope, stoniness, rockiness, and depth to bedrock are the main limitations for farming and woodland harvesting.

These soils have poor potential for urban or residential development because of slope, depth to rock, stoniness, and rockiness. They provide good woodland and fair rangeland wildlife habitats.

10. Kruse-Ulricher

Sloping to very steep, deep and very deep soils that formed in decomposed gneiss and schist mixed with loess and volcanic ash

These soils are mainly in the west-central part of the county, south of the Spokane River.

This map unit makes up about 7 percent of the survey area. About 55 percent is Kruse soils, 30 percent is Ulricher soils, and 15 percent is soils of minor extent.

The Kruse soils are very deep. Typically, they have a silt loam surface layer, a clay loam subsoil, and a fine sandy loam substratum.

The Ulricher soils are deep. Typically, they have a loam surface layer and a sandy loam and cobbly sandy loam subsoil. The substratum is cobbly loamy sand over weathered gneiss at a depth of 40 to 60 inches.

Soils of minor extent include the moderately well drained Santa soils and the well drained Lenz, Vassar, and Schumacher soils.

The soils in this map unit are used for woodland, hay, pasture, and small grain. On the steeper slopes, the high hazard of erosion is the main limitation for farming.

These soils have fair potential for urban or residential development on the lesser slopes. The moderately slow permeability of the subsoil in the Kruse soils and the depth to bedrock in the Ulricher soils are the main limitations for septic tank filter fields. Inaccessibility is a concern on the very steep slopes.

These soils have good potential for development of woodland wildlife habitat.

11. Divers-Brickel

Sloping to very steep, moderately deep and deep soils that formed in material weathered from metasedimentary and granitic rock mantled with mixed loess and volcanic ash

Areas of these mountain soils are in the southeastern part of the survey area; some are in the northwestern part of the county and are generally at higher elevations than the surrounding areas.

This map unit makes up about 1 percent of the survey area. About 40 percent is Divers soils, 35 percent is Brickel soils, and 25 percent is miscellaneous areas.

The Divers soils are deep. Typically, they have a silt loam surface layer and a silt loam and very gravelly silt loam subsoil. The substratum is very cobbly loam over bedrock at a depth of more than 60 inches.

The Brickel soils are moderately deep. Typically, they have a stony silt loam surface layer and subsoil. The substratum is very cobbly silt loam over fractured metasedimentary rock at a depth of 20 to 40 inches.

The Divers soils have been more influenced by volcanic ash than the Brickel soils. The Brickel soils are generally higher in elevation than the Divers soils.

The miscellaneous areas in this map unit are Rubble land, which consists of stones and boulders.

The soils in this map unit are used for woodland wildlife habitat, limited grazing, recreation, and watershed. The main limitations are the cold climate, high elevation, and the great amount of rock fragments. These soils are highly erosive because of the great amounts of volcanic ash.

These soils have poor potential for residential uses because of the steep slopes and inaccessibility of the area.

Potential for woodland wildlife habitat is fair.

Level and nearly level, very deep, very poorly drained to somewhat poorly drained soils on flood plains and low stream terraces

These soils formed in mixed alluvium and organic material. They are on flood plains and low stream terraces along the Coeur d'Alene River and in drainageways and low bottomland areas throughout the county. Elevation is 2,100 to 3,200 feet, and the average annual precipitation is 20 to 30 inches. The average annual air temperature is 42 to 47 degrees F, and the average frost-free season is 80 to 140 days.

The map units in this group make up 3 percent of the survey area and are used for cropland, pasture, and some woodland.

12. Pywell-Cald-Cougarbay

Level and nearly level, very poorly drained and somewhat poorly drained peat and stratified mineral soils that formed in alluvium and in organic materials

Areas of these soils are scattered throughout the county. They are in drainageways, low flood plains, low stream terraces, and bottomland positions.

This map unit makes up about 2 percent of the survey area. About 40 percent is Pywell soils, 30 percent is Cald soils, 20 percent is Cougarbay soils, and 10 percent is soils of minor extent.

The Pywell soils are very poorly drained. The surface layer, the next layer, and the bottom layer are organic material.

The Cald soils are somewhat poorly drained. They have a silt loam surface layer and substratum.

The Cougarbay soils are very poorly drained. They have a silt loam surface layer. The substratum is stratified silty clay, coarse sand, and loamy coarse sand.

The soils of minor extent in this map unit are the moderately well drained Thatuna soils, the poorly drained Potlatch and Seelovers soils, and the very poorly drained Porrett and Ramsdell soils.

These soils are mainly used for hay, pasture, and some small grain. Wetness is the main limitation for farming. These soils (fig. 4) have a high water table and need to be drained to obtain the best yields. They are also subject to common or frequent flooding.

Wetness and flooding are severe limitations for devel opment of urban and residential areas. These soils have good potential for wetland or rangeland wildlife habitat.

Figure 4.-Pywell-Cald-Cougarbay soils on the Coeur d'Alene River flood plain. When the snow melts, these soils have a high water table and are flooded unless they are protected by dikes and levees.

13. Slickens-Xerofluvents

Slickens, and nearly level, poorly drained stratified soils that formed in alluvium

Areas of the Slickens material are on low stream terraces along the Coeur d'Alene River. Xerofluvent soil materials are on low stream terraces in areas of active streams throughout the county.

This map unit makes up 1 percent of the survey area. About 70 percent is Slickens, 25 percent is Xerofluvents, and 5 percent is a soil of minor extent.

Slickens materials are ore-mill tailings that have been deposited along the Coeur d'Alene River. Xerofluvents are soils that have been mixed and worked by continual stream overflow or action. They are mostly sand, gravel, cobbles, and stones. Some areas do have a medium textured surface layer.

The soil of minor extent is the very poorly drained Ramsdell soil.

The soils in this map unit are used for some woodland and grazing. They have very poor potential for farming because of the continued overflowing of streams and the nature of the material.

Potential for urban and residential development is poor because of the frequent flooding and the high water table. The rapid permeability of this material is a limitation for the proper function of sanitary facilities.

These soils have good potential for wetland wildlife habitat and fair potential for woodland wildlife habitat.

Undulating to steep, very deep, moderately well drained and well drained soils on lake terraces

These soils formed in lake sediment and volcanic ash. They are on lacustrine terraces scattered throughout the county. Elevation is 2,200 to 2,800 feet, and the average annual precipitation is 23 to 30 inches. The average annual air temperature is 40 to 43 degrees F, and the average frost-free season is 60 to 110 days.

The map unit in this group makes up about 3 percent of the survey area. Most of the acreage is used for woodland. Areas are cleared and used for small grain, pasture, hay, and homesites.

14. Chatcolet-Mokins-Selle

Undulating to steep soils that formed in lacustrine sediment and volcanic ash

Areas of this map unit are scattered throughout the county on lake terraces.

This map unit makes up about 3 percent of the survey area. About 40 percent is Chatcolet soils, 35 percent is Mokins soils, 10 percent is Selle soils, and 15 percent is soils of minor extent.

The Chatcolet soils are moderately well drained. Typically, they have a silt loam surface layer and subsoil over a buried silty clay loam subsoil.

The Mokins soils are moderately well drained. Typically, they have a silt loam surface layer and a silt loam and gravelly silt loam subsoil over a buried subsoil that is silty clay loam and silty clay.

The Selle soils are well drained. Typically, they have a fine sandy loam surface layer and subsoil and a fine sandy loam and loamy fine sand substratum.

The soils of minor extent are the well drained Rubson and Dorb soils.

The soils in this map unit are mainly used for woodland. Cleared areas are used for small grain, hay, and pasture. The main limitations for farming are the fine textured subsoil and the cold soil temperature of the Mokins and Chatcolet soils. The Selle soils have rapid permeability in the substratum and lower available water capacity. All the soils in this map unit are highly erosive.

These soils have fair potential for urban and residential development. The moderately slow and slow permeability of the Chatcolet and Mokins soils are limitations for septic tank absorption fields. The Selle soils have a rapidly permeable substratum, which is a hazard for pollution of ground water. Community sewage systems are needed in areas of high population density. Frost action and low strength are the main limitations for road construction and maintenance.

These soils have good potential for woodland wildlife habitat.

Broad land use considerations

The general soil map is most helpful for planning the general outline of urban or residential areas, agricultural areas, woodland areas, and other land uses. It cannot be used for the selection of sites for specific uses or structures. The data in this survey can be helpful in planning future land use patterns.

The soils in the Larkin-Southwick map unit and Taney map unit, located in the southwestern part of the county, are good farmland. The soils in the Avonville-Garrison-McGuire map unit, on the Rathdrum Prairie, are also used for farming, but have limitations because of the high content of gravel and the low available water capacity. The soils in the Santa map unit, scattered throughout the southern part of the county, have a very dense subsoil which limits root growth and restricts permeability. These soil characteristics are limitations for farming and for urban and residential development.

Some of the soils on the flood plains and bottom lands are used for farming. The soils in the Pywell-Cald-Cougarbay map unit are used for farm crops. Wetness is a limitation on these soils. Proper drainage and protection from flooding help overcome the limitation for farming. These soils have poor potential for non-farm uses because of wetness.

The soils in the Chatcolet-Mokins-Selle map unit are also used for farming. The main limitation for farming and for residential and urban uses for the Chatcolet and Mokins soils is a moderately fine textured and fine textured subsoil that is slowly permeable.

The sloping to very steep mountainous soils such as those in the Huckleberry-McCrosket-Ardenvoir map unit are good for woodland, grazing, wildlife habitat, and recreation. These soils have poor potential for urban and residential development because of the steep slopes, rock fragments, and the high hazard of erosion. They have good potential for woodland wildlife habitat. The coniferous forests enhance the beauty of these areas and are good for nature study and recreation.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series.* Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of *a soil phase* commonly indicates a feature that affects use or management. For example, Santa silt loam, 5 to 20 percent slopes, is one of several phases within the Santa series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes or soil associations.

A soil complex consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Kootenai-Bonner complex, 0 to 20 percent slopes, is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. Divers-Brickle association, 45 to 75 percent slopes, is an example.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas;* they are delineated on the soil map and given descriptive names. Rock outcrop is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

This survey was mapped at two levels of detail. At the most detailed level, map units are narrowly defined. This means that soil boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Soil boundaries were plotted and verified at wider intervals. The broadly defined units are indicated by an asterisk in the soil map legend. The detail of mapping was selected to meet the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions and potentials

101-Aquic Xerofluvents, nearly level. Aquic Xerofluvents are made up of poorly drained, stratified soils on stream bottoms and low stream terraces. They formed in alluvium from mixed sources recently deposited by rivers and streams. Elevation is 2,200 to 2,600 feet. The average annual precipitation is 30 inches, average annual air temperature is 43 degrees F, and average frost-free period is 120 days.

Included with these soils in mapping are small areas of Cougarbay silt loam, Pywell muck, and Slickens, all with 0 to 2 percent slopes. Also included are Chatcolet cobbly loam, Mokins silt loam, and Rubson silt loam, with 5 to 20 percent slopes.

These soils are highly stratified silt loams, very fine sandy loams, sand, gravel, or cobbles.

The rooting depth is somewhat limited by the layers of sand, pebbles, and cobbles. Available water capacity is

very low in most places. Permeability varies from moderate to very rapid, runoff is slow, and erosion by channelization is very likely during flooding. A high water table is at a depth of 18 to 24 inches from February through May. These soils are frequently flooded for brief periods in spring.

These soils are used for pasture, woodland, or wildlife habitat.

Areas of these soils that have a fairly thick surface layer of silt loam or loam are suited to western redcedar, grand fir, western white pine, Douglas-fir, western larch, and lodgepole pine. These soils are capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the presence of cobbles, the high water table, and the flooding in the spring. Conventional methods can be used for tree harvest, but are restricted during the wet season.

After trees and brush are removed, a good pasture growth can be obtained with a well balanced fertilization program. Adapted forage includes tall fescue, reed canarygrass, timothy, and meadow foxtail. Periodic flooding is a hazard in pasture management.

Forested areas provide good habitat for white-tailed deer, black bear, elk, squirrels, chipmunks, and various songbirds. These areas also have good potential for wetland wildlife habitat .

Homesite development and recreational facilities are severely limited because of the hazard of flooding and the high water table (fig. 5). Surface cobbles are limitations for recreation.

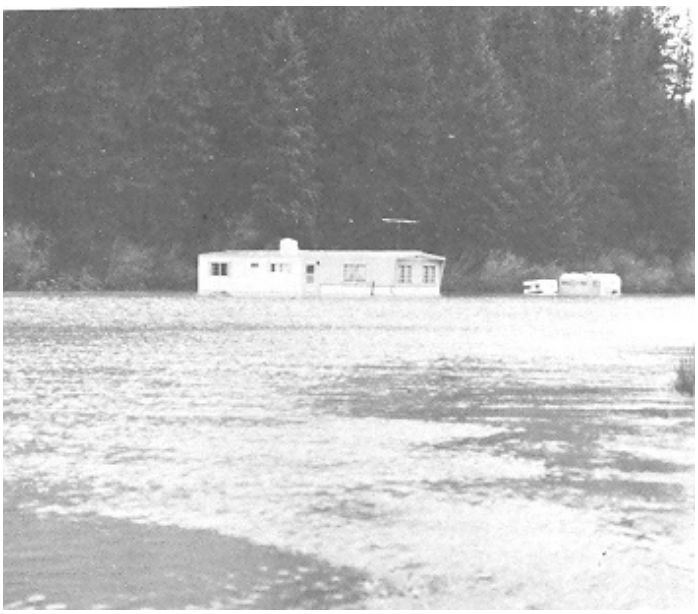

Figure 5.-Flooded area of Aquic Xerofluvents.

This map unit is in capability subclass Vllw.

102-Avonville gravelly coarse sandy loam, 0 to 20 percent slopes. This Avonville soil is a very deep, well drained soil that formed in loess and volcanic ash mixed with glacial outwash material. It is on hummocky areas of the glacial outwash plains and terraces. Elevation is 2,200 to 2,400 feet. Slope is 0 to 20 percent but is mostly less than 7 percent. The average annual precipitation is 24 inches, average annual air temperature is 44 degrees F, and average annual frost-free period is 140 days.

Included with this soil in mapping are small areas of Garrison gravelly silt loam, Kootenai gravelly silt loam, McGuire gravelly sandy loam, and Marble coarse sandy loam, all with slopes of 0 to 7 percent. Also included are Bonner gravelly silt loam, 0 to 8 percent slopes; Narcisse silt loam, 0 to 5 percent slopes; and Avonville fine gravelly silt loam, 0 to 20 percent slopes.

Typically, the surface layer of this Avonville soil is dark grayish brown gravelly coarse sandy loam about 16 inches thick, and is medium acid. The subsoil is yellowish brown and pale brown very gravelly sandy loam about 21 inches thick, and is neutral. The substratum is variegated very gravelly sand to a depth of 60 inches.

The rooting depth is 60 inches or more. Permeability is moderately rapid, the available water capacity is low, and runoff is slow to medium. The hazard of erosion is moderate to high.

This soil is mainly used for pasture, hay, small grain, and grass for seed production.

Limitation for crop production is the droughty soil condition caused by the gravelly subsoil. Deep-rooted perennial crops are the most reliable. This soil is well adapted to irrigation, and all crop yields can be expected to increase under proper irrigation management.

Fertilization is necessary, and the rates and timing need to be determined for each crop.

The hazard of soil blowing is slight where summer fallow is used. Proper use of straw and crop residue is needed.

This soil is suited to pasture and hay. A well balanced fertilization program, including the use of nitrogen and possibly sulfur, helps obtain good plant growth on irrigated land. Phosphorus is also needed when legumes are grown.

Good water management on irrigated land helps obtain maximum plant growth. Without irrigation, plant growth is only fair. On pastures, grazing management will benefit from a rotation grazing system and a proper regrowth period for the plants.

Adapted forage plants for irrigated lands include Latar orchardgrass, smooth brome, or Regar bromegrass. Dryland plants include smooth brome and intermediate wheatgrass.

Native plants provide some habitat elements for white-tailed deer, songbirds, various small mammals, some

Chinese pheasant, and Hungarian partridge. Deer and bear seasonally visit the forested areas and feed on cropland fields. Forest grouse also inhabit the forested areas. Shortage of water is a limitation for wildlife unless the soil is irrigated. Potential for Chinese pheasant is poor because of clean till farming.

Slope of more than 8 percent is the main limitation for homesites. Sanitary facilities are limited by seepage and by these slopes. This soil is suited to septic tank absorption fields; however, ground water pollution is a hazard. Community sewage systems should be considered in areas of high population density. Excavation operations, including sloping of banks or shoring, help prevent cut-banks from caving.

Slope is the main limitation for road construction. There is a potential for paths and trails; however, slopes of more than 8 percent are a restriction for playgrounds, picnic areas, and camp areas.

This map unit is in capability subclass IVe and IIIe, irrigated.

103-Avonville fine gravelly silt loam, 0 to 7 percent slopes. This Avonville soil is a very deep, well drained soil that formed in loess and volcanic ash mixed with glacial outwash material. It is on glacial outwash plains and terraces at an elevation ranging from 2,200 to 2,400 feet. The average annual precipitation is 24 inches, average annual air temperature is 44 degrees F, and average annual frost-free period is 140 days.

Included with this soil in mapping are areas of Garrison gravelly silt loam, Kootenai gravelly silt loam, McGuire gravelly sandy loam, and Marble sandy loam, all with slopes of 0 to 7 percent. Also included are Bonner gravelly silt loam, 0 to 8 percent slopes; Narcisse silt loam, 0 to 5 percent slopes; and Avonville fine gravelly silt loam, 7 to 20 percent slopes.

Typically, the surface layer of this Avonville soil is dark grayish brown gravelly silt loam about 16 inches thick, and is medium acid. The subsoil is yellowish brown and pale brown very gravelly silt loam and very gravelly sandy loam about 21 inches thick, and is neutral. The substratum is variegated very gravelly sand below a depth of 37 inches.

The rooting depth of this soil is more than 60 inches. Available water capacity is low. Permeability is moderate, runoff is slow, and the hazard of erosion is slight.

This soil is mainly used for pasture, hay, small grain, and grass seed.

Crop production is limited by the droughty soil conditions. There is a slight hazard of water erosion where sprinkler irrigation is used. The very gravelly subsoil is the main limitation for plant growth. Deep-rooted perennial crops are the most reliable. This soil is well adapted to irrigation, and proper irrigation management helps increase plant growth.

Fertilization is necessary, and the rates and timing need to be determined for each crop.

The hazard of soil blowing is slight where summer fallow is used. Proper use of straw and crop residue is a necessity.

This soil is well suited to pasture and hay. A well balanced fertilization program, including the use of nitrogen and possibly sulfur, helps obtain excellent plant growth on irrigated land. Phosphorus is also needed when legumes are grown.

Good water management on irrigated land helps obtain maximum plant growth. Without irrigation, plant growth is only fair. Pastures benefit from a rotation grazing system and a proper regrowth period for the plants.

Adapted forage plants for irrigated lands include Latar orchardgrass, smooth brome, or Regar bromegrass. Dryland plants include smooth brome and intermediate wheatgrass.

Vegetation provides some habitat elements for whitetailed deer, songbirds, various small mammals, some Chinese pheasant, and Hungarian partridge. Deer and bear seasonally visit forested areas and feed on cropland fields. Forest grouse also inhabit the forested areas. Shortage of water is a limitation for wildlife, unless irrigation is used. Potential for Chinese pheasant is poor because of clean-till farming.

The main limitations for sanitary facilities are the small stones and the rapid permeability of the substratum. This soil is suited to septic tank absorption fields; however, ground water pollution is a hazard. Community sewage systems should be considered in areas of high population density.

Frost action is a potential hazard for roads. The depth of frost penetration should be considered when footings and road base designs are planned. Small surface stones are limitations for recreational development.

This map unit is in capability subclass IIIs, nonirrigated and irrigated.

104-Avonville fine gravelly silt loam, 7 to 20 percent slopes. This Avonville soil is a very deep, well drained soil that formed in loess and volcanic ash mixed with glacial outwash material. The soil is on short, glacial outwash terrace slopes. Elevation is 2,200 to 2,400 feet. The average annual precipitation is 24 inches, average annual air temperature is 44 degrees F, and average annual frost-free period is 140 days.

Included with this soil in mapping are small areas of Avonville fine gravelly silt loam, Garrison gravelly silt loam, Marble sandy loam, and McGuire gravelly sandy loam, all with slopes of 0 to 7 percent. Also included are Bonner gravelly silt loam, 0 to 8 percent slopes, and Narcisse silt loam, 0 to 5 percent slopes.

Typically, the surface layer of this Avonville soil is dark grayish brown gravelly silt loam about 16 inches thick, and is medium acid. The subsoil is yellowish brown and pale brown very gravelly silt loam and very gravelly sandy loam about 21 inches thick, and is neutral. The substratum is variegated very gravelly sand below a depth of 37 inches.

The rooting depth of this soil is 60 inches or more. Available water capacity is low. Permeability is moderate, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for pasture, hay, small grain, and grass for seed production.

This soil has limitations for cropland because of slope and the droughty nature of the soil under dryland conditions. Small grain, perennial forage, or grass seed are adequate cropping systems. Fertilization of all crops is a necessity, and rates and timing need to be determined for each crop. Irrigation increases the yields of all crops, but a surface irrigation program is needed to minimize water erosion.

The hazard of soil blowing is slight when summer fallow is used. Proper use of straw and crop residue is needed.

This soil is well suited to pasture and hay. A well balanced fertilization program, including the use of nitrogen and possibly sulfur, helps obtain good plant growth on irrigated land. Phosphorus is also needed when legumes are grown.

Good water management on irrigated land helps obtain maximum plant growth. Without irrigation, plant growth is only fair. Pastures benefit from a rotation grazing system and a proper regrowth period for the plants.

Adapted forage for irrigated land includes Latar orchardgrass, smooth brome, or Regar bromegrass. Dryland plants include smooth brome and intermediate wheatgrass.

Vegetation on this Avonville soil provides some habitat elements for white-tailed deer, songbirds, various small mammals, some Chinese pheasant, and Hungarian partridge. Deer and bear seasonally visit the forested areas and feed on cropland fields. Forest grouse also inhabit the forested areas.

Shortage of water is a limitation for wildlife unless irrigation is used. Potential for Chinese pheasant is poor because of clean-till farming.

The main restriction for homesites is slope. Most sanitary facilities are limited by seepage and slope. This soil is suited to septic tank absorption fields; however, ground water pollution is a hazard. Community sewage systems are needed in areas of high population density.

Frost action is a hazard for roads. The depth of frost penetration should be considered when footing and road base designs are planned.

There is potential for paths and trails on this soil; however, slope is a limitation for the development of playgrounds, picnic areas, and camp areas.

This map unit is in capability subclass IVe and IIIe, irrigated.

105-Blinn stony loam, 5 to 35 percent slopes. This Blinn soil is a moderately deep, well drained soil that formed in material weathered from basalt and a thin mantle of loess and volcanic ash. It is on terrace escarpments and foot slopes. Elevation is 2,125 to 3,200 feet. The average annual precipitation is 26 inches, average annual air temperature is 43 degrees F, and average frost-free period is 100 days.

Included with this soil in mapping are small areas of Bobbitt stony loam, Dorb silt loam, and Lacy stony loam, all with slopes of 5 to 35 percent.

Typically, the surface layer of this Blinn soil is light brownish gray and pale brown stony loam about 9 inches thick. The subsoil is pale brown stony loam about 12 inches thick. The substratum is very pale brown, very stony loam about 9 inches thick. This soil is neutral throughout. Fractured basalt bedrock is at a depth of about 30 inches.

The rooting depth of this soil is 20 to 40 inches. The available water capacity is low. The content of organic matter in the surface layer is low. Permeability is moderate, runoff is rapid to very rapid, and the hazard of erosion is very high.

This Blinn soil is mainly used for woodland, wildlife habitat, grazing, and some pasture and hay.

This soil is suited to grand fir, Douglas-fir, ponderosa pine, western larch, lodgepole pine, and western white pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are stones and the hazard of erosion. Conventional methods of tree harvest can be used, but logging roads, skid trails, and landings need to be planned to reduce soil losses. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants.

After the timber is harvested, there can be a fair plant growth of pasture or hay with a well balanced fertilization program that includes the use of nitrogen and sulfur. Phosphorus is also needed when legumes are grown.

Pastures benefit from a rotation grazing system during the growing season. Adapted, improved forage includes orchardgrass, bromegrass, tall fescue, and alfalfa.

This soil has potential for grazing when the canopy has been opened. Forage production can be increased by seeding disturbed areas to grass.

Forage plants include elk sedge, bluebunch wheatgrass, blue wildrye, Columbia brome, and willow. Tall, relatively unpalatable shrubs may dominate the site once the canopy is opened. Proper management of the vegetation helps protect timber regeneration and insure adequate litter for soil protection. When well managed, this soil can continually produce forage. Under unmanaged conditions, forage can be produced for 20 to 30 years.

Areas of this soil provide a good habitat for such woodland wildlife as white-tailed deer, black bear, elk, forest grouse, songbirds, and squirrels.

This soil is also used for recreation, although slope and stoniness are limitations.

Limitations for homesites and road construction are slope, depth to bedrock, and stoniness.

This map unit is in capability subclass VIe.

106-Blinn stony loam, 35 to 65 percent slopes. This Blinn soil is a moderately deep, well drained soil that formed in material weathered from basalt and a thin mantle of loess and volcanic ash. It is on terrace escarpments and foot slopes. Elevation is 2,125 to 3,200 feet. The average annual precipitation is 26 inches, average annual air temperature is 43 degrees F, and average frost-free period is 100 days.

Included with this soil in mapping are small areas of Bobbitt stony loam and Lacy stony loam, both with slopes of 35 to 65 percent.

Typically, the surface layer of this Blinn soil is light brownish gray and pale brown stony loam about 9 inches thick. The subsoil is pale brown stony loam about 12 inches thick. The substratum is very pale brown very stony loam about 9 inches thick. This soil is neutral throughout. Fractured basalt rock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Organic matter content in the surface layer is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

This soil is mainly used for woodland, wildlife habitat, and limited grazing.

This soil is suited to grand fir, Douglas-fir, ponderosa pine, western larch, lodgepole pine, and western white pine.

It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the steep slopes, the presence of stones, and the hazard of erosion. Specialized equipment and logging operations that cause a minimum of soil disturbance are needed. Reforestation after harvest needs to be carefully managed to reduce plant competition of undesirable understory plants.

The soil has limited potential for grazing when the canopy has been opened. Forage production can be increased by seeding disturbed areas to grass.

Forage plants include elk sedge, bluebunch wheatgrass, blue wildrye, Columbia brome, and willow. Tall, relatively unpalatable shrubs may dominate the site. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

When well managed, this soil can continually produce forage. If not managed, forage can be produced for 20 to 30 years. Slopes over 35 percent limit livestock movement and forage accessibility.

Areas of this soil provide good habitat for such woodland wildlife as white-tailed deer, black bear, elk, forest grouse, songbirds, and squirrels.

The main limitation for construction is the high cost of site preparation because of the steep slope. Homesite development and road construction are limited by the depth to bedrock and stoniness. Limitations for recreation are steep slopes and stoniness. This map unit is in capability subclass VIIe.

107-Bonner silt loam, 0 to 8 percent slopes. This Bonner soil is a very deep, well drained soil that formed in glacial outwash material mantled with volcanic ash and loess. It is on glacial outwash plains and terraces. Elevation is 2,000 to 2,500 feet. The average annual precipitation is 28 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are areas of Avonville gravelly silt loam, Kootenai gravelly silt loam, and Rathdrum silt loam, all with 0 to 7 percent slopes.

Typically, the surface layer of this Bonner soil is yellowish brown silt loam about 8 inches thick, and is neutral. The subsoil is brown and pale brown gravelly silt loam and gravelly sandy loam about 18 inches thick, and is slightly acid and neutral. The substratum is a pale brown very gravelly loamy sand below a depth of 26 inches, and is neutral.

The rooting depth is 60 inches. The available water capacity is low. Permeability is moderately rapid, runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is mainly used for woodland and cropland. The main crops are hay, pasture, oats, barley, and wheat.

The main limitations for crop growth are the gravelly subsoil, the droughty soil conditions, and cool soil temperatures. Proper irrigation management helps increase all crop yields, and water erosion is not a concern when sprinkler irrigation is used. Deep rooted perennial crops are the most reliable.

Fertilization of all crops is necessary, and the rates and timing need to be determined for each crop.

This soil is suited to Douglas-fir, grand fir, ponderosa pine, lodgepole pine, and western larch. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber, 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

Conventional methods can be used for tree harvest. Reforestation after harvest needs to be carefully managed to reduce the competition of undesirable understory plants.

This soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

Native forage includes Columbia brome, elk sedge, willow, and redstem ceanothus. Proper management of the vegetation helps protect the regeneration of timber and insures adequate litter for soil protection.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is

open. Total production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 100 pounds.

After the timber is harvested, this soil can be used for pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pastures benefit from a rotation grazing system during the growing season.

Adapted, improved forage includes orchardgrass, smooth brome, and Regar bromegrass. Alfalfa and clover grow well.

Potential for irrigated pasture on some areas of this soil is realized by good water management in addition to dry pasture management.

Native plants provide some habitat, elements for white-tailed deer, black bear, some elk, various small mammals, forest grouse, and songbirds.

Both the forested and cleared areas of this soil help provide food and cover favorable to wildlife. Shortage of water is a limitation for wildlife unless irrigation is used.

This soil has good potential for community development. The main limitation for most sanitary facilities is seepage. This soil is suited to septic tank absorption fields; however, ground water pollution is a hazard. Community sewage systems are indicated in areas of high population density.

Frost action is a hazard for roads. The depth of frost penetration should be considered when footing and road base designs are planned.

The main limitations for recreational development are the small stones and dustiness of the soil surface when dry.

This map unit is in capability subclass IVs and IIIs, irrigated.

108-Bonner gravelly silt loam, 0 to 8 percent slopes. This Bonner soil is a very deep, well drained soil that formed in glacial outwash mantled with volcanic ash and loess. It is on glacial outwash plains and terraces. Elevation is 2,000 to 2,500 feet. The average annual precipitation is 28 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are areas of Kootenai gravelly silt loam and Rathdrum silt loam, both having slopes of 0 to 7 percent.

Typically, the surface layer of this Bonner soil is yellowish brown gravelly silt loam about 8 inches thick, and is neutral. The subsoil is brown and pale brown gravelly silt loam and gravelly sandy loam about 18 inches thick and is slightly acid and neutral. The substratum is pale brown very gravelly loamy sand below a depth of 26 inches, and is neutral.

The rooting depth is more than 60 inches. Available water capacity is low. Permeability is moderately rapid, runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is mainly used for woodland and some cropland. The main crops are hay, pasture, oats, barley, and wheat.

Crop production is limited by droughty soil conditions, cool soil temperatures, and the gravelly subsoil. Deep rooted perennial crops are the most reliable. Proper irrigation helps increase all crop growth, and water erosion is not a hazard unless furrow irrigation is used.

Fertilization of all crops is necessary, and the rates and timing need to be determined for each crop.

This Bonner soil is suited to Douglas-fir, grand fir, ponderosa pine, lodgepole pine, and western larch. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

Conventional methods can be used for tree harvest. Reforestation after harvest needs to be carefully managed to reduce the competition of undesirable understory plants.

This soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

Native forage includes Columbia brome, elk sedge, willow, and redstem ceanothus. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the tree canopy is open. During this period, total production can vary from about 1,800 pounds air-dry herbage per acre per year to less than 100 pounds.

After the timber is harvested, this soil can be used for pasture and hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain fair to good plant growth. Phosphorus is also needed when legumes are grown.

Pastures benefit from a rotation grazing system during the growing season.

Adapted, improved forage includes orchardgrass, smooth brome, and Regar bromegrass. Alfalfa and clover also grow well.

Potential for irrigated pasture on some areas of these soils is realized by good water management in addition to dry pasture management.

Native plants provide some habitat for black bear, white-tailed deer, some elk, various small mammals, forest grouse, and songbirds.

Both the forested and cleared areas of this soil help provide food and cover favorable to wildlife. Shortage of water is a limitation for wildlife, unless irrigation is used.

This soil has good potential for community development. The main limitation for sanitary facilities is seepage. The soil is suited to septic tank absorption fields; however, ground water pollution is a hazard. Community

sewage systems are indicated in areas of high population density.

Frost action is a hazard for roads. The depth of frost penetration should be considered in planning footing and road base designs. Excavation operations, including sloping of banks or shoring, help prevent cutbanks from caving.

The main limitations for recreational development are small stones and dustiness of the soil surface when it is dry.

This map unit is in capability subclass IVs and IIIs, irrigated.

109-Brickel-Rubble land association. This association is made up of rolling to steep soils on mountain ridgetops with areas of stones and boulders. Elevation is 4,500 to 6,500 feet. The average annual precipitation is 40 inches, average annual air temperature is 40 degrees F, and average frost-free period is 45 days.

This association is 65 percent Brickel stony silt loam, 5 to 45 percent slopes, and about 25 percent Rubble land. The Brickel soil has convex slopes and is on all exposures. It is on the flatter or concave areas on ridgetops.

Included with this association in mapping are areas of Brickel cobbly loam and Divers silt loam, both having 45 to 75 percent slopes; and Moscow loam and Vassar silt loam, both having 35 to 65 percent slopes. These inclusions make up about 10 percent of this association.

The Brickel soil is a moderately deep, well drained soil over granitic stones, cobbles, and gravel. It formed in material weathered from granitic or metasedimentary rock with a mixture of loess and volcanic ash in the upper **part** of the profile.

Typically, the surface layer of this Brickel soil is very dark grayish brown stony silt loam about 3 inches thick. The subsoil is brown very stony silt loam about 14 inches thick. The substratum is yellowish brown very cobbly silt loam about 13 inches thick. Highly fractured metasedimentary rock is at a depth of about 30 inches. This soil is medium acid throughout.

The rooting depth is 20 to 40 inches, and the available water capacity is very low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

Areas of Brickel soil are very fragile and are mainly used for watershed, recreation, and some limited grazing. Limitations for most plant growth are the high elevation, short growing season, and large amounts of stones and cobbles.

Native vegetation is beargrass, huckleberry, mountain ash, red fescue, bromegrass, sedges, and scattered subalpine fir.

This soil is limited for grazing by domestic livestock. The grazing needs to be confined to summer, when the soil is dry and forage plants are nearly full grown. Proper grazing management helps maintain adequate vegetative cover and litter to provide soil protection. Careful management of vegetation on the Brickel soil helps keep soil losses to a minimum and maintains the watershed potential.

Native forage plants for livestock are red fescue, bromegrass, and sedges. This soil can produce forage for livestock and big game animals. Total forage production varies from about 1,200 pounds of air-dry herbage per acre per year to less than 150 pounds.

Areas of Brickel soil are suited to rangeland wildlife habitat.

This soil is not used for homesites because of the steep slopes, depth to rock, and inaccessibility. Roads having low slope gradients help minimize soil losses and soil slumps on unprotected cutbanks.

The main limitations for recreational uses are the steep slopes and surface stones.

Rubble land has areas of large stones and boulders where there is almost no vegetation, except lichens. These areas are not suitable for production of timber, for wildlife habitat, roads, or homesites.

The Brickel soil is in capability subclass VIIe, and Rubble land is in capability subclass VIIIs.

110-Cald silt loam. This Cald soil is a very deep, somewhat poorly drained soil that formed in alluvium mainly from loess with variable amounts of volcanic ash. It is on bottom lands and in drainageways. Elevation is 2,125 to 2,800 feet. Slope is 0 to 2 percent. The average annual precipitation is 20 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are small areas of Aquic Xerofluvents, Latahco silt loam, Porrett silt loam, Potlatch silt loam, and Ramsdell silt loam, all with 0 to 2 percent slopes; and Thatuna silt loam, 3 to 7 percent slopes.

Typically, the surface layer of this Cald soil is dark gray silt loam about 28 inches thick, and is slightly acid and neutral. The substratum is mottled, light gray silt loam below a depth of 28 inches, and is neutral.

The rooting depth is 60 inches or more when the soil is drained. A high water table is at a depth of 3 to 5 feet from November through June, and the soil is occasionally flooded for brief periods early in spring. The available water capacity is high. Organic matter content in the surface layer is high. Permeability is moderately slow, runoff is very slow, and the hazard of erosion is slight.

This soil is used for small grain, hay, pasture, and grass seed. Peas and lentils are sometimes damaged by frost. Wheat and barley are the most popular crops. The hazard of erosion is slight; therefore, a normal agronomic use of crop residue and continuous cropping will keep soil losses within allowable limits. When it is adequately fertilized, this soil is well adapted to a continuous cropping program that produces high yields. Nitrogen, sulfur, and sometimes phosphorus are needed in all cropping systems.

Alfalfa is short-lived on the poorly drained sites, and land smoothing is very desirable for surface water removal.

Under good management, pasture and hay production is excellent. A well balanced fertilization program is essential to obtain high levels of production. Adapted forage includes timothy, tall fescue, smooth bromegrass, reed canarygrass, and alfalfa.

Areas of this soil are suited to such upland birds as ring-necked pheasant, mourning dove, Hungarian partridge, chukar, and quail. They are also a habitat for songbirds and starlings. These birds feed primarily on cropland. Shrubs and other plants that help provide wildlife habitat can be planted along ditchbanks, fence rows, and odd corners.

This soil has good potential for openland wildlife habitat, and a fair potential for wetland wildlife habitat. Natural vegetation is basin wildrye, silver lupine, iris, blue camas, sedges, snowberry, tufted hairgrass, willow, and hawthorn.

The Cald soil has severe limitations for homesites and roads because of the potential hazard of flooding, the high seasonal water table, and the low support strength of the soil.

Flooding and the seasonal high water table are hazards for septic tank absorption fields. Contamination of the ground water supply is also a hazard.

Recreational development is restricted by the potential hazard of flooding.

This map unit is in capability subclass IIw.

111-Cald-Thatuna silt loams, 0 to 7 percent slopes. These level and sloping soils are in and along large drainageways of loess plains. Elevation is 2,125 to 2,800 feet. The average annual precipitation is 20 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

The Cald soil makes up about 55 percent of the map unit and the Thatuna soil about 25 percent. The Cald soil is in large drainageways and has slopes of 0 to 2 percent. The Thatuna soil is adjacent to the Cald soil on both sides of the drainageways and has slopes of 3 to 7 percent at the base of steep slopes.

Included with these soils in mapping are Larkin, Latahco, and Southwick silt loams. They make up 20 percent of this map unit.

The Cald soil is a very deep, somewhat poorly drained soil that formed in alluvium from loess with volcanic ash.

Typically, the surface layer of the Cald soil is dark gray silt loam about 28 inches thick, and is slightly acid and neutral. The substratum is mottled, light gray silt loam below a depth of 28 inches, and is neutral.

The rooting depth is 60 inches when the soil is drained. A high water table is at a depth of 3 to 5 feet from November through June, and these soils are occasionally flooded for brief periods early in spring. Available water capacity is high. Organic matter content in the surface layer is high. Permeability is moderately slow, runoff is very slow, and the hazard of erosion is slight.

The Thatuna soil is a very deep, moderately well drained soil that formed in deep loess.

Typically, the surface layer of the Thatuna soil is dark grayish brown and grayish brown silt loam about 19 inches thick, and is neutral and slightly acid. The subsoil is brown silt loam about 6 inches thick, and is slightly acid. The subsurface layer is very pale brown silt loam about 8 inches thick, and is neutral. The lower part of the subsoil is brown silty clay loam to a depth of 60 inches, and is slightly acid.

The rooting depth is 60 inches. The available water capacity is high. Organic matter content is high in the surface layer. Permeability is slow, runoff is medium, and the hazard of erosion is moderate. A perched water table is at a depth of 3 to 4 feet from February to April.

These soils are an important component of the Palouse area and produce good yields of small grain, hay, pasture, and grass seed. The wetness of the Cald soil limits crop choices (fig. 6), but is generally corrected by drainage. Most of these soils have been converted to cropland or are used for hay and pasture.

Continuous grain in various combinations with peas or lentils makes up the usual crop rotations. Minimum tillage and crop residue also form an adequate erosion control program for these soils. Land smoothing and tile drainage are used extensively for seepage and surface water. Use of hay or pasture on the poorly drained sites further benefits the soil in terms of organic material. Under good management, pasture and hay production is excellent. A well balanced fertilization program helps obtain high levels of pasture and hay production. Nitrogen, sulfur, and sometimes phosphorus are necessary in all cropping systems.

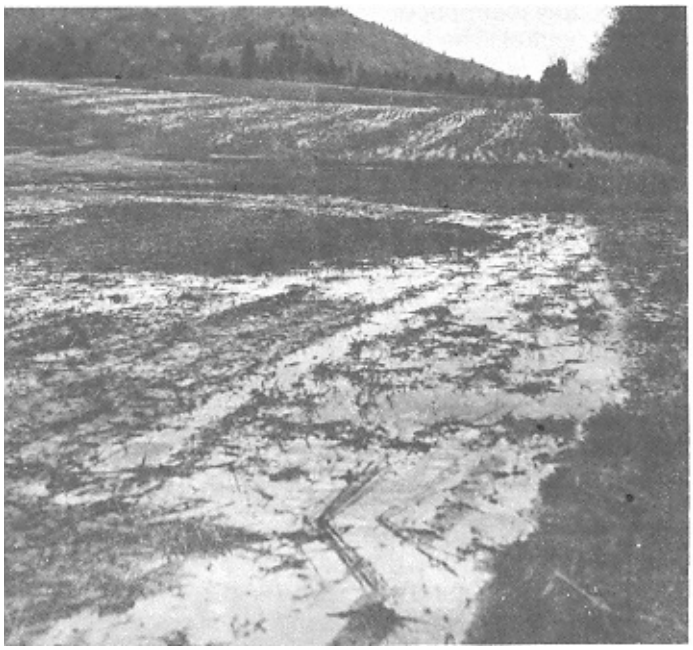

Figure 6.-Wet area on Cald-Thatuna silt loams. Crop choices are limited unless drainage is provided.

Adapted forage includes Latar orchardgrass, smooth bromegrass, timothy, tall fescue, clover, and alfalfa.

These soils are good for openland wildlife habitat. The Cald soil has fair potential, and the Thatuna soil has very poor potential for wetland wildlife habitat.

The Cald soil has limitations for building sites and sanitary facilities because of the seasonal high water table. An additional limitation on the Cald soil is potential flooding from February through April. Contamination of the ground water supply is also a hazard.

Both soils have a limitation for road construction because of frost action. The soil's inherent low support strength is an additional limitation on the Cald soil.

Recreational development is limited on the Cald soil by the potential hazard of flooding. The Thatuna soil is better suited to recreational development; however, the soil surface tends to be dusty when dry.

This map unit is in capability subclass IIw.

112-Chatcolet cobbly loam, 7 to 25 percent slopes. This Chatcolet soil is a very deep, moderately well drained soil that formed in volcanic ash and loess over lake-laid sediment. It is on glaciolacustrine terraces. Elevation is 2,300 to 2,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 40 degrees F, and average frost-free period is 80 days.

Included with this soil in mapping are small areas of Mokins silt loam, 5 to 20 percent slopes, and Rubson silt loam, 0 to 20 percent slopes.

Typically, the surface layer of this Chatcolet soil is pale brown cobbly loam about 8 inches thick, and is medium acid. The upper part of the subsoil is very pale brown cobbly loam about 18 inches thick, and is medium acid and neutral. The lower part of the subsoil to a depth of 60 inches is very pale brown silty clay loam, and is medium acid.

The rooting depth is 60 inches or more. The available water capacity is moderate to high. Permeability is moderately slow, runoff is rapid to very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland, pasture, and homesites.

Use of this soil for cropland is limited because of the cold soil temperatures, the high hazard of erosion, and the small stones.

This Chatcolet soil is suited to western hemlock, western redcedar, western white pine, grand fir, Douglas-fir, and western larch. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantabletimber 12.6 inches or more in diameter from an unmanaged stand of 80-year-old trees.

Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be carefully planned to avoid excessive soil erosion.

After the timber is harvested, this soil can be used for pasture or hay. A well balanced fertilization program, including nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

This soil has potential for grazing for 5 to 10 years after the tree canopy has been opened. Forage production for livestock and big game animals can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, tall fescue, orchardgrass, and white Dutch clover. Total production varies from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds.

Pastures benefit from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, timothy, and alfalfa.

Native forage includes sedges, willow, maple, and redstem ceanothus. Proper management of the vegetation helps protect regeneration of timber and insure adequate litter for soil protection.

Native plants provide essential habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitation for homesites and sanitary facilities is slope. The use of septic tank absorption fields is also restricted by the permeability of the subsoil.

Construction of roads and dwellings is limited by the inherent low support strength of the soil and potential frost action damage. Design considerations include placing footings below depths of frost penetration. Limitations for recreational areas are slope and large stones.

This map unit is in capability subclass IVe.

113-Chatcolet cobbly loam, 25 to 65 percent slopes. This Chatcolet soil is a very deep, moderately well drained soil that formed in volcanic ash and loess over lake-laid sediment. It is on glaciolacustrine terraces. Elevation is 2,300 to 2,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 40 degrees F, and average frost-free period is 80 days.

Included with this soil in mapping are small areas of Mokins silt loam, 35 to 65 percent slopes; Huckleberry silt loam, 35 to 65 percent slopes; and Ardenvoir gravelly loam, 35 to 65 percent slopes.

Typically, the surface layer of this Chatcolet soil is pale brown cobbly loam about 8 inches thick, and is medium acid. The upper part of the subsoil is very pale brown cobbly loam about 18 inches thick, and is medium acid and neutral. The lower part of the subsoil to a depth of 60 inches is very pale brown silty clay loam, and is medium acid.

The rooting depth is 60 inches or more. The available water capacity is moderate to high. Permeability is moderately slow, runoff is very rapid, and the hazard of erosion is very high.

This soil is mainly used for woodland and limited grazing.

This soil is suited to western hemlock, western redcedar, western white pine, grand fir, Douglas-fir, and western larch. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope and hazard of erosion. This soil is too steep for conventional methods of tree harvest. Specialized logging methods that cause a minimum of soil disturbance need to be considered to reduce soil losses.

This soil has limited potential for grazing when the tree canopy is opened.

Native forage includes sedges, willow, maple, and redstem ceanothus. Proper management of the vegetation helps protect regeneration of timber and insure adequate litter for soil protection.

After the canopy is open, this soil can produce forage for livestock and big game animals for 5 to 10 years. Total production varies from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds.

Forage production can be increased and soil protection provided by seeding disturbed areas to such adapted species as timothy, tall fescue, orchardgrass, and white Dutch clover.

The steep slopes limit livestock movement and forage accessibility.

Native plants provide essential habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

The main limitation for all structural development is the steep slope. Septic tank absorption fields are also limited by the moderately slow permeability of the subsoil. Construction of roads and dwellings is limited by the inherent low support strength of the soil and potential frost action damage. Design considerations include placing footings below depths of frost penetration. The steep slope and large stones limit the development of recreational areas.

This map unit is in capability subclass VIe.

114-Chatcolet-Rubson silt loams, 5 to 20 percent slopes. These rolling to hilly soils are on glaciolacustrine terraces. Elevation is 2,200 to 2,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 40 degrees F, and average frost-free period is 80 days.

The Chatcolet soil makes up about 55 percent of the map unit, and the Rubson soil about 35 percent. The remaining 10 percent is Mokins silt loam and Chatcolet cobbly loam.

The Chatcolet soil is a very deep, moderately well drained soil that formed in volcanic ash and loess over lake-laid sediment.

Typically, the surface layer of the Chatcolet soil is pale brown silt loam about 8 inches thick, and is medium acid. The upper part of the subsoil is very pale brown silt loam about 18 inches thick, and is medium acid and neutral. The lower part of the subsoil, to a depth of about 60 inches, is very pale brown silty clay loam, and is medium acid.

The rooting depth of the Chatcolet soil is 60 inches or more. The available water capacity is high. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is high.

The Rubson soil is a very deep, well drained soil that formed in silty, glaciolacustrine sediment and a thin mantle of volcanic ash and loess.

Typically, the surface layer of the Rubson soil is pale brown silt loam about 6 inches thick, and is medium acid. The subsoil is pale brown silt loam about 10 inches thick, and is slightly acid. The substratum is very pale brown and brown silt loam and very fine sandy loam to a depth of 60 inches, and is medium acid and slightly acid.

The rooting depth of the Rubson soil is 60 inches or more. The available water capacity is high. Permeability is moderate, runoff is rapid, and the hazard of erosion is high.

These soils are mainly used for woodland, hay, pasture, and some small grain.

Both of these soils produce fairly good yields of locally adapted crops. The steep slopes are an erosion hazard that is especially acute under intensive tillage such as summer fallow. Erosion is reduced under a continuous cropping system using minimum tillage. Sod crops are desirable in the cropping system, especially on the steeper slopes. Crop residue, weed control, and fertilization need to be used. Stripcropping is an alternative for control of erosion where slopes are long.

These soils are suited to western hemlock, western redcedar, western white pine, grand fir, Douglas-fir, and western larch. They are capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees. Conventional methods can be used for tree harvest; but logging roads, skid trails, and landings need to be carefully planned to avoid excessive soil erosion. Equipment operation is restricted during wet periods because of a lack traction.

After the timber is harvested, these soils can be used for pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pastures benefit from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth bromegrass, timothy, and alfalfa.

These soils have potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, tall fescue, orchardgrass, and white Dutch clover.

Native forage includes sedges, willow, maple, redstem ceanothus, Columbia brome, and pine reedgrass. Proper

management of the vegetation helps protect regeneration of timber and insure adequate litter for soil protection.

These soils can produce forage for livestock and big game animals for 5 to 10 years after the canopy is opened. Total production varies from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds.

Native plants provide habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of these soils provide food and cover favorable to wildlife.

The main limitation for homesites and for sanitary facilities is slope. Septic tank absorption fields are limited by the moderately slow permeability of the Chatcolet subsoil.

The construction of roads and dwellings is limited by the inherent low support strength of the soils and potential frost action damage. Design considerations include placing footings below depths of frost penetration. Slope limits the use of these soils for recreational areas.

This map unit is in capability subclass lVe.

115-Cougarbay silt loam. This Cougarbay soil is a nearly level, very deep, very poorly drained soil that formed in recent lake sediment and sandy alluvium. It is on low lying bottomland areas adjacent to lakes. Elevation is 2,100 to 2,500 feet. Slope is 0 to 2 percent. The average annual precipitation is 24 inches, average annual air temperature is 44 degrees F, and average frost-free period is 115 days.

Included with this soil in mapping are small areas of Ramsdell silt loam and Pywell muck.

Typically, the surface layer of this Cougarbay soil is very dark gray silt loam about 10 inches thick, and is slightly acid. The substratum is dark grayish brown and grayish brown stratified silty clay, coarse sand, and loamy coarse sand to a depth of 60 inches, and is neutral and slightly acid. Mottles are faint in the surface layer and prominent throughout the substratum.

The rooting depth is 60 inches or more when the soil is drained. Available water capacity is high. Permeability and runoff are very slow, and the hazard of erosion is slight. A high water table is between the surface and a depth of 18 inches during spring. The soil is occasionally flooded for very long periods in spring.

This soil is mainly used for pasture and hay. Some small acreages are used for corn silage and small grain.

The main limitation for cropland is wetness. Overflow from stream channels is an occasional hazard, and cold soil temperatures have an adverse effect. Hay and pasture are the most reliable crops, unless the soil is drained. Fertilization is needed on all crops.

This soil is well suited to long term production of hay and pasture. A well balanced fertilization program, including the use of nitrogen, sulfur, and possibly phospho rus, helps obtain excellent crop growth.

Pastures benefit from a rotation grazing system during the growing season.

Adapted, improved forage includes creeping meadow foxtail, meadow foxtail, timothy, reed canarygrass, trefoil, and clover.

Native plants provide some habitat for white-tailed deer, black bear, various small mammals, and songbirds. Woodland areas surrounding this soil are habitat for forest grouse.

Both the surrounding forest areas and the cleared areas of this soil help provide food and cover favorable to wildlife. There is good potential for wetland wildlife habitat.

The main limitations for all structural development are the hazard of flooding and the depth to the seasonal high water table (fig. 7).

Construction is limited by the high shrink-swell potential and the inherent low support strength of the soil. Recreational development is severely limited because of the hazard of flooding and the seasonal high water table.

This map unit is in capability subclass Vw.

116-Divers-Brickel association, 45 to 75 percent slopes. This association is made up of very steep soils on mountainsides and ridgetops. Elevation is 4,200 to 6,000 feet. The average annual precipitation is 42 inches, average annual air temperature is 40 degrees F, and average frost-free period is 45 days.

This association is about 50 percent Divers silt loam and about 20 percent Brickel cobbly loam. The Divers soil is at lower elevations on steep mountainsides. The Brickel soil is at higher elevations on ridgetops and mountaintops.

Included with this association in mapping are small areas of Brickel silt loam, 5 to 45 percent slopes; areas of Rubble land; and areas where bedrock is at a depth of 40 to 60 inches. The included soils make up about 30 percent of the mapped area.

The Divers soil is a very deep, well drained soil over metasedimentary stones, cobbles, and gravel. It formed in material weathered from metasedimentary rock and a mantle of volcanic ash.

Typically, the surface layer of the Divers soil is dark yellowish brown silt loam about 3 inches thick. The upper part of the subsoil is yellowish brown silt loam about 4 inches thick. The lower part of the subsoil is pale brown very gravelly silt loam and very gravelly loam about 23 inches thick. The surface layer and subsoil are slightly acid. The substratum, below a depth of about 30 inches, is pale brown very cobbly loam, and is medium acid.

The rooting depth of the Divers soil is more than 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Brickel soil is a moderately deep, well drained soil

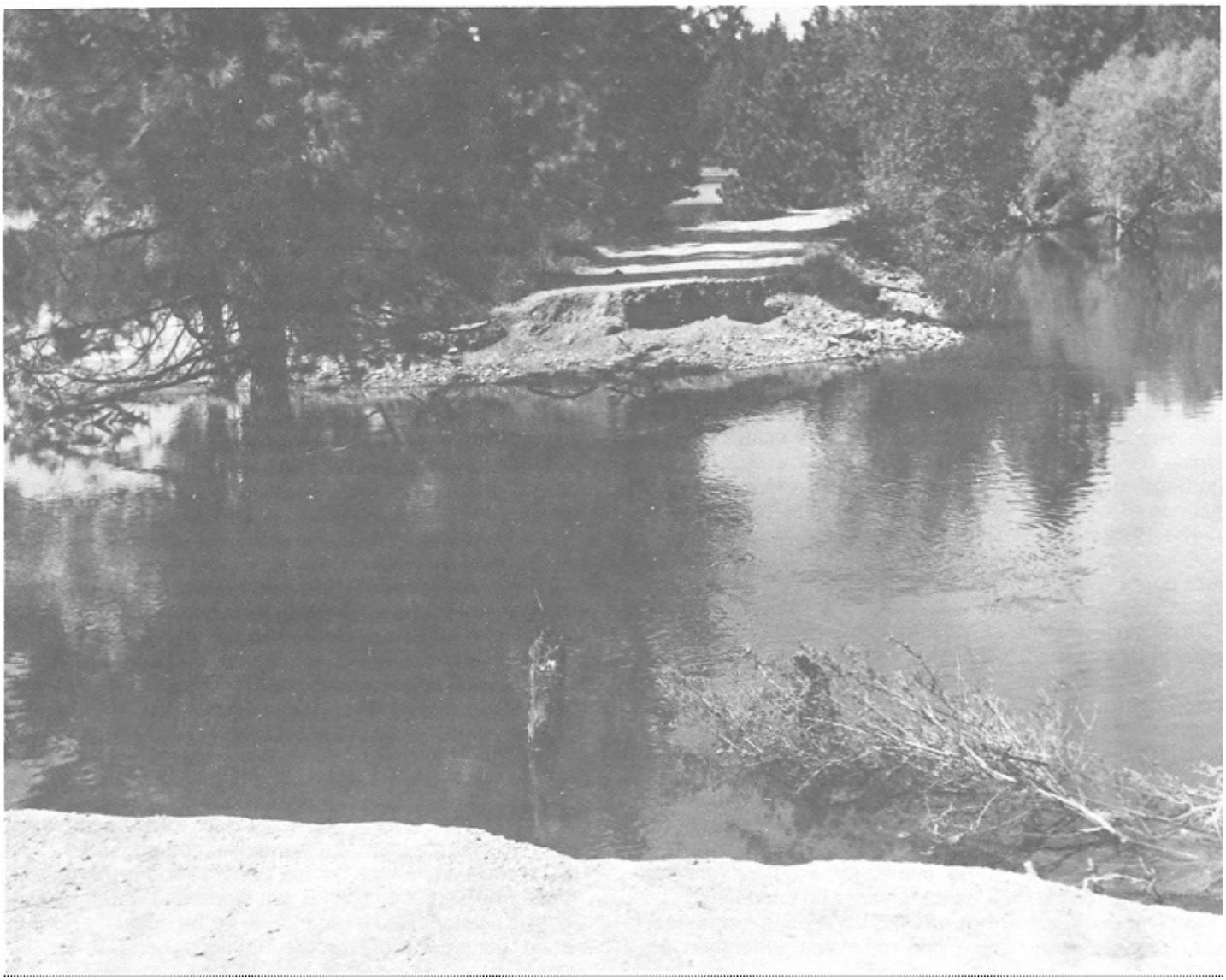

Figure 7.-Structural developments on Cougarbay silt loam are restricted because of flood hazard.

over granitic stones, cobbles, and gravel. It formed mainly in material weathered from granitic or metasedimentary rock and has a mixture of loess and volcanic ash in the upper part of the profile.

Typically, the surface layer of the Brickel soil is very dark grayish brown cobbly loam about 3 inches thick, and is medium acid. The subsoil is brown very cobbly loam about 11 inches thick, and is medium acid. The substratum is yellowish brown very cobbly loam about 16 inches thick, and is medium acid. Fractured metasedimentary rock is at a depth of about 30 inches.

The rooting depth of the Brickel soil is 20 to 40 inches. The available water capacity is very low to low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The soils in this association are mainly used for limited grazing, recreation, watershed, and wildlife habitat.

The Divers soil is suited to subalpine fir, Douglas-fir, western white pine, Engelmann spruce, grand fir, and western larch. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,000 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations in use for timber production are the very steep slopes and the erosion hazard. Logging roads are difficult to maintain, because the road banks tend to slide or slump. Specialized equipment and logging operations that cause a minimum of soil disturbance help alleviate this problem.

This soil is also suited to woodland wildlife habitat. White-tailed deer, elk, black bear, small rodents, forest grouse, and various songbirds are in these areas.

The very steep slopes are severe limitations for homesites, road construction, and recreational uses.

Areas of the Brickel soil are very fragile and are used mainly for recreation, watershed, and some limited grazing.

Limitations for most plants at high elevations are the short growing season and the presence of stones and cobbles in the soil.

Native vegetation is beargrass, huckleberry, mountainash, red fescue, bromegrass, sedge, and scattered subalpine fir. The soil produces about 650 pounds of air-dry herbage per year in favorable years and about 400 pounds of air-dry herbage per year in unfavorable years.

The Brickel soil is suited to rangeland wildlife habitat.

A limitation for homesites on the Brickel soil is slope and depth to rock. Recreational uses are also limited by steep slopes.

Both soils in this association have limited value for grazing by domestic livestock.

On the Divers soil, the grazing management can be designed to protect tree regeneration and maintain adequate vegetative cover and litter. This soil can produce forage for livestock and big game animals for 15 to 20 years after the tree canopy is open.

Together, the soils have a total forage production that ranges from about 1,200 pounds of air-dry herbage per acre per year to less than 150 pounds.

The main native forage plants for livestock are red fescue, western fescue, bromegrass, and sedge.

Careful management of existing vegetation helps keep soil losses to a minimum and maintains watershed potential.

This map unit is in capability subclass VIIe.

117-Dorb silt loam, 5 to 35 percent slopes. This Dorb soil is a moderately deep, well drained soil that formed in material weathered from basalt and a mantle of volcanic ash. It is on basaltic plateaus and in canyons. Elevation is 2,125 to 3,200 feet. The average annual precipitation is 27 inches, average annual air temperature is 40 degrees F, and average frost-free period is 80 days.

Included with this soil in mapping are small areas of Blinn, Lacy, and Bobbitt stony loams, and Rock outcrop, all having slopes of 5 to 35 percent.

Typically, the surface layer of this Dorb soil is yellowish brown and pale brown silt loam about 7 inches thick, and is neutral. The subsoil is light yellowish brown and pale brown very cobbly silt loam about 21 inches thick, and is slightly acid and neutral. Fractured basalt bedrock is at a depth of about 28 inches.

The rooting depth is 20 to 40 inches. The available water capacity is very low. Permeability is moderate, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for woodland, recreation, wildlife habitat, and watershed.

It is suited to western hemlock, western redcedar, Douglas-fir, grand fir, western larch, and western white pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the excessive rock fragments in the soil and the erosion hazard. Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be planned to minimize soil losses.

Native forage includes elk sedge, willow, mountain maple, and redstem ceanothus. Proper management of the vegetation helps protect regeneration of timber and insure adequate litter for soil protection.

The Dorb soil has potential for grazing when the tree canopy is opened. Forage production can be increased by seeding disturbed areas to adapted grass.

After the canopy is open, this soil can produce forage for livestock and big game animals for 5 to 15 years. The total forage production varies from about 3,000 pounds of air-dry herbage per acre per year to less than 300 pounds.

Some areas of this soil are used for recreation. The main limitation for such development is slope.

Areas of this soil provide a good habitat for such woodland wildlife as white-tailed deer, black bear, many songbirds, forest grouse, chipmunks, and squirrels.

The main limitations for the construction of homesites, roads, and sanitary facilities are slope and depth to rock. Other limitations are large stones in the subsoil and frost action damage. Construction footings need to be extended below the depth of frost penetration. The high cost of site preparation is a main deterrent for urbanization.

This map unit is in capability subclass VIe.

118-Dystrochreptic Arents, 0 to 20 percent slopes. Dystrochreptic Arents are made up of well drained, variable, man-disturbed soils on glacial outwash terraces. They are located in Farragut State Park. Elevation is 2,200 to 2,400 feet. They are made up of Bonner soils that have been stripped of the surface soil, then thoroughly mixed. The average annual precipitation is 28 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with these soils in mapping are small areas of Bonner gravelly silt loam, 0 to 8 percent slopes.

In most places, the rooting depth is 60 inches. The available water capacity is very low. Permeability varies

from moderate to rapid, runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are mainly used for wildlife habitat and recreation.

The vegetation provides some habitat for white-tailed deer, black bear, some elk, various small mammals, and songbirds. The woodland areas surrounding these soils also provide habitat for forest grouse.

The main limitations for recreational development are the small stones and slope of the steeper areas. Sanitary facility installation is limited by the permeability of the substratum. Most areas are suited to septic tank absorption fields; however, ground water pollution can be a hazard.

This map unit is in capability subclass VIe.

119-Garrison gravelly silt loam, 0 to 7 percent slopes. This Garrison soil is a very deep, somewhat excessively drained soil that formed in glacial outwash mixed with loess and volcanic ash. It is on outwash plains and terraces. Elevation is 2,100 to 2,300 feet. The average annual precipitation is 24 inches, average annual air temperature is 47 degrees F, and average frost-free period is 150 days.

Included with this soil in mapping are areas of Avonville fine gravelly silt loam, McGuire gravelly sandy loam, Marble coarse sandy loam, and Kootenai gravelly silt loam, all with slopes of 0 to 7 percent. Also included are Narcisse silt loam, 0 to 5 percent slopes, some small areas of Garrison very gravelly silt loam, and steep areas of Garrison gravelly silt loam on short terrace slopes.

Typically, the surface layer of this Garrison soil is very dark grayish brown gravelly silt loam about 12 inches thick, and is neutral. The subsoil is brown and pale brown very gravelly loam about 16 inches thick, and is neutral and mildly alkaline. The substratum below a depth of 28 inches is yellowish brown and variegated very gravelly sandy loam and very gravelly coarse sand, and is neutral.

The rooting depth is more than 60 inches. The available water capacity is low. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight.

This soil is mainly used for pasture, hay, and irrigated crops such as grass for seed production (fig. 8) and small grain.

Crop production is limited by the droughty soil conditions and the very gravelly subsoil. Deep-rooted perennial crops are the most reliable.

This soil is well suited to irrigation, and proper irrigation management helps increase crop growth. Without irrigation, plant growth is only fair.

Figure 8.-Sprinkler-irrigated bluegrass seed production on Garrison gravelly silt loam.

The hazard of soil blowing is slight when summer fallow is used. The proper use of straw and crop residue is a necessity.

All crops need fertilization, and the rates and timing need to be determined for each crop. A well balanced fertilization program, including the use of nitrogen and possibly sulfur, helps obtain excellent plant growth on irrigated land. Phosphorus is also needed when legumes are used.

Pastures benefit from a rotation grazing system and a proper regrowth period for plants.

Adapted forage for irrigated lands includes Latar orchardgrass, smooth brome, and Regar bromegrass. Adapted dryland plants include smooth brome and intermediate wheatgrass.

Native plants provide some habitat for songbirds, various small mammals, some Chinese pheasant, and Hungarian partridge.

White-tailed deer and black bear seasonally visit forested areas and feed on cropland fields. Forest grouse also inhabit the forested areas.

Shortage of water is a limitation for wildlife, unless the soil is irrigated. The potential for Chinese pheasant is poor because of clean-till farming.

This soil has good potential for urban or residential development. The main limitation for sanitary facility installation is the very rapid permeability of the substratum. This soil is suited to septic tank absorption fields, although there is a hazard of ground water pollution. Community sewage systems should be considered in areas of high population density. Shallow excavations are severely limited by of the hazard of cutbanks caving.

Potential frost action damage is a moderate hazard for roads. Planning of footing and road base designs should consider the depth of frost penetration.

The main limitations for recreational development are small stones and dustiness of the soil surface when it is dry.

This map unit is in capability subclass IIIs, irrigated.

120-Garrison very stony silt loam, 0 to 7 percent slopes. This Garrison soil is a very deep, somewhat excessively drained soil that formed in glacial outwash mixed with loess and volcanic ash. It is on outwash plains and terraces. Elevation is 2,100 to 2,300 feet. The average annual precipitation is 24 inches, average annual air temperature is 47 degrees F, and average frost-free period is 150 days.

Included with this soil in mapping are areas of Garrison gravelly silt loam, 0 to 7 percent slopes, and small areas of a Garrison soil having short, steep terrace slopes.

Typically, the surface layer of this Garrison soil is very dark brown very stony silt loam about 12 inches thick, and is neutral. The subsoil is brown and pale brown very stony loam about 16 inches thick, and is neutral and mildly alkaline. The substratum, below a depth of 28 inches, is yellowish brown and variegated very stony sandy loam and very stony coarse sand, and is neutral.

The rooting depth is more than 60 inches. The available water capacity is low. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight.

This soil is mainly used for pasture. It is too stony for cultivation, and it is generally not economically feasible to remove the surface stones.

The plants which are present are a result of cultivation and vary from annual weeds or bluegrass to areas having Idaho fescue, bluebunch wheatgrass, and arrowleaf balsamroot.

Periodic rest until plants mature and the prevention of excessive grazing help maintain or improve the existing plant cover. Reseeding is not practical, but proper management helps protect the existing vegetation.

Native plants have poor potential as a habitat for openland and woodland wildlife.

White-tailed deer and black bear seasonally visit the forested hills and feed on the cropland fields. Forest grouse also inhabit the forested areas. Shortage of water is a limitation for wildlife.

The main limitations for homesites and sanitary facilities are the large stones and the very rapid permeability of the substratum. Potential frost action damage should be considered in the construction of roads. Large stones in the soil and potential caving of cutbanks hinder excavation. Recreational development is limited by large stones.

This map unit is in capability subclass VIIs.

121-Pits, gravel. These are open excavations from which the soil and underlying material have been removed. They are generally in areas underlain by sand and gravel. Revegetation of these areas is generally not economically feasible.

This map unit is in capability subclass VIIIs.

122-Huckleberry silt loam, 20 to 35 percent slopes. This Huckleberry soil is a moderately deep, well drained soil that formed in loess and volcanic ash mixed with material weathered from metasedimentary rock. It is on mountainsides. Elevation is 2,600 to 3,600 feet. The average annual precipitation is 35 inches, average annual air temperature is 41 degrees F, and average frost-free period is 80 days.

Included with this soil in mapping are small areas of Ardenvoir gravelly loam and McCrosket gravelly silt loam, both having 20 to 35 percent slopes, and Tekoa gravelly silt loam, 5 to 25 percent slopes.

Typically, the surface layer of this Huckleberry soil is brown silt loam about 11 inches thick, and is slightly acid. The subsoil is yellowish brown and pale brown channery silt loam about 8 inches thick, and is slightly acid and medium acid. The substratum is pale brown very flaggy loam about 14 inches thick, and is medium acid. Fractured metasedimentary bedrock is at a depth of about 33 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

This soil is not suited to cultivation. Its main uses are timber production, wildlife habitat, watershed, and limited grazing on cleared areas.

This soil is suited to western redcedar, Douglas-fir, grand fir, western larch, and western white pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope and erosive nature of the soil. Conventional methods can be used for tree harvest, but landings, logging roads, and skid trails need to be carefully planned to minimize soil losses.

This soil has limited potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses. The steeper slopes limit movement of livestock and accessibility of forage.

Native forage includes bromegrass, elk sedge, willow, mountain maple, and redstem ceanothus. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals for 10 to 15 years after the canopy is open. The total forage production varies from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds.

The main limitations for the construction of homes, buildings, and roads are the slope, depth to rock, and high potential for frost action damage. The steep slopes limit recreational development.

This soil is well suited to woodland wildlife habitat. Some areas provide a good habitat for white-tailed deer, elk, black bear, squirrels, chipmunks, forest grouse, and various songbirds.

This map unit is in capability subclass VIe.

123-Huckleberry silt loam, 35 to 75 percent slopes. This Huckleberry soil is a moderately deep, well drained soil that formed in loess and volcanic ash mixed with material weathered from metasedimentary rock. It is on mountainsides. Elevation is 2,600 to 6,000 feet. The average annual precipitation is 35 inches, average anuual air temperature is 41 degrees F, and average frost-free period is 80 days.

Included with this soil in mapping are small areas of Ardenvoir gravelly loam and McCrosket gravelly silt loam, both having 35 to 65 percent slopes, and Brickel cobbly loam and Divers silt loam, both having 45 to 75 percent slopes.

Typically, the surface layer of this Huckleberry soil is brown silt loam about 11 inches thick, and is slightly acid. The subsoil is yellowish brown and pale brown channery silt loam about 8 inches thick, and is slightly acid and medium acid. The substratum is pale brown very flaggy loam about 14 inches thick, and is medium acid. Fractured metasedimentary bedrock is at a depth of about 33 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The main uses of this soil are timber production, wildlife habitat, watershed, and limited grazing on cleared areas.

This soil is suited to western redcedar, Douglas-fir, grand fir, western larch, and western white pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the steep and very steep slopes and the hazard of erosion. Specialized equipment and logging operations are needed to minimize soil losses.

This soil has limited potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses. The slope severely limits livestock movement and accessibility of the forage.

Native forage includes bromegrass, elk sedge, willow, mountain maple, and redstem ceanothus. Proper management of the vegetation helps to protect the regeneration of timber and to insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals for 10 to 15 years after the canopy is open. The total forage production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds.

The very steep slope severely limits all potential structural and recreational development.

This soil is well suited to woodland wildlife habitat. Some areas provide a good habitat for white-tailed deer, elk, black bear, squirrels, chipmunks, forest grouse, and various songbirds.

This map unit is in capability subclass VIIe.

124-Huckleberry-Ardenvoir association, 20 to 35 percent slopes. This association is made up of steep soils on mountainsides. Elevation is 2,200 to 3,600 feet. The average annual precipitation is 32 inches, average annual air temperature is 41 degrees F, and average frost-free period is 80 days.

This association is about 60 percent Huckleberry silt loam and 35 percent Ardenvoir gravelly loam.

Included with this association in mapping are small areas of Ardenvoir gravelly loam and McCrosket gravelly silt loam, both having 20 to 35 percent slopes, and Tekoa gravelly silt loam, having 5 to 35 percent slopes. These inclusions make up about 5 percent of the association.

The Huckleberry soil is a moderately deep, well drained soil over metasedimentary rock. It formed in material weathered from metasedimentary rock having a surface mixture of volcanic ash and loess. It has northerly exposures, is in swale positions, and is moist for longer periods than other soils in the association.

Typically, the surface layer of the Huckleberry soil is brown silt loam about 11 inches thick, and is slightly acid. The subsoil is yellowish brown and pale brown channery silt loam about 8 inches thick, and is slightly acid and medium acid. The substratum is pale brown very flaggy loam about 14 inches thick, and is medium acid. Fractured metasedimentary bedrock is at a depth of about 33 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Ardenvoir soil is a deep, well drained soil over metasedimentary bedrock. It formed in material weathered from metasedimentary rock with a mixture of loess and volcanic ash. It has southerly exposures and is on ridgetops.

Typically, the surface layer of the Ardenvoir soil is pale brown gravelly loam about 7 inches thick. The upper part of the subsoil is light yellowish brown gravelly loam about 9 inches thick. The lower part of the subsoil is very pale brown very gravelly loam about 21 inches thick. The substratum is very pale brown very cobbly loam about 10 inches thick. The soil is slightly acid throughout. Fractured metasedimentary bedrock is at a depth of 47 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

These soils are not suited to cultivation. Livestock grazing is limited to small cleared areas. Most of these soils are used for woodland timber production, watershed, and wildlife habitat.

The Huckleberry soil is suited to western redcedar, Douglas-fir, grand fir, western larch, and western white pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope and erosion hazard. Conventional methods can be used for tree harvest, but landings, logging roads, and skid trails need to be carefully planned to minimize soil losses.

The Huckleberry soil has potential for grazing when the tree canopy is opened. Forage production can be increased by seeding disturbed areas to grasses.

Native forage includes elk sedge, willow, mountain maple, and redstem ceanothus. Proper management of the vegetation helps protect the regeneration of timber .and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals for 10 to 15 years after the canopy is open. During this period, the total forage production varies from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds.

The Ardenvoir soil is suited to grand fir, Douglas-fir, and western larch. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main restrictions for timber production are the slope and the erosion hazard. Conventional methods can be used for tree harvest, but landings, logging roads, and skid trails must be carefully planned to minimize soil losses. Reforestation, after harvest, needs to be carefully managed to reduce the competition of undesirable understory plants.

The Ardenvoir soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses.

Native forage includes elk sedge, mountain maple, redstem ceanothus, and bluegrass. Creambush oceanspray and mallow ninebark, two relatively unpalatable shrubs, tend to dominate the site once the canopy is opened.

Proper management of the vegetation helps to protect the timber regeneration and to insure adequate litter for soil protection. This soil can produce forage for livestock and big game animals for 20 to 30 years after the canopy is open. During this period, the total forage production varies from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds.

Areas of these soils provide a good habitat for such woodland wildlife as white-tailed deer, elk, black bear, chipmunk, squirrel, and forest grouse.

The steep slopes on both soils and depth to rock on the Huckleberry soil are the main limitations for homesites, cabins, and roads. Road and dwelling construction is subject to potential damage from frost action. Small stones hinder excavation operations.

This map unit is in capability subclass Vle.

125-Huckleberry-Ardenvoir association, 35 to 60 percent slopes. This association is made up of very steep soils on mountainsides. Elevation is 2,200 to 6,000 feet. The average annual precipitation is 32 inches, average annual air temperature is 41 degrees F, and average frost-free period is 80 days.

This association is about 60 percent Huckleberry silt loam and about 35 percent Ardenvoir gravelly loam.

Included with this association in mapping are Brickel cobbly loam and Divers silt loam, both having 45 to 75 percent slopes; McCrosket gravelly silt loam, 35 to 65 percent slopes; and Rubble land. These inclusions make up about 5 percent of the association.

The Huckleberry soil is a moderately deep, well drained soil over metasedimentary rock. It formed in material weathered from metasedimentary rock having a

surface mixture of volcanic ash and loess. This soil has northerly exposures, is in swale positions, and is moist for longer periods than other soils in the association.

Typically, the surface layer of the Huckleberry soil is brown silt loam about 11 inches thick, and is slightly acid. The subsoil is yellowish brown and pale brown channery silt loam about 8 inches thick, and is slightly acid and medium acid. The substratum is pale brown very flaggy loam about 14 inches thick, and is medium acid. Fractured metasedimentary bedrock is at a depth of about 33 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

This Ardenvoir soil is a deep, well drained soil over metasedimentary rock. It formed in material weathered from metasedimentary rock with a mixture of loess and volcanic ash. It has southerly exposures and is on ridgetops.

Typically, the surface layer of the Ardenvoir soil is pale brown gravelly loam about 7 inches thick. The upper part of the subsoil is light yellowish brown gravelly loam about 9 inches thick. The lower part of the subsoil is very pale brown very gravelly loam about 21 inches thick. The substratum is very pale brown very cobbly loam about 10 inches thick. This soil is slightly acid throughout. Fractured metasedimentary bedrock is at a depth of about 47 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Huckleberry soil is suited to western redcedar, Douglas-fir, grand fir, western larch, and western white pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the very steep slopes and the erosion hazard. Specialized equipment and logging operations may be needed to minimize soil losses.

Native forage includes elk sedge, willow, mountain maple, and redstem ceanothus.

The Huckleberry soil has limited potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses. This Huckleberry soil can produce forage for livestock and big game animals for 10 to 15 years after the canopy is open, but the total forage production varies from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

Slope severely limits movement of livestock and accessibility of forage.

The Ardenvoir soil is suited to Douglas-fir, grand fir, and western larch. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main restrictions for timber production are the slope and the erosion hazard. Specialized equipment and logging operations may be needed to keep soil losses to a minimum. Reforestation after harvest needs to be carefully managed to reduce the competition of undesirable understory plants.

The Ardenvoir soil has limited potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses. Slope severely limits movement of livestock and accessibility of forage.

Native forage includes elk sedge, mountain maple, redstem ceanothus, and bluegrass. Creambush oceanspray and mallow ninebark, two relatively unpalatable shrubs, dominate the site when the canopy is open. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

This Ardenvoir soil can produce forage for livestock and big game animals for 20 to 30 years after the canopy is open. During this period, the total forage production varies from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds.

Areas of these soils provide a good habitat for such woodland wildlife as white-tailed deer, elk, black bear, chipmunk, squirrel, and forest grouse.

Potential structural and recreational development on these soils is severely limited by the very steep slopes.

This map unit is in capability subclass VIIe.

126-Kootenai gravelly silt loam, 0 to 7 percent slopes. This Kootenai soil is a very deep, well drained soil that formed in slightly weathered glacial till that has been modified by water and mantled by loess and volcanic ash. It is on glacial outwash plains, terraces, and recessional moraines. Elevation is 2,100 to 2,600 feet. The average annual precipitation is 27 inches, average annual air temperature is 44 degrees F, and average frost-free period is 100 days.

Included with this soil in mapping are small areas of Avonville fine gravelly silt loam, Garrison gravelly silt loam, McGuire sandy loam, Rathdrum silt loam, and Bonner silt loam, all having 0 to 7 percent slopes.

Typically, the surface layer of this Kootenai soil is dark brown gravelly silt loam about 6 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown gravelly silt loam and very gravelly loam about 20 inches thick, and is slightly acid. The substratum is variegated very gravelly coarse sand below a depth of 26 inches.

The rooting depth is 60 inches or more. The available water capacity is low. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is mainly used for woodland. Some cleared areas are used for small grain, hay, and pasture.

The main limitation for cropland is droughtiness because of the low moisture-holding capacity. Use of fertilizer and crop residue on favorable sites economically promotes crop growth.

This Kootenai soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main restriction for timber production is the seedling mortality. Conventional methods can be used for tree harvest, but some shade may be needed from larger trees to reforest the soil after harvest.

Native forage plants include bluebunch wheatgrass, elk sedge, pine reedgrass, and snowberry. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

This Kootenai soil has good potential for grazing when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

In a managed woodlot condition, this soil can produce forage for livestock almost continually. If not managed, forage can be produced for 20 to 25 years. Total production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 500 pounds.

After the timber is harvested, this soil can be used for hay and pasture on irrigated land and dryland.

A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain excellent plant growth on irrigated land. Phosphorus is also needed where legumes are grown. Without irrigation, plant growth is fair to good.

Pasture benefits from a rotation grazing system and a proper regrowth period for plants.

Adapted forage for irrigated land and dryland include Latar orchardgrass, Manchar smooth brome, and Regar bromegrass.

Native plants provide some habitat for whitetailed deer, black bear, songbirds, various small mammals, and forest grouse.

Both the forested and cleared areas of this soil provide food and cover favorable to wildlife. Shortage of water is a limiting factor for wildlife unless there is irrigation.

This soil has good potential for urban or residential development. The main limitation for sanitary facility installation is the very rapid permeability of the substratum. Community sewage systems should be considered in areas of high population density to avoid the possibility of ground water pollution.

Potential frost action damage is a hazard for roads and dwellings. Footing and road base designs should consider the depth of frost penetration. Excavations that include sloping of banks or shoring help prevent cut-banks from caving. Recreational developments are limited because of the small surface stones.

This map unit is in capability subclass IVs and IIIs, irrigated.

127-Kootenai gravelly silt loam, 20 to 45 percent slopes. This Kootenai soil is a very deep, well drained soil that formed in slightly weathered glacial till that has been modified by water and mantled by loess and volcanic ash. It is on glacial outwash terraces and escarpments. Elevation is 2,100 to 2,600 feet. The average annual precipitation is 27 inches, average annual air temperature is 44 degrees F, and average frost-free period is 100 days.

Included with this soil in mapping are small areas of Avonville gravelly silt loam and Garrison gravelly silt loam.

Typically, the surface layer of this Kootenai soil is dark brown gravelly silt loam about 6 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown gravelly silt loam and very gravelly loam about 20 inches thick, and is slightly acid. The substratum is variegated very gravelly coarse sand below a depth of 26 inches.

The rooting depth is more than 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

This soil is mainly used for woodland. Some areas are used for grazing.

This Kootenai soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope, erosion hazard, and seedling mortality.

Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be carefully planned to minimize soil losses. Reforestation needs some shade from large trees to prevent seedling mortality during the summer.

Native forage includes bluebunch wheatgrass, elk sedge, pine reedgrass, and snowberry.

This soil has limited potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, tall fescue, timothy, and white Dutch clover.

Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

In a managed woodlot condition, this soil can continually produce forage for livestock. If not managed, forage is produced for 20 to 25 years, and total production can vary from about 1,700 pounds of air-dry herbage per acre per year to less than 400 pounds.

The steeper slopes limit movement of livestock and forage accessibility.

Native plants provide some habitat for white-tailed deer, black bear, songbirds, various small mammals, and forest grouse. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife. Shortage of water is a limitation for wildlife.

The main limitation for all structural development is the steep slope. A limitation for sanitary facility installation is the very rapid permeability of the substratum. Community sewage systems should be considered in areas of high population density to avoid the possibility of ground water pollution. The steep slope is a limitation for all recreational development.

This map unit is in capability subclass VIe.

128-Kootenai cobbly silt loam, 0 to 7 percent slopes. This Kootenai soil is a very deep, well drained soil that formed in slightly weathered glacial till that has been modified by water and mantled by loess and volcanic ash. It is on glacial outwash plains, terraces, and recessional moraines. Elevation is 2,100 to 2,600 feet. The average annual precipitation is 27 inches, average annual air temperature is 44 degrees F, and average frost-free period is 100 days.

Included with this soil in mapping are small areas of Avonville fine gravelly silt loam, Rathdrum silt loam, and Bonner silt loam, all with slopes of 0 to 7 percent.

Typically, the surface layer of the Kootenai soil is dark brown cobbly silt loam about 6 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown cobbly silt loam and very gravelly loam about 20 inches thick, and is slightly acid. The substratum is variegated very gravelly coarse sand below a depth of 26 inches.

The rooting depth is 60 inches or more. The available water capacity is low. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is mainly used for woodland. Some areas are used for small grain, hay, and pasture. Potential is marginal for cropland because of the cobbly and gravelly nature of the soil.

This Kootenai soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main restriction for timber production is the seedling mortality. Conventional methods can be used for tree harvest, but some shade may be needed from larger trees to reforest the soil after harvest.

Native forage includes bluebunch wheatgrass, elk sedge, pine reedgrass, and snowberry. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchard grass, tall fescue, timothy, and white Dutch clover.

This soil can produce forage for livestock almost continually under a managed woodlot condition. If not managed, forage can be produced for 20 to 25 years, and total production can vary from 1,800 pounds of air-dry herbage per acre per year to less than 500 pounds.

After the timber is harvested, this soil can be used for hay or pasture on irrigated land and dryland. A well balanced fertilization program including the use of nitrogen and sulfur helps obtain excellent plant growth on irrigated land. Phosphorus is also needed when legumes are grown.

Good water management on irrigated land helps obtain maximum plant growth. Without irrigation, plant growth is fair to good.

Pastures benefit from a rotation grazing system and a proper regrowth period for plants.

Adapted forage for irrigated land and dryland include Latar orchardgrass, Manchar smooth brome, Regar bromegrass, and alfalfa.

Native plants provide some habitat for white-tailed deer, black bear, songbirds, various small mammals, and forest grouse. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife. Shortage of water is a limitation for wildlife.

The main limitation for sanitary facility installation is the very rapid permeability of the substratum. Community sewage systems should be considered in areas of high population density to avoid the possibility of ground water pollution.

Potential frost action damage is a hazard for roads. Footing and road base designs should consider the depth of frost penetration. Excavations that include sloping of banks or shoring help prevent cutbanks from caving.

Recreational development is limited by the large surface stones.

This map unit is in capability subclass IVs and IIIs, irrigated.

129-Kootenai-Bonner complex, 0 to 20 percent slopes. These nearly level to moderately steep soils are on hummocky glacial outwash plains, terraces, and recessional moraines. Elevation is 2,100 to 2,600 feet. The average annual precipitation is 28 inches, average annual air temperature is 44 degrees F, and average frost-free period is 110 days.

This complex is 60 percent Kootenai gravelly silt loam, 0 to 20 percent slopes, and 30 percent Bonner gravelly silt loam, 0 to 8 percent slopes. Rathdrum silt loam, 0 to 7 percent slopes, and Kootenai cobbly silt loam and Avonville gravelly silt loam, both having slopes of 0 to 20 percent, make up the remaining 10 percent of this complex.

The Kootenai soil is a very deep, well drained soil that formed in slightly weathered glacial till modified by water and mantled by loess and volcanic ash.

Typically, the surface layer of the Kootenai soil is dark brown gravelly silt loam about 6 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown gravelly silt loam and very gravelly loam about 20 inches thick, and is slightly acid. The substratum is variegated very gravelly coarse sand below a depth of 26 inches.

The rooting depth is more than 60 inches. The available water capacity is low. Permeability is moderate, runoff is medium to rapid, and the hazard of erosion is moderate to high.

The Bonner soil is a very deep, well drained soil that formed in glacial outwash mantled with volcanic ash and loess.

Typically, the surface layer of the Bonner soil is yellowish brown gravelly silt loam about 8 inches thick, and is neutral. The subsoil is brown and pale brown gravelly silt loam and gravelly sandy loam about 18 inches thick, and is slightly acid and neutral. The substratum below a depth of 26 inches is pale brown very gravelly loamy sand, and is neutral.

The rooting depth is more than 60 inches. The available water capacity is low. Permeability is rapid, runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are mainly used for woodland. Some cleared areas are used for small grain, hay, or pasture.

Crop production is limited by the droughty soil conditions. The main limitation for crop growth is the very gravelly subsoil. Deep-rooted perennial crops are the most reliable. Proper irrigation management helps increase all plant growth.

Fertilization of all crops is necessary, and the rates and timing need to be determined for each crop. Cool soil temperatures have an adverse effect on plant growth.

The Kootenai soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitation for timber production is the seedling mortality. Conventional methods can be used for tree harvest, but some shade may be needed from larger trees to reforest the soil after harvest.

The Bonner soil is suited to Douglas-fir, grand fir, ponderosa pine, lodgepole pine, and western larch. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

Conventional methods can be used for tree harvest. Reforestation after harvest needs to be carefully managed to reduce the competition of undesirable understory plants.

After the timber is harvested these soils can be used for hay and pasture on irrigated land and dryland. Good management and a well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain excellent plant growth on irrigated land. Phosphorus is also needed when legumes are grown. Without irrigation, plant growth is fair to good.

Pastures benefit from a rotation grazing system and a proper regrowth period for plants.

Native forage includes elk sedge, bluebunch wheatgrass, pine reedgrass, and redstem ceanothus.

Adapted forage for irrigated land and dryland includes Latar orchardgrass, Manchar smooth brome, Regar bromegrass, and alfalfa.

Once the tree canopy is open, these soils have potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total forage production for livestock and big game animals can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 150 pounds for 15 to 25 years after the canopy is open.

Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

Native plants provide essential habitat for white-tailed deer, black bear, some elk, songbirds, various small mammals, and forest grouse.

Both the forested and cleared areas of these soils provide food and cover favorable to wildlife. Shortage of water is a limitation for wildlife, unless irrigation is used.

The main limitations for sanitary facility installation are slope and the rapid permeability of the substratum. Community sewage systems should be considered in areas of high population density to avoid the possibility of ground water pollution.

Potential damage from frost action is a moderate hazard for roads. Footing and road base designs should consider the depth of frost penetration.

The main limitations for recreational development are slope and small stones.

This map unit is in capability subclass IVe.

130-Kootenai-Rathdrum association, 0 to 20 percent slopes. This soil association is made up of very deep soils on hummocky glacial outwash plains and recessional moraines. Elevation is 2,100 to 2,600 feet. The average annual precipitation is 28 inches, average annual air temperature is 44 degrees F, and average frost-free period is 100 days.

This association is about 60 percent Kootenai gravelly silt loam, 0 to 20 percent slopes, and 30 percent Rathdrum silt loam, 0 to 7 percent slopes.

Included with this association in mapping are areas of Bonner silt loam and Bonner gravelly silt loam, both having slopes of 0 to 8 percent.

The Kootenai soil is a very deep, well drained soil on knobs or ridges. It formed in slightly weathered glacial till that has been modified by water and mantled by a thin layer of loess and volcanic ash.

Typically, the surface layer of the Kootenai soil is dark brown gravelly silt loam about 6 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown gravelly silt loam and very gravelly loam about 20 inches thick, and is slightly acid. The substratum is variegated very gravelly coarse sand below a depth of 26 inches.

The rooting depth is 60 inches or more, and the available water capacity is low. Permeability is moderate, runoff is medium to rapid, and the hazard of erosion is moderate to high.

The Rathdrum soil is a very deep, well drained soil that formed in deep volcanic ash and loess over glacial outwash material. It is in swales and depressions.

Typically, the surface layer of the Rathdrum soil is pale brown silt loam about 4 inches thick. The subsoil is pale brown silt loam about 18 inches thick. The upper part of the substratum is very pale brown silt loam and very fine sandy loam about 32 inches thick. The lower part below a depth of 54 inches is pale brown gravelly silt loam. This soil is slightly acid throughout.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to medium.

These soils are mainly used for woodland. Some cleared areas are used for hay, pasture, and small grain.

Limitations for cropland are the predominantly gravelly nature of the Kootenai soil and the cool soil temperatures of the Rathdrum soil. Long term sod crops are the most reliable and need fertilization to produce good plant growth.

The Kootenai soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitation for timber production is the severe seedling mortality. Conventional methods can be used for tree harvest, but partial shade is desirable for reforestation.

The Rathdrum soil is suited to western redcedar, Douglas-fir, grand fir, western larch, western white pine, lodgepole pine, and ponderosa pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees. Conventional methods can be used for tree harvest.

Native forage includes elk sedge, bluebunch wheatgrass, and redstem ceanothus.

Proper management of the vegetation helps protect the regeneration of timber and insures adequate litter for soil protection.

When the tree canopy is opened, the soil has potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total production can vary from about 2,200 pounds of air-dry herbage per acre per year to less than 150 pounds for 5 to 20 years after the canopy is open.

After timber is harvested, some areas of these soils can be used for pasture or hay on irrigated land and dryland.

A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain excellent plant growth on irrigated land. Phosphorus is also needed when legumes are grown.

Good water management on irrigated land helps obtain maximum plant growth. Without irrigation, crop growth is fair to good.

Pasture benefits from a rotation grazing system and a proper regrowth period for plants.

Adapted forage for irrigated land and dryland include Latar orchardgrass, Manchar smooth brome, Regar bromegrass, and alfalfa.

Native plants provide some habitat for white-tailed deer, black bear, songbirds, various small mammals, and forest grouse. Both the forested and cleared areas of these soils provide food and cover favorable to wildlife, though shortage of water is a limitation unless irrigation is used.

Potential frost action damage is a hazard for roads. Footings and road base designs should consider the depth of frost penetration.

The Kootenai soils are suited to septic tank absorption fields. The main limitation for sanitary facilities is the very rapid permeability of the substratum in the Kootenai soil, which causes a potential hazard of seepage. Slope is a limitation on steeper hillsides. Recreational development is limited by slope and small stones.

This map unit is in capability subclass IVe.

131-Kruse silt loam, 0 to 5 percent slopes. This Kruse soil is a very deep, well drained soil that formed in loess deposits overlying material weathered from gneiss and schist bedrock. It is on mountain foot slopes. Elevation is 2,200 to 3,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Santa silt loam, 3 to 5 percent slopes; and Kruse silt loam, Santa silt loam, and Ulricher loam, all with 5 to 20 percent slopes.

Typically, the surface layer of this Kruse soil is grayish brown and pale brown silt loam about 13 inches thick. The subsoil is pale brown and very pale brown loam and clay loam about 29 inches thick. The substratum below a depth of 42 inches is pale brown and yellowish brown fine sandy loam. The soil is medium acid throughout.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderately slow, runoff is medium, and the hazard of erosion is moderate.

This soil is mainly used for woodland. Some cleared areas are used for hay, pasture, small grain, and grass for seed production.

This soil has limitations for cropland. Where tillage is intensive, the sloping soils easily erode, and runoff from adjacent steep land also contributes to erosion. The best conservation treatment is adequately fertilized, long term sod crops. Good management for a small grain program includes fertilization, minimum tillage, continuous cropping, residue utilization, grassed waterways, some diversion terraces or field stripcropping, and weed control.

This Kruse soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 8,500 cubic feet per acre, 0.6 inch and more in diameter, or 34,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitation for timber production is the moderately slow permeability that reduces this soil's trafficability during wet periods. Conventional methods of tree harvest can be used but may be restricted during the rainy winter and spring months. Reforestation after harvest needs to be carefully planned to reduce the competition of undesirable understory plants.

Native forage includes Columbia brome, elk sedge, snowberry, and rose. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

When the tree canopy is open, the soil has a potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds for 15 to 25 years after the canopy is open.

After the timber is removed, this soil can be used for pasture or hay.

A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season.

Adapted, improved forage includes Latar orchardgrass, Manchar smooth brome, Regar bromegrass, alfalfa, and clover.

The native plants provide essential habitat for white-tailed deer, black bear, some elk, songbirds, various small mammals, forest grouse, and, near cleared areas, Chinese pheasant and Hungarian partridge.

Limitations for dwellings and road construction are the shrink-swell potential of the subsoil during wetting and drying, and the inherent low support strength of the soil. Septic tank absorption fields are limited by the moderately slow permeability of the subsoil. Planning of sewage lagoons and trench-type sanitary landfill designs should consider the permeability of the substratum.

Grassed waterways and diversions are limited by the high hazard of erosion.

The main limitation for paths and trails is dustiness.

This map unit is in capability subclass IVe.

132-Kruse silt loam, 5 to 20 percent slopes. This Kruse soil is a very deep, well drained soil that formed in loess deposits overlying material weathered from gneiss and schist bedrock. It is on mountain foot slopes. Elevation is 2,200 to 3,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Vassar silt loam, Santa silt loam, and Ulricher loam, all having 5 to 20 percent slopes; and Kruse silt loam, 0 to 5 percent slopes and 20 to 35 percent slopes.

Typically, the surface layer of this Kruse soil is grayish brown and pale brown silt loam about 13 inches thick. The subsoil is pale brown and very pale brown loam and clay loam about 29 inches thick. The substratum below a depth of 42 inches is pale brown and yellowish brown fine sandy loam. This soil is medium acid throughout.

The rooting depth is 60 inches or more, and the available water capacity is high. Permeability is moderately slow, runoff is rapid to very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland. Some cleared areas are used for hay, pasture, small grain, and grass for seed.

This soil has severe limitations for cropland in a small grain program. Where tillage is intensive, the soil erodes easily even on moderate slopes. Runoff from adjacent steeper land also contributes to erosion. The best conservation treatment is adequately fertilized long term sod crops. In a small grain program, good management includes minimum tillage, continuous cropping, utilization of residue, grassed waterways, and some diversion terraces or field stripcropping. Weed control is also needed.

This Kruse soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 8,500 cubic feet per acre, 0.6 inch and more in diameter, or 34,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitation for timber production is the moderately slow permeability that reduces this soil's trafficability during wet periods. Conventional methods of tree harvest can be used but may be limited during the rainy winter and spring months. Reforestation after harvest needs to be carefully planned to reduce the competition of undesirable understory plants.

Native forage includes Columbia brome, elk sedge, snowberry, and rose.

When the tree canopy is opened, the soil has potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total forage production for livestock and big game animals can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds for 15 to 25 years after the canopy is open.

Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

After the timber is removed, this soil can be used for pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season.

Adapted, improved forage includes Latar orchardgrass, Manchar smooth brome, Regar bromegrass, alfalfa, and clover.

Native plants provide essential habitat for white-tailed deer, black bear, some elk, songbirds, various small mammals, forest grouse, and, near cleared areas, Chinese pheasant and Hungarian partridge. Both the forested and cleared areas supplement each other in providing food and cover favorable to wildlife.

Dwelling and road construction is limited by slope, the shrink-swell potential of the subsoil during wetting and drying, and the inherent low support strength of the soil.

Septic tank absorption field designs are limited by the subsoil's moderately slow permeability. Sewage lagoons and trench-type sanitary landfill designs are limited by the moderately rapid permeability of the substratum. Slope is a limitation for all sanitary facilities.

Grassed waterways and diversions are subject to the high hazard of erosion and the slope.

The main limitations for recreational development are the slope and the dustiness of the soil during the dry season.

This map unit is in capability subclass IVe.

133-Kruse silt loam, 20 to 35 percent slopes. This Kruse soil is a very deep, well drained soil that formed in loess deposits overlying material weathered from gneiss and schist bedrock. It is on mountainsides. Elevation is 2,200 to 3,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Vassar silt loam, Santa silt loam, and Ulricher loam, all with slopes of 20 to 35 percent; and Kruse silt loam and Ulricher loam, both with 5 to 20 percent slopes and 35 to 65 percent slopes.

Typically, the surface layer of this Kruse soil is grayish brown and pale brown silt loam about 13 inches thick. The subsoil is pale brown and very pale brown loam and clay loam about 29 inches thick. The substratum below a depth of 42 inches is pale brown and yellowish brown fine sandy loam. The soil is medium acid throughout.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderately slow, runoff is very rapid, and the hazard of erosion is very high.

This soil is mainly used for woodland. Some cleared areas are used for hay and pasture. The soil is not suited to cultivation because of the slope and the hazard of erosion.

This Kruse soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 8,500 cubic feet per acre, 0.6 inch and more in diameter, or 34,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the erosion hazard and the moderately slow permeability that reduces this soil's trafficability during wet periods.

Conventional methods of tree harvest can be used but may be restricted during the rainy winter and spring months. Reforestation after harvest needs to be carefully planned to reduce the competition of undesirable understory plants.

Native forage includes Columbia brome, elk sedge, snowberry, and rose.

Once the tree canopy is opened, this soil has potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total production of forage for livestock and big game animals can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds for 15 to 25 years after the canopy is open.

Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

After the timber is removed, this soil can be used for pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season.

Adapted, improved forage includes Latar orchardgrass, Manchar smooth brome, Regar bromegrass, alfalfa, and clover.

Native plants provide habitat for white-tailed deer, black bear, some elk, songbirds, various small mammals, and forest grouse. Near cleared areas, this soil provides a fair habitat for some Chinese pheasant and Hungarian partridge. Both the forested and cleared areas of this soil supplement each other in providing food and cover favorable to wildlife.

Dwelling and road construction is limited by the steep slope, the shrink-swell potential of the subsoil during wetting and drying, and the inherent low support strength of the soil. The steep slopes limit sanitary facility installation.

Grassed waterways and diversions are limited by the high hazard of erosion and the steep slopes. The steep slopes also limit recreational development.

This map unit is in capability subclass VIe.

134-Kruse-Ulricher association, 35 to 65 percent slopes. This association is made up of deep and very

deep soils on mountainsides. Elevation is 2,200 to 3,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 to 45 degrees F, and average frost-free period is 110 days.

This association is about 55 percent Kruse silt loam and 40 percent Ulricher loam.

Included with this association in mapping are small areas of Lenz loam, Lenz very stony loam, and Vassar silt loam, all with 35 to 65 percent slopes; Kruse silt loam, Ulricher loam, and Ulricher stony loam, all with 20 to 35 percent slopes; and small areas of Rock outcrop. These inclusions make up about 5 percent of this association.

The Kruse soil is mainly on northerly aspects and is a very deep, well drained soil over weathered gneiss and schist. It formed in loess deposits overlying material weathered from gneiss and schist bedrock.

Typically, the surface layer of the Kruse soil is grayish brown and pale brown silt loam about 13 inches thick. The subsoil is pale brown and very pale brown loam and clay loam about 29 inches thick. The substratum is pale brown and yellowish brown fine sandy loam below a depth of about 42 inches. This soil is medium acid throughout.

The rooting depth is 60 inches or more, and the available water capacity is high. Permeability is moderately slow, runoff is very rapid, and the hazard of erosion is very high.

The Ulricher soil is a deep, well drained soil over weathered gneiss. It formed in weathered gneiss and other metamorphic rocks mixed with loess and volcanic ash in the upper part of the profile. This soil is warmer than the Kruse soil and is mainly on southerly aspects.

Typically, the surface layer of the Ulricher soil is brown loam about 3 inches thick, and is slightly acid. The subsoil is pale brown, light yellowish brown, and very pale brown loam, sandy loam, and cobbly sandy loam about 28 inches thick, and is medium acid. The substratum is yellow cobbly loamy sand about 11 inches thick, and is medium acid. Weathered gneiss bedrock is at a depth of about 42 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderately rapid, runoff is very rapid, and the hazard of erosion is very high.

These soils are mainly used for woodland, grazing, recreation, and wildlife habitat.

Both of these soils are suited to Douglas-fir and ponderosa pine. They are capable of producing about 8,500 cubic feet per acre, 0.6 inch and more in diameter, or 34,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope, erosion hazard, and the moderately slow permeability of the Kruse soil that reduces trafficability during the rainy winter and spring months. Consideration needs to be given to specialized logging equipment that causes a minimum of soil disturbance. Reforestation after harvest needs to be carefully managed to reduce the competition of undesirable understory plants.

Native forage on the Kruse soil includes Columbia brome, elk sedge, snowberry, and rose. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

Once the tree canopy is open, this soil has a limited potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total production of forage for livestock and big game animals varies from about 1,800 pounds of air-dry herbage per acre per year to less than 150 pounds for 15 to 25 years after the canopy is open.

The steep slopes limit movement of livestock and accessibility of forage.

Native forage on the Ulricher soil includes Columbia brome, elk sedge, snowberry, willow, and serviceberry.

Once the canopy is opened, tall shrubs may dominate the site. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection. Total production of forage for livestock and big game animals can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 100 pounds.

Native plants supported by these soils provide habitat for white-tailed deer, black bear, some elk, songbirds, various small mammals, and forest grouse.

Slope is the main limitation for all structural development. Other limitations are the depth to rock on the Ulricher soil, the shrink-swell potential during wetting and drying, and the inherent low strength of these soils.

Recreational development is limited by the steep slope.

This map unit is in capability subclass VIIe.

135-Lacy-Rock outcrop complex, 5 to 35 percent slopes. This complex is on rolling to steep mountainsides and canyon positions where basalt bedrock outcrops. Elevation is 2,125 to 3,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 48 degrees F, and average frost-free period is 120 days.

Lacy stony loam makes up about 55 percent of the map unit and Rock outcrop makes up about 35 percent. Blinn stony loam and Bobbitt stony loam, both having 5 to 35 percent slopes, make up the remaining 10 percent of the complex.

The Lacy soil is a shallow, well drained soil that formed in material weathered from basalt, with a small amount of loess in the upper part of the profile.

Typically, the surface layer of the Lacy soil is dark brown stony loam about 7 inches thick, and is slightly acid and strongly acid. The subsoil is dark brown stony clay loam and very stony clay loam about 12 inches thick, and is slightly acid and strongly acid. Fractured basalt bedrock is at a depth of about 19 inches.

The rooting depth is 10 to 20 inches. The available water capacity is very low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Rock outcrop is made up of exposures of bare basalt bedrock, with a few inches of soil over the bedrock in some areas. Crevices in the rock contain some soil material. The vegetation is moss and lichens.

These areas are mainly used for woodland, recreation, and wildlife habitat. Native plants on the Lacy soil are ponderosa pine and Idaho fescue.

The Lacy soil is suited to ponderosa pine. It is capable of producing about 3,400 cubic feet per acre, 0.6 inch and more in diameter, or 3,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the large amount of rock on the soil surface and the low available water capacity that can influence seedling survival. Conventional tree harvest methods can be used, but road construction is limited. Reforestation after harvest must be carefully planned to establish adequate reproduction.

The Lacy soil has high potential for grazing. Forage production can be increased by seeding disturbed areas to adapted grasses.

Native forage on this soil includes Idaho fescue, bluebunch wheatgrass, arrowleaf balsamroot, and geranium. Proper management of the vegetation helps protect the regeneration of timber and increase the production of Idaho fescue and bluebunch wheatgrass.

If well managed, this soil can continually produce forage for livestock and big game animals. Total forage production varies from about 1,600 pounds of air-dry herbage per acre per year to about 250 pounds, depending upon the type of grazing management.

Areas of Rock outcrop provide very little grazing for domestic livestock.

Wildlife habitat is limited by the rocky soil.

Homesites, roads, sanitary facilities, and recreational development are limited by slope and depth to rock.

This map unit is in capability subclass VIIs.

136-Lacy-Bobbitt association, 5 to 35 percent slopes. These shallow and moderately deep soils are on mountainsides and terrace escarpments. Elevation is 2,125 to 3,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 48 degrees F, and average frost-free period is 120 days.

The Lacy soil makes up about 55 percent of the map unit and the Bobbitt soil makes up about 35 percent.

Included with this association in mapping are areas of Blinn stony loam and Santa silt loam, both having 5 to 35 percent slopes; Taney silt loam, 3 to 25 percent slopes; and Rock outcrop. These inclusions make up about 10 percent of this association.

The Lacy soil is a shallow, well drained soil that formed in material weathered from basalt that has a small amount of loess in the upper part of the profile. It is on convex side slopes of ridges.

Typically, the surface layer of the Lacy soil is dark brown stony loam about 7 inches thick, and is slightly acid and medium acid. The subsoil is dark brown stony clay loam and very stony clay loam about 12 inches thick, and is slightly acid and strongly acid. Fractured basalt is at a depth of about 19 inches.

The rooting depth is 10 to 20 inches, and the available water capacity is very low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Bobbitt soil is a moderately deep, well drained soil that formed in material weathered from basalt and a thin mantle of loess and volcanic ash. It is on concave or flatter areas than the Lacy soils.

Typically, the surface layer of the Bobbitt soil is grayish brown and dark grayish brown stony loam about 10 inches thick, and is neutral. The subsoil is brown and very pale brown very stony clay loam about 25 inches thick, and is slightly acid and medium acid. Fractured basalt bedrock is at a depth of about 35 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is rapid, and the hazard of erosion is high.

These soils are used for woodland, wildlife habitat, recreation, and limited grazing.

The Lacy soil is suited to ponderosa pine. It can produce about 3,400 cubic feet per acre, 0.6 inch and more in diameter, or 3,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the shallow depth to bedrock, the presence of stones, and the low available water capacity that can influence seedling survival. Conventional methods can be used for tree harvest, but road construction is limited by depth to rock and the very high erosion hazard. Reforestation after harvest needs to be carefully planned to establish adequate reproduction.

The Bobbitt soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the depth to bedrock, the presence of stones, and the low available water capacity that can influence seedling survival. Conventional methods can be used for tree harvest, but road construction may be limited. Harvest methods and site preparation need to be carefully planned to establish adequate reproduction.

The Lacy soil has high potential for grazing. Native forage plants include Idaho fescue, bluebunch wheatgrass, arrowleaf balsamroot, and geranium.

Proper management of the vegetation helps protect the regeneration of timber and increases the production of Idaho fescue and bluebunch wheatgrass. Forage production can be increased by seeding disturbed areas to adapted grasses.

If well managed, the Lacy soil can continually produce forage for livestock and big game animals. Total forage production varies from about 1,600 pounds of air-dry herbage per acre per year to about 250 pounds, depending on the type of grazing management.

Native forage plants on the Bobbitt soil include Idaho fescue, bluebunch wheatgrass, bluegrass, American vetch, and rose.

When the canopy is open, the Bobbitt soil has a limited potential for grazing. Tall, relatively unpalatable shrubs may dominate the site. However, forage production can be increased by seeding disturbed areas to adapted grasses.

Proper management of the vegetation helps protect the regeneration of timber and increase the production of Idaho fescue and bluebunch wheatgrass.

When well managed, the Bobbitt soil can continually produce forage for livestock and big game animals. If the soil is unmanaged, the total production can vary from 2,000 pounds of air-dry herbage per acre per year to less than 200 pounds for 20 to 40 years.

These soils provide some wildlife habitat for small animals such as chipmunks, squirrels, various game birds, and songbirds. Some white-tailed deer or mule deer are present in wooded areas.

Limitations for homesites, roads, and sanitary facilities are the depth to rock, the slope, and large stones.

The soil has potential for paths and trails; however, slope is a limitation for such uses on the steeper areas.

This map unit is in capability subclass Vle.

137-Lacy-Bobbitt association, 35 to 65 percent slopes. These shallow and moderately deep soils are on mountain slopes and terrace escarpments. Elevation is 2,125 to 3,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 48 degrees F, and average frost-free period is 120 days.

The Lacy soil makes up about 55 percent of the map unit and the Bobbitt soil makes up about 35 percent.

Included with this association in mapping are Blinn stony loam, 35 to 65 percent slopes, and Rock outcrop. These inclusions make up about 10 percent of the association.

The Lacy soil is a shallow, well drained soil that formed in material weathered from basalt and a small amount of loess in the upper part of the profile. It is on ridges, and the slopes are convex.

Typically, the surface layer of the Lacy soil is dark brown stony loam about 7 inches thick, and is slightly acid and medium acid. The subsoil is dark brown and brown stony clay loam and very stony clay loam about 12 inches thick, and is slightly acid to strongly acid. Fractured basalt bedrock is at a depth of about 19 inches.

The rooting depth is 10 to 20 inches. The available water capacity is very low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Bobbitt soil is a moderately deep, well drained soil that formed in material weathered from basalt and a thin mantle of loess and volcanic ash. It is in concave areas.

Typically, the surface layer of the Bobbitt soil is gray ish brown and dark grayish brown stony loam about 10 inches thick, and is neutral. The subsoil is brown and very pale brown very stony clay loam about 25 inches thick, and is slightly acid and medium acid. Fractured basalt bedrock is at a depth of about 35 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

These soils are used for woodland, wildlife habitat, recreation, and limited grazing.

The Lacy soil is suited to ponderosa pine. It is capable of producing about 3,400 cubic feet per acre, 0.6 inch and more in diameter, or 3,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the shallow depth to bedrock, the presence of stones, the steep slopes, and seeding mortality. Specialized equipment and logging operations may be needed to prevent excessive soil losses. Adequate reproduction can be established by means of special site preparation.

The Bobbitt soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the depth to bedrock, the presence of stones, and the steep slopes. Conventional methods of tree harvest are limited, and specialized equipment and logging operations may be needed to prevent excessive soil loss.

This Lacy soil has high potential for grazing. Native forage includes Idaho fescue, bluebunch wheatgrass, arrowleaf balsamroot, and geranium. Forage production can be increased by seeding disturbed areas to adapted grasses. Proper management of the vegetation helps to protect the regeneration of timber and increase the production of Idaho fescue and bluebunch wheatgrass.

Under a woodlot situation, this soil can continually produce forage for livestock and big game animals. Total forage production varies from about 1,600 pounds of air-dry herbage per acre per year to about 250 pounds, depending on the type of management.

Slope limits the movement of livestock and the accessibility of forage.

Native forage plants on the Bobbitt soil include Idaho fescue, bluebunch wheatgrass, bluegrass, American vetch, and rose. Proper management of the vegetation helps protect the regeneration of timber and increases the production of Idaho fescue and bluebunch wheatgrass.

This Bobbitt soil has a limited potential for grazing, especially when the canopy has been opened. After this,

tall, relatively unpalatable shrubs may dominate the site. Forage production can be increased by seeding disturbed areas to adapted grasses.

When well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds for 20 to 40 years. Steep slopes limit movement of livestock and accessibility of forage.

These soils provide some wildlife habitat for chipmunks, squirrels, various game birds, songbirds, and some white-tailed deer or mule deer.

The very steep slope is the main limitation for all structural and recreational development. This map unit is in capability subclass VIIe.

138-Larkin silt loam, 3 to 12 percent slopes. This Larkin soil is a very deep, well drained soil that formed in deep loess with a mixture of volcanic ash. It is on loess hills. Elevation is 2,500 to 3,000 feet. The average annual precipitation is 23 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Taney, Southwick, and Worley silt loams, all with slopes of 3 to 12 percent.

Typically, the surface layer of this Larkin soil is dark grayish brown silt loam about 16 inches thick, and is medium acid and slightly acid. The upper part of the subsoil is brown loam about 7 inches thick, and is slightly acid. The lower part of the subsoil below a depth of about 23 inches is brown and yellowish brown silty clay loam, and is slightly acid and neutral.

Organic matter content in the surface layer is high. The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderately slow, runoff is medium, and the hazard of erosion is moderate.

This soil is mainly used for wheat, barley, peas, grass seed, hay, pasture, and woodland, and has a wide range of crop adaptability. Where management is good, the soil produces good yields of all adapted crops. An adequate conservation program includes the use of crop residue, minimum tillage, and a continuous cropping system using small grain and peas.

When water runoff is significant, grassed waterways help prevent gullies in natural drainageways. Other methods for the control of erosion are contour farming, divided slope farming, diversions, gradient terraces, and field stripcropping. Legume-grass crops are an alternative for the control of erosion.

Chemical weed control, and the addition of nitrogen, sulfur, and sometimes phosphorus, are necessary in all cropping systems.

This Larkin soil is suited to ponderosa pine. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the moderately slow permeability that causes a lack of traction on the soil during the rainy winter and spring months. Conventional methods can be used for tree harvest, but may be limited during the rainy period. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants.

Native forage includes Idaho fescue, bluebunch wheatgrass, blue wildrye, bluegrass, hawkweed, and arrowleaf balsamroot.

When the canopy has been opened, the Larkin soil has good potential for grazing, though tall, relatively unpalatable shrubs may dominate the site. Forage production can be increased by seeding disturbed areas to adapted grasses.

Proper management of vegetation helps to protect the regeneration of timber and increase the production of Idaho fescue and bluebunch wheatgrass.

If well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 250 pounds for 15 to 25 years.

This soil has good potential for openland, rangeland, or woodland wildlife habitat. Some wildlife in wooded areas are white-tailed deer, black bear, small rodents, forest grouse, and songbirds.

The main limitations for homesites and roads are the shrink-swell potential of the soil during wetting and drying, the inherent low strength of the soil, and potential frost action damage.

The moderately slow permeability of the soil is a limitation for septic tank absorption fields. Community sewage systems should be considered in areas of high population density.

The complex slope and the hazard of erosion are limitations for the design of terraces, diversions, and grassed waterways.

Recreational development is limited by surface dust when the soil is dry.

This map unit is in capability subclass IIIe.

139-Larkin silt loam, 12 to 20 percent slopes. This Larkin soil is a very deep, well drained soil that formed in deep loess and a mixture of volcanic ash. It is on dissected loess plains. Elevation is 2,500 to 3,000 feet. The average annual precipitation is 23 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Taney, Southwick, and Worley silt loams, all with slopes of 12 to 20 percent.

Typically, the surface layer of this Larkin soil is dark grayish brown silt loam about 16 inches thick, and is medium acid and slightly acid. The upper part of the subsoil is brown silt loam about 7 inches thick, and is slightly acid. The lower part of the subsoil below a depth of about 23 inches is brown and yellowish brown silty clay loam, and is slightly acid and neutral.

Organic matter content in the surface layer is high. The rooting depth is 60 inches or more, and the available water capacity is high. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for wheat, barley, peas, grass seed, hay, pasture, and woodland, and has a wide range of crop adaptability. If management is good, this soil produces good yields of all adapted crops. Adequate conservation methods include the use of crop residue, minimum tillage, and a continuous cropping system such as small grain and peas.

Field strips and divided slope farming help overcome the hazard of erosion that is caused by the steep slopes. Where runoff is significant, grassed waterways help prevent gully formation in the natural drainageways. Other erosion control methods are use of contour farming, diversions, gradient terraces, and legume-grass crops.

Chemical weed control, nitrogen, sulfur, and sometimes phosphorus are necessary in all cropping systems.

This Larkin soil is suited to ponderosa pine. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the moderately slow permeability that causes a lack of traction on the soil during the rainy winter and spring months. Conventional methods can be used for tree harvest, but may be limited during the rainy period. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants.

Native forage includes Idaho fescue, bluebunch wheatgrass, blue wildrye, bluegrass, hawkweed, and arrowleaf balsamroot.

When the tree canopy has been opened, the soil has good potential for grazing, although tall, relatively unpalatable shrubs may dominate the site. Forage production can be increased by seeding disturbed areas to adapted grasses. Proper management of the vegetation helps protect the regeneration of timber and increase the production of Idaho fescue and bluebunch wheatgrass.

When well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 250 pounds for 15 to 25 years.

This soil has good potential for openland, rangeland, or woodland wildlife habitat. Wildlife in wooded areas includes white-tailed deer, black bear, small rodents, forest grouse, and songbirds.

The main limitations for roads and homesites are the shrink-swell potential, the inherent low support strength of the soil, slope, and potential frost action damage. Septic tank absorption fields are limited by the soil's moderately slow permeability. Community sewage systems should be considered in areas of high population density.

The main limitations for terraces, diversions, and grassed waterways are the complex slope and the hazard of erosion. Recreational development is limited by slope. This map unit is in capability subclass IVe.

140-Larkin silt loam, 3 to 20 percent slopes, eroded. This Larkin soil is a very deep, well drained soil that formed in deep loess and a mixture of volcanic ash. It is on loess hills. Elevation is 2,500 to 3,000 feet. The average annual precipitation is 23 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Taney, Southwick, and Worley silt loams, all with slopes of 3 to 20 percent.

Typically, the surface layer of this Larkin soil is dark grayish brown silt loam about 8 inches thick, and is slightly acid. The upper part of the subsoil is brown silt loam about 7 inches thick, and is slightly acid. The lower part of the subsoil below a depth of about 15 inches is brown and yellowish brown silty clay loam, and is slightly acid and neutral.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for wheat, barley, peas, grass seed, hay, and pasture. It has lost much of its original topsoil and suffers from high moisture stress and runoff, which reduce most crop growth. This soil is intermingled with the uneroded Larkin soil and has the same management needs.

A conservation program includes a continuous cropping system with minimum tillage, crop residue, and extra support from field stripcropping. Peas or lentils do not provide enough residue for soil protection and are not an adequate part of the cropping system. Grass-legume crops are appropriate for this soil, especially on the steep slopes. Chemical weed control, nitrogen, sulfur, and phosphorus fertilizers are necessary in all cropping systems.

This Larkin soil is suited to ponderosa pine. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the moderately slow permeability that causes. easy rutting and a lack of traction on the soil during the rainy winter and spring months. Conventional methods can be used for tree harvest, but may be limited during the rainy period. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants.

Native forage includes Idaho fescue, bluebunch wheatgrass, blue wildrye, bluegrass, hawkweed, and arrowleaf balsamroot.

This soil has potential for grazing, although when the canopy is opened, tall, relatively unpalatable shrubs may dominate the site. Forage production can be increased by seeding disturbed areas to adapted grasses, and proper management of the vegetation helps protect the regeneration of timber and increase the production of Idaho fescue and bluebunch wheatgrass.

When well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds for 20 to 30 years.

This soil has good potential for openland, rangeland, and woodland wildlife habitat. Some kinds of wildlife in wooded areas are white-tailed deer, black bear, small rodents, forest grouse, and songbirds.

Homesites and roads are limited by the shrink-swell potential, the inherent low support strength of the soil, the slope, and potential frost action damage. The moderately slow permeability of the soil limits the use of septic tank absorption fields. Community sewage systems should be considered in areas of high population density.

Recreational development is limited by slope and the dustiness of the soil surface when it is dry.

Terraces, diversions, and grassed waterways are limited by the complex slope and the hazard of erosion.

This map unit is in capability subclass IVe.

141-Latahco-Thatuna silt loams, 0 to 7 percent slopes. These very deep soils are mostly on low terraces, bottom lands, and drainageways associated with loess hills and dissected plains. Elevation is 2,500 to 2,800 feet. The average annual precipitation is 20 inches, average annual air temperature is 43 to 47 degrees F, and average frost-free period is 120 to 135 days.

Latahco silt loam, 0 to 2 percent slopes, makes up about 60 percent of the map unit; Thatuna silt loam, 0 to 7 percent slopes, makes up about 35 percent; and the rest is Cald silt loam, 0 to 2 percent slopes.

The Latahco soil is a very deep, somewhat poorly drained soil that formed in local alluvium from the surrounding loess hills. It is on lower drainageway positions.

Typically, the surface layer of the Latahco soil is grayish brown silt loam about 13 inches thick, and is slightly acid. The subsurface layer is light gray silt loam about 9 inches thick, and is neutral. The subsoil is light yellowish brown and pale brown silty clay loam about 31 inches thick, and is mildly alkaline. The substratum below a depth of about 53 inches is very pale brown silty clay loam, and is mildly alkaline. The subsoil has a few faint to distinct mottles.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderately slow, runoff is slow, and the hazard of erosion is slight. A high water table is at a depth of 6 to 30 inches in spring, and the soil is occasionally flooded for brief periods.

The Thatuna soil is a very deep, moderately well drained soil that formed in deep loess with minor amounts of volcanic ash. It is on higher terraces.

Typically, the surface layer of the Thatuna soil is dark grayish brown and grayish brown silt loam about 19 inches thick, and is neutral and slightly acid. The upper part of the subsoil is brown silt loam about 6 inches thick, and is slightly acid. The next layer is very pale brown silt loam about 8 inches thick, and is neutral. The lower part of the subsoil is brown silty clay loam to a depth of 60 inches, and is slightly acid.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is slow, runoff is slow to medium, and the hazard of erosion is slight to moderate. A perched water table is at a depth of 36 to 48 inches in spring.

These soils are mainly used for wheat, barley, hay, pasture, and grass seed. A few areas are used for woodland.

Latahco and Thatuna soils are mainly under cultivation. There are remnants of shrubby and woodland cover along some streams; these are narrow strips within large acreages of cropland. Wetness and cool temperatures affect the choice of crops. Alfalfa is generally short-lived, and peas and lentils do poorly. These soils are well adapted to a continuous cropping program and produce good plant growth where adequately fertilized and drained. Tile drainage and land smoothing help correct seeps and improve surface water removal. The hazard of erosion is limited where stubble utilization and continuous cropping are used to keep soil losses within allowable limits. Nitrogen, sulfur, and sometimes phosphorus are needed in all cropping systems. Runoff from adjacent lands can create scouring and excess surface water.

The Latahco soil is suited to ponderosa pine. It is capable of producing about 11,650 cubic feet per acre, 0.6 inch and more in diameter, or 54,800 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are a seasonal high water table and potential flooding. Conventional methods can be used for tree harvest but must be carried out during the dry summer and fall months. After harvest, reforestation must be carefully managed to reduce the competition of undesirable plants.

The Latahco and Thatuna soils are well suited to long term production of hay and pasture. If management is good, plant growth is excellent. A well-balanced fertilization program, including the use of nitrogen, sulfur, and possibly phosphorus, helps maintain plant growth.

Pasture benefits from a rotation grazing system during the growing season.

Adapted, improved forage includes Latar orchardgrass, smooth brome, tall fescue, red clover, and alfalfa.

Native plants provide some habitat for white-tailed deer, songbirds, various small mammals, some Chinese pheasant, and Hungarian partridge.

The seasonal high water table is the main limitation for homesites, roads, and sanitary facilities. Potential flooding is a hazard on the Latahco soil. Other limitations are potential frost action, the shrink-swell potential, and the inherent low strength of the soils.

Recreational development is limited on the Latahco soil by the seasonal high water table and flooding. The Thatuna soil is better suited to recreational development; however, the soil surface tends to be dusty when dry.

This map unit is in capability subclass IIIw.

142-Lenz loam, 5 to 35 percent slopes. This Lenz soil is a moderately deep, well drained soil that formed in gneiss and other metamorphic rocks mixed with small amounts of loess in the upper part of the profile. It is on mountains and foot slopes. Elevation is 2,500 to 4,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 47 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Kruse silt loam, Ulricher loam, Skalan gravelly loam, and Spokane loam, all with slopes of 5 to 35 percent.

Typically, the surface layer of this Lenz soil is dark brown loam about 12 inches thick, and is slightly acid. The subsoil is brown and light yellowish brown very gravelly sandy loam about 11 inches thick, and is slightly acid. The substratum is light yellowish brown very stony sandy loam about 13 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of about 36 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is very low to low. Permeability is moderately rapid, runoff is rapid to very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland, watershed, wildlife habitat, grazing, and some hay and small grain. It is limited for use as cropland because of the depth to bedrock and the hazard of erosion.

This Lenz soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope, erosion hazard, and depth to rock. Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

After the timber is harvested, this soil can be converted to pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain fair plant growth. Phosphorus is also needed where legumes are grown.

Pasture benefits from a rotation grazing system during the growing season.

Native forage includes bluebunch wheatgrass, elk sedge, Idaho fescue, rose, and snowberry. Proper management of the vegetation helps protect the regeneration of timber and increase the production of bluebunch wheatgrass, Idaho fescue, and elk sedge.

Adapted, improved forage includes Latar orchardgrass, Manchar smooth brome, Regar bromegrass, and clover.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, orchardgrass, tall fescue, and white Dutch clover.

When well managed, this soil can continually produce forage for livestock. If not managed, the total production can vary from about 1,800 pounds of air-dry herbage per acre per year to about 700 pounds for 20 to 25 years.

Native plants provide habitat for white-tailed deer, black bear, some elk, various small mammals, songbirds, and forest grouse. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitations for sanitary facilities are the depth to rock, rapid permeability of the substratum, and slope.

The construction of roads and dwellings is limited by the depth to rock and the slope. Roads are also subject to frost action.

Grassed waterways and diversions are limited by slope, depth to rock, and the rooting depth of the soil.

This soil is suited to picnic areas, camp areas, paths, and trails; however, slope is a limitation on the moderately steep areas.

This map unit is in capability subclass IVe.

143-Lenz very stony loam, 5 to 35 percent slopes. This Lenz soil is a moderately deep, well drained, very stony soil that formed in gneiss and other metamorphic rock mixed with small amounts of loess in the upper part of the profile. It is on mountains and foot slopes. Elevation is 2,500 to 4,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 47 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Kruse silt loam, Skalan gravelly loam, Ulricher loam, and Spokane loam, all having 5 to 35 percent slopes.

Typically, the surface layer of this Lenz soil is dark brown very stony loam about 12 inches thick, and is slightly acid. The subsoil is brown and light yellowish brown very stony loam and very stony sandy loam about 11 inches thick, and is slightly acid. The substratum is light yellowish brown very stony sandy loam about 13 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of about 36 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is very low to low. Permeability is moderately rapid, runoff is rapid to very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland, watershed, wildlife habitat, and some grazing.

This Lenz soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board

feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope, erosion hazard, depth to rock, and stones. Conventional methods can be used for tree harvest, but road construction may be limited because of the stones and depth to rock. Logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, orchardgrass, tall fescue, and white Dutch clover.

Native forage includes bluebunch wheatgrass, Idaho fescue, elk sedge, rose, and snowberry. Proper management of the vegetation helps protect the regeneration of timber and increase the production of bluebunch wheatgrass and Idaho fescue.

When well managed, this soil can continually produce forage for livestock. If not managed, forage can be produced for 20 to 25 years. Total production can vary from about 1,500 pounds of air-dry herbage per acre per year to about 500 pounds, depending on the management. Surface stones inhibit movement of livestock.

Native plants provide some essential habitat elements for white-tailed deer, black bear, some elk, various small mammals, songbirds, and forest grouse. Both the forested and open areas of this soil provide food and cover favorable to wildlife.

The main limitations for sanitary facilities are the large stones, depth to rock, rapid permeability of the substratum, and slope.

The construction of roads and dwellings is limited by depth to rock, potential for frost action, and large stones. Design specifications include placing footings below frost penetration depths.

Recreational development is limited by the large stones and slope on the steeper areas.

This map unit is in capability subclass VIs.

144-Lenz complex, 35 to 65 percent slopes. These steep to very steep, moderately deep, well drained soils formed in gneiss and other metamorphic rocks mixed with small amounts of loess in the upper part of the profile. They are on mountainsides. Elevation is 2,500 to 4,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 47 degrees F, and average frost-free period is 110 days.

Lenz loam makes up about 35 percent of the map unit and Lenz very stony loam about 45 percent.

Included with this soil in mapping are Kruse silt loam, Ulricher loam, Skalan gravelly loam, and Spokane loam, all having slopes of 35 to 65 percent; and small areas of Lenz loam, 5 to 35 percent slopes. The included soils make up 20 percent of this complex.

Typically, the surface layer of Lenz loam is dark brown and brown loam about 12 inches thick, and is slightly acid. The subsoil is light yellowish brown very gravelly sandy loam about 11 inches thick, and is slightly acid. The substratum is light yellowish brown very stony sandy loam about 13 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of about 36 inches.

Typically, the surface layer of Lenz very stony loam is dark brown very stony loam about 12 inches thick, and is slightly acid. The subsoil is light yellowish brown very stony loam and very stony sandy loam about 11 inches thick, and is slightly acid. The substratum is light yellowish brown very stony sandy loam about 13 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of 36 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is low to very low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

These soils are used for woodland and limited grazing.

These Lenz soils are suited to ponderosa pine and Douglas-fir. They are capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope, stones, depth to rock, and hazard of erosion.

Equipment use is limited because of the stones and steep slopes. The use of specialized equipment that causes a minimum of soil disturbance and keeps soil losses at a minimum is needed.

Native forage includes bluebunch wheatgrass, Idaho fescue, elk sedge, rose, and snowberry. Proper management of the vegetation helps to protect the regeneration of timber, increase the production of Idaho fescue and bluebunch wheatgrass, and maintain cover for soil protection.

The potential for grazing is limited, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, orchardgrass, tall fescue, and white Dutch clover.

When well managed, these soils can continually produce forage for livestock. If not managed, total production can vary from about 1,500 pounds of air-dry herbage per acre per year to less than 500 pounds for 20 to 25 years.

The steep slopes and stoniness limit movement of livestock and accessibility of forage.

Native plants provide some habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

Slope, depth to rock, and large stones are the main limitations for all structural development, including roads, dwellings, sanitary facilities, and recreational areas.

Careful management of the timber resource and understory vegetation helps keep soil losses to a minimum and maintain watershed potential.

This map unit is in capability subclass VIIs.

145-Lenz-Spokane-Rock outcrop association, 30 to 55 percent slopes. This association is made up of steep soils on mountainsides. Elevation is 2,500 to 4,000 feet. The average annual precipitation is 24 inches, average annual air temperature is 47 degrees F, and average frost-free period is 110 days.

This association is about 45 percent Lenz loam, 25 percent Spokane loam, and 20 percent Rock outcrop. The Lenz soil is on the higher, more convex positions; the Spokane soil is on the lower, more concave positions; and the Rock outcrop areas are on or near the ridgetops.

Included with the association in mapping are small areas of Lenz very stony loam, Moscow loam, Ulricher loam, Skalan gravelly loam, and a soil that is similar to the Lenz soil but is less than 20 inches to bedrock. These inclusions make up about 10 percent of the association.

The Lenz soil is a moderately deep, well drained soil over gneiss. It formed in gneiss and other metamorphic rocks mixed with loess in the upper part of the profile.

Typically, the surface layer of the Lenz soil is dark brown and brown loam about 12 inches thick, and is slightly acid. The subsoil is light yellowish brown very gravelly sandy loam about 11 inches thick, and is slightly acid. The substratum is light yellowish brown very stony sandy loam about 13 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of about 36 inches.

The rooting depth is 20 to 40 inches. The available water capacity is very low to low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Spokane soil is a moderately deep, well drained soil over weathered schist. It formed in material weathered from gneiss, schist, or granite mixed with loess in the upper part of the profile.

Typically, the upper part of the surface layer of the Spokane soil is dark brown loam about 8 inches thick. The lower part of the surface layer is brown gravelly loam about 6 inches thick. The subsoil is yellowish brown gravelly loam about 9 inches thick. The surface layer and subsoil are slightly acid throughout. The substratum is light yellowish brown gravelly sandy loam about 4 inches thick, and is medium acid. Weathered schist bedrock is at a depth of about 27 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderately rapid, runoff is very rapid, and the hazard of erosion is very high.

Rock outcrop areas are exposures of bare gneiss, schist, or granite bedrock. Crevices in the rock have some soil material.

These soils are used for woodland, limited grazing, and wildlife habitat.

These soils are suited to Douglas-fir and ponderosa pine. They are capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope, depth to rock, rock outcrops, and hazard of erosion. Use of conventional equipment is limited because of the slope and rock outcrops. Consideration needs to be given to specialized logging equipment that causes a minimum of soil disturbance so that soil losses are kept a minimum.

Native forage includes bluebunch wheatgrass, Idaho fescue, elk sedge, rose, and snowberry. Proper management of the vegetation helps to protect the regeneration of timber and increase the production of bluebunch wheatgrass and Idaho fescue.

These soils have limited potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass and tall fescue.

If well managed, these soils can continually produce forage for livestock. If not managed, the total production can vary from about 1,500 pounds of air-dry herbage per acre per year to less than 400 pounds for 20 to 25 years.

The Rock outcrop areas have no grazing potential. The Rock outcrops and steep slopes severely limit movement of livestock and accessibility of forage.

Plants provide some habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

The main limitations for all structural development are slope and depth to rock. Sanitary facility installation is limited by the rapid permeability of the substratum.

Limitations for the construction of, roads and dwellings are the depth to rock and potential frost action. Design specifications include placing footings below frost penetration depths. Recreational development is limited by the steep slope.

The Lenz and Spokane soils are in capability subclass VIIe, and the Rock outcrop is in capability subclass VIIIs.

146-McCrosket-Ardenvoir association, 20 to 35 percent slopes. This association is made up of steep soils on mountainsides. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 27 inches, average annual air temperature is 42 to 47 degrees F, and average frost-free period is 100 to 110 days. ,

This association is about 55 percent McCrosket gravelly silt loam and about 35 percent Ardenvoir gravelly loam. The McCrosket soil is on southerly exposures and ridgetops, and the Ardenvoir soil is on northerly exposures and in swales.

Included with this association in mapping are areas of Blinn, Bobbitt, and Lacy stony loams, all with 5 to 35 percent slopes; Taney silt loam, 7 to 25 percent slopes; and Huckleberry silt loam and Tekoa gravelly silt loam, both having 20 to 35 percent slopes. These inclusions make up about 10 percent of the association.

The McCrosket soil is a deep, well drained soil over metasedimentary rock and loess.

Typically, the surface layer of the McCrosket soil is dark grayish brown gravelly silt loam about 10 inches thick, and is medium and slightly acid. The subsoil is brown and pale brown very gravelly silt loam about 31 inches thick, and is slightly acid and medium acid. The substratum is very pale brown very gravelly silt loam about 7 inches thick, and is medium acid. Fractured metasedimentary rock is at a depth of about 48 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Ardenvoir soil is a deep, well drained soil over metasedimentary bedrock. It formed in material weathered from metasedimentary rock with a mixture of loess and volcanic ash.

Typically, the surface layer of the Ardenvoir soil is pale brown gravelly loam about 7 inches thick, and is slightly acid. The upper part of the subsoil is light yellowish brown gravelly loam about 9 inches thick, and is slightly acid. The lower part of the subsoil is very pale brown very gravelly loam about 21 inches thick, and is slightly acid. The substratum is very pale brown very cobbly loam about 10 inches thick, and is slightly acid. Fractured metasedimentary bedrock is at a depth of about 47 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

These soils are used for timber production, grazing, wildlife habitat, and recreation.

The McCrosket soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet per acre (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber are the slope and hazard of erosion. Careful selection of landings, roads, and skid trails can minimize soil losses.

The Ardenvoir soil is suited to grand fir, Douglas-fir, and western larch. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope and hazard of erosion. Conventional methods can be used for tree harvest, but landings, logging roads, and skid trails need to be carefully planned to minimize soil losses. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants.

Native forage includes elk sedge, mountain maple, redstem ceanothus, and pine reedgrass. Creambush oceanspray and mallow ninebark, relatively unpalatable shrubs, tend to dominate the site when the canopy is opened. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

Following the opening of the canopy, these soils have potential for grazing and can produce forage for livestock and big game animals for 20 to 30 years. Total production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses.

Areas of these soils provide a good habitat for such woodland wildlife as white-tailed deer, elk, black bear, chipmunk, squirrel, and forest grouse.

Slope and depth to rock are the main limitations for homesites, roads, and sanitary facilities.

Steep slopes and small stones are the main limitations for paths and trails.

The soils in this map unit are in capability subclass VIe.

147-McCrosket-Ardenvoir association, 35 to 65 percent slopes. This association is made up of deep soils on mountainsides. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 27 inches, average annual air temperature is 42 to 47 degrees F, and average frost-free period is 100 to 110 days.

This association is about 55 percent McCrosket gravelly silt loam and about 35 percent Ardenvoir gravelly loam.

Included with this association in mapping are areas of Blinn stony loam, Huckleberry silt loam, and Tekoa gravelly silt loam, all with 35 to 65 percent slopes. These inclusions make up about 10 percent of the association.

The McCrosket soil is a deep, well drained soil over metasedimentary rock. It formed in material weathered from metasedimentary rock and loess. This soil has southerly exposures and is on ridgetops.

Typically, the surface layer is dark grayish brown gravelly silt loam about 10 inches thick, and is medium acid and slightly acid. The subsoil is brown and pale brown very gravelly silt loam about 31 inches thick, and is slightly acid and medium acid. The substratum is very pale brown very gravelly silt loam about 7 inches thick, and is medium acid. Fractured metasedimentary rock is at a depth of about 48 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Ardenvoir soil is a deep, well drained soil over metasedimentary bedrock. It formed in material weathered from metasedimentary rock with a mixture of loess and volcanic ash. This soil has northerly exposures and is in swales.

Typically, the surface layer of the Ardenvoir soil is pale brown gravelly loam about 7 inches thick. The upper part of the subsoil is light yellowish brown gravelly loam about 9 inches thick. The lower part of the subsoil is very pale brown very gravelly loam about 21 inches

thick. The substratum is very pale brown very cobbly loam about 10 inches thick. This soil is slightly acid throughout. Fractured metasedimentary bedrock is at a depth of about 47 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

These soils are used for timber production, wildlife habitat, watershed, and limited grazing.

The McCrosket soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope and erosion hazard. Conventional logging methods are severely limited, and alternative methods need to be considered to keep soil losses to a minimum.

The Ardenvoir soil is suited to grand fir, Douglas-fir, and western larch. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope and hazard of erosion. Special equipment and methods of operation can keep soil losses to a minimum. If the Ardenvoir soil is not properly managed, brush encroachment can prevent adequate natural or artificial regeneration.

Native forage includes elk sedge, mountain maple, redstem ceanothus, and pine reedgrass. Creambush oceanspray and mallow ninebark, two relatively unpalatable shrubs, tend to dominate the site once the canopy is opened. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

When the tree canopy is open, these soils have limited potential for grazing and can produce forage for livestock and big game animals for 20 to 30 years. Total forage production varies from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses.

Areas of these soils provide good habitat for such woodland wildlife as white-tailed deer, elk, black bear, chipmunks, squirrel, and forest grouse.

All structural and recreational development is limited by the very steep slope and depth to rock. This map unit is in capability subclass VIIe.

148-McCrosket-Tekoa association, 35 to 65 percent slopes. This association is made up of very steep soils on mountain slopes. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 24 inches, average annual air temperature is 47 degrees F, and average frost-free period is 110 to 120 days.

This association is about 60 percent McCrosket gravelly silt loam and 35 percent Tekoa gravelly silt loam.

Included with this association in mapping are areas of Ardenvoir gravelly loam and Blinn, Bobbitt, and Lacy stony loams, all with 35 to 65 percent slopes; and small areas of Taney silt loam, 7 to 25 percent slopes. These inclusions make up about 5 percent of the association.

The McCrosket soil is a deep, well drained soil over metasedimentary rock. It formed in material weathered from metasedimentary rock and loess. This soil is on more northerly exposures and is in swales.

Typically, the surface layer of the McCrosket soil is dark grayish brown, gravelly silt loam about 10 inches thick, and is medium acid and slightly acid. The subsoil is brown and pale brown very gravelly silt loam about 31 inches thick, and is slightly acid and medium acid. The substratum is very pale brown very gravelly silt loam about 7 inches thick, and is medium acid. Fractured metasedimentary rock is at a depth of about 48 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Tekoa soil is a moderately deep, well drained soil over shale bedrock. It formed in material weathered from shale or sandstone and a mantle of loess and volcanic ash. This soil is on the drier aspects of southern slopes and ridgetops.

Typically, the surface layer of the Tekoa soil is brown gravelly silt loam about 7 inches thick, and is slightly acid. The upper part of the subsoil is brown very gravelly heavy silt loam about 7 inches thick, and is slightly acid. The lower part of the subsoil is light yellowish brown very gravelly silt loam about 16 inches thick, and is medium acid. Fractured sandstone bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is very low to low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The soils are used for timber production, wildlife habitat, watershed, and limited grazing.

The McCrosket soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope and hazard of erosion. Conventional methods of tree harvest are severely limited, and special methods and equipment need to be used to keep soil losses to a minimum.

The Tekoa soil is suited to ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope, hazard of erosion, and seedling mortality. Conventional methods of tree harvest are severely limited, and alternative methods can keep soil losses to a minimum. Some shade from larger trees can help reforest the area after harvest.

Native forage includes elk sedge, mountain maple, redstem ceanothus, and pine reedgrass. Creambush oceanspray and mallow ninebark, two relatively unpalatable shrubs, tend to dominate the site once the canopy is open. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

When the tree canopy is open, this soil has potential for grazing, and can produce forage for livestock and big game animals for 20 to 30 years. Total forage production varies from about 1,800 pounds of air-dry herbage per acre per year to less than 150 pounds. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses.

The Tekoa soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grass.

Native forage includes elk sedge, mountain maple, redstem ceanothus, pine reedgrass, and Idaho fescue. Creambush oceanspray and mallow ninebark, two relatively unpalatable shrubs, tend to dominate the site when the canopy is open. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

After the canopy is open, this soil can produce forage for livestock and big game animals for 20 to 30 years. Production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds.

Areas of the soils in this association provide good woodland wildlife habitat for white-tailed deer, elk, forest grouse, squirrels, chipmunks, black bear, and various songbirds.

All structural and recreational development is limited by the very steep slope and depth to rock. This map unit is in capability subclass VIIe.

149-McGuire-Marble association, 0 to 7 percent slopes. This association is made up of very deep soils on outwash terraces. Elevation is 2,000 to 2,400 feet. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 140 days.

This association is about 60 percent McGuire gravelly sandy loam and about 30 percent Marble sandy loam.

Included with this association in mapping are areas of Garrison gravelly silt loam, Avonville fine gravelly silt loam, Kootenai gravelly silt loam, and Narcisse silt loam, all with 0 to 7 percent slopes. These inclusions make up about 10 percent of the association.

The McGuire soil is a very deep, somewhat excessively drained soil that formed in glacial outwash materials mixed with minor amounts of loess and volcanic ash. It is on higher terraces.

Typically, the surface layer of the McGuire soil is dark brown and pale brown gravelly sandy loam about 8 inches thick. The subsoil is pale brown and light yellowish brown very gravelly sandy loam about 14 inches thick. The substratum below a depth of about 22 inches is very pale brown and variegated very gravelly coarse sandy loam and very gravelly coarse sand. This soil is neutral throughout.

The rooting depth is 60 inches or more. The available water capacity is very low to low. Permeability is moderately rapid, runoff is slow, and the hazard of erosion is slight.

The Marble soil is a very deep, excessively drained soil that formed in wind- and water-worked sandy outwash materials. It is on lower terraces.

Typically, the surface layer of the Marble soil is grayish brown sandy loam about 6 inches thick, and is slightly acid. The substratum below a depth of about 6 inches is pale brown loamy sand and coarse sand, and is slightly acid and neutral.

The rooting depth is 60 inches or more. The available water capacity is low. Permeability is rapid, runoff is slow, and the hazard of erosion is slight.

These soils are used for woodland, grazing, small grain, hay, pasture, and urban development.

These soils have poor potential for small grain because of their droughty condition,

Hay and pasture are the most dependable crops. Fertility is low, and fertilization is needed. These soils are well adapted to sprinkler irrigation.

Both soils are suited to ponderosa pine. They are capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the severe seedling mortality. Conventional methods can be used for tree harvest, but some shade may be needed from the larger trees to reforest the soils after harvest.

The McGuire and Marble soils are well suited to pasture and hay. A well balanced fertilization program, including the use of nitrogen and possibly sulfur, helps obtain excellent crop growth on irrigated land. Phosphorus is also needed when legumes are grown.

Good water management on the irrigated land helps obtain maximum plant growth. Without irrigation, crop growth is only fair. Pasture benefits from a rotation grazing system and a proper regrowth period for plants.

Native forage includes bluebunch wheatgrass, Idaho fescue, elk sedge, lupine, and bearberry. Proper management of the vegetation helps to protect the regeneration of timber and increase the production of bluebunch wheatgrass and Idaho fescue.

These soils have good potential for grazing, especially when the canopy has been opened. Forage production

can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass and tall fescue.

Adapted forage for irrigated land includes Latar orchardgrass, Manchar smooth brome, and Regar bromegrass. Adapted dryland plants include intermediate wheatgrass.

Where well managed, these soils can continually produce forage for livestock. If not managed, the total annual production can vary from about 1,000 pounds of air-dry herbage per acre per year to less than 150 pounds for 15 to 25 years.

Native plants provide essential habitat for white-tailed deer, black bear, some elk, various small mammals, songbirds, and forest grouse. Both the forested and cleared areas of these soils provide food and cover favorable to wildlife.

These soils have good potential for urban and residential development. The main limitation for sanitary facilities is the rapid and very rapid permeability of the substratum. These soils are suited to septic tank absorption fields; however, ground water pollution is a hazard. Community sewage systems should be considered in areas of high population density. Sloping of banks or shoring helps prevent cutbanks from caving. Roads and dwellings are subject to potential frost action damage. Design considerations include placing footings below the depth of frost penetration.

Recreational development on the McGuire soil is limited by the small surface stones. Development on the Marble soil is limited by dustiness of the soil when it is dry.

This map unit is in capability subclass IVs, irrigated and nonirrigated.

150-McGuire-Marble association, 20 to 45 percent slopes. This association is made up of very deep soils on outwash terraces and escarpments. Elevation is 2,000 to 2,400 feet. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 140 days.

This association is about 70 percent McGuire gravelly sandy loam and 25 percent Marble sandy loam. The McGuire soil is on the higher and more convex slopes, and the Marble soil is on the lower slopes.

Included with this association in mapping are small areas of Garrison gravelly silt loam and Avonville fine gravelly silt loam, both with slopes of 7 to 20 percent; and Kootenai gravelly silt loam, 20 to 45 percent slopes. These inclusions make up about 5 percent of the associ
ation.

The McGuire soil is a very deep, somewhat excessively drained soil that formed in glacial outwash material mixed with minor amounts of loess and volcanic ash.

Typically, the surface layer of the McGuire soil is dark brown and pale brown gravelly sandy loam about 8 inches thick. The subsoil is pale brown and light yellowish brown very gravelly sandy loam about 14 inches thick. The substratum below a depth of about 22 inches is very pale brown and variegated very gravelly coarse sandy loam and very gravelly coarse sand. The soil is neutral throughout.

The rooting depth is 60 inches or more, and the available water capacity is very low to low. Permeability is moderately rapid, runoff is rapid to very rapid, and the hazard of erosion is very high.

The Marble soil is a very deep, excessively drained soil that formed in wind- and water-worked sandy outwash materials. It is on lower slopes.

Typically, the surface layer of the Marble soil is grayish brown sandy loam about 6 inches thick, and is slightly acid. The substratum below a depth of about 6 inches is pale brown loamy sand and coarse sand, and is slightly acid and neutral.

The rooting depth is 60 inches or more. The available water capacity is low. Permeability is rapid, runoff is rapid to very rapid, and the hazard of erosion is very high.

These soils are mainly used for woodland, grazing, and wildlife habitat.

Both soils are suited to ponderosa pine. They are capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope, erosion hazard, and seedling mortality. Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be carefully planned to reduce soil losses. Some shade from the larger trees can help to reforest the soil after harvest.

After the timber is harvested, these soils can be used for pasture. A well balanced fertilization program, including the use of nitrogen and possibly sulfur, helps obtain fair plant growth. Phosphorus is also needed when legumes are grown.

Native forage includes bluebunch wheatgrass, Idaho fescue, elk sedge, lupine, and bearberry. Proper management of the vegetation helps protect the regeneration of timber and increase the production of bluebunch wheatgrass and Idaho fescue.

These soils have good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass and tall fescue.

Grazing management should include a rotation grazing system during the growing season. Adapted, improved forage includes Manchar smooth brome and intermediate wheatgrass.

When well managed, these soils can continually produce forage for livestock. If not managed, the total production can vary from about 1,000 pounds of air-dry herbage per acre per year to less than 150 pounds for 15 to 25 years.

The steep slopes limit movement of livestock and accessibility of forage.

Native plants provide some habitat for white-tailed deer, black bear, some elk, various small mammals, songbirds, and forest grouse.

Slope is the main limitation for all structural development. Sanitary facilities are limited by the rapid and very rapid permeability of the substratum. The steep slopes limit recreational development.

This map unit is in capability subclass VIe.

151-Mokins silt loam, 5 to 20 percent slopes. This Mokins soil is a very deep, moderately well drained soil that formed in volcanic ash and loess over lake-laid sediment. It is on glaciolacustrine terraces. Elevation is 2,200 to 2,600 feet. Slopes are rolling to hilly. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 90 days.

Included with this soil in mapping are areas of Chatcolet silt loam, Rubson silt loam, and Chatcolet cobbly loam, all with slopes of 5 to 20 percent; small areas of Mokins silt loam, 20 to 35 percent slopes; and Selle fine sandy loam, 0 to 7 percent slopes.

Typically, the surface layer of this Mokins soil is brown silt loam about 3 inches thick, and is neutral. The subsoil is light yellowish brown and very pale brown silt loam and gravelly silt loam about 11 inches thick over a buried subsurface layer of white silt loam about 6 inches thick. The buried subsoil is reddish yellow and brownish yellow silty clay loam and silty clay to a depth of 60 inches, and is very strongly acid. Common, prominent, and distinct mottles are below a depth of about 14 inches.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is slow, runoff is rapid, and the hazard of erosion is high. A perched water table is at a depth of 12 to 30 inches in spring.

This soil is mainly used for woodland and some hay, pasture, and small grain.

Cropland use is marginal. Root penetration is somewhat restricted in the subsoil, and cool soil temperatures limit crop growth. Fertilization is necessary on all crops. Use of crop residue and minimum tillage help prevent excessive erosion. Hay and pasture are best adapted to this soil.

This Mokins soil is suited to grand fir, Douglas-fir, western larch, and western white pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the perched water table during winter and spring and the low support strength. Conventional methods can be used for tree harvest but may be limited during the rainy period. Logging operations need to be carefully planned to avoid excessive soil losses.

After the timber is harvested, this soil can be used for pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain fair plant growth. Phosphorus is also needed when legumes are grown.

Native forage includes bluebunch wheatgrass, Idaho fescue, elk sedge, lupine, and bearberry. Proper management of the vegetation helps protect the regeneration of timber and increase the production of bluebunch wheatgrass and Idaho fescue.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

Grazing management should include a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, tall fescue, alfalfa, and clover.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is open. During this period, total production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 200 pounds.

Native plants provide habitat for white-tailed deer, black bear, elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitations for sanitary facility installation are the slow permeability of the subsoil and the perched water table during wet months. Slope is also a limitation on the steeper areas.

The construction of roads and dwellings is limited by the high shrink-swell potential of the subsoil during wetting and drying, and the soil's inherent low support strength.

There is potential for development of paths and trails. Slow permeability and slope limit the development of playgrounds, camp areas, and picnic areas.

This map unit is in capability subclass IVe.

152-Mokins silt loam, 20 to 35 percent slopes. This Mokins soil is a very deep, moderately well drained soil that formed in volcanic ash and loess over lake-laid sediment. It is on glaciolacustrine terraces. Elevation is 2,200 to 2,600 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 90 days.

Included with this soil in mapping are areas of Chatcolet cobbly loam, 25 to 65 percent slopes; Mokins silt loam, 5 to 20 percent slopes; and Mokins silt loam, 35 to 65 percent slopes.

Typically, the surface layer of this Mokins soil is brown silt loam about 3 inches thick, and is neutral. The subsoil is light yellowish brown and very pale brown silt loam and gravelly silt loam about 11 inches thick over a buried subsurface layer of white silt loam about 6 inches thick. The buried subsoil is reddish yellow and brownish yellow silty clay loam and silty clay to a depth of 60 inches, and is very strongly acid. Common, prominent and distinct mottles are below a depth of about 14 inches.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is slow, runoff is very rapid, and the hazard of erosion is very high. A perched water table is at a depth of 12 to 30 inches in spring.

This soil is mainly used for woodland and some hay and pasture. It is suited to grand fir, Douglas-fir, western larch, western white pine, and ponderosa pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the erosion hazard, perched water table during the wet periods, and low support strength. Conventional methods can be used for tree harvest, but may be limited during the rainy period. Logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

After the timber is harvested, this soil can be used for seeded pasture. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain fair plant growth. Phosphorus is also needed when legumes are grown.

Native forage includes sedges, Columbia brome, pine reedgrass, and snowberry. Proper management of the vegetation helps protect the regeneration of timber and increase the production of bluebunch wheatgrass and Idaho fescue.

These soils have a good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, tall fescue, alfalfa, and clover.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is open. During this period, total production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 200 pounds. The steeper slopes limit movement of livestock and accessibility of forage.

Native plants provide habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitations for homesites and sanitary facility installation are slope and the perched water table during wet months.

The construction of roads and dwellings is limited by the shrink-swell potential of the subsoil during wetting and drying and the inherent low support strength of the soil. Slope is the main limitation for the development of recreational areas.

This map unit is in capability subclass VIe.

153-Mokins silt loam, 35 to 65 percent slopes. This Mokins soil is a very deep, moderately well drained soil that formed in volcanic ash and loess over lake-laid sediment. It is on glaciolacustrine terraces. Elevation is 2,200 to 2,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 90 days.

Included with this soil in mapping are areas of Chatcolet cobbly loam, 25 to 65 percent slopes, and Mokins silt loam, 20 to 35 percent slopes.

Typically, the surface layer of this Mokins soil is brown silt loam about 3 inches thick, and is neutral. The subsoil is light yellowish brown and very pale brown silt loam and gravelly silt loam about 11 inches thick over a buried subsurface layer of white silt loam about 6 inches thick. The buried subsoil is reddish yellow and brownish yellow silty clay loam and silty clay to a depth of 60 inches, and is very strongly acid. Common, prominent and distinct mottles are below a depth of about 14 inches.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is slow, runoff is very rapid, and the hazard of erosion is very high. A perched water table is at a depth of 12 to 30 inches in the spring.

This soil is mainly used for woodland and some grazing.

This Mokins soil is suited to grand fir, Douglas-fir, western larch, western white pine, and ponderosa pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the erosion hazard and slope too steep for safe operation of conventional equipment. Specialized logging methods that cause a minimum of soil disturbance help keep soil losses at a minimum. The perched water table can limit logging during rainy winter and spring months.

Native forage includes sedges, Columbia brome, pine reedgrass, and snowberry. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

This soil has fair potential for grazing, when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is open. During this period, total production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 200 pounds. The steep slopes limit movement of livestock and accessibility of forage.

The vegetation provides habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

The main limitations for all structural development are slope, low support strength, the perched water table

during wet months, and the high shrink-swell potential during wetting and drying.

This map unit is in capability subclass VIIe.

154-Mokins-Chatcolet complex, 5 to 20 percent slopes. These rolling to hilly soils are on glaciolacustrine terraces. Elevation is 2,200 to 2,800 feet. The average annual precipitation is 27 inches, average annual air temperature is 40 to 43 degrees F, and average frost-free period is 80 to 90 days.

Mokins silt loam makes up about 55 percent of the map unit and Chatcolet cobbly loam about 35 percent. Chatcolet silt loam and Rubson silt loam, both having slopes of 5 to 20 percent; and Selle fine sandy loam, 0 to 7 percent slopes, make up the remaining 10 percent of this complex.

The Mokins soil is a very deep, moderately well drained soil that formed in volcanic ash and loess over lake-laid sediment.

Typically, the surface layer of the Mokins soil is brown silt loam about 3 inches thick, and is neutral. The subsoil is light yellowish brown and very pale brown silt loam and gravelly silt loam about 11 inches thick over a buried subsurface layer of white silt loam about 6 inches thick. The buried subsoil is reddish yellow and brownish yellow silty clay loam and silty clay to a depth of 60 inches, and is very strongly acid. Common, prominent and distinct mottles are below a depth of about 14 inches.

The rooting depth is 60 inches or more, and the available water capacity is high. Permeability is slow, runoff is rapid, and the hazard of erosion is high. A perched water table is at a depth of 12 to 30 inches during spring.

The Chatcolet soil is a very deep, moderately well drained soil that formed in volcanic ash and loess over lake-laid sediment.

Typically, the surface layer of the Chatcolet soil is pale brown cobbly loam about 8 inches thick, and is medium acid. The upper part of the subsoil is very pale brown cobbly loam about 18 inches thick, and is medium acid and neutral. The lower part of the subsoil to a depth of 60 inches is very pale brown cobbly loam and silty clay loam, and is medium acid.

The rooting depth is 60 inches or more. The available water capacity is moderate. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is high.

These soils are mainly used for woodland, hay, pasture, and some small grain. Use for cropland is marginal, and hay and pasture are the most reliable crops. Root penetration is somewhat restricted in the Mokins subsoil, and the cool soil temperatures restrict crop growth. Fertilization is needed for all crops, and use of crop residue and minimum tillage is necessary in a small grain cropping system.

The Mokins soil is suited to grand fir, Douglas-fir, ponderosa pine, western larch, and western white pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the perched water table and the low strength. Logging operations need to be carefully planned to avoid excessive soil losses. Conventional methods can be used for tree harvest, but may be limited during the rainy period.

The Chatcolet soil is suited to western hemlock, western redcedar, western white pine, grand fir, Douglas-fir, and western larch. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees. Conventional methods can be used for tree harvest, but logging operations need to be planned to avoid excessive soil erosion.

After the timber is harvested, these soils can be used for pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain fair to good plant growth. Phosphorus is also needed where legumes are grown.

Native forage includes sedges, Columbia brome, pine reedgrass, and snowberry. Proper management of the vegetation helps protect the regeneration of timber and increase the production of Columbia brome and sedges.

These soils have a good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, timothy, alfalfa, and clover.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is open. During this period, total production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 200 pounds.

The Chatcolet soil also has potential for grazing when the tree canopy is opened. Native forage includes sedges, willow, maple, and redstem ceanothus. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals for 5 to 10 years after the canopy is open. Annual production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds.

Native plants provide habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of these soils provide food and cover favorable to wildlife.

The main limitations for homesites and septic tank absorption fields are slope, the slow permeability of the

subsoil, and the perched water table in the Mokins soil during the wet season. The construction of roads and dwellings is limited by the shrink-swell potential of the subsoil during wetting and drying, the inherent low support strength of the soils, and the potential frost action.

Limitations for recreational uses are slope, small stones in the Chatcolet soil, and the restricted permeability of the subsoil.

This map unit is in capability subclass IVe.

155-Moscow loam, 5 to 35 percent slopes. This Moscow soil is a moderately deep, well drained soil that formed in material weathered from granite, gneiss, or schist and a mantle of loess and volcanic ash. It is on mountainsides. Elevation is 2,500 to 5,000 feet. The average annual precipitation is 27 inches, average annual air temperature is 44 degrees F, and average frost-free period is 90 days.

Included with this soil in mapping are small areas of Spokane loam, Kruse silt loam, Lenz loam, and Ulricher loam.

Typically, the surface layer of this Moscow loam is very dark grayish brown loam about 1 inch thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown loam about 25 inches thick, and is slightly acid. Weathered granitic bedrock is at a depth of about 26 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is rapid to very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland, grazing, hay, and pasture. It is suited to Douglas-fir and ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the erosion hazard and depth to rock. Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

After the timber is harvested, this soil can be used for pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Native forage includes elk sedge, Columbia brome, redstem ceanothus, willow, and maple. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

This soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, tall fescue, orchardgrass, and white Dutch clover.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, and alfalfa.

This soil can produce forage for livestock and big game animals for 5 to 15 years after the canopy is open. Total annual production can vary from about 1,500 pounds of air-dry herbage per acre per year to less than 150 pounds.

Native plants provide habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitations for homesites, roads, and sanitary facilities are slope and depth to rock. Community sewage systems should be considered in areas of high population density.

Slope is a limitation for camp areas, picnic areas, paths, and trails. This soil tends to be dusty when dry.

This map unit is in capability subclass VIe.

156-Narcisse silt loam, 0 to 5 percent slopes. This Narcisse soil is a very deep, moderately well drained soil that formed in alluvium from surrounding areas. It is in drainageways on the Rathdrum Prairie. Elevation is 2,000 to 2,500 feet. The average annual precipitation is 24 inches, average annual air temperature is 46 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Avonville fine gravelly silt loam, Garrison gravelly silt loam, McGuire gravelly sandy loam, and Marble sandy loam.

Typically, the surface layer of this Narcisse soil is dark grayish brown and grayish brown silt loam about 25 inches thick, and is neutral. The subsoil is very pale brown silt loam about 11 inches thick, and is slightly acid. The upper part of the substratum is very pale brown very fine sandy loam about 15 inches thick, and is slightly acid. The lower part of the substratum is very pale brown, stratified very cobbly fine sandy loam below a depth of about 51 inches.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate. This soil is frequently flooded for brief periods during spring. A seasonal high water table is at a depth of 36 to 60 inches.

This soil is mainly used for hay, pasture, grass seed, and small grain.

Crop growth is generally good on this soil, although flooding by runoff from adjacent lands is a limitation. Fertilization and weed control need to be similar to that of the surrounding soils. Grassed waterways and diversions help carry runoff through these areas.

This soil is well suited to long term production of hay and pasture. A well balanced fertilization program, including nitrogen, sulfur, and possibly phosphorus, helps obtain and maintain excellent plant growth.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes timothy, smooth brome, bluegrass, orchardgrass, and clover or trefoil.

The vegetation provides some habitat for white-tailed deer, various small mammals, songbirds, and some Chinese pheasant and Hungarian partridge. Deer and bear seasonally visit the forested hills surrounding the soil and feed on the cropland fields. Potential for Chinese pheasant is poor because of clean-till farming methods.

The main limitations for homesites, sanitary facilities, and roads are the seasonal high water table and the potential hazard of flooding.

Wetness limits early season recreational uses. For summer recreational uses, dustiness is a problem. This map unit is in capability subclass IIIw.

157-Porrett silt loam. This Porrett soil is a very deep, very poorly drained soil that formed in a mixture of loess and volcanic ash material. It is on alluvial bottom lands and broad drainageways. Elevation is 2,125 to 2,800 feet. Slope is 0 to 2 percent. The average annual precipitation is 30 inches, average annual air temperature is 42 degrees F, and average frost-free period is 80 days.

Included with this soil in mapping are areas of Cald silt loam and Potlatch silt loam, both having 0 to 2 percent slopes; and Santa silt loam, 3 to 5 percent slopes.

Typically, the surface layer of this Porrett soil is mottled very dark grayish brown silt loam about 3 inches thick, and is slightly acid. The subsurface layer is mottled dark grayish brown and grayish brown silt loam about 25 inches thick, and is neutral. The subsoil below a depth of about 28 inches is mottled dark grayish brown silty clay loam, and is neutral.

A high water table fluctuates between the surface and a depth of 12 inches from April through June. This soil is frequently flooded for brief periods early in spring. If drained, the rooting depth is 60 inches. The available water capacity is high. Permeability is moderately slow, runoff is slow, and the hazard of erosion is none to slight.

This soil is used for hay and pasture. The main limitations for agricultural uses are the cold temperature of the soil and poor drainage. Meadowlands can be used for improved domestic grasses if tillage is continued to summer and seeding is done late in fall.

Conventional drainage methods obtain only partial drainage, and cool soil temperatures affect crops.

This soil is well suited to long term production of hay and pasture. A well balanced fertilization program, including the use of nitrogen, sulfur, and possibly phosphorus, maintains excellent plant growth. Response is normally expected from nitrogen, but local testing is needed.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes timothy, tall fescue, creeping or meadow foxtail, and clover.

This soil is well suited to wetland wildlife habitat, and has fair potential for rangeland and woodland wildlife habitats.

Roads, buildings, and sanitary facilities are limited by the potential hazard of flooding and by a seasonal high water table. Building and road construction are also limited by the potential frost action damage and inherent low support strength of the soil. Drainage is limited by flooding and the moderately slow permeability. Recreational development is limited by the seasonal high water table.

This map unit is in capability subclass IVw.

158-Potlatch silt loam. This Potlatch soil is a nearly level, very deep, poorly drained soil that formed in mixed alluvium. It is on alluvial fans and terraces. Elevation is 2,200 to 2,900 feet. Slope is 0 to 2 percent. The average annual precipitation is 27 inches, average annual air temperature is 42 degrees F, and average frost-free period is 80 days.

Included with this soil in mapping are small areas of Porrett silt loam and Seelovers silt loam, both with 0 to 2 percent slopes; Santa silt loam, 3 to 5 percent slopes; and Taney silt loam, 3 to 7 percent slopes.

Typically, the surface layer of this Potlatch soil is gray silt loam in the upper part. The lower part of the surface layer is light brownish gray silt loam about 12 inches thick. The subsurface layer is mottled light gray silt loam about 10 inches thick. The surface and subsurface layers are medium acid. The subsoil is mottled light brownish gray silty clay about 22 inches thick, and is neutral. The substratum is mottled light brownish gray silty clay loam to a depth of 60 inches, and is neutral.

The rooting depth is 60 inches. The available water capacity is high. Permeability is very slow, runoff is very slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 18 to 42 inches from February to July, and the soil is subject to flooding.

This soil is mainly used for hay, pasture, and wildlife habitat; it is well suited to long term production of hay and pasture. A well balanced fertilization program, including the use of nitrogen, sulfur, and possibly phosphorus, helps obtain and maintain excellent plant growth.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved -forage includes creeping foxtail, meadow foxtail, timothy, reed canarygrass, trefoil, and clovers.

The vegetation provides some habitat for white-tailed deer, black bear, some elk, various small mammals, and songbirds. The woodland areas surrounding this soil provide habitat for forest grouse.

The main limitations for homesites, roads, and sanitary facilities are the seasonal high water table and possibility of flooding. Road construction is subject to high potential frost action.

Drainage is limited by the very slow permeability of the subsoil and the hazard of flooding.

Recreational uses are limited by flooding and permeability.

This map unit is in capability subclass IVw.

159-Pywell muck. This Pywell soil is a very deep, very poorly drained soil that formed in organic materials mainly from herbaceous plants, but includes some material from trees and shrubs. It is in level depressions of flood plains and bottom lands. Elevation is 2,125 to 2,250 feet. Slope is 0 to 2 percent. The average annual precipitation is 25 inches, average annual air temperature is 43 degrees F, and average frost-free period is 90 days.

Included with this soil in mapping are areas of Aquic Xerofluvents, Cougarbay silt loam, Cald silt loam, Ramsdell silt loam, and Slickens, all with 0 to 2 percent slopes.

Typically, this soil is made up of stratified, highly decomposed, very dark brown, dark brown, and black organic material that is strongly acid and medium acid. A few thin layers of volcanic ash are present.

The rooting depth is 60 inches when drained, and the available water capacity is very high. A high water table ranges from the surface to a depth of 24 inches in spring. Areas of this soil are diked against overflow from the river, but flooding is still a hazard. Permeability is moderate, runoff is very slow, and the hazard of erosion is slight. Channelization is possible during flooding.

This soil is used for small grain, hay (fig. 9), pasture, and grass seed.

Figure 9.-Drained and protected areas of Pywell muck produce good yields of hay.

Pywell soil is often cultivated for small grain and grass seed, and is well suited to long term production of hay. and pasture. Tillage and choice of crops are strongly influenced by the organic nature of the soil, its low fertility, and the high water table. Spring-seeded crops are the most reliable. Fertilization is necessary and includes the use of nitrogen, sulfur, and phosphorus. Tillage is especially critical because of the direct effect of the high water table.

Land smoothing and maintenance of the drainage system are needed. Crop residue is excessive in some wet seasons, but normal residue management is possible.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes reed canarygrass, timothy, creeping or meadow foxtail, and clover.

If not drained or protected, the soil is wet late into the season. Grazing is limited to summer and early in fall because of the wetness. The vegetation includes sedges and other grasslike plants, quackgrass, and reed canarygrass.

Proper management on the natural areas of this soil helps to maintain the production of quackgrass and reed canarygrass. Production on these areas varies from about 4,000 to 6,000 pounds of air-dry herbage per acre per year.

Pywell soils are well suited to wetland wildlife habitat (fig. 10). Migratory fowl do well in these areas.

Limitations for building sites, roads, and sanitary facilities are the high water table, excess humus, and the possibility of flooding.

Drainage is limited by flooding and frost action. Dike and levee construction is subject to the wetness of the soil.

Limitations for recreational facilities are the flooding, the high water table, and excess humus. This map unit is in capability subclass IVw.

160-Ramsdell silt loam. This Ramsdell soil is a nearly level, very deep, very poorly drained soil that formed in alluvium deposited by rivers and streams. It is on low terraces and in flood plains. Elevation is 2,140 to 2,200 feet. Slope is 0 to 2 percent. The average annual precipitation is 29 inches, average annual air temperature is 44 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Cougarbay silt loam and Pywell muck, both having 0 to 2 percent slopes.

Typically, the surface layer of this Ramsdell soil is dark grayish brown silt loam about 8 inches thick, and is slightly acid. The subsoil is grayish brown silt loam about 7 inches thick, and is neutral. The substratum below a depth of about 15 inches is grayish brown silt loam and fine sandy loam, and is neutral. The substratum has distinct and prominent mottles throughout.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderate, runoff is

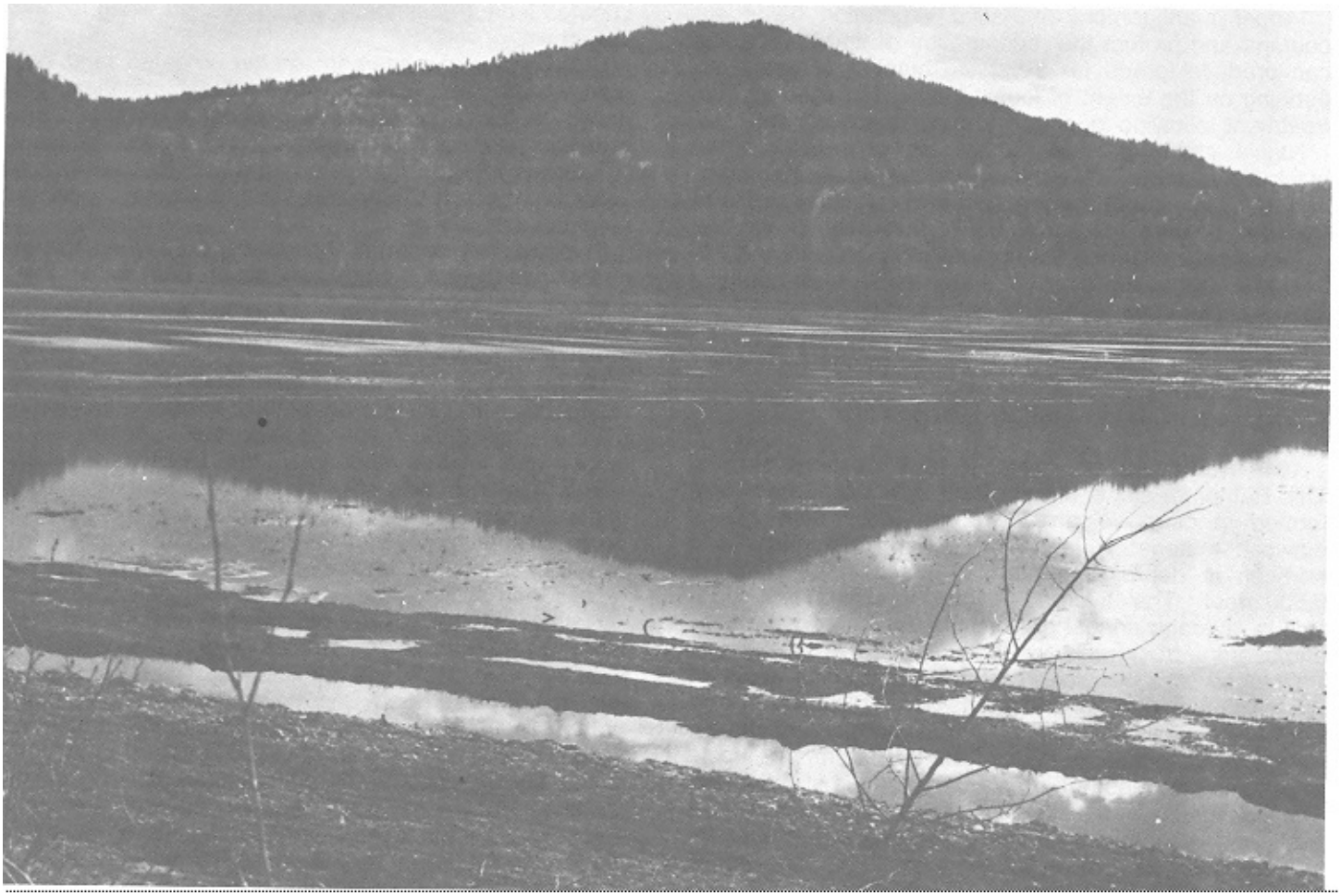

Figure 10.-Flooded area of Pywell muck provides excellent habitat for wetland wildlife.

slow, and the hazard of erosion is slight. This soil has a high water table at a depth of 12 to 24 inches in spring, and is frequently flooded for long periods. Areas are diked against overflow, but flooding is still a hazard.

This soil is mainly used for woodland and cropland. The main limitations for cropland are very poor drainage and overflow from stream channels. In addition, cool soil temperatures adversely affect crop production.

This Ramsdell soil is suited to western redcedar, western white pine, grand fir, and Douglas-fir. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the seasonal high water table and potential flooding. Conventional methods can be used for tree harvest, but must be carried out during the dry summer and fall months. Reforestation after harvest must be carefully managed to reduce the competition of undesirable understory plants.

This Ramsdell soil is well suited to long term production of hay and pasture. These are the most reliable crops, except when the soil is drained in sizable units. A well balanced fertilization program, including the use of nitrogen, sulfur, and possibly phosphorus, is necessary on all crops and helps obtain and maintain excellent plant growth.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes timothy, creeping or meadow foxtail, reed canarygrass, tall fescue, and alsike clover.

This soil has limited potential for grazing when the canopy is opened. Unpalatable grasses and grass-like plants and shrubs dominate as the timber is removed. After the timber is harvested, this soil can be used for pasture or hay.

Proper management of native vegetation helps encourage and protect the regeneration of timber. The site can produce forage for a varying number of years depending on the extent of logging, available seed source, treatment following logging, and other management.

Native plants provide habitat for white-tailed deer, black bear, some elk, grouse, various small mammals, and songbirds. Both the forested and cultivated areas of this soil provide food and cover favorable to wildlife.

The main limitations for homesites and sanitary facilities are the seasonal high water table and potential flooding. The construction of roads and dwellings is limited by potential frost action.

Recreational development is limited by the high water table and floods.

This map unit is in capability subclass IVw.

161-Rathdrum silt loam, 0 to 7 percent slopes. This Rathdrum soil is a very deep, well drained soil that formed in deep volcanic ash and loess over glacial outwash material. It is on glacial outwash plains and terraces in depressional areas. Elevation is 2,000 to 2,500 feet. The average annual precipitation is 28 inches, average annual air temperature is 43 degrees F, and average frost-free period is 100 days.

Included with this soil in mapping are small areas of Avonville fine gravelly silt loam, Bonner silt loam, and Kootenai gravelly silt loam, all with 0 to 7 percent slopes.

Typically, the surface layer of the Rathdrum soil is pale brown silt loam about 4 inches thick, and is slightly acid. The subsoil is pale brown silt loam about 18 inches thick, and is slightly acid. The upper part of the substratum is very pale brown silt loam and very fine sandy loam about 32 inches thick, and is slightly acid. The lower part of the substratum below a depth of about 54 inches is pale brown gravelly silt loam, and is slightly acid.

The rooting depth is 60 inches or more, and the available water capacity is high. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is mainly used for woodland. Some cleared areas are used for hay and pasture, but use as cropland is limited because of the cool soil temperatures. Long term sod crops are the most reliable, and require fertilization for good plant growth.

This Rathdrum soil is suited to western redcedar, Douglas-fir, grand fir, western larch, and western white pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees. Conventional methods can be used for tree harvest.

After the timber is harvested, this soil can be used for pasture or hay on irrigated land and dryland. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain excellent plant growth on irrigated land. Phosphorus is also needed when legumes are grown.

Good water management on the irrigated land helps obtain maximum plant growth. Without irrigation, plant growth is fair to good. Pasture benefits from a rotation grazing system and a proper regrowth period for plants.

Adapted forage for irrigated land and dryland includes Latar orchardgrass, Manchar smooth brome, Regar bromegrass, and clover.

This soil has potential for grazing only when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, tall fescue, timothy, and white Dutch clover.

Native forage includes sedges, Columbia brome, pine reedgrass, and redstem ceanothus. Proper management of the vegetation helps protect the regeneration of timber and insures adequate litter for soil protection.

This soil can produce forage for livestock and big game animals for five to fifteen years after the canopy is open. During this period, total production can vary from about 2,200 pounds of air-dry herbage per acre per year to less than 100 pounds.

Native plants provide habitat for white-tailed deer, black bear, songbirds, various small mammals, and forest grouse. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife. Water is a limitation for wildlife habitat, unless irrigation is used.

This soil is suited to the construction of most sanitary facilities. Homesites are limited by the low strength of the soil. Potential frost action damage is a hazard for roads, and footing and road base designs are subject to the depth of frost penetration.

This soil is suited to most recreational development, but the soil surface is dusty when dry.

This map unit is in capability subclass IVe and IIIe, irrigated.

162-Rathdrum-Bonner complex, 0 to 7 percent slopes. These nearly level to gently sloping soils are on glacial outwash plains and terraces in depressional areas. Elevation is 2,000 to 2,500 feet. The average annual precipitation is 28 inches, average annual air temperature is 43 degrees F, and average frost-free period is 100 days.

This complex is 55 percent Rathdrum silt loam and about 35 percent Bonner silt loam. Avonville fine gravelly silt loam and Kootenai gravelly silt loam, both with 0 to 7 percent slopes, make up the remaining 10 percent of this complex.

The Rathdrum soil is a very deep, well drained soil that formed in deep volcanic ash and loess over glacial outwash materials.

Typically, the surface layer of the Rathdrum soil is pale brown silt loam about 4 inches thick, and is slightly acid. The subsoil is pale brown silt loam about 18 inches thick, and is slightly acid. The upper part of the substra-

turn is very pale brown silt loam and very fine sandy loam about 32 inches thick, and is slightly acid. The lower part of the substratum below a depth of about 54 inches is pale brown gravelly silt loam, and is slightly acid.

The rooting depth is 60 inches or more, and the available water capacity is high. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate.

The Bonner soil is a very deep, well drained soil that formed in glacial outwash mantled with volcanic ash and loess.

Typically, the surface layer of the Bonner soil is yellowish brown silt loam about 8 inches thick, and is neutral. The subsoil is brown and pale brown gravelly silt loam and gravelly sandy loam about 18 inches thick, and is slightly acid and neutral. The substratum below a depth of about 26 inches is pale brown very gravelly loamy sand, and is neutral.

The rooting depth is 60 inches or more. The available water capacity is low. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are mainly used for woodland and some hay, pasture, and small grain.

Cultivation is limited because of the cool soil temperatures and the droughtiness of the Bonner soil. Hay and pasture are the most reliable crops, and small grain is secondary. A conservation program uses crop residue and long term sod crops. Fertilization and weed control are needed.

The Rathdrum soil is suited to western redcedar, Douglas-fir, grand fir, western larch, and western white pine. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and-more in diameter from an unmanaged stand of 80-year-old trees. Conventional methods can be used for tree harvest.

The Bonner soil is suited to Douglas-fir, grand fir, ponderosa pine, lodgepole pine, and western larch. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees. Conventional methods can be used for tree harvest. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants.

After the timber is harvested, these soils can be used for hay and pasture on irrigated land and dryland. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain excellent plant growth on irrigated land. Phosphorus is also needed when legumes are grown.

Good water management on the irrigated land helps obtain maximum plant growth. Without irrigation, plant growth is fair to good. Pasture benefits from a rotation grazing system and a proper regrowth period for plants. Adapted forage for irrigated land and dryland includes Latar orchardgrass, Manchar smooth brome, and Regar bromegrass.

These soils have potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

Native forage includes dryland sedges, pine reedgrass, spirea, and rose. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

These soils can produce forage for livestock and big game animals for 5 to 20 years after the canopy is opened. During this period, total production can vary from about 2,200 pounds of air-dry herbage per acre per year to less than 100 pounds.

Native plants provide some habitat for white-tailed deer, black bear, songbirds, various small mammals, and forest grouse. Both the forested and cleared areas of these soils provide food and cover favorable to wildlife. Shortage of water is a limitation for wildlife, unless irrigation is used.

Potential frost action damage is a hazard for roads. Footings and road bases are limited by the depth of frost penetration.

The Rathdrum soil is suited to the construction of most sanitary facilities. The Bonner soil is suited to septic tank absorption fields; however, ground water pollution is a hazard. Limitations for sewage lagoons and sanitary landfills are the rapid permeability of the substratum and the potential hazard of seepage.

These soils are suited to most recreational development but are dusty during dry summer months.

This map unit is in capability subclass IVe and IIIe, irrigated.

163-Rock outcrop. This miscellaneous area consists of exposures of bare bedrock. Crevices in the rock contain some soil material. Areas of Rock outcrop are too small to be indicated on the map and are shown by symbols. Some areas are large but are broken by small spots of soil. This miscellaneous area is mostly in the mountains and is associated with the Ardenvoir, Huckleberry, Lacy, Lenz, and Vassar soils.

This miscellaneous area is in capability subclass VIIIs.

164-Rubson-Mokins complex, 0 to 20 percent slopes. These very deep soils are on glaciolacustrine terraces. Elevation is 2,200 to 2,600 feet. The average annual precipitation is 27 inches, average annual air temperature is 42 degrees F, and average frost-free period is 100 days.

The Rubson soil makes up about 55 percent of the map unit, the Mokins soil makes up about 35 percent, and 10 percent is Chatcolet silt loam, 5 to 20 percent slopes.

The Rubson soil is a very deep, well drained soil that formed in silty lake-laid sediment.

Typically, the surface layer is pale brown silt loam about 6 inches thick, and is medium acid. The subsoil is pale brown silt loam about 10 inches thick, and is slightly acid. The substratum is very pale brown and brown silt loam and very fine sandy loam to a depth of 60 inches, and is medium acid and slightly acid. There are clay bands below a depth of about 16 inches.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is moderate, runoff is medium to rapid, and the hazard of erosion is moderate to high.

The Mokins soil is a very deep, moderately well drained soil that formed in lake-laid sediment mantled with volcanic ash and loess.

Typically, the surface layer is brown silt loam about 3 inches thick, and is neutral. The subsoil is light yellowish brown and very pale brown silt loam and gravelly silt loam about 11 inches thick over a buried subsurface layer of white silt loam about 6 inches thick. The buried subsoil is reddish yellow and brownish yellow silty clay loam and silty clay to a depth of 60 inches, and is very strongly acid. Common, prominent and distinct mottles are below a depth of about 4 inches.

The rooting depth is 60 inches or more, and the available water capacity is high. Permeability is slow, runoff is rapid, and the hazard of erosion is moderate to high. There is a seasonal perched water table.

These soils are used for woodland, hay, pasture, and some small grain. They produce good plant growth of all locally adapted crops. The steeper slopes impose an acute hazard of erosion when intensive tillage, such as summer fallow, is used. A continuous cropping system using minimum tillage helps control erosion. Sod crops are desirable, especially on steeper slopes. Use of crop residue, weed control, and fertilization are necessary. Stripcropping is an alternative for erosion control where slopes are long.

The Rubson soil is suited to western hemlock, western redcedar, western white pine, grand fir, Douglas-fir, and western larch. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees. Conventional methods can be used for tree harvest, but trafficability can be a hazard during wet periods.

The Mokins soil is suited to grand fir, Douglas-fir, western larch, and western white pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the seasonal perched water table and the low support strength of the soil. Conventional methods can be used for tree harvest, but may be limited during the rainy periods.

After the timber is harvested, these soils can be used for hay and pasture. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Native forage includes elk sedge, Columbia brome, redstem ceanothus, maple, and pine reedgrass. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

The Rubson soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, tall fescue, orchardgrass, and white Dutch clover.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, tall fescue, timothy, and alfalfa or clover.

This soil can produce forage for livestock and big game animals for 5 to 8 years after the canopy is open. Total annual production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 100 pounds.

The Mokins soil also has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as tall fescue, timothy, orchardgrass, and white Dutch clover.

Native forage includes sedges, pine reedgrass, Columbia brome, rose, and willow. Proper management of the vegetation helps protect the timber regeneration and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is open. During this period, total production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 200 pounds.

Native plants provide habitat for white-tailed deer, black bear, some elk, various small mammals, songbirds, and forest grouse. Both the forested and cleared areas of these soils provide food and cover favorable to wildlife.

The main limitations for homesites and sanitary facilities are slope, the slow permeability, and the seasonal perched water table of the Mokins soil. Community sewage systems should be considered in areas of high population density.

The construction of roads and dwellings is limited by slope, potential frost action damage, the inherent low support strength of the soils, and the high shrink-swell potential of the Mokins subsoil during wetting and drying.

Recreational development on the Mokins soil is limited by the slow permeability of the subsoil. Potential recreational uses are paths and trails. The main limitations for recreational development are the dustiness of the soils when dry and slope.

This map unit is in capability subclass IVe.

165-Santa silt loam, 3 to 5 percent slopes. This Santa soil is moderately deep to a fragipan. It is a moderately well drained soil that formed in deep loess deposits that have a minor influence from volcanic ash. It is on dissected loess hills. Elevation is 2,300 to 3,000 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Cald silt loam, 0 to 2 percent slopes, Kruse silt loam, 0 to 5 percent slopes, and Taney silt loam, 3 to 7 percent slopes.

Typically, the surface layer of this Santa soil is pale brown and light yellowish brown silt loam about 27 inches thick, and is medium acid and slightly acid. The subsurface layer is very pale brown silt about 7 inches thick, and is medium acid. The subsoil is light yellowish brown and yellowish brown silt loam and silty clay loam fragipan to a depth of 65 inches, and is medium acid.

The rooting depth is restricted at a depth of 22 to 36 inches by the fragipan. The available water capacity is moderate. Permeability is very slow in the fragipan, causing a perched water table at a depth of 22 to 36 inches in the spring. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for woodland, grazing, hay, pasture, small grain, and bluegrass for seed production. The fragipan limits the growth of deeper rooted plants. Conservation helps maintain fertility and checks erosion. Grain recrop and sod crops are the best cropping systems. Cross-slope farming, minimum tillage, and use of crop residue help reduce erosion. Most crops respond to applications of nitrogen, phosphorus, and potassium fertilizers.

This Santa soil is suited to grand fir, Douglas-fir, ponderosa pine, western larch, lodgepole pine, and western white pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the very slow permeability, perched water table during the wet winter and spring months, and severe windthrow hazard. Conventional logging methods are possible except during rainy periods. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants.

Native forage includes elk sedge, rose, Columbia brome, and willow. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

This soil has good potential for grazing when the tree canopy is opened. Forage production can be increased by seeding disturbed areas to adapted grasses such as timothy, tall fescue, orchardgrass, and white Dutch clover.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, and clover.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is open. Total annual herbage production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 250 pounds.

Santa soils are suited to woodland and rangeland wildlife habitats. Openland wildlife habitat can be developed under the right conditions. Cultivated areas are suited to upland game birds, and shrub hedgerows along fence lines, roadsides, and streambanks encourage increased populations of these birds. These plants provide needed cover and nesting areas. Protected strip plantings of grain also provide good sources of food.

Building and road construction is limited by the perched water table during wet periods and potential frost action damage. Septic tank absorption fields are limited by the perched water table and very slow permeability of the soil.

This soil is suited to most recreational development, although the surface tends to be dusty when dry.

This map unit is in capability subclass lVe.

166-Santa silt loam, 5 to 20 percent slopes. This Santa soil is moderately deep to a fragipan. It is a moderately well drained soil that formed in deep loess deposits that have a minor influence from volcanic ash. It is on dissected loess hills. Elevation is 2,300 to 3,000 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Cald silt loam, 0 to 2 percent slopes; Taney silt loam, 7 to 25 percent slopes; and Kruse silt loam and Santa Variant silt loam, both with 5 to 20 percent slopes.

Typically, the surface layer of this Santa soil is pale brown and light yellowish brown silt loam about 27 inches thick, and is medium acid and slightly acid. The subsurface layer is very pale brown silt about 7 inches thick, and is medium acid. The subsoil is a light yellowish brown and yellowish brown silt loam and silty clay loam fragipan to a depth of 65 inches, and is medium acid.

The rooting depth is limited at 22 to 36 inches by the fragipan. The available water capacity is moderate. Permeability is very slow in the fragipan, causing a perched water table at a depth of 22 to 36 inches in the spring. Runoff is rapid, and the hazard of erosion is high.

This soil is used for woodland, grazing, hay, pasture (fig. 11), small grain, and bluegrass for seed production. The bluegrass helps to check erosion. The fragipan limits the growth of deeper rooted plants. Conservation methods are necessary to maintain fertility and check erosion. Cross-slope farming, minimum tillage, crop residue use, and cover crops help reduce erosion. Most crops respond to applications of nitrogen, phosphorus, and potassium fertilizers.

Figure 11.-Good pasture on a cleared area of Santa silt loam.

This Santa soil is suited to grand fir, Douglas-fir, ponderosa pine, western larch, lodgepole pine, and western white pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the very slow permeability, the perched water table during the wet winter and spring months, and severe windthrow hazard. Conventional logging methods are possible except during rainy periods. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants.

Native forage includes elk sedge, rose, Columbia brome, and willow. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

This soil has good potential for grazing when the tree canopy is opened. Forage production can be increased by seeding disturbed areas to adapted grasses such as timothy, tall fescue, orchardgrass, and white Dutch clover.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, and clover.

Once the canopy is opened, this soil can produce forage for 10 to 20 years. During this period, total herbage production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 250 pounds.

This soil is suited to woodland and rangeland wildlife habitats. Openland wildlife habitat can be developed under the right conditions. Cultivated areas are suited to upland game birds. Shrub hedgerows along fence lines, roadsides, and streambanks encourage increased populations of these birds by providing needed cover and nesting areas. Protected strip plantings of grain also provide good sources of food.

Building and road construction is limited by slope, the perched water table during wet periods, and potential frost action damage. Septic tank absorption fields are limited by the perched water table and very slow permeability of the soil.

This Santa soil has potential for picnic areas and paths and trails; however, slope and permeability are limitations for these uses.

This map unit is in capability subclass IVe.

167-Santa silt loam, 20 to 35 percent slopes. This Santa soil is moderately deep to a fragipan. It is a moderately well drained soil that formed in deep loess deposits with a minor influence from volcanic ash. It is on loess hills. Elevation is 2,300 to 3,000 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Kruse silt loam, 20 to 35 percent slopes, and Taney silt loam, 7 to 25 percent slopes.

Typically, the surface layer of this Santa soil is pale brown and light yellowish brown silt loam about 27 inches thick, and is medium acid and slightly acid. The subsurface layer is very pale brown silt about 7 inches thick, and is medium acid. The subsoil is a light yellowish brown and yellowish brown silt loam and silty clay loam fragipan to a depth of 65 inches, and is medium acid.

The rooting depth is restricted at a depth of 22 to 36 inches by the fragipan. The available water capacity is moderate. Permeability is very slow in the fragipan, causing a perched water table at a depth of 22 to 36 inches in spring. Runoff is very rapid, and the hazard of erosion is very high.

This soil is used for woodland and grazing. Small areas are cultivated for small grain, hay, pasture, or bluegrass for seed production. The fragipan limits the growth of deeper rooted plants. Bluegrass helps check erosion on the steep slopes. Use of cross-slope farming, conservation cropping systems, crop residue, minimum tillage, and cover crops also help to control erosion. Most crops respond to nitrogen, phosphorus, and potassium fertilizers.

This soil is suited to grand fir, Douglas-fir, ponderosa pine, western larch, lodgepole pine, and western white pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80year-old trees.

The main limitations for timber production are the very slow permeability, perched water table during the wet winter and spring months, the erosion hazard, and severe windthrow hazard. Conventional logging methods are possible except during rainy periods. After harvest, reforestation needs to be carefully managed to reduce the competition of undesirable understory plants. Soil losses can be minimized by careful planning of logging roads, skid trails, and landings.

Native forage includes elk sedge, rose, Columbia brome, and willow. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

This soil has limited potential for grazing when the tree canopy is opened. Forage production can be increased by seeding disturbed areas to adapted grasses such as timothy, tall fescue, orchardgrass, and white Dutch clover.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, and clover.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is open. Total annual production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 250 pounds.

After the timber is harvested, this soil can be used for pasture and hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed where legumes are grown.

This soil is suited to woodland and rangeland wildlife habitats. Openland wildlife habitat can be developed under the right conditions. Cultivated areas are suited to upland game birds. Shrub hedgerows along fence lines, roadsides, and streambanks encourage increased populations of these birds by providing needed cover and nesting areas. Protected strip plantings of grain also provide good sources of food.

Buildings, roads, and sanitary facilities are limited by slope, a perched water table during wet periods, and potential frost action damage. Slope is also a limitation for recreational development.

This map unit is in capability subclass VIe.

168-Santa Variant silt loam, 5 to 20 percent slopes. The Santa Variant soil is a moderately deep, moderately well drained soil that formed in loess deposits over fractured basalt or metasedimentary rock. It is on dissected, loess-covered plains. Elevation is 2,300 to 3,000 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Blinn stony loam, 5 to 35 percent slopes; Santa silt loam, 5 to 20 percent slopes; and Ardenvoir gravelly loam and McCrosket gravelly silt loam, both with 20 to 35 percent slopes.

Typically, the surface layer of this Santa Variant soil is light brownish gray and light gray silt loam about 9 inches thick, and is medium acid. The subsurface layer is light gray silt loam about 14 inches thick, and is medium acid. The subsoil is a yellowish brown silty clay loam fragipan about 13 inches thick, and is strongly acid. Fractured basalt is at a depth of about 36 inches.

The rooting depth is restricted at a depth of 16 to 25 inches because of the fragipan. Available water capacity is low. Permeability is very slow in the fragipan, causing a perched water table at a depth of 16 to 25 inches in spring. Runoff is very rapid, and the hazard of erosion is very high.

This soil is mainly used for woodland. Small areas are used for cultivated crops of wheat, barley, grass-legume hay, pasture, and some bluegrass for seed production. The fragipan and depth to bedrock greatly restrict root growth of most plants. These areas are best if used as woodland.

The Santa Variant soil is suited to grand fir, Douglas-fir, ponderosa pine, western larch, lodgepole pine, and western white pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 17,900 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the very slow permeability in the fragipan, the perched water table during rainy winter and spring months, depth to bedrock, and severe windthrow hazard. Conventional logging methods can be used except during rainy periods. After harvest, careful management of reforestation can reduce the competition of undesirable understory plants.

Native forage includes elk sedge, Columbia brome, rose, and willow. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

This soil has potential for grazing when the tree canopy is opened. Forage production can be increased by seeding disturbed areas to adapted grasses such as timothy, tall fescue, and white Dutch clover.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, and clover.

This soil can produce forage for livestock and big game animals for 10 to 20 years after the canopy is open. Total annual production can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 250 pounds.

After the timber is harvested, this soil can be used for pasture and hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

This soil is best suited to woodland and rangeland wildlife habitats. Openland wildlife habitat can be developed under the right conditions. Cultivated areas are suited to upland game birds. Shrub hedgerows along fence lines, roadsides, and streambanks encourage increased populations of these birds by providing needed cover and nesting areas. Protected strip planting of grain also provides good food sources.

Buildings are limited by the very slow permeability of the subsoil, the perched water table, and depth to bedrock. Septic tank absorption fields are limited by the perched water table and very slow permeability of the subsoil. On steeper areas, slope is an additional limitation for buildings and sanitary facilities. The design and construction of roads are subject to potential frost action damage.

This soil has potential for use as picnic areas and paths and trails, although slope is a limitation. This map unit is in capability subclass Vle.

169-Schumacher silt loam, 3 to 7 percent slopes. This Schumacher soil is a gently sloping, deep, well drained soil that formed in loess and material weathered from metasedimentary rocks. It is on mountain foot slopes. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 130 days.

Included with this soil in mapping are small areas of Kruse silt loam, 0 to 5 percent slopes; Lenz loam, Tekoa gravelly silt loam, and Skalan gravelly loam, all with slopes of 5 to 20 percent; and Santa silt loam and Taney silt loam, 3 to 7 percent slopes.

Typically, the surface layer of this Schumacher soil is brown silt loam about 19 inches thick, and is slightly acid. The subsoil is brown and yellowish brown gravelly silt loam and gravelly silty clay loam about 21 inches thick, and is slightly acid. Fractured metasedimentary bedrock is at a depth of about 40 inches.

The rooting depth is 40 to 60 inches. The available water capacity is moderate. Permeability is moderately slow, runoff is medium, and the hazard of erosion is moderate.

This soil is mainly used for hay, pasture, and some small grain. Erosion is the main limitation when the soil is intensively cultivated. Conservation methods maintain crop residue under a small grain system and use grasses and legumes for hay and pasture. Fertilization and weed control are necessary.

This soil is well suited to pasture or hay. A well balanced fertilization program helps obtain good plant growth.

Pasture benefits from a rotation grazing system during the growing season. Adapted forage includes intermediate wheatgrass, orchardgrass, smooth bromegrass, and alfalfa.

Potential native vegetation is dominated by Idaho fescue, rough fescue, and bluebunch wheatgrass. When the range deteriorates, the proportion of Idaho fescue and bluebunch wheatgrass decreases, and the proportion of less palatable forbs, shrubs, undesirable weeds, and annual grasses increases. Proper management of

the vegetation helps increase the production of bluebunch wheatgrass and Idaho fescue. Use of proper grazing and a rotation-deferred grazing system help maintain or improve range conditions. When the range is in a depleted condition, the soil can be used for seeded pasture or hay.

The vegetation provides some essential habitat for mule deer, black bear, some elk, various small mammals, and songbirds. The surrounding forested and cultivated areas provide food and cover favorable to wildlife.

Homesites and septic tank absorption fields are limited by the moderately slow permeability of the subsoil. The construction of roads and dwellings is limited by the shrink-swell potential of the subsoil during wetting and drying and the inherent low support strength of the soil.

Grass waterways and diversion designs are limited by the erodibility of the soil and depth to rock.

This soil has potential for recreational development, although the soil surface tends to be dusty when dry.

This map unit is in capability subclass IIIe.

170-Schumacher silt loam, 7 to 20 percent slopes. This Schumacher soil is a rolling to hilly, deep, well drained soil that formed in loess and material weathered from metasedimentary rocks. It is on mountain foot slopes. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 130 days.

Included with this soil in mapping are areas of Lenz loam, Kruse silt loam, Santa silt loam, Skalan gravelly loam, and Taney silt loam, all with 7 to 20 percent slopes.

Typically, the surface layer of this Schumacher soil is brown silt loam about 19 inches thick, and is slightly acid. The subsoil is brown and yellowish brown gravelly silt loam and gravelly silty clay loam about 21 inches thick, and is slightly acid. Fractured metasedimentary bedrock is at a depth of about 40 inches.

The rooting depth is 40 to 60 inches, and the available water capacity is moderate. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for hay, pasture, and some small grain.

Erosion is a hazard when this soil is intensively cultivated. Conservation methods needed are the maintenance of crop residue under a small grain system and use of grasses and legumes for hay and pasture. Fertilization and weed control are necessary.

This Schumacher soil is well suited to pasture or hay. A well balanced fertilization program helps obtain good plant growth.

Pasture benefits from a rotation grazing system during the growing season. Adapted forage includes intermediate wheatgrass, orchardgrass, smooth bromegrass, and alfalfa.

Potential native vegetation is dominated by Idaho fescue, rough fescue, and bluebunch wheatgrass. When the range deteriorates, the proportion of Idaho fescue and bluebunch wheatgrass decreases, and the proportion of less palatable forbs, shrubs, undesirable weeds, and annual grasses increases. Proper management of the vegetation helps increase the production of bluebunch wheatgrass and Idaho fescue. Use of proper grazing and a rotation-deferred grazing system help maintain or improve the range condition. When the range is in a depleted condition, the soil can be used for seeded pasture or hay.

The vegetation provides some essential habitat for deer, black bear, some elk, various small mammals, and songbirds. Both the surrounding forested and cultivated areas provide food and cover favorable to wildlife.

Homesites and septic tank absorption fields are limited by the moderately slow permeability of the subsoil and the slope. The construction of roads and dwellings is limited by slope, the shrink-swell potential of the subsoil during wetting and drying, and the inherent low support strength of the soil.

Slope is a limitation for recreational development. Also, the soil surface tends to be dusty when dry.

Grass waterways and diversion designs are limited by the erodibility of the soil and slope.

This map unit is in capability subclass IVe.

171-Schumacher-Skalan association, 20 to 35 percent slopes. This association is made up of moderately deep and deep soils on mountainsides. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 24 inches, average annual air temperature is 47 degrees F, and the average frost-free season is 120 days.

This association is about 55 percent Schumacher silt loam and 35 percent Skalan gravelly loam.

Included with this association in mapping are small areas of Lenz loam, Lenz very stony loam, Spokane loam, and Kruse silt loam, all with slopes of 5 to 35 percent. These inclusions make up about 10 percent of the association.

The Schumacher soil is a deep, well drained soil over fractured bedrock. It formed in loess and material weathered from metasedimentary rocks, and is in concave areas.

Typically, the surface layer of the Schumacher soil is brown silt loam about 19 inches thick, and is slightly acid. The subsoil is brown and yellowish brown gravelly silt loam and gravelly silty clay loam about 21 inches thick, and is slightly acid. Fractured metasedimentary bedrock is at a depth of about 40 inches.

The rooting depth is 40 to 60 inches, and the available water capacity is moderate. Permeability is moderately slow, runoff is very rapid, and the hazard of erosion is very high.

The Skalan soil is a moderately deep, well drained soil over fractured gneiss bedrock. It formed in material weathered from gneiss and other metamorphic rocks mixed with small amounts of volcanic ash and loess in the upper part of the profile. This soil is on ridges that have convex slopes.

Typically, the surface layer of the Skalan soil is dark grayish brown gravelly loam about 3 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown very gravelly clay loam and very gravelly loam about 15 inches thick, and is medium acid. The substratum is light yellowish brown very gravelly loam about 12 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches. The available water capacity is very low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

Woodland and grazing are the main uses for these soils. These soils are suited to ponderosa pine. They are capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the erosion hazard and seedling mortality. Conventional methods can be used for tree harvest, but road construction may be limited because of the depth to rock. Reforestation may require some shade from large trees to prevent the tree seedlings from dying during the hot summer months. Logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

On the Schumacher soil, the potential native vegetation is dominated by Idaho fescue, rough fescue, and bluebunch wheatgrass. When the range deteriorates, the proportion of Idaho fescue and bluebunch wheatgrass decreases, and the proportion of less palatable forbs, shrubs, undesirable weeds, and annual grasses increases. Proper management of the vegetation helps increase the production of bluebunch wheatgrass and Idaho fescue. Proper grazing and a rotation-deferred grazing system help to maintain or improve the range condition. Total herbage production can vary from about 2,400 pounds of air-dry herbage per acre per year under favorable conditions to about 1,000 pounds under unfavorable conditions.

The Skalan soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass or tall fescue.

Native forage includes bluebunch wheatgrass, rough fescue, blue wildrye, and trisetum. Proper management of the vegetation on the Skalan soil helps protect timber regeneration and increase the production of bluebunch wheatgrass and rough fescue.

If well managed, this soil can continually produce forage for livestock for 20 to 30 years. Total production can vary from about 1,200 pounds of air-dry herbage per acre per year to less than 200 pounds per acre.

All structural development is limited by slope. On the Skalan soil, homesites and sanitary facility installations are limited by depth to rock and small stones. Roads and dwellings are limited by depth to rock and the shrink-swell potential during wetting and drying.

On the Schumacher soil, septic tank absorption fields are limited by the moderately slow permeability, and road and dwelling construction is limited by the inherent low support strength of the soil. Recreational development is limited by the slope and the small stones on the Skalan soil.

This map unit is in capability subclass VIe.

172-Schumacher-Skalan association, 35 to 65 percent slopes. This association is made up of steep to very steep soils on mountain slopes. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 24 inches, average annual air temperature is 47 degrees F, and average frost-free season is 120 days.

This association is about 45 percent Schumacher silt loam and 40 percent Skalan gravelly loam.

Included with this association in mapping are small areas of Kruse silt loam, Lenz loam, Lenz very stony loam, and Spokane loam. These inclusions make up about 15 percent of the association.

The Schumacher soil is a deep, well drained soil over fractured bedrock. It formed in loess and material weathered from metasedimentary rock. This soil is in concave areas.

Typically, the surface layer of this Schumacher soil is brown silt loam about 19 inches thick, and is slightly acid. The subsoil is brown and yellowish brown gravelly silt loam and gravelly silty clay loam about 21 inches thick, and is slightly acid. Fractured metasedimentary bedrock is at a depth of about 40 inches.

The rooting depth is 40 to 60 inches, and the available water capacity is moderate. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

The Skalan soil is a moderately deep, well drained soil over fractured gneiss bedrock. It formed in material weathered from gneiss and other metamorphic rocks mixed with small amounts of volcanic ash and loess in the upper part of the profile. This soil is on ridges that have convex slopes.

Typically, the surface layer of the Skalan soil is dark grayish brown gravelly loam about 3 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown very gravelly clay loam and very gravelly loam about 15 inches thick, and is medium acid. The substratum is light yellowish brown very gravelly loam about 12 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches. The available water capacity is very low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

These soils are used for woodland and limited grazing. They are suited to ponderosa pine, and are capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of

merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are erosion hazard, seedling mortality, and a slope too steep to accommodate conventional logging equipment. Specialized logging equipment that causes a minimum of soil disturbance can keep soil losses at a minimum. Reforestation requires some shade from large trees to prevent the tree seedlings from dying during the hot summer months.

Potential native vegetation on the Schumacher soil is dominated by Idaho fescue, rough fescue, and bluebunch wheatgrass. When the range deteriorates, the proportion of Idaho fescue and bluebunch wheatgrass decreases, and the proportion of less palatable forbs, shrubs, undesirable weeds, and annual grasses increases. Proper management of the vegetation helps increase the production of bluebunch wheatgrass and Idaho fescue. Use of proper grazing and a rotation-deferred grazing system help maintain or improve the range condition. Total herbage production can vary from about 2,400 pounds of air-dry herbage per acre per year under favorable conditions to about 1,000 pounds under unfavorable conditions.

The Skalan soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass or tall fescue.

Native forage on the Skalan soil includes bluebunch wheatgrass, rough fescue, blue wildrye, and trisetum. Proper management of the vegetation helps to protect timber regeneration and increase the production of bluebunch wheatgrass and rough fescue.

If well managed, this soil can continually produce forage for livestock. If not managed, forage can be produced for 20 to 30 years. Total production can vary from about 1,200 pounds of air-dry herbage per acre per year to less than 200 pounds per acre.

The vegetation supported by the soils in this association provides some essential habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and open areas of these soils provide food and cover favorable to wildlife.

Slope is the main limitation for all structural development. Limitations for homesites, roads, and sanitary facilities are depth to rock on the Skalan soil, and the low support strength and shrink-swell potential on the Schumacher soil. The steep slope is a limitation for recre
ational development.

This map unit is in capability subclass VIIe.

173-Seelovers-Potlatch complex. These level to nearly level soils are in drainageways. Elevation is 2,300 to 2,800 feet. Slope is 0 to 2 percent. The average annual precipitation is 26 inches, average annual air temperature is 42 degrees F, and average frost-free period is 90 days.

The Seelovers soil makes up about 55 percent of the map unit and the Potlatch soil makes up about 35 percent. Cald silt loam, Porrett silt loam, Pywell muck, and Ramsdell silt loam, all with 0 to 2 percent slopes, make up the remaining 10 percent of the complex.

The Seelovers soil is a very deep, poorly drained soil that formed in local alluvium.

Typically, the surface layer of the Seelovers soil is black silt loam about 9 inches thick, and is slightly acid. The subsoil is grayish brown silt loam about 17 inches thick, and is slightly acid. The substratum, below a depth of 26 inches, is dark grayish brown and brown silty clay loam stratified with sandy loam, and is slightly acid. Many dark brown mottles are in the subsoil and substratum.

The rooting depth is 60 inches or more when the soil is drained. Available water capacity is high. A high water table is above a depth of 18 inches, and the soil is subject to flooding in winter and in spring. Permeability is moderately slow, runoff is very slow, and the hazard of erosion is slight.

The Potlatch soil is a very deep, poorly drained soil that formed in mixed alluvium.

Typically, the surface layer of the Potlatch soil is dark gray silt loam about 7 inches thick. The next layer is dark grayish brown silt loam about 5 inches thick. The subsurface layer is dark gray silt loam about 10 inches thick. The soil is medium acid to a depth of 22 inches. The subsoil is grayish brown and dark grayish brown silty clay about 22 inches thick, and is neutral. Distinct, yellowish brown mottles are below a depth of 12 inches.

The rooting depth is 60 inches or more when the soil is drained. The available water capacity is high. Permeability is very slow, runoff is very slow, and the hazard of erosion is slight. A high water table is at a depth of 18 to 42 inches, and the soil is subject to flooding in winter and in spring.

These soils are used for woodland, hay, pasture, and wildlife habitats.

The Seelovers soil is suited to western hemlock, western redcedar, grand fir, Douglas-fir, western white pine and western larch. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the high water table and flooding. Conventional methods can be used for tree harvest, but may be limited to winter months when the surface is frozen.

The Seelovers soil has limited potential for grazing when the canopy is opened. Unpalatable grasses and grass-like plants and shrubs take over as the timber is removed. Seeding disturbed areas to tall fescue, creeping foxtail, and meadow foxtail helps improve forage production.

Proper management of the vegetation helps encourage and protect timber regeneration. The site can pro-

duce forage for a varying number of years, depending on the extent of logging, available seed source, treatment following logging, and management.

The Potlatch soil is well suited to long term production of hay and pasture. A well balanced fertilization program, including the use of nitrogen, sulfur, and possibly phosphorus, helps obtain excellent plant growth and maintain good yields.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes tall fescue, timothy, meadow foxtail, creeping foxtail, and alsike clover.

Native plants supported by these Seelovers and Potlatch soils provide essential habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas provide food and cover favorable to wildlife.

The main limitations for homesites, roads, and sanitary facility installation are the high water table and the hazard of flooding. The construction of roads is limited by the high potential for frost action.

Drainage designers need to consider the moderately slow to very slow permeability of the soil. Excavated ponds are suited to these soils.

Potential recreational uses are limited by the high water table and the hazard of flooding.

This map unit is in capability subclass Vw.

174-Selle fine sandy loam, 0 to 7 percent slopes. This Selle soil is a very deep, well drained soil that formed in sandy, glaciolacustrine sediment. It is on glaciolacustrine terraces. Slopes are nearly level to undulating. Elevation is 2,100 to 2,500 feet. The average annual precipitation is 27 inches, average annual air temperature is 43 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are small areas of Rubson silt loam, 0 to 20 percent slopes; Chatcolet silt loam and Mokins silt loam, both with 5 to 20 percent slopes; and Bonner silt loam and Rathdrum silt loam, both with 0 to 7 percent slopes.

Typically, the surface layer of this Selle soil is yellowish brown fine sandy loam about 6 inches thick. The subsoil is yellowish brown and light yellowish brown fine sandy loam about 11 inches thick. The substratum below a depth of 17 inches is light yellowish brown and very pale brown fine sandy loam and loamy fine sand. The soil is slightly acid throughout.

The rooting depth is 60 inches or more, and the available water capacity is low to moderate. Permeability is moderately rapid, runoff is slow, and the hazard of erosion is slight.

This soil is mainly used for woodland, pasture, hay, and some small grain.

Limitations for cropland are the cool soil temperatures and the soil conditions caused by the sandy nature of the soil.

This soil can produce reasonably good growth of small grain. Use of straw is beneficial in a small grain program. Intensive tillage, such as summer fallow, can be harmful. Fertilization is needed and should include nitrogen, phosphorus, and sulfur. This soil is suited to sprinkler irrigation.

This Selle soil is suited to western redcedar, grand fir, Douglas-fir, western white pine, and western larch. It is capable of producing about 10,350 cubic feet per acre, 0.6 inch and more in diameter, or 34,600 board feet (Scribner rule) of merchantable timber 12.6 inches or more in diameter from an unmanaged stand of 80-year old trees. Conventional methods can be used for tree harvest.

After the timber is harvested, this soil can be used for pasture and hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain fair plant growth. Phosphorus is also needed where legumes are grown.

Pasture benefits from a rotation grazing system during the growing season and minimum stubble heights for livestock turn-on and removal. Adapted, improved forage includes intermediate wheatgrass, smooth bromegrass, Regar bromegrass, orchardgrass, alfalfa, and clover.

This Selle soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to such adapted species as orchardgrass, timothy, tall fescue, and white Dutch clover.

Native forage includes pine reedgrass, sedges, and redstem ceanothus. Proper management of vegetation helps to protect timber regeneration and insure adequate litter for soil protection.

After the canopy is open, this soil can produce forage for livestock and big game animals for 10 to 15 years. Total production can vary from about 1,500 pounds of air-dry herbage per acre per year to less than 250 pounds per acre.

Native plants provide the essential habitat for whitetailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

This soil is suited to dwellings. The main limitation for homesites and sanitary facilities is the rapid permeability in the substratum. This soil is suited to septic tank absorption fields; however, ground water pollution is a hazard. Community sewage systems should be considered in areas of high population density. This soil is suited to most recreational development.

This map unit is in capability subclass IVs.

175-Setters silt loam, 3 to 20 percent slopes. This Setters soil is a very deep, moderately well drained soil that formed in deep loess. It is mainly on ridgetops of dissected loess plains. Elevation is 2,300 to 2,800 feet. The average annual precipitation is 25 inches, average annual air temperature is 44 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are areas of Santa silt loam, 3 to 20 percent slopes; Taney silt loam, 3 to 25

percent slopes; and Setters silt loam, 3 to 20 percent slopes, eroded.

Typically, the surface layer of this Setters soil is brown silt loam about 11 inches thick, and is slightly acid and medium acid. The subsoil is brown silt loam about 5 inches thick, and is medium acid. The subsurface layer is very pale brown silt loam about 1 inch thick, and is medium acid. The lower part of the subsoil is yellowish brown and pale brown silty clay to a depth of 60 inches, and is slightly acid to neutral.

The rooting depth is 60 inches or more. A perched water table is at a depth of 12 to 24 inches during spring. The available water capacity is high. Permeability is very slow, runoff is rapid, and the hazard of erosion is high.

Most areas of this soil are used for such crops as wheat, barley, peas, lentils, grass seed, grass-legume hay, and pasture. A few areas are used for timber production and grazing.

This soil is mainly cultivated and is in an irregular pattern associated with the more extensive Taney soils. The silty clay subsoil increases potential for runoff and results in considerable soil loss during agricultural use. The thickness of the topsoil is less than that of the other soils with which it is associated. Continuous cropping, use of crop residue, and minimum tillage are adequate methods of conservation on slopes less than 8 percent. On steeper slopes, extra runoff protection can be provided by field strips or sod crops. Diversions and gradient terraces are helpful when slopes are moderate. Grassed waterways are needed where natural drainageways cross the land. Nitrogen, sulfur, and sometimes phosphorus are needed in all cropping systems.

This soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 4,100 cubic feet per acre, 0.6 inch and more in diameter, or 7,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the seedling mortality, and the very slowly permeable subsoil and resultant perched water table during the rainy winter and spring months. Some wind-blown trees can be expected because of the restricted rooting depth. Conventional methods can be used for tree harvest, but may be limited during the rainy period. The harvest methods and site preparation planning can establish an adequate stand of desirable seedlings.

This soil is well suited to hay and pasture. A well balanced fertilization program, including the use of nitrogen, sulfur, and possibly phosphorus, helps obtain and maintain good plant growth.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, and alfalfa.

Important forage plants include elk sedge, bluebunch wheatgrass, bluegrass, American vetch, rose, and willow. A variety of shrubs may dominate the site once the canopy is opened. Proper management of the vegetation helps protect the regeneration of timber and increase the production of elk sedge, Idaho fescue, and bluebunch wheatgrass.

The soil has potential for grazing, especially when the canopy has been opened. Forage production can be increased by seeding disturbed areas to grass.

When well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 200 pounds.

This soil has fair potential for woodland or rangeland wildlife habitat. Upland game birds appear where crops provide necessary food and shelter.

Limitations for homesites and sanitary facilities are slope, very slow permeability, and the perched water table. The construction of buildings and roads is also limited by the inherent low strength of the soil, the perched water table, potential frost action damage, and the high shrink-swell potential of the soil during wetting and drying.

Recreational facilities are limited by slope, the tendency of the soil surface to be dusty when dry, and the very slow permeability of the subsoil.

This map unit is in capability subclass IVe.

176-Setters silt loam, 3 to 20 percent slopes, eroded. This Setters soil is a very deep, moderately well drained soil that formed in deep loess. It is mainly on ridgetops of dissected loess plains. Elevation is 2,300 to 2,800 feet. The average annual precipitation is 25 inches, average annual air temperature is 44 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are areas of Santa silt loam, 3 to 20 percent slopes; Taney silt loam, 3 to 25 percent slopes; and Setters silt loam, 3 to 20 percent slopes.

Typically, the surface layer of this Setters soil is brown silt loam about 6 inches thick, and is slightly acid and medium acid. The subsoil is brown silt loam about 5 inches thick, and is medium acid. The subsurface layer is very pale brown silt loam about 1 inch thick, and is medium acid. The lower part of the subsoil is yellowish brown and pale brown silty clay to a depth of 60 inches, and is slightly acid to neutral.

The rooting depth is 60 inches or more, and the available water capacity is high. There is a perched water table at a depth of 9 to 18 inches in spring. Permeability is very slow, runoff is very rapid, and the hazard of erosion is very high.

Most areas of this soil are used for such crops as wheat, barley, peas, lentils, grass seed, grass-legume hay, and pasture. A few areas are used for timber production and grazing.

This Setters soil is mainly cultivated and is in an irregular pattern associated with the more extensive Taney soils. The silty clay subsoil increases potential for runoff

and results in much soil loss during agricultural use. The thickness of the topsoil is less than that of the other soils with which it is associated. Continuous cropping, use of crop residue, and minimum tillage are adequate methods of conservation on moderate slopes less than 8 percent. On steeper slopes, extra runoff protection can be provided by field strips or sod crops. Diversions and gradient terraces are helpful when slopes are moderate. Grassed waterways are needed where natural drainageways cross the land. Nitrogen, sulfur, and sometimes phosphorus are needed in all cropping systems.

Proper hay and pasture planting involves the use of species of grasses and legumes best suited for this Setters soil. Proper management includes rotation grazing, deferred grazing, or limited grazing to allow proper regrowth of grass-legume crops after grazing.

This soil is suited to ponderosa pine and Douglas-fir. It is capable of producing about 4,100 cubic feet per acre, 0.6 inch and more in diameter, or 7,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the seedling mortality and the very slowly permeable lower part of the subsoil, which results in a perched water table during the rainy winter and spring months. Some wind-thrown trees can be expected because of the limited rooting depth. Conventional methods can be used for tree harvest, but may be limited during the rainy period. Harvest methods and site preparation need to be carefully planned to establish an adequate stand of desirable seedlings.

This soil has potential for grazing, especially when the canopy has been opened. Forage production can be increased by seeding disturbed areas to grass.

Forage plants include elk sedge, bluebunch wheatgrass, bluegrass, American vetch, rose, and willow. A variety of shrubs may dominate the site when the canopy is open. Proper management of the vegetation helps protect the regeneration of timber and increase the production of elk sedge, Idaho fescue, and bluebunch wheatgrass.

The Setters soil is well suited to hay and pasture. A well balanced fertilization program, including the use of nitrogen, sulfur, and possibly phosphorus, helps obtain and maintain good plant growth.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, and alfalfa.

If well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 200 pounds for 20 to 30 years.

This soil has fair potential for woodland or rangeland wildlife habitats. Upland game birds appear where crops provide necessary food and shelter.

Limitations for homesites and most sanitary facilities are the very slow permeability and the perched water table. The construction of buildings and roads is limited by the inherent low strength of the soil, the perched water table, potential frost action damage, and the high shrink-swell potential of the soil during wetting and drying.

Recreational facilities are limited by slope, the tendency of the soil surface to be dusty when dry, and the very slow permeability of the subsoil.

This map unit is in capability subclass IVe.

177-Skalan gravelly loam, 5 to 25 percent slopes. This Skalan soil is a moderately deep, well drained soil that formed in material weathered from gneiss and other metamorphic rocks mixed with small amounts of volcanic ash and loess in the upper part of the profile. It is on mountain foot slopes. Elevation is 2,100 to 3,500 feet. The average annual precipitation is 25 inches, average annual air temperature is 47 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Kruse silt loam and Ulricher loam, both with 5 to 20 percent slopes; Lenz loam and Schumacher silt loam, both with 5 to 35 percent slopes; and small areas of Rock outcrop.

Typically, the surface layer of this Skalan soil is dark grayish brown gravelly loam about 3 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown very gravelly clay loam and very gravelly loam about 15 inches thick, and is medium acid. The substratum is light yellowish brown very gravelly loam about 12 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is very low. Permeability is moderate, runoff is rapid to very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland, hay, pasture, and some small grain.

Use for cropland is marginal because of the depth to rock and droughtiness. Erosion is a hazard when the soil is intensively cultivated. Conservation methods maintain crop residue under a small grain program and use grasses and legumes for hay or pasture. Fertilization and weed control are necessary.

This Skalan soil is suited to ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the erosion hazard and seedling mortality. Conventional methods can be used for tree harvest, but road construction may be restricted because of the depth to rock. Reforestation requires some shade from large trees to prevent the tree seedlings from dying during the hot summer months. Logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass or tall fescue.

Native forage includes bluebunch wheatgrass, rough fescue, blue wildrye, and trisetum. Proper management of the vegetation helps protect timber regeneration and increase the production of bluebunch wheatgrass and rough fescue.

If well managed, this soil can continually produce forage for livestock. If not managed, the total production can vary from about 1,200 pounds of air-dry herbage per acre per year to less than 200 pounds per acre for 20 to 30 years.

After the timber is harvested, this soil can be used for pasture and hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain fair plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, intermediate wheatgrass, and alfalfa.

Native plants provide some essential habitat elements for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitations for homesites, roads, and sanitary facilities are depth to rock and slope on steeper areas. Recreational areas are limited by slope and small stones.

This map unit is in capability subclass IVe.

178-Skalan-Rock outcrop complex, 5 to 30 percent slopes. These sloping to moderately steep soils are on mountainsides. Elevation is 2,200 to 3,500 feet. The average annual precipitation is 25 inches, average annual air temperature is 47 degrees F, and average frost-free period is 110 days.

The Skalan soil makes up about 55 percent of the map unit, and Rock outcrop areas make up about 35 percent. Tekoa extremely stony silt loam, Lenz very stony loam, and a soil similar to the Skalan soil, but which is less than 20 inches to bedrock make up the remaining 10 percent of this complex.

The Skalan soil is a moderately deep, well drained soil over gneiss. It formed in material weathered from gneiss and other related metamorphic rocks mixed with small amounts of volcanic ash and loess in the upper part of the profile.

Typically, the surface layer of the Skalan soil is dark grayish brown gravelly loam about 3 inches thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown very gravelly clay loam and very gravelly loam about 15 inches thick, and is medium acid. The substratum is light yellowish brown very gravelly loam about 12 inches thick, and is medium acid. Fractured gneiss bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is low. Permeability is moderate, runoff is rapid to very rapid, and the hazard of erosion is high to very high.

The Rock outcrop areas are exposures of bare gneiss or other metamorphic rocks having some soil material in the cracks and crevices.

This complex is used for woodland and limited grazing. This Skalan soil is suited to ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the erosion hazard, rock outcrops, and seedling mortality. Conventional methods can be used for tree harvest, but road construction can be limited because of rock outcrops and depth to rock. Reforestation may require some shade from large trees to prevent the tree seedlings from dying during the hot summer months. Logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

The Skalan soil has potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass or tall fescue.

Native forage includes bluebunch wheatgrass, rough fescue, blue wildrye, and trisetum. Proper management of the vegetation helps protect timber regeneration and increase the production of bluebunch wheatgrass and rough fescue.

If well managed, this soil can continually produce forage for livestock. If not managed, forage can be produced for 20 to 30 years. The total production can vary from about 1,200 pounds of air-dry herbage per acre per year to less than 200 pounds per acre.

The Rock outcrop areas have no value for grazing by livestock. They often interfere with movement of livestock, which limits accessibility of forage.

The vegetation provides some essential habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

The main limitations for homesites, roads, and sanitary facilities are depth to rock, small stones, slope, and rock outcrops. The main limitations for recreational areas are the rock outcrops, small stones, and slope.

This map unit is in capability subclass VIIs.

179-Slickens. This miscellaneous area is made up of poorly drained accumulations of medium textured materials, separated in ore mill operations, over stratified moderately fine and fine textured soils and organic material. It is on the flood plain along the Coeur d'Alene River and mainly consists of mine tailings from the Coeur d'Alene Mining District and alluvium from yearly overflow. Slope

is 0 to 2 percent. The average annual precipitation is 30 inches, average annual air temperature is 44 degrees F, and average frost-free period is 100 days.

Included with this miscellaneous area in mapping are small areas of Pywell muck, Aquic Xerofluvents, Cougarbay silt loam, and Ramsdell silt loam, all with slopes of 0 to 2 percent.

Typically, this material is freshly ground rock that has been chemically treated during the milling process. It is often mixed and stratified with soil and organic materials. The material is detrimental to plant growth because of the salinity and high concentrations of heavy metals.

Permeability and the available water capacity are variable. Runoff is slow. Erosion by channelization is a hazard during yearly overflow.

This miscellaneous area has severe limitations for cropland, hay, or pasture because of the high water table, flooding, and the nature of the material.

Parts of this miscellaneous area have good potential for wetland wildlife habitat. Use by other wildlife is limited by the lack of food and cover.

Severe limitations for all structural development and recreational areas are flooding and the high water table. This map unit is in capability subclass VIIIw.

180-Southwick silt loam, 3 to 12 percent slopes. This Southwick soil is a very deep, moderately well drained soil that formed in loess. It is on loess-covered hills. Elevation is 2,400 to 3,000 feet. The average annual precipitation is 23 inches, average annual air temperature is 46 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are small areas of Larkin and Taney silt loams, both with 3 to 12 percent slopes; and Worley silt loam, 5 to 12 percent slopes.

Typically, the upper part of the surface layer of this Southwick soil is dark grayish brown silt loam about 10 inches thick. The lower part of the surface layer is grayish brown silt loam about 11 inches thick. The subsurface layer is pale brown and light gray silt loam about 13 inches thick. The surface and subsurface layers are slightly acid. The subsoil below a depth of 34 inches is light yellowish brown silty clay loam, and is neutral.

The rooting depth is 60 inches or more. The available water capacity is high. A perched water table is at a. depth of 31 to 46 inches in spring. Permeability is slow, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for small grain, peas, lentils, grass seed, hay, pasture, and timber production.

This soil has a wide range of crop adaptability. It is adjacent to the prairie soils in the western part of the county. Where management is good, this soil produces good growth of all adapted crops. Erosion is not difficult to control if continuous cropping and minimum tillage are used. If peas and lentils are grown in the system, extra protection against runoff is necessary in the form of divided slope farming. Use of crop residue is also necessary. Grassed waterways are needed on all major drainageways where cutting and gully formation are hazards. Other desirable methods are terraces and contour farming. Nitrogen, sulfur, sometimes phosphorus, and chemical weed control are necessary in all cropping systems.

This Southwick soil is suited to ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the slowly permeable subsoil, resulting in a perched water table during the rainy winter and spring months. Roads tend to rut, and traction of the soil for equipment is poor. Conventional tree harvest methods can be used, but may be limited during the rainy period.

After the timber is removed, this soil is suited to pasture and hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, Regar brome, and alfalfa.

This soil has a good potential for grazing, especially when the canopy has been opened. Forage production can be increased by seeding disturbed areas to adapted grasses.

Forage plants include Idaho fescue, bluebunch wheatgrass, blue wildrye, bluegrass, hawkweed, and arrowleaf balsamroot. Low shrubs such as snowberry and white spirea may dominate the site once the canopy is opened. Proper management of the vegetation helps protect the timber regeneration and increase the production of Idaho fescue and bluebunch wheatgrass.

If well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 200 pounds for 25 to 40 years.

This soil has good potential for openland, woodland, and rangeland wildlife habitats. Areas in grain are good for upland game, such as cottontail rabbit, ring-necked pheasant, and Hungarian partridge, if cover is provided. Other kinds of wildlife in woodland areas are white-tailed deer, songbirds, and black bear.

Limitations for sanitary facilities and homesites are slow permeability and a perched water table in spring. The construction of roads is limited by potential frost action damage, the inherent low support strength of the soil, and the shrink-swell potential of the soil during wetting and drying.

The design and installation of terraces, diversions, and grassed waterways are subject to the complex slopes, wetness, slow permeability, and the erodibility of the soil. Limitations for recreational facilities are slope and dustiness during summer.

This map unit is in capability subclass IIIe.

181-Southwick silt loam, 12 to 20 percent slopes. This Southwick soil is a very deep, moderately well drained soil that formed in loess. It is on loess-covered hills. Elevation is 2,400 to 3,000 feet. The average annual precipitation is 23 inches, average annual air temperature is 46 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Larkin and Taney silt loams, both with slopes of 12 to 20 percent; and Worley silt loam, 10 to 25 percent slopes.

Typically, the upper part of the surface layer of this Southwick soil is dark grayish brown silt loam about 10 inches thick. The lower part of the surface layer is grayish brown silt loam about 11 inches thick. The subsurface layer is pale brown and light gray silt loam about 13 inches thick. The surface and subsurface layers are slightly acid. The subsoil below a depth of 34 inches is light yellowish brown silty clay loam, and is neutral.

The rooting depth is 60 inches or more. The available water capacity is high. A perched water table is at a depth of 30 to 46 inches in spring. Permeability is slow, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for wheat, barley, peas, lentils, grass seed, hay, pasture, and the production of timber.

This soil, adjacent to the prairie soils in the western part of the county, has a wide range of crop adaptability. If management is good, the soil produces good growth of all adapted crops. An adequate conservation program includes small grain and peas along with minimum tillage and crop residue utilization. Nitrogen, sulfur, and chemical weed control are necessary in all cropping systems. Phosphorus is also needed when legumes are grown.

The steepness of the slopes imposes a hazard of erosion that requires additional support from field strips and divided slope farming. Grassed waterways help prevent gullies in the natural drainageways where runoff is significant. Other erosion control methods are contour farming, terraces, and field stripcropping. Legume-grass crops are an alternative for control of erosion on this soil.

This Southwick soil is suited to ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slow permeability and perched water table. They cause the surface soil to rut easily and poor traction during the rainy winter and spring months. Conventional methods can be used for tree harvest, but may be limited during the rainy period.

After the timber is removed, this soil is suited to pasture and hay. Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, Regar brome, and alfalfa.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased by seeding disturbed areas to adapted grasses.

Forage plants include Idaho fescue, bluebunch wheat grass, blue wildrye, bluegrass, rose, and hawkweed. A variety of shrubs may dominate the site once the canopy is opened. Proper management of the vegetation helps protect the timber regeneration and increase the production of grasses.

If well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 200 pounds for 25 to 40 years.

Areas of this soil have good potential for woodland or rangeland wildlife habitats. Wooded areas support white-tailed deer, black bear, small rodents, ruffed grouse, and various songbirds.

The main limitations for homesites and sanitary facilities are slow permeability, a perched water table during the rainy season, and slope. Community sewage systems should be considered in areas of high density population. The construction of buildings and roads is limited mainly by slope, potential frost action damage, and the inherent low strength of the soil.

Plans for embankments, terraces, diversions, and grassed waterways are limited by the complex slope, wetness, permeability, and the erodibility of the soil.

Limitations for recreational development are slope, slow permeability, and the tendency of the soil surface to be dusty when dry.

This map unit is in capability subclass IVe.

182-Southwick silt loam, 3 to 20 percent slopes, eroded. This Southwick soil is a very deep, moderately well drained soil that formed in loess. It is on dissected, loess-covered plains. Elevation is 2,400 to 3,000 feet. The average annual precipitation is 23 inches, average annual air temperature is 46 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Larkin and Taney silt loams, both with 3 to 20 percent slopes; and Worley silt loam, 5 to 25 percent slopes.

Typically, the upper part of the surface layer of this Southwick soil is dark grayish brown silt loam about 6 inches thick. The lower part of the surface layer is grayish brown silt loam about 11 inches thick. The subsurface layer is pale brown and light gray silt loam about 13 inches thick. The surface and subsurface layer are slightly acid. The subsoil below a depth of 30 inches is light yellowish brown silty clay loam, and is neutral.

The rooting depth is 60 inches or more. The available water capacity is high. A perched water table is at a depth of 26 to 40 inches in spring. Permeability is slow, runoff is very rapid, and the hazard of erosion is very high.

This soil is mainly used for wheat, barley, peas, lentils, hay, grass seed, pasture, and the production of timber.

The shallow nature of the topsoil causes special problems of water infiltration, storage, and runoff. The usual cropping system on this soil is similar to that used on the uneroded Southwick soil. However, an erosion control program requires the use of minimum tillage and crop residue. It also requires such extra protection from runoff as field strips, diversion terraces, or long term sod crops. Such low residue crops as peas or lentils do not provide enough surface residue during the runoff season, and the moisture storage is low. On moderate slopes, continuous cropping is an adequate conservation practice. On slopes steeper than about 12 percent, the above mentioned method is needed. Grassed waterways are sometimes needed. All cropping systems need nitrogen, sulfur, weed control, and phosphorus when legumes are grown.

After the timber is removed, this soil is suited to pasture and hay. Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, Regar brome, and alfalfa.

This Southwick soil is suited to ponderosa pine. It is capable of producing about 9,000 cubic feet per acre, 0.6 inch and more in diameter, or 6,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the slowly permeable subsoil and resultant perched water table during the rainy winter and spring months. Roads tend to rut, and traction of the soil for equipment is poor. Conventional methods can be used for tree harvest, but may be limited during the rainy period.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased by seeding disturbed areas to adapted grasses.

Forage plants include Idaho fescue, bluebunch wheatgrass, blue wildrye, hawkweed, and arrowleaf balsamroot. Low shrubs such as snowberry and white spirea may dominate the site once the canopy is opened. Proper management of the vegetation helps protect timber regeneration and increase the production of Idaho fescue and bluebunch wheatgrass.

If well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds for 25 to 40 years.

This soil has good potential for openland, woodland, and rangeland wildlife habitats. Areas in grain are good for upland game such as cottontail rabbit, ring-necked pheasant, and Hungarian partridge, if cover is provided. Other kinds of wildlife in wooded areas are white-tailed deer, songbirds, and black bear.

Limitations for sanitary facilities and homesites are the slow permeability, a seasonal perched water table, and slope. The construction of buildings and roads is limited by slope, the inherent low strength of the soil, potential frost action damage, and the shrink-swell potential of the soil during wetting and drying.

Recreational development is limited by slope and by a tendency for the surface to be dusty when dry.

The design and installation of terraces, diversions, and grassed waterways are limited by the complex slopes, the slow permeability, wetness, and the erodibility of the soil.

This map unit is in capability subclass IVe.

183-Spokane loam, 5 to 30 percent slopes. This Spokane soil is a moderately deep, well drained soil that formed in material weathered from gneiss, schist, or granite mixed with loess in the upper part of the profile. It is on mountain foot slopes. Elevation is 2,200 to 3,000 feet. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are small areas of Lenz loam, Moscow loam, Ulricher loam, and Skalan gravelly loam, all with slopes of 5 to 35 percent; and small areas of Spokane loam, 30 to 65 percent slopes.

Typically, the upper part of the surface layer of this Spokane soil is dark brown loam about 8 inches thick. The lower part of the surface layer is brown gravelly loam about 6 inches thick. The subsoil is yellowish brown gravelly loam about 9 inches thick. The substratum is light yellowish brown gravelly sandy loam about 4 inches thick. This soil is slightly acid throughout. Weathered schist bedrock is at a depth of about 27 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is low. Permeability is moderately rapid, runoff is rapid to very rapid, and the hazard of erosion is high.

This soil is mainly used for woodland and grazing. A few small areas are used for hay, pasture, or small grain. This soil is limited for use as cropland because of the depth to bedrock and the high hazard of erosion.

This Spokane soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the depth to rock, which may restrict road construction. Conventional methods can be used for tree harvest, but landings, logging roads and skid trails need to be carefully planned to minimize soil losses.

This soil has good potential for grazing (fig. 12), especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, tall fescue, and tall oatgrass.

Native forage includes bluebunch wheatgrass, Idaho fescue, elk sedge, rose, and snowberry. Proper management of the vegetation helps protect the regeneration of

Figure 12.-A good cover of Idaho fescue and bluebunch wheatgrass on Spokane loam used for grazing.

timber and increase the production of bluebunch wheatgrass and Idaho fescue.

If well managed, this soil can continually produce forage for livestock. If not managed, the total production can vary from about 1,400 pounds of air-dry herbage per acre per year to less than 400 pounds for 20 to 25 years.

Native plants provide some habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitations for homesites, roads, and sanitary facilities are slope, depth to bedrock, and rapid permeability of the substratum. Slope is also a limitation for picnic areas, camp areas, and paths and trails.

This map unit is in capability subclass IVe.

184-Spokane loam, 30 to 65 percent slopes. This Spokane soil is a moderately deep, well drained soil that formed in material weathered from gneiss, schist, or granite mixed with loess in the upper part of the profile. It is on mountainsides. Slopes are steep to very steep. Elevation is 2,200 to 3,000 feet. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Moscow loam, Lenz loam, and Ulricher loam, all with 35 to 65 percent slopes.

Typically, the upper part of the surface layer of this Spokane soil is dark brown loam about 8 inches thick. The lower part of the surface layer is brown gravelly loam about 6 inches thick. The subsoil is yellowish brown gravelly loam about 9 inches thick. The substratum is light yellowish brown, gravelly sandy loam about 4 inches thick. Weathered schist bedrock is at a depth of about 27 inches. This soil is slightly acid throughout.

The rooting depth is 20 to 40 inches. The available water capacity is very low to low. Permeability is moderately rapid, runoff is very rapid, and the hazard of erosion is very high.

This soil is used for woodland, wildlife habitat, and limited grazing.

This Spokane soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope, erosion hazard, and depth to rock. The latter may limit road construction. The slope is too steep for the operation of conventional logging equipment. Specialized logging methods that cause a minimum amount of soil disturbance need to be considered.

This Spokane soil has limited potential for grazing when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, tall fescue, and tall oatgrass.

Native forage includes bluebunch wheatgrass, Idaho fescue, elk sedge, rose, and snowberry: 1 Proper management of the vegetation helps protect timber regeneration and increase the production of bluebunch wheatgrass and Idaho fescue.

If well managed, this soil can continually produce forage for livestock. If not managed, the total production can vary from about 1,200 pounds of air-dry herbage per acre per year to less than 400 pounds for 20 to 25 years. The steep slopes severely limit movement of livestock and accessibility of forage.

Native plants provide essential habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

Maintaining watershed potential helps keep soil losses to a minimum. The main concern is the careful management of the timber resource and understory vegetation.

All structural development is limited by slope. Homesites and sanitary facilities are also limited by the depth to rock and the rapid permeability of the subsoil. Recreational development is limited by the steep slopes.

This map unit is in capability subclass VIIe.

185-Spokane-Moscow association, 35 to 65 percent slopes. This association is made up of moderately deep soils on mountainsides. Elevation is 2,500 to 3,600 feet. The average annual precipitation is 25 inches, average annual air temperature is 44 to 47 degrees F, and average frost-free period is 90 to 110 days.

This association is about 45 percent Spokane loam and 35 percent Moscow loam. The Spokane soil is on southern and western aspects, and the Moscow soil is on northern and eastern aspects.

Included with this association in mapping are small areas of Vassar silt loam and Ulricher loam, both having 35 to 65 percent slopes.

The Spokane soil is a moderately deep, well drained soil over weathered schist. It formed in material weathered from gneiss, schist, or granite mixed with loess in the upper part of the profile.

Typically, the upper part of the surface layer of this Spokane soil is dark brown loam about 8 inches thick. The lower part of the surface layer is brown gravelly loam about 6 inches thick. The subsoil is yellowish brown gravelly loam about 9 inches thick. The substratum is light yellowish brown gravelly sandy loam about 4 inches thick. Weathered schist bedrock is at a depth of about 27 inches. This soil is slightly acid throughout.

The rooting depth is 20 to 40 inches. The available water capacity is very low to low. Permeability is moderately rapid, runoff is very rapid, and the hazard of erosion is very high.

The Moscow soil is a moderately deep, well drained soil over weathered granite. It formed in material weathered from granite, gneiss, or schist with a mantle of loess and volcanic ash.

Typically, the surface layer of the Moscow soil is very dark grayish brown loam about 1 inch thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown loam about 25 inches thick, and is slightly acid. Weathered granitic bedrock is at a depth of about 26 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

These soils are mainly used for woodland and limited grazing.

The Spokane soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 5,900 cubic feet per acre, 0.6 inch and more in diameter, or 18,500 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The Moscow soil is also suited to Douglas-fir and ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope, erosion hazard, and depth to rock. The latter can limit road construction. The natural slope is too steep to operate conventional logging equipment; therefore, specialized logging equipment that causes a minimum of soil disturbance needs to be considered to keep soil losses at a minimum.

Native forage includes elk sedge, bluebunch wheatgrass, Idaho fescue, rose, and snowberry. Proper management of the vegetation on the Spokane soil helps protect timber regeneration and increase the production of bluebunch wheatgrass and elk sedge.

The Spokane soil has limited potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided

by seeding disturbed areas to adapted species such as orchardgrass, timothy, and tall fescue.

If well managed, this soil can continually produce forage for livestock. If not managed, the total production can vary from about 1,200 pounds of air-dry herbage per acre per year to less than 400 pounds for 20 to 30 years. The steep slopes severely limit movement of livestock and accessibility of forage.

Native forage on the Moscow soil includes Columbia brome, elk sedge, redstem ceanothus, and willow. Proper management of the vegetation helps protect the timber regeneration and insure adequate litter for soil protection.

The Moscow soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, tall fescue, orchardgrass, and white Dutch clover.

This soil can produce forage for livestock and big game animals for 15 to 20 years after the canopy has been opened. During this period total production can vary from about 1,500 pounds of air-dry herbage per acre per year to less than 150 pounds per acre. The steep slopes severely limit movement of livestock and accessibility of forage.

The vegetation supported by these soils provides habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

Maintaining watershed potential helps keep soil losses to a minimum. The primary concern is the careful management of the timber resource and understory vegetation.

All structural development is limited by the slope, and homesites and sanitary facilities are also limited by the depth to rock and the rapid permeability of the substratum. Recreational developments are limited by the steep slope.

This map unit is in capability subclass VIIe.

186-Taney silt loam, 3 to 7 percent slopes. This Taney soil is a very deep, moderately well drained soil that formed in deep loess with a minor influence from volcanic ash. It is on loess hills. Elevation is 2,300 to 3,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Larkin, Santa, Setters, and Southwick silt loams, all with slopes of 3 to 7 percent; and Worley silt loam, 5 to 7 percent slopes.

Typically, the upper part of the surface layer of this Taney soil is dark grayish brown silt loam about 9 inches thick, and is medium acid. The lower part of the surface layer is brown and pale brown silt loam about 12 inches thick, and is slightly acid. The subsurface layer is light gray silt loam about 5 inches thick, and is medium acid. The subsoil is yellowish brown and light yellowish brown silty clay loam to a depth of 60 inches, and is medium acid.

The rooting depth is 60 inches or more. The available water capacity is high. A perched water table is at a depth of 18 to 30 inches in spring. Permeability is slow, runoff is medium, and the hazard of erosion is moderate.

This soil is mainly used for small grain, peas, lentils, grass for seed production, hay, pasture, and woodland.

If well managed, this soil produces satisfactory crop growth. It erodes more easily than the darker colored soils of the grassland area, and requires a stronger erosion control program. Minimum tillage and use of crop residue are especially important, and continuous cropping provides an adequate cropping system. Grassed waterways, contour farming, divided slope farming, diversions, and gradient terraces are needed. Nitrogen, sulfur, sometimes phosphorus, and chemical weed control are also necessary.

When the timber is removed, the soil is suited to pasture and hay. Yields are good, with a high level of management and a well balanced fertilization program. Nitrogen and sulfur are essential, as well as phosphorus if legumes are included in the stand.

Pasture benefits from a rotation grazing system during the growing season, and minimum stubble heights for livestock turn-on and removal. Adapted, improved forage includes Latar orchardgrass, smooth brome, Regar brome, and alfalfa.

This soil is suited to ponderosa pine and Douglas-fir. On an acre of land, it can produce about 7,100 cubic feet, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the slowly permeable subsoil resulting in a perched water table. When the soil is wet, roads tend to rut, and traction of the soil for equipment is poor. Conventional methods can be used for tree harvest, but may be limited during the rainy period.

This soil has potential for grazing, especially when the canopy has been opened. Forage production can be increased by seeding disturbed areas to grass.

Native forage includes Idaho fescue, bluebunch wheatgrass, bluegrass, blue wildrye, and American vetch. Tall, relatively unpalatable shrubs may dominate the site once the canopy is opened. Proper management of the vegetation helps to protect the timber regeneration and increase production of grasses.

If well managed, this soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from 2,000 pounds of air-dry herbage per acre per year to less than 200 pounds for 15 to 20 years.

This soil provides good woodland and rangeland wildlife habitat. It is fairly good for openland wildlife. Upland game birds populate cultivated areas where food and cover are available. White-tailed deer, black bear, snowshoe hare, squirrels, chipmunks, small rodents, ruffed grouse, and songbirds do well in wooded areas.

The planning and installation of terraces, diversions, and grassed waterways are limited by the slow permeability, the complex slopes, and wetness.

Limitations for homesites and septic tank absorption fields are the slow permeability of the subsoil and the seasonal perched water table. The primary limitations for the construction of roads are potential frost action damage and the inherent low support strength of the soil.

Recreational facilities are limited by the dustiness of the soil surface when it is dry.

This map unit is in capability subclass IIIe.

187-Taney silt loam, 7 to 25 percent slopes. This Taney soil is a very deep, moderately well drained soil that formed in deep loess having a minor influence from volcanic ash. It is on loess hills. Elevation is 2,300 to 3,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Larkin, Worley, Santa, Setters, and Southwick silt loams, all with slopes of 7 to 25 percent.

Typically, the upper part of the surface layer of this Taney soil is dark grayish brown silt loam about 9 inches thick, and is medium acid. The lower part of the surface layer is brown and pale brown silt loam about 12 inches thick, and is slightly acid. The subsurface layer is light gray silt loam about 5 inches thick, and is medium acid. The subsoil is yellowish brown and light yellowish brown silty clay loam to a depth of 60 inches, and is medium acid.

The rooting depth is 60 inches or more, and the available water capacity is high. A perched water table is at a depth of 18 to 30 inches in spring. Permeability is slow, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for small grain, peas, lentils, grass for seed production, hay, pasture, and woodland.

If well managed, this soil produces satisfactory crop growth. It erodes more easily than the darker colored soils of the grasslands and requires a stronger erosion control program. An adequate cropping system consists of continuous cropping using minimum tillage, residue, and some extra runoff control measures such as field strips (fig. 13), diversions, or gradient terraces. Grassed waterways are often necessary. Other desirable methods are contour farming and divided slope farming. Nitrogen, sulfur, and chemical weed control are needed, as well as phosphorus when legumes are grown.

This soil is suited to ponderosa pine and Douglas-fir. It can produce about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitation for timber production is the slowly permeable subsoil resulting in a perched water table.

Figure 13.-Stripcropping of wheat on Taney silt loam helps control erosion.

When the soil is wet, roads tend to rut and traction of the soil for equipment is poor. Conventional methods can be used for tree harvest, but may be limited during the rainy period.

This soil has potential for grazing, especially when the canopy has been opened. Forage production can be increased by seeding disturbed areas to grass.

Native forage includes Idaho fescue, bluebunch wheatgrass, bluegrass, blue wildrye, and American vetch. Tall, relatively unpalatable shrubs can dominate the site once the canopy is open. Proper management of the vegetation helps protect the regeneration of timber and increase the production of grasses.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, Regar brome, and alfalfa.

If well managed, this soil can produce forage for livestock and big game animals. If not managed, the total forage production can vary from 2,000 pounds of air-dry herbage per acre per year to less than 200 pounds of herbage per acre for 15 to 20 years.

This soil provides good woodland and rangeland wildlife habitat. It is fairly good for openland wildlife habitat. Upland game birds populate cultivated areas where food and cover are available. White-tailed deer, black bear, snowshoe hare, squirrels, chipmunks, small rodents, ruffed grouse, and songbirds do well in wooded areas.

The installation of terraces, diversions, and grassed waterways is subject to complex slopes and slow permeability.

Limitations for homesites and septic tank absorption fields are slope, the slow permeability of the subsoil, and a seasonal perched water table. The main limitations for roads are potential frost action damage, slope, and the inherent low support strength of the soil.

Recreational facilities are limited by slope and by the dustiness of the soil when it is dry.

This map unit is in capability subclass IVe.

188-Taney silt loam, 3 to 25 percent slopes, eroded. This Taney soil is a very deep, moderately well drained soil that formed in deep loess having a minor influence from volcanic ash. It is on loess hills. Elevation is 2,300 to 3,000 feet. The average annual precipitation is 25 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Larkin, Santa, Setters, and Southwick silt loam, all with slopes of 3 to 25 percent; and Worley silt loam, 5 to 25 percent slopes.

Typically, the upper part of the surface layer of this Taney soil is dark grayish brown silt loam about 9 inches thick, and is medium acid. The lower part of the surface layer is brown and pale brown silt loam about 12 inches thick, and is slightly acid. The subsurface layer is light gray silt loam about 5 inches thick, and is medium acid. The subsoil is yellowish brown and light yellowish brown silty clay loam to a depth of 60 inches, and is medium acid.

The rooting depth is 60 inches or more, and the available water capacity is high. A perched water table is at a depth of 18 to 30 inches in spring. Permeability is slow, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for small grain, peas, lentils, grass for seed production, hay, and pasture.

The shallow nature of the topsoil causes moisture storage and runoff. This soil is farmed together with the uneroded Taney soils. There is an acute hazard of erosion and a decline in crop growth because of the shallowness to the dense subsoil. Peas and lentils do not provide enough residue for control of erosion. Small grain in a continuous cropping sequence, using minimum tillage and crop residue, needs extra protection from field strips to adequately control soil erosion. Grassed waterways are needed where natural drainageways cross the land (fig. 14). In some cases, sod crops help control soil erosion. Nitrogen, sulfur, and sometimes phosphorus are needed in the cropping system.

This soil has potential for grazing. Forage production can be increased by seeding disturbed areas to grass.

Native forage includes Idaho fescue, bluebunch wheatgrass, bluegrass, blue wildrye, and American vetch. Tall, relatively unpalatable shrubs can dominate the site. Proper management of the vegetation helps increase the production of grasses.

This soil can produce forage for livestock and big game animals. Total forage production varies from 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds.

This soil has good potential for woodland and rangeland wildlife habitat. It is fairly good for openland wildlife habitat. Upland game birds populate cultivated areas where food and cover are available.

The installation of terraces, diversions, and grassed waterways is limited by complex slopes, wetness, and slow permeability.

Recreational facilities are limited by slope and by the dustiness of the soil when it is dry.

This map unit is in capability subclass IVe.

189-Tekoa gravelly silt loam, 5 to 20 percent slopes. This Tekoa soil is a moderately deep, well drained soil that formed in material weathered from shale, siltstone, or sandstone with a mixture of loess and volcanic ash in the upper part of the profile. It is on mountainsides. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Santa, Schumacher, and Southwick silt loams, all with 3 to 20 percent slopes; and Taney silt loam, 3 to 25 percent slopes.

Typically, the surface layer of this Tekoa soil is brown gravelly silt loam about 7 inches thick, and is slightly

Figure 14.-Newly seeded grassed waterway on Taney silt loam carries runoff water across the drainageway without cutting a gully.

acid. The upper part of the subsoil is brown very gravelly heavy silt loam about 7 inches thick, and is slightly acid. The lower part of the subsoil is light yellowish brown very gravelly silt loam about 16 inches thick, and is medium acid. Fractured sandstone bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches. The available water capacity is very low to low. Organic matter content in the surface layer is high. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is high.

This soil is used for timber production, grazing, and wildlife habitat. A few cleared areas are used for small grain, hay, and pasture.

Use of the soil for cropland and pasture is limited because of the depth to bedrock and the gravelly nature of the soil.

The soil is suited to ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitation for timber production is the low available water capacity that can influence seedling survival. Grasses and shrubs invade disturbed areas and will limit the regeneration of natural tree seedlings.

This soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grasses.

Native forage includes elk sedge, mountain maple, redstem ceanothus, pine reedgrass, and Idaho fescue. Creambush oceanspray and mallow ninebark, two relatively unpalatable shrubs, tend to dominate the site once the canopy is open. Proper management of the vegetation helps protect timber regeneration and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals after the canopy is opened. Total production varies from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds for 20 to 30 years.

Areas of this soil have good potential for woodland wildlife habitat. White-tailed deer, elk, black bear, chipmunks, squirrels, and forest grouse do well in wooded areas.

The main limitation for development of homesites and septic tank absorption fields is the depth to rock. Construction of roads is limited by potential frost action damage. Slope is a limitation on the steeper areas. The

main limitations for recreational facilities are dustiness, small stones, and slope.

This map unit is in capability subclass lVe.

190-Tekoa gravelly silt loam, 20 to 35 percent slopes. This Tekoa soil is a moderately deep, well drained soil that formed in material weathered from shale, siltstone, or sandstone with a mixture of loess and volcanic ash in the upper part of the profile. It is on mountainsides. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Ardenvoir gravelly loam, McCrosket gravelly silt loam, and Santa and Schumacher silt loams, all with 20 to 35 percent slopes; and Tekoa extremely stony silt loam, 5 to 35 percent slopes.

Typically, the surface layer of this Tekoa soil is brown gravelly silt loam about 7 inches thick, and is slightly acid. The upper part of the subsoil is brown very gravelly heavy silt loam about 7 inches thick, and is slightly acid. The lower part of the subsoil is light yellowish brown very gravelly silt loam about 16 inches thick, and is medium acid. Fractured sandstone bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches. The available water capacity is very low to low. Organic matter content in the surface layer is high. Permeability is moderately slow, runoff is very rapid, and the hazard of erosion is very high.

This soil is used for timber production, grazing, and wildlife habitat.

This Tekoa soil is suited to ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable' timber 11.6 inches and more in diameter from an unmanaged stand of 80-yearold trees.

The main limitations for timber production are the low available water capacity that can influence seedling survival, and the erosion hazard. Grasses and shrubs invade disturbed areas and limit the regeneration of natural tree seedlings.

This soil has potential for grazing when the tree canopy is opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted grass.

Native forage includes elk sedge, mountain maple, redstem ceanothus, pine reedgrass, and Idaho fescue. Creambush oceanspray and mallow ninebark, two relatively unpalatable shrubs, tend to dominate the site when the canopy is open. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals. Total production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds for 20 to 30 years.

This soil has good potential for woodland wildlife habitat for white-tailed deer, elk, black bear, chipmunks, squirrels, and forest grouse.

Homesite developments, roads, and sanitary facilities are severely limited by the slope and depth to rock. Road construction is limited by potential frost action damage. The main limitations for recreational facilities are slope and dustiness.

This map unit is in capability subclass Vle.

191-Tekoa gravelly silt loam, 35 to 65 percent slopes. This Tekoa soil is a moderately deep, well drained soil that formed in material weathered from shale, siltstone, or sandstone with a mixture of loess and volcanic ash in the upper part of the profile. It is on mountain slopes. Elevation is 2,500 to 4,000 feet. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are areas of Ardenvoir gravelly loam and McCrosket gravelly silt loam, both having 35 to 65 percent slopes.

Typically, the surface layer of this Tekoa soil is brown gravelly silt loam about 7 inches thick, and is slightly acid. The upper part of the subsoil is brown very gravelly heavy silt loam about 7 inches thick, and is slightly acid. The lower part of the subsoil is light yellowish brown very gravelly silt loam about 16 inches thick, and is medium acid. Fractured sandstone bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches, and the available water capacity is very low to low. Organic matter content in the surface layer is high. Permeability is moderately slow, runoff is very rapid, and the hazard of erosion is very high.

This Tekoa soil is used for timber production, watershed, and wildlife habitat.

The soil is suited to ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope, very high erosion hazard, and low available water capacity that can influence seedling survival. Specialized logging methods that cause a minimum of soil disturbance can keep soil losses at a minimum.

Maintaining watershed potential also helps keep soil losses to a minimum. The main concern is the careful management of the timber resource and understory vegetation.

Areas of this soil provide good woodland wildlife habitat for white-tailed deer, elk, black bear, chipmunks, squirrels, and forest grouse.

The very steep slope is a limitation for all potential structural and recreational development.

This map unit is in capability subclass VIIe,

192-Tekoa extremely stony silt loam, 5 to 35 percent slopes. This Tekoa soil is a moderately deep, well drained soil that formed in material weathered from shale, siltstone, or sandstone mixed with loess and volcanic ash in the upper part of the profile. It is on mountain foot slopes. Elevation is 2,200 to 4,000 feet. Slopes are rolling to moderately steep. The average annual precipitation is 22 inches, average annual air temperature is 47 degrees F, and average frost-free period is 120 days.

Included with this soil in mapping are small areas of Skalan gravelly loam, Tekoa gravelly silt loam, and Rock outcrop.

Typically, the surface layer of this Tekoa soil is brown extremely stony silt loam about 7 inches thick, and is slightly acid. The subsoil is brown and light yellowish brown very stony silt loam about 23 inches thick, and is slightly acid or medium acid. Fractured sandstone bedrock is at a depth of about 30 inches.

The rooting depth is 20 to 40 inches. The available water capacity is very low to low. Permeability is moderately slow, runoff is rapid or very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland, grazing, and wildlife habitat.

This Tekoa soil is suited to ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-yearold trees.

The main limitations for timber production are the stones, erosion hazard, and seedling mortality. Conventional methods can be used for tree harvest, but road construction is limited because of the stones on the surface and in the profile. Logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

This soil has potential for grazing. Native vegetation is Idaho fescue, rough fescue, and bluebunch wheatgrass. Proper management of the vegetation helps increase the production of these grasses. Proper grazing and a rotation-deferred grazing system are necessary.

The vegetation provides some habitat elements for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and open areas of this soil provide food and cover favorable to wildlife.

Large stones are a limitation for all structural development. Homesites and sanitary facilities are limited by the depth to rock and slope. Recreational development is limited by slope and large stones.

This map unit is in capability subclass VIIs.

193-Treble gravelly fine sandy loam, 20 to 55 percent slopes. This Treble soil is a very deep, well drained soil that formed in glacial till mantled with a thin layer of volcanic ash. It is on mountain slopes. Slopes are moderately steep to steep. Elevation is 2,200 to 3,200 feet. The average annual precipitation is 26 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

Included with this soil in mapping are small areas of Moscow loam, Ulricher loam, and Spokane loam, all with 30 to 65 percent slopes.

Typically, the surface layer of this Treble soil is dark grayish brown gravelly fine sandy loam about 3 inches thick, and is neutral. The subsoil is light yellowish brown gravelly fine sandy loam and very gravelly sandy loam about 14 inches thick, and is neutral and slightly acid. The substratum below a depth of about 17 inches is light yellowish brown and very pale brown very gravelly sandy loam, and is slightly acid.

The rooting depth is 60 inches or more, and the available water capacity is low. Permeability is moderately rapid, runoff is rapid or very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland, limited grazing, and wildlife habitat.

This Treble soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are slope and erosion hazard. Conventional methods of tree harvest can be used for slopes between 20 and 35 percent. Specialized logging methods that cause a minimum of soil disturbance need to be considered on slopes steeper than 35 percent.

Native forage includes bluebunch wheatgrass, elk sedge, rose, and tall trisetum. Proper management of the vegetation helps protect the regeneration of timber and increase the production of bluebunch wheatgrass and elk sedge.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass or tall fescue.

If well managed, this soil can continually produce forage for livestock. If not managed, the total production can vary from about 1,300 pounds of air-dry herbage per acre per year to less than 400 pounds for 20 to 30 years.

The steeper slopes severely limit movement of livestock and accessibility of forage.

The vegetation provides some habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

Slope is the main limitation for all structural development. Sanitary facility installation is limited by the moderately rapid permeability and potential seepage of ground water pollutants.

Limitations for recreational development are the steep slope and small stones. The soil tends to be dusty when dry.

This map unit is in capability subclass VIIe.

194-Treble-Rock outcrop association, 20 to 65 percent slopes. This association is made up of moderately steep to very steep soils on mountains. Elevation is 2,200 to 3,200 feet. The average annual precipitation is 26 inches, average annual air temperature is 43 degrees F, and average frost-free period is 110 days.

This association is about 55 percent Treble gravelly fine sandy loam and about 35 percent Rock outcrop.

Included with this association in mapping are areas of Spokane loam, Moscow loam, and Ulricher loam, all with slopes of 30 to 65 percent, and areas where bedrock is at a depth of 40 to 60 inches. These inclusions make up about 10 percent of the association.

The Treble soil is a very deep, well drained soil that formed in glacial till mantled with a thin layer of volcanic ash. It is mainly on southern exposures with Rock outcrop interspersed throughout.

Typically, the surface layer of the Treble soil is dark grayish brown gravelly fine sandy loam about 3 inches thick, and is neutral. The subsoil is light yellowish brown gravelly fine sandy loam and very gravelly sandy loam about 14 inches thick, and is neutral and slightly acid. The substratum below a depth of about 17 inches is light yellowish brown and very pale brown very gravelly sandy loam, and is slightly acid.

The rooting depth is 60 inches or more, and the available water capacity is low. Permeability is moderately rapid, runoff is rapid or very rapid, and the hazard of erosion is high to very high.

Areas of Rock outcrop are exposures of bare granitic bedrock that have some soil material in cracks and crevices.

This association is used for woodland, limited grazing, and wildlife habitat.

The Treble soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope, erosion hazard, and Rock outcrop. Conventional methods of tree harvest can be used on slopes between 20 and 35 percent, but road construction and equipment operation can be restricted by the Rock outcrop. Specialized logging methods that cause a minimum of soil disturbance need to be considered on slopes steeper than 35 percent to reduce soil losses.

Native forage includes bluebunch wheatgrass, elk sedge, rose, and tall trisetum. Proper management of the vegetation helps protect timber regeneration and increase the production of bluebunch wheatgrass and elk sedge.

This soil has good potential for grazing, especially when the canopy has been opened. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass or tall fescue.

If well managed, this soil can continually produce forage for livestock. If not managed, the total production can vary from about 1,300 pounds of air-dry herbage per acre per year to less than 400 pounds for 20 to 30 years.

Areas of Rock outcrop have no value for grazing. They often interfere with the movement of livestock, which limits accessibility of forage.

The vegetation provides habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

The main limitations for all structural development and recreational areas are slope and Rock outcrop.

This Treble soil is in capability subclass VIIe, and Rock outcrop is in capability subclass VIIIs.

195-Ulricher loam, 5 to 20 percent slopes. This Ulricher soil is a deep, well drained soil that formed in weathered gneiss and other metamorphic rocks mixed with small amounts of loess and volcanic ash in the upper part of the profile. It is on mountain foot slopes. Elevation is 2,200 to 4,600 feet. The average annual precipitation is 27 inches, average annual air temperature is 46 degrees F, and the average frost-free period is 110 days.

Included with this soil in mapping are small areas of Kruse silt loam, Lenz loam, Moscow loam, Spokane loam, and Vassar silt loam, all with slopes of 5 to 35 percent; and small areas of Ulricher loam, 20 to 35 percent slopes.

Typically, the surface layer of this Ulricher soil is brown loam about 3 inches thick, and is slightly acid. The subsoil is light yellowish brown and very pale brown sandy loam and cobbly sandy loam about 28 inches thick, and is medium acid. The substratum is yellow cobbly loamy sand about 11 inches thick, and is medium acid. Weathered gneiss bedrock is at a depth of about 42 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderately rapid, runoff is medium, and the hazard of erosion is moderate.

This soil is mainly used for woodland, grazing, wildlife habitat, and some hay, pasture, and small grain. Use as cropland is limited by the droughty soil conditions and the hazard of erosion on the steeper slopes. Deep-rooted perennial forage crops are the most reliable. Small grain has limited success. Fertilization is needed for good plant growth. Intensive tillage is not needed.

This Ulricher soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 8,500 cubic feet per acre, 0.6 inch and more in diameter, or 34,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

Conventional methods can be used for tree harvest. Careful management of reforestation after harvest helps

reduce growth competition of undesirable understory plants.

This soil has potential for grazing when the tree canopy is opened. Forage-production can be increased and soil pro ion provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

Native forage includes Columbia brome, elk sedge, snowberry, willow, and serviceberry. Tall shrubs tend to dominate the site once the canopy is opened. Proper management of the vegetation helps to protect timber regeneration and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals after the canopy is opened. Total production varies from about 2,200 pounds of air-dry herbage per acre per year to less than 100 pounds for 10 to 20 years.

After the timber is removed, this soil can be used for pasture or hay. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes orchardgrass, smooth brome, Regar bromegrass, alfalfa, and clover.

Native plants provide habitat elements for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitations for homesites and sanitary facilities are slope, depth to rock, and the rapid permeability of the substratum.

The construction of roads is limited by the potential frost action. Design considerations need to include placing footings below depths of frost penetration.

This soil has potential for paths and trails, but slope is a limitation.

This map unit is in capability subclass lVe.

196-Ulricher loam, 20 to 35 percent slopes. This Ulricher soil is a deep, well drained soil that formed in weathered gneiss and other metamorphic rocks mixed with small amounts of loess and volcanic ash in the upper part of the profile. It is on mountain foot slopes. Elevation is 2,200 to 4,600 feet. The average annual precipitation is 27 inches, average annual air temperature is 46 degrees F, and the average frost-free period is 110 days.

Included with this soil in mapping are small areas of Kruse silt loam, Lenz loam, Moscow loam, Spokane loam, and Vassar silt loam, all with slopes of 5 to 35 percent; and small areas of Ulricher loam, 35 to 65 percent slopes.

Typically, the surface layer of this Ulricher soil is brown loam about 3 inches thick, and is slightly acid. The subsoil is light yellowish brown and very pale brown sandy loam and cobbly sandy loam about 28 inches thick, and is medium acid. The substratum is yellow cobbly loamy sand about 11 inches thick, and is medium acid. Weathered gneiss bedrock is at a depth of about 42 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderately rapid, runoff is rapid, and the hazard of erosion is high.

This soil is mainly used for woodland, wildlife habitat, and some pasture.

This Ulricher soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 8,500 cubic feet per acre, 0.6 inch and more in diameter, or 34,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope and erosion hazard. Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be carefully planned to minimize soil losses. Reforestation after harvest must be carefully managed to reduce the competition of undesirable understory plants.

When the canopy is opened, this soil has potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover.

Native forage includes Columbia brome, elk sedge, snowberry, willow, and serviceberry. Tall shrubs tend to dominate the site once the canopy is opened. Proper management of the vegetation helps to protect timber regeneration and insure adequate litter for soil protection.

This soil can produce forage for livestock and big game animals after the canopy is opened. Total production varies from about 2,200 pounds of air-dry herbage per acre per year to less than 100 pounds for 10 to 20 years.

After the timber is removed, this soil can be used for pasture. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes orchardgrass, smooth brome, Regar bromegrass, alfalfa, and clover.

Native plants provide habitat elements for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

Slope is the main limitation for all structural development. Limitations for homesites and sanitary facilities are slope, depth to rock, and the rapid permeability of the substratum. Recreational areas are limited by the steep slope.

This map unit is in capability subclass VIe.

197-Ulricher stony loam, 5 to 35 percent slopes. This Ulricher soil is a deep, well drained soil that formed in weathered gneiss and other metamorphic rocks mixed with small amounts of loess and volcanic ash in the upper part of the profile. It is on mountain slopes. Elevation is 2,200 to 4,600 feet. The average annual precipitation is 27 inches, average annual air temperature is 46 degrees F, and the average frost-free period is 110 days.

Included with this soil in mapping are small areas of Kruse silt loam, Lenz very stony loam, Moscow loam, Spokane loam, and Vassar silt loam.

Typically, the surface layer is brown stony loam about 3 inches thick, and is slightly acid. The subsoil is light yellowish brown and very pale brown stony loam and stony sandy loam about 28 inches thick, and is medium acid. The substratum is yellow stony loamy sand about 11 inches thick, and is medium acid. Weathered gneiss bedrock is at a depth of about 42 inches.

The rooting depth is 40 to 60 inches. The available water capacity is low. Permeability is moderately rapid, runoff is medium or rapid, and the hazard of erosion is moderate to high.

This soil is mainly used for woodland, wildlife habitat, and some pasture.

This Ulricher soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 8,500 cubic feet per acre, 0.6 inch and more in diameter, or 34,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope and erosion hazard. Conventional methods can be used for tree harvest, but road construction may be limited by the large stones. Logging roads, skid trails, and landings need to be carefully planned to minimize soil losses. After harvest, carefully managed reforestation can reduce the competition of undesirable understory plants.

Native forage includes Columbia brome, elk sedge, snowberry, willow, and serviceberry. Tall shrubs tend to dominate the site once the tree canopy is open. Proper management of the vegetation helps to protect the regeneration of timber and to insure adequate litter for soil protection.

After the canopy is opened, this soil has potential for grazing. Forage for livestock and big game animals can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total production varies from about 2,200 pounds of air-dry herbage per acre per year to less than 100 pounds for 10 to 20 years.

After the timber is removed, this soil can be used for pasture. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes orchardgrass, smooth brome, Regar bromegrass, alfalfa, and clover.

Native plants provide habitat elements for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

The main limitations for homesites and sanitary facilities are large stones, depth to rock, rapid permeability of the substratum, and slope. Limitations for recreational development are slope and large stones.

This map unit is in capability subclass VIe.

198-Vassar silt loam, 5 to 30 percent slopes. This Vassar soil is a very deep, well drained soil that formed in weathered granite, gneiss, and schist having a mixture of loess and volcanic ash in the upper part of the profile. It is on mountains. Elevation is 2,500 to 6,000 feet. The average annual precipitation is 35 inches, average annual air temperature is 42 degrees F, and average frost-free period is 75 days.

Included with this soil in mapping are small areas of Spokane loam, Kruse silt loam, Lenz loam, Moscow loam, Ulricher loam, and areas where bedrock is at a depth of 40 to 60 inches.

Typically, the surface layer of this Vassar soil is yellowish brown silt loam about 4 inches thick, and is slightly acid. The subsoil is light yellowish brown silt loam about 16 inches thick, and is neutral. The substratum is pale brown, very pale brown, and light yellowish brown sandy loam to a depth of 60 inches, and is slightly acid.

The rooting depth is 60 inches or more, and the available water capacity is moderate. Permeability is moderate, runoff is rapid or very rapid, and the hazard of erosion is high to very high.

This soil is mainly used for woodland, recreation, watershed, wildlife habitat, and some hay, pasture, and grazing.

This Vassar soil is suited to western white pine, grand fir, Douglas-fir, western larch, and western redcedar. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the erosion hazard. The low bulk density of the surface layer makes this a highly erodible soil. Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

After the timber is harvested, this soil can be used for hay or pasture. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Pasture benefits from a rotation grazing system during the growing season and minimum stubble heights for livestock turn-on and removal. Adapted, improved forage includes orchardgrass, Manchar smooth brome, Regar bromegrass, alfalfa, and clover.

Native forage includes dryland sedges, willow, maple, and redstem ceanothus. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

When the tree canopy is opened, this soil has potential for grazing. Forage production for livestock and big game animals can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Annual production can vary from about 2,200 pounds of air-dry herbage per acre per year to less than 150 pounds for 5 to 10 years.

The vegetation provides habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of this soil provide food and cover favorable to wildlife.

Slope is the main limitation for all structural development. Limitations for sanitary facility installation are the moderately rapid permeability of the substratum and the possible hazard of seepage. The construction of roads is limited by the potential for frost action. Design considerations need to include placing footings below depths of frost penetration.

There is potential for paths and trails, but slope is a limitation.

This map unit is in capability subclass VIe.

199-Vassar silt loam, 30 to 65 percent slopes. This Vassar soil is a very deep, well drained soil that formed in weathered granite, gneiss, and schist with a mixture of loess and volcanic ash in the upper part of the profile. It is on mountains. Elevation is 2,500 to 6,000 feet. The average annual precipitation is 35 inches, average annual air temperature is 42 degrees F, and average frost-free period is 75 days.

Included with this soil in mapping are small areas of Kruse silt loam, Lenz loam, Moscow loam, Spokane loam, Ulricher loam, and areas where bedrock is at a depth of 40 to 60 inches.

Typically, the surface layer of this Vassar soil is yellowish brown silt loam about 4 inches thick, and is slightly acid. The subsoil is light yellowish brown silt loam about 16 inches thick, and is neutral. The substratum is pale brown, very pale brown, and light yellowish brown sandy loam to a depth of 60 inches, and is slightly acid.

The rooting depth is 60 inches or more, and the available water capacity is moderate. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

This soil is mainly used for woodland, watershed, recreation, and wildlife habitat.

This Vassar soil is suited to western white pine, grand fir, Douglas-fir, western larch, and western redcedar. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-yearold trees.

The main limitations for timber production are the erosion hazard and steep slope. The low bulk density of the surface layer makes this a highly erodible soil. The natural slope is too steep for operation of conventional logging equipment. Specialized logging operations that cause a minimum of soil disturbance need to be considered to prevent excessive soil erosion.

Native forage includes dryland sedges, willow, maple, and redstem ceanothus. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

When the tree canopy is opened, this soil has limited potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total production of forage for livestock and big game animals can vary from about 2,200 pounds of air-dry herbage per acre per year to less than 150 pounds for 5 to 10 years. Steep slopes severely limit the movement of livestock and accessibility of forage.

The vegetation provides habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

Slope is the main limitation for all structural development. Sanitary facility installation is limited by the moderately rapid permeability of the substratum and the possible hazard of seepage. Recreational areas are limited by the slope.

This map unit is in capability subclass VIIe.

200-Vassar-Rock outcrop complex, 20 to 55 percent slopes. This very deep Vassar soil and Rock outcrop are on mountains. Elevation is 2,500 to 5,000 feet. The average annual precipitation is 35 inches, average annual air temperature is 42 degrees F, and average frost-free period is 75 days.

The Vassar soil makes up about 55 percent of the map unit, and Rock outcrop areas make up about 35 percent. Lenz loam, Moscow loam, Spokane loam, and Ulricher loam, all with slopes of 20 to 65 percent; and areas where bedrock is at a depth of 40 to 60 inches make up the remaining 10 percent of this complex.

The Vassar soil is a very deep, well drained soil over highly weathered bedrock. It formed in material weathered from granite, gneiss, or schist mantled with volcanic ash and loess.

Typically, the surface layer is yellowish brown silt loam about 4 inches thick, and is slightly acid. The subsoil is light yellowish brown silt loam about 16 inches thick, and is neutral. The substratum is pale brown, very pale brown, and light yellowish brown sandy loam to a depth of about 60 inches, and is slightly acid.

The rooting depth is 60 inches or more, and the available water capacity is moderate. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

Areas of Rock outcrop consist of exposures of bare bedrock that have some soil material in cracks and crevices.

The soil in this complex is mainly used for woodland, wildlife habitat, and limited grazing.

The Vassar soil is suited to western white pine, grand fir, western larch, Douglas-fir, and western redcedar. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the slope, erosion hazard, and Rock outcrop. Roadbanks tend to slip and erode easily. The low bulk density of the surface layer makes this a highly erodible soil. The slope and Rock outcrop severely limit the use of conventional equipment. Specialized logging equipment that causes a minimum of soil disturbance needs to be considered.

Native forage includes elk sedge, pine reedgrass, willow, maple, and redstem ceanothus. Proper management of the vegetation helps to protect the regeneration of timber and insure adequate litter for soil protection.

When the tree canopy is opened, the soil has potential for grazing. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as orchardgrass, timothy, tall fescue, and white Dutch clover. Total production of forage for livestock and big game animals can vary from about 2,000 pounds of air-dry herbage per acre per year to less than 150 pounds for 10 to 15 years.

Areas of Rock outcrop have no potential for grazing. The steep slopes and rocks severely limit the movement of livestock and accessibility of forage.

The vegetation provides habitat for white-tailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

All structural development is limited by the steep slope and the Rock outcrop. Sanitary facility installation is limited by the possible hazard of seepage. Recreational areas are limited by the slope.

This map unit is in capability subclass VIIe.

201-Vassar-Moscow association, 5 to 35 percent slopes. This association is made up of very deep and moderately deep soils on mountains. Elevation is 2,500 to 5,000 feet. The average annual precipitation is 32 inches, average annual air temperature is 42 to 44 degrees F, and average frost-free period is 75 to 90 days.

This association is about 50 percent Vassar silt loam and about 30 percent Moscow loam. The Vassar soils have more northerly and easterly exposures, and the Moscow soils have more southerly and westerly exposures.

Included with this association in mapping are areas of Kruse silt loam, Lenz loam, Spokane loam, Ulricher loam, and areas where bedrock is at a depth of 40 to 60 inches. The included soils make up 20 percent of the map unit.

The Vassar soil is a very deep, well drained soil over highly weathered bedrock. It formed in material weathered from granite, gneiss, or schist and a mantle of volcanic ash and loess.

Typically, the surface layer of the Vassar soil is yellowish brown silt loam about 4 inches thick, and is slightly acid. The subsoil is light yellowish brown silt loam about 16 inches thick, and is neutral. The substratum is pale brown, very pale brown, and light yellowish brown sandy loam to a depth of about 60 inches, and is slightly acid.

The rooting depth is 60 inches or more. The available water capacity is moderate, and the soil has moderate permeability. Runoff is rapid to very rapid, and the hazard of erosion is high to very high.

The Moscow soil is a moderately deep, well drained soil over weathered bedrock. It formed in material weathered from granite, gneiss, or schist and a mantle of loess and volcanic ash.

Typically, the surface layer of the Moscow soil is very dark grayish brown loam about 1 inch thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown loam about 25 inches thick, and is slightly acid. Weathered granitic bedrock is at a depth of about 26 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is rapid and very rapid, and the hazard of erosion is high to very high.

These soils are used for woodland, grazing, watershed, wildlife habitat, recreation, and, after the timber is harvested, for some pasture and hay.

The Vassar soil is suited to western white pine, grand fir, Douglas-fir, western larch, and western redcedar. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-yearold trees.

The main limitation for timber production is the erosion hazard. The low bulk density of the surface layer makes this soil highly erodible. Conventional methods can be used for tree harvest, but logging roads, skid trails, and landings need to be carefully planned to minimize soil losses.

The Moscow soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitations for timber production are the erosion hazard and depth to rock. Conventional methods can be used for tree harvest, but logging roads, skid

trails, and landings need to be carefully planned to minimize soil losses.

Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, bromegrass, and alfalfa. A well balanced fertilization program, including the use of nitrogen and sulfur, helps obtain good plant growth. Phosphorus is also needed when legumes are grown.

Native forage includes elk sedge, Columbia brome, redstem ceanothus, willow, and maple. Proper management of vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

When the tree canopy is opened, these soils have potential for grazing for 5 to 15 years. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, tall fescue, orchardgrass, and white Dutch clover. Total forage production for livestock and big game animals can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 150 pounds.

The vegetation provides essential habitat for whitetailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds. Both the forested and cleared areas of these soils provide food and cover favorable to wildlife.

The main limitations for homesites and sanitary facilities are slope and rapid permeability of the substratum. The depth to rock is a limitation on the Moscow soil. Recreational development is limited by the slope.

This map unit is in capability subclass VIe.

202-Vassar-Moscow association, 35 to 65 percent slopes. This association is made up of very deep and moderately deep soils on mountains. Elevation is 2,500 to 5,000 feet. The average annual precipitation is 32 inches, average annual air temperature is 42 to 44 degrees F, and average frost-free period is 75 to 90 days.

This association is about 50 percent Vassar silt loam and about 30 percent Moscow loam. The Vassar soil has more northerly and easterly exposures, and the Moscow soil has more southerly and westerly exposures.

Included with the association in mapping are areas of Kruse silt loam, Lenz loam, Spokane loam, Ulricher loam, and areas where bedrock is at a depth of 40 to 60 inches. These soils make up 20 percent of the map unit.

The Vassar soil is a deep, well drained soil over highly weathered bedrock. It formed in material weathered from granite, gneiss, or schist and a mantle of volcanic ash and loess.

Typically, the surface layer of the Vassar soil is yellowish brown silt loam about 4 inches thick, and is slightly acid. The subsoil is light yellowish brown silt loam about 16 inches thick, and is neutral. The substratum is pale brown, very pale brown, and light yellowish brown sandy loam to a depth of 60 inches, and is slightly acid.

The rooting depth is 60 inches or more. The available water capacity is moderate. Permeability is very rapid, and the hazard of erosion is very high.

The Moscow soil is a moderately deep and well drained soil over weathered bedrock. It formed in material weathered from granite, gneiss, or schist with a mantle of loess and volcanic ash.

Typically, the surface layer of the Moscow soil is very dark grayish brown loam about 1 inch thick, and is slightly acid. The subsoil is yellowish brown and light yellowish brown loam about 25 inches thick, and is slightly acid. Weathered granitic bedrock is at a depth of about 26 inches.

The rooting depth is 20 to 40 inches. The available water capacity is low. Permeability is moderate, runoff is very rapid, and the hazard of erosion is very high.

These soils are used for woodland, limited grazing, watershed, wildlife habitat, and recreation.

The Vassar soil is suited to western white pine, grand fir, Douglas-fir, western larch, and western redcedar. It is capable of producing about 11,750 cubic feet per acre, 0.6 inch and more in diameter, or 50,500 board feet (Scribner rule) of merchantable timber 12.6 inches and more in diameter from an unmanaged stand of 80-yearold trees.

The main limitations for timber production are the erosion hazard and steep slope. The low bulk density of the surface layer makes this soil highly erodible. The natural slope is too steep for the operation of conventional logging equipment. Specialized logging operations that cause a minimum of soil disturbance need to be considered to keep soil losses to a minimum.

The Moscow soil is suited to Douglas-fir and ponderosa pine. It is capable of producing about 7,100 cubic feet per acre, 0.6 inch and more in diameter, or 26,000 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year-old trees.

The main limitations for timber production are the slope, erosion hazard, and depth to rock. The natural slope is too steep to use conventional logging equipment. Specialized logging equipment that causes a minimum of soil disturbance needs to be considered to prevent excessive soil erosion.

Native forage includes elk sedge, Columbia brome, redstem ceanothus, willow, and maple. Proper management of the vegetation helps protect the regeneration of timber and insure adequate litter for soil protection.

When the tree canopy is opened, these soils have limited potential for grazing for 5 to 15 years. Forage production can be increased and soil protection provided by seeding disturbed areas to adapted species such as timothy, tall fescue, orchardgrass, and white Dutch clover. Total production of forage for livestock and big game animals can vary from about 1,600 pounds of air-dry herbage per acre per year to less than 150 pounds. The steep slopes limit movement of livestock and accessibility of forage.

The vegetation provides essential habitat for whitetailed deer, black bear, some elk, forest grouse, various small mammals, and songbirds.

Maintaining watershed potential helps keep soil losses to a minimum. The main concern is the careful management of the timber resource and understory vegetation.

All structural development is limited by slope and depth to rock, and recreational areas are severely limited by slope.

This map unit is in capability subclass VIIe.

203-Worley silt loam, 10 to 25 percent slopes. This Worley soil is a very deep, moderately well drained soil that formed in deep loess. It is on narrow ridgetops of loess-covered hills. Elevation is 2,300 to 2,800 feet. The average annual precipitation is 23 inches, average annual air temperature is 48 degrees F, and average frost-free period is 130 days.

Included with this soil in mapping are small areas of Larkin, Southwick, and Taney silt loams, all with slopes of 10 to 2.5 percent; and Worley silt loam, 5 to 10 percent slopes.

Typically, the surface layer of this Worley soil is grayish brown silt loam about 14 inches thick, and is medium acid. The subsurface layer is pale brown silt loam about 2 inches thick, and is medium acid. The subsoil is light yellowish brown and brown silty clay and silty clay loam to a depth of 60 inches, and is medium acid and neutral.

The rooting depth is 60 inches or more, and the available water capacity is high. Permeability is very slow, runoff is very rapid, and the hazard of erosion is very high. A perched water table is at a depth of 14 to 24 inches from February to April.

Most areas of this soil are cultivated. The main crops are wheat, peas, hay, and pasture, and some barley, lentils, and grass for seed production. There are a few scattered areas of woodland.

This soil is often intermingled with the Southwick and Larkin soils. It is a productive agricultural soil but has a very dense subsoil which increases runoff under intensive cultivation. This results in the loss of topsoil during agricultural use. Continuous cropping, use of crop residue, and minimum tillage are adequate cropping systems on slopes less than 8 percent. On steeper areas, field strips or sod crops provide extra runoff protection. Diversions and gradient terraces are helpful where slopes are moderate. Nitrogen, sulfur, sometimes phosphorus, and chemical weed control are necessary in all cropping systems.

This Worley soil is suited to ponderosa pine. It is capable of producing about 4,900 cubic feet per acre, 0.6 inch and more in diameter, or 12,200 board feet (Scribner rule) of merchantable timber 11.6 inches and more in diameter from an unmanaged stand of 80-year old trees.

The main limitation for timber production is the slowly permeable subsoil and resultant perched water table. Roads tend to rut, and traction of the soil is poor for equipment during the rainy winter and spring months. Conventional methods can be used for tree harvest, but may be limited during the rainy period.

Native forage includes Idaho fescue, rough fescue, bluebunch wheatgrass, blue wildrye, bluegrass, rose, and hawkweed. A variety of shrubs can dominate the site once the canopy is opened. Proper management of the vegetation helps protect the regeneration of timber and increase the production of the grasses.

When the timber is removed, this soil is suited to pasture and hay and needs a well balanced fertilization program. Pasture benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, Regar brome, and alfalfa.

When the canopy has been opened, this soil has good potential for grazing. Forage production can be increased by seeding disturbed areas to adapted grasses. If well managed, the soil can continually produce forage for livestock and big game animals. If not managed, the total forage production can vary from about 1,800 pounds of air-dry herbage per acre per year to less than 200 pounds for 25 to 40 years.

This soil has good potential for woodland, rangeland, or openland wildlife habitat. Populations of upland game birds increase in cultivated areas. Hedgerows along fences and roads provide cover, and protected strips of grain are good food sources. White-tailed deer, black bear, snowshoe hare, squirrels, chipmunks, and various songbirds do well in wooded areas.

The establishment of terraces and diversions is subject to the slope and permeability of the soil.

Homesite development and septic tank absorption fields are limited by the very slow permeability of the subsoil, a seasonal perched water table, and slope. Dwellings and roads are subject to slope, potential frost action damage, the shrink-swell potential, and the inherent low strength of the soil. Recreational facilities are limited by the slow permeability, dustiness, and slope.

This map unit is in capability subclass IVe.

204-Worley silt loam, 10 to 25 percent slopes, eroded. This Worley soil is a very deep, moderately well drained soil that formed in deep loess. It is on narrow ridgetops of dissected, loess-covered plains. Elevation is 2,300 to 2,800 feet. The average annual precipitation is 23 inches, average annual air temperature is 48 degrees F, and average frost-free period is 130 days.

Included with this soil in mapping are small areas of Larkin, Southwick, and Taney silt loams, all with slopes of 10 to 25 percent.

Typically, the surface layer of this Worley soil is grayish brown silt loam about 7 inches thick, and is medium acid. The subsurface layer is pale brown silt loam about 2 inches thick, and is medium acid. The subsoil is light yellowish brown and brown silty clay and silty clay loam to a depth of 60 inches, and is medium acid and neutral.

The rooting depth is 60 inches or more. The available water capacity is high. Permeability is very slow, runoff is very rapid, and the hazard of erosion is very high. There is a perched water table 8 to 14 inches below the surface from February to April.

Most areas of this soil are cultivated. The main crops are wheat, peas, hay, and pasture, with some barley, lentils, and grass for seed production.

The depth of the topsoil varies from only a few inches to below the plow layer. When the extremely firm, very sticky subsoil is in the tillage zone, tillage and crop production are difficult because of the poor physical condition of the soil. Runoff is also an acute hazard.

Sod crops and continuous small grain, excluding lentils and peas, are suitable cropping systems. Good management includes minimum tillage and use of crop residue; stripcropping and diversions help control runoff. Other helpful methods are farming on the contour and divided slope farming. Nitrogen, sulfur, and phosphorus are needed in all cropping systems.

This soil is suited to pasture and hay. On pastures, grazing management benefits from a rotation grazing system during the growing season. Adapted, improved forage includes Latar orchardgrass, smooth brome, Regar bromegrass, and alfalfa.

The Worley soil has good potential for grazing. Forage production can be increased by seeding disturbed areas to adapted grasses.

Forage plants include Idaho fescue, rough fescue, bluebunch wheatgrass, blue wildrye, bluegrass, rose, and hawkweed. A variety of shrubs can dominate the site. Proper management of the vegetation can help increase the production of the grasses.

This soil has fair potential for rangeland or woodland habitats for wildlife such as white-tailed deer, black bear, snowshoe hare, squirrels, chipmunks, and various songbirds.

Homesite development and septic tank absorption field installation are limited by slope, very slow permeability, and a seasonal perched water table. Dwelling and road construction is subject to slope, potential frost action damage, the inherent low strength, and the shrink-swell potential during wetting and drying. Recreational facilities are limited by very slow permeability, dustiness, and slope.

This map unit is in capability subclass IVe.

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 behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and pasture

This section was prepared by Kenneth E. Riersgard, agronomist, and Dennis K. Froeming, range conservationist, Soil Conservation Service, Moscow, Idaho.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; 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 are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

Crops

The cropland of the survey area is approximately 121,000 acres, according to the 1967 Idaho Soil and Water Conservation Needs Inventory. Of this total, 69,580 acres were used for field crops, 37,800 acres for rotation hay and pasture, and the rest was idle cropland.

The Kootenai County cropland can be divided into 3 areas: the Rathdrum Prairie, the Worley dryfarmed area, and the woodland farms. The latter consists of scattered farms in the cutover forested areas that grow small grain in commercial quantities and are not part of the contiguous grainland areas.

Agricultural production in the survey area is largely confined to the Rathdrum Prairie and the Worley dryland area.

The Rathdrum Prairie is an extensive glacial outwash plain that is largely cultivated, except for the areas still in woodland at the northern end. The cultivated section was formerly a dryland-fallow wheat province, but since the early 1960's it has been a prime grass seed producer, mainly under sprinkler irrigation. Barley and winter and spring wheat are the long-time basic crops. Where irrigation is used, crop growth is very good. The soils of the Avonville and Garrison series are naturally droughty, and only modest growth of small grain is obtained under dryland conditions. Irrigation helps obtain high growth of grass seed, mainly varieties of Kentucky bluegrass.

Use of crop residue helps improve and conserve these gravelly soils, but excessive amounts of straw, obtained under irrigation, cause difficulties. Burning of grass seed stubble is an accepted practice among growers and is a requirement for economic plant growth. An adequate fertilizer program and weed control are necessary for all crops.

Wind erosion is a conservation concern in a dryland program. A continuous surface protection is needed in this case. Proper water management is the main conservation need under irrigated conditions.

The Worley dryland area is the main wheat, barley, pea, and lentil producing section of the survey area. Since the mid-1960's, bluegrass seed production has become an important cash crop on the Larkin, Southwick, and Taney soils (fig. 15). The Harrison flats area is included in the Worley dryland area. Livestock is a minor phase of the economy, except on the woodland farms.

Enterprise is more diversified on the woodland farms. An adequate conservation program includes using sod crops as part of the cropping system and less intensive cultivation. Long term sod crops, small grain, minimum tillage during the grain sequence, and management of crop residue constitute a suitable cropping system. Use of nitrogen, sulfur, and phosphorus helps obtain economic yields.

The main conservation problem in the Worley dryland area is soil erosion from runoff. The bottom lands are less affected, but they are sometimes scoured by runoff from adjacent hills. Soil losses from erosion are largely

Figure 15.-Taney soil in the Worley dryfarmed area produces small grain.

attributed to the practice of summer fallow. Since the land was first cultivated, summer fallow has been a common weed control method in the wheat, pea, and barley system, which was the major cropland enterprise. This method resulted in very severe soil erosion on some of the sloping lands. Annual soil losses of 50 to 100 tons per acre were not uncommon on many slopes seeded to winter wheat or on summer fallow land. This has left many slopes and ridges with only a thin topsoil. Currently, this practice is largely abandoned, and continuous cropping with reliance on chemical weed control is commonly used.

Drainage from localized seepage is a minor concern throughout the cropland, but is a fairly significant feature which keeps many small tracts from producing to their full potential. These sites can be effectively drained by tile drainage into existing outlets.

Wetness is the main concern on such soils as the Pywell, Cougarbay, and Ramsdell soils in the Coeur d'Alene River flood plain. These soils have a high water table and are subject to flooding, unless they are protected by levees. Draining these soils helps obtain optimum crop growth.

The conservation needs on the cropland of the survey area are continuous cropping and minimum tillage for the moderately sloping lands. The eroded soils and the steeper land need additional practices such as field stripcropping, divided slope farming, or gradient terraces in a small grain program to help keep soil erosion within allowable limits. The use of sod crops on eroded soils and steep slopes is also an alternative for part of the cropping system. Another important consideration in the survey area is accommodating the large amount of water flowing through the natural drainageways during spring runoff. This can cause uncrossable gullies and yield sediment. Grassed waterways (fig. 16) in these major drainageways prevent formation of gullies and help support a good cropping system.

Other essential practices for soil maintenance are stubble utilization and contour farming. A fertilization program, including nitrogen, sulfur, and phosphorus, is necessary in a small grain cropping system.

Excessive tillage is damaging from the standpoint of soil erosion. A long term soil maintenance program under a small grain system is possible by using a combination of soil conservation methods.

Figure 16.-A grassed waterway on Cald-Thatuna silt loam helps prevent gullies by carrying runoff water through the drainageway.

Pasture management

According to the 1967 Idaho Soil and Water Conservation Needs Inventory, there are about 42,170 acres of pastureland in the survey area. Of the total, about 1,115 acres are irrigated, and 41,053 acres are dryland pastures. The pastureland is mainly too steep, too wet, or is unsuitable for annual crops or hay production.

Poor management of the pastures is very common. The concerns include spring turnout before the plants have adequate growth, continuous grazing throughout the season, inadequate fertilization, overgrazing, and the use of species poorly adapted to the site. As a result, the production of both forage and meat is reduced, and the stand of desirable plants is quickly invaded by weeds. On the more erosive soils, such as the Santa, Setters, and Taney soils, the deterioration of the stand results in severe soil erosion.

Good management includes cross fencing, adequate water developments, proper regrowth periods, and a balanced fertilization program. Adapted plants that respond to good management are needed.

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. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations

and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; 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; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

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 in proper amounts as needed; and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of the soils 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 included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at two levels: capability class and subclass. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

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 manage ment, 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 landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w*, s, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main 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 too cold or too 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, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes II and III. Capability data can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Most of the soils of the area are not irrigated, therefore the capability classes given are for nonirrigated soils, unless otherwise indicated.

Native grazing lands

This section was prepared by Dennis K. Froeming, range conservationist, Soil Conservation Service, Moscow, Idaho.

There are approximately 78,860 acres of native grazing lands in the Kootenai County Soil Survey Area, according to the 1967 Idaho Soil and Water Conservation Needs Inventory. Of this total, about 2,170 acres are rangeland and 76,690 acres are grazed forest land.

The rangeland is mostly in isolated areas too steep or too rocky to be used for cropland, improved pasture, or hayland. Some of the areas are fenced and are grazed by livestock; other areas are not used, but generally have a good cover of native vegetation. These areas serve as valuable native sites to show existing conditions prior to the settlement period.

The fenced and grazed areas are generally in very poor condition because of a long period of overuse. Providing adequate cover for soil protection is the main management objective.

The forage resource on forested lands is produced in association with the timber resource. The amount of herbage produced and used depends on the amount of sunlight that reaches the forest floor. Generally, when there is about 60 percent or more canopy cover, usable forage is not available, and the areas are used only for shade and protection. Once a timber stand is opened by logging, fire, insects, or some other disturbance, the usable herbage can be produced until the canopy closes again to the 60 percent level. The length of time an area can produce forage depends upon the amount of disturbance, the site potential, the species involved, and the level of management. The management and yield of the soils are included in the map unit descriptions of appropriate soils in the section "Soil maps for detailed planning."

In some areas, a small but important part of the grazing land is made up of small, narrow meadows adjacent to drainageways. These meadows are potentially very high forage producers and natural concentration areas for livestock, and are often in a depleted condition because of continual overuse.

Grazing management on native grazing lands includes a periodic rest for seed maturity on the key areas. In addition, a good grazing management system on forested lands helps protect the regeneration of timber and the standing timber crop.

The most important management practice is proper grazing use, based on selected key species in areas such as roads, meadows, and openings. Associated with proper use is rotational grazing, which allows the important forage plants to rest periodically until they reach maturity. Other essential management practices include fencing, adequate salting away from natural concentration areas, and keeping animals distributed throughout the grazing area.

Woodland management and productivity

This section was prepared by David J. Poe, woodland conservationist, Soil Conservation Service, Moscow, Idaho, who was assisted by Dewey Almas, branch chief, Cooperative Forest Program, Idaho Department of Lands, Coeur d'Alene, Idaho.

Kootenai County's settlement began in the 1880's. From about 1883, when a railroad entered the area, to the present time, lumbering and wood processing have been the backbone of the local economy.

The county is over 75 percent forest, with 614,767 acres of commercial forest and 319,000 acres of private woodland. Some of the forest land in the eastern part of the county was burned over in the great fires of 1910.

In the 1920's, lumber company railroads were built throughout the gently sloping and flat forest lands of the county to harvest the best trees of the virgin stands of white pine, ponderosa pine, and cedar poles.

After the best timber was taken, the railroads were pulled up and the slash was broadcast burned. This frequently destroyed the other tree species and young growth. Farming was tried on much of this land and was later abandoned. These lands provided ideal conditions for re-establishment of natural stands of lodgepole pine, ponderosa pine, white pine, Douglas-fir, and larch, which presently cover a large part of the private woodlands of the county.

The average size woodlot in 1974 was approximately 83 acres, representing about 1,700 ownerships. A large amount of woodland is annually subdivided into 5 to 20 acre lots for homesites. Much of the woodland is on erodible soils that have steep slopes.

The value of the wooded areas is enormous. They act as giant sponges, soaking up the water and gradually releasing it to the streams, rivers, and lakes. They are also important for their wildlife and scenic beauty. Many visitors come into Kootenai County because of the high recreational value of lakes and vast wooded areas.

Table 6 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol,* a number, indicates the potential productivity of the soils for common trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter x indicates stoniness or rockiness; w, excessive water in or on the soil; t, toxic substances in the soil; d, restricted root depth; c, clay in the upper part of the soil; s, sandy texture; f, high content of coarse fragments in the soil profile; and r, steep slopes. The letter o indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority

in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 6 the soils are also rated for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate,* 25 to 50 percent; and *severe,* more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade or grow if openings are made in the tree canopy. The invading plants compete with native plants or planted seedlings by impeding or preventing their growth. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* means that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as *a site index.* This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Common trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

The volume yields for ponderosa pine are determined from tables in USDA technical bulletin 630 (4). Yields for western white pine, grand fir, and other species are taken from USDA technical bulletin 323 (3).

Woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some types of forest, under proper management, can produce enough understory vegetation to support grazing of livestock or wildlife, or both.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees, the density of the canopy, and the depth and condition of the forest litter. The density of the forest canopy affects the amount of light that understory plants receive during the growing season.

Table 7 shows, for each soil suitable for woodland, the potential for producing understory vegetation. The table also lists the common names of the characteristic vegetation that grows on a specified soil and the percentage composition, by air-dry weight, of each kind of plant. The kind and percentage of understory plants listed in the table are those to be expected where canopy density is most nearly typical of forests that yield the highest production of wood crops.

The total production of understory vegetation is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the soil moisture is above average during the optimum part of the growing season; in a normal year soil moisture is average; and in an unfavorable year it is below average.

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broad-leaved and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on erodibility of the soil. They protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Table 8 shows the height that locally grown trees and shrubs are expected to reach on various kinds of soil in 20 years. The estimates in table 8 based on measurements and observation of established plantings that have been given adequate care, can be used as a guide in planning windbreaks and screens. Additional information about planning windbreaks and screens and the planting

and care of trees can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from nurserymen.

Engineering

G. Arthur Shoemaker, civil engineer, and Neil P. Fitzsimmons, agricultural engineer, Soil Conservation Service, Moscow, Idaho, assisted in preparing this section.

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 9 shows, for each kind of soil, the degree and kind of limitations for building site development; table 10, for sanitary facilities; and table 12, for water management. Table 11 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 9. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. *A moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. *A severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by

slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 9 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and inplace density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 9 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, 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 10 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight,* soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate,* soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe, soil* properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good, fair,* or *poor,* which, respectively, mean about the same as the terms *slight, moderate,* and *severe.*

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold 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. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 10 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 11 by ratings of good, fair, or poor. The texture, thickness, and organic matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 15 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor.*

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 11 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 15.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good is* not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic matter content. This horizon is designated as Al or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 12 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

There are abundant opportunities in the area for outdoor recreation. Camping, hiking, hunting, fishing, boating, and nature study are among the most popular.

The soils of the survey area are rated in table 13 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the 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 13 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 10, and interpretations for dwellings without basements and for local roads and streets, given in table 9.

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

stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as 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 will 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 or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cuffing and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

Clyde Scott, biologist, Soil Conservation Service, Boise, Idaho, assisted in preparing this section.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 14, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are blue wildrye, pine reedgrass, bluebunch wheatgrass, elk sedge, hawkweed, peavine, and geranium.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are redstem ceanothus, snowberry, baldhip rose, and mountain blueberry.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive

of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, and cordgrass and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Open/and habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include Hungarian partridge, pheasant, meadowlark, field sparrow, mourning dove, cottontail rabbit, skunk, and woodchuck.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, elk, and black bear.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

Rangeland habitat consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, meadowlark, and lark bunting.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 15 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 15 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 15 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (2) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (1).

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, plasticity index, liquid limit, and organic matter content. Soils are grouped into 15 classes-eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two

classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging 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. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 15. Also in table 15 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 16 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses and crop production. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field-particularly soil structure, porosity, and gradation or texture-that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 16. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on

the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if disturbed. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing 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, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 17 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received 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 chiefly of deep, well drained to excessively drained sands or gravels. 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 that have a layer that impedes the downward movement of water or soils that have 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 soils that have a 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 is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 17 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 commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (6). Unless otherwise noted, colors described are for dry soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Ardenvoir series

The Ardenvoir series consists of deep, well drained soils on mountains. These soils formed in material weathered from metasedimentary bedrock and a mixture of loess and volcanic ash. Slopes are 20 to 65 percent. The mean annual precipitation is 29 inches, and mean annual air temperature is 42 degrees F.

Ardenvoir soils are similar to the Blinn and Divers soils and are near the Huckleberry, McCrosket, and Tekoa soils. Blinn soils have fractured basalt bedrock at a depth of 20 to 40 inches. Divers soils contain more volcanic ash and have a bulk density of less than 0.95 grams per cubic centimeter in the upper 30 inches. Huckleberry soils have weathered shale bedrock at a depth of 20 to 40 inches and a bulk density of less than 0.85 grams per cubic centimeter to a depth of 14 inches or more. McCrosket and Tekoa soils have a mean annual soil temperature of more than 47 degrees F.

Typical pedon of Ardenvoir gravelly loam, from an area of McCrosket-Ardenvoir association, 35 to 65 percent slopes, about 500 feet east of Wolf Lodge Creek, 300 feet north of the southwest corner of sec. 28, T. 50 N., R. 2 W:

O1-1 inch to 0; undecomposed and partially decomposed needles, leaves, and twigs.

A1-0 to 7 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; weak fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine and common medium roots; many very fine and fine tubular pores; 20 percent gravel; slightly acid; clear wavy boundary.

B21-7 to 16 inches; light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine, fine and common medium roots; many very fine and fine tubular pores; 30 percent gravel; slightly acid; clear wavy boundary.

B22-16 to 37 inches; very pale brown (10YR 7/4) very gravelly loam, yellowish brown (10YR 5/4) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine and few medium roots; common very fine and fine tubular pores; 40 percent gravel, 20 percent cobbles; slightly acid; clear wavy boundary.

C1-37 to 47 inches; very pale brown (10YR 7/4) very cobbly loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky, non-plastic; common very fine, fine, and few medium roots; common very fine and fine tubular pores; 40 percent cobbles, 25 percent gravel; slightly acid; clear wavy boundary.

C2r-47 inches; fractured metasedimentary bedrock with few fines in the fractures.

Depth to fractured metasedimentary bedrock is 40 to 60 inches. The solum is 32 to 37 inches thick. The mean annual soil temperature ranges from 43 to 47 degrees F.

The A horizon is gravelly loam. Gravel content ranges from 15 to 25 percent.

The B2 horizon has value of 6 or 7 dry, 4 or 5 moist, and chroma of 3 or 4. The amount of coarse fragments in the B2 horizon ranges from 25 to 60 percent. Reaction is slightly acid or neutral.

The C horizon is very cobbly loam or very gravelly loam. Coarse fragments make up 50 to 90 percent of this horizon. Reaction is slightly acid or medium acid.

Avonville series

The Avonville series consists of very deep, well drained soils on outwash plains, terraces, and short terrace escarpments. These soils formed in glacial outwash materials mixed with loess and volcanic ash. Slopes are 0 to 20 percent. The mean annual precipitation is 24 inches, and mean annual air temperature is 44 degrees F.

Avonville soils are similar to and near the Bonner, Garrison, Kootenai, and McGuire soils. Bonner soils have a yellowish brown A horizon. Garrison soils have more than 50 percent base saturation in the A horizon and a mean annual soil temperature of more than 47 degrees F. Kootenai and McGuire soils have Al horizons of less than 7 inches in thickness.

Typical pedon (fig. 17) of Avonville fine gravelly silt loam, 0 to 7 percent slopes, west of the Coeur d'Alene Airport, about 2,500 feet west and 50 feet south of the northeast corner of sec. 16, T. 51 N., R. 4 W:

Ap-0 to 5 inches; dark grayish brown (10YR 4/2) fine gravelly silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; 25 percent fine gravel; medium acid; abrupt smooth boundary.

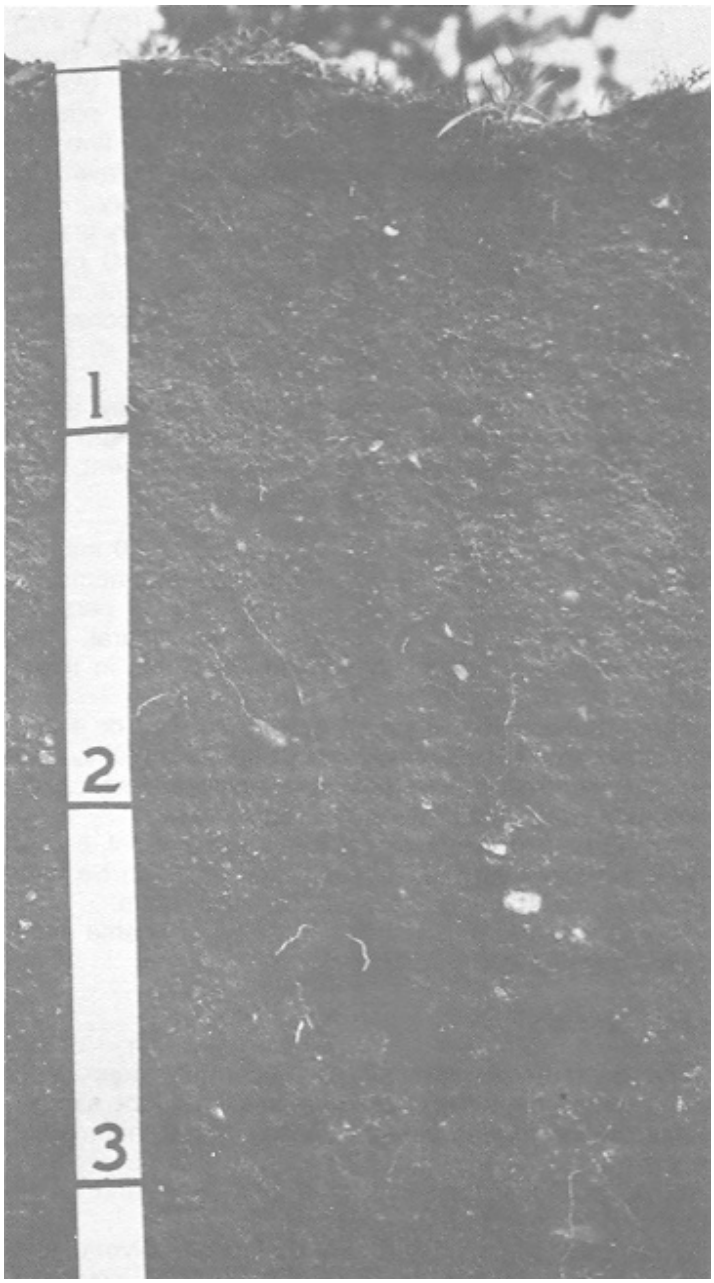

Figure 17.-Profile of Avonville fine gravelly silt loam.

A12-5 to 16 inches; dark grayish brown (10YR 4/2) fine gravelly silt loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure that parts to weak fine subangular blocky; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine and common fine tubular pores; 25 percent fine gravel; medium acid; clear wavy boundary.

B2-16 to 25 inches; yellowish brown (10YR 5/4) very gravelly silt loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure that parts to weak fine subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine and common fine tubular pores; 50 percent gravel, 10 percent cobbles; neutral; clear wavy boundary.

B3-25 to 37 inches; pale brown (10YR 6/3) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; loose, nonsticky, nonplastic; few fine roots; many very fine and common fine tubular pores; 60 percent gravel, 10 percent cobbles; neutral; clear wavy boundary.

IIC-37 to 60 inches; variegated very gravelly sand; single grain, loose, nonsticky, nonplastic; few fine roots; porous; 70 percent gravel, 10 percent cobbles.

Thickness of the solum ranges from 20 to 40 inches. The solum has 25 to 75 percent coarse fragments by volume, but has an average of more than 35 percent. Reaction ranges from medium acid to neutral. The umbric epipedon ranges from 12 to 18 inches in thickness.

The A horizon has value of 2 or 3 moist, 3 or 4 dry, and chroma of 1 or 2 moist, 2 or 3 dry. It is mainly fine gravelly silt loam but ranges to gravelly coarse sandy loam. Base saturation is less than 50 percent.

The B2 horizon has value of 3 through 5 moist, 5 or 6 dry. It is mainly very gravelly silt loam but can be very gravelly loam or very gravelly coarse sandy loam.

The C horizon ranges from very gravelly coarse sand to very gravelly loamy sand.

Blinn series

The Blinn series consists of moderately deep, well drained soils on terrace escarpments and foot slopes. These soils formed in basalt colluvium and a thin mantle of loess and volcanic ash. Slopes are 5 to 65 percent. The mean annual precipitation is 26 inches, and mean annual air temperature is 43 degrees F.

Blinn soils are similar to the Ardenvoir, Divers, and Huckleberry soils and are near the Bobbitt, Lacy, and Santa soils. Ardenvoir soils have fractured metasedimentary bedrock at a depth of 40 to 60 inches. Divers soils contain more volcanic ash and have a bulk density of less than 0.95 grams per cubic centimeter in the upper 30 inches. Huckleberry soils have a bulk density of less than 0.85 grams per cubic centimeter to a depth of 14 inches or more. Bobbitt soils have a darker colored Al horizon and a mean annual soil temperature of more than 47 degrees F. Lacy soils have fractured basalt bedrock at a depth of 10 to 20 inches. Santa soils do not have coarse fragments and have a fragipan.

Typical pedon of Blinn stony loam, 5 to 35 percent slopes, near Lowmeister Bay on Lake Coeur d'Alene, about 1,640 feet east and 2,100 feet north of the southwest corner of sec. 12, T. 47 N., R. 4 W:

O1-1.5 inches to 0.5 inch; needles and twigs.

O2-0.5 inch to 0; partially decomposed needles and twigs.

A11-0 to 5 inches; light brownish gray (10YR 6/2) stony loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure that parts to moderate fine granular; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many fine and fine irregular pores; about 2 percent angular basalt stones; neutral; clear smooth boundary.

A12-5 to 9 inches; pale brown (10YR 6/3) stony loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure that parts to moderate fine granular; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many fine irregular pores; 5 percent angular basalt stones; neutral; abrupt wavy boundary.

B21-9 to 15 inches; pale brown (10YR 6/3) stony loam, brown (10YR 4/3) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; common fine tubular pores; about 15 percent angular basalt stones; neutral; clear wavy boundary.

B22-15 to 21 inches; pale brown (10YR 6/3) stony loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; common fine tubular pores; about 15 percent angular basalt stones; neutral; clear irregular boundary.

C-21 to 30 inches; very pale brown (10YR 7/3) very stony loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; common fine tubular pores; about 60 percent angular basalt stones; neutral; abrupt irregular boundary.

R-30 inches; basalt fractured in upper 2 to 3 feet, with few fines in the cracks.

Depth to fractured basalt is 20 to 40 inches. The solum is 20 to 28 inches thick. The mean annual soil temperature ranges from 44 to 46 degrees F.

The A1 horizon has value of 6 or 7 dry, 3 through 5 moist, and chroma of 2 or 3. Rock fragments make up 2 to 10 percent of this horizon.

The B horizon has value of 6 or 7 dry, 4 or 5 moist; and chroma of 2 or 3. Texture is cobbly loam or stony loam. Rock fragments make up 15 to 30 percent of this horizon.

The C horizon has value of 6 or 7 dry, and chroma of 3 or 4. Rock fragments make up 50 to 80 percent of the horizon.

Bobbitt series

The Bobbitt series consists of moderately deep, well drained soils on terrace escarpments and dissected plains. These soils formed in basalt residuum and colluvium, and a thin mantle of loess and volcanic ash. Slopes are 5 to 65 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 47 degrees F.

Bobbitt soils are similar to the Lacy, Schumacher, and Tekoa soils and are near the Blinn, Santa, and Taney soils. Lacy soils have fractured basalt bedrock at a depth of 10 to 20 inches. Schumacher soils have an average of less than 35 percent rock fragments in the B horizon. Tekoa soils have weathered shale bedrock at a depth of 20 to 40 inches. Blinn soils have a light brownish gray and pale brown A1 horizon and do not have a B2t horizon. Santa and Taney soils do not have coarse fragments.

Typical pedon of Bobbitt stony loam, from an area of Lacy-Bobbitt association, 5 to 35 percent slopes, west of Coeur d'Alene, about 280 feet west and 1,180 feet south of the northeast corner of sec. 15, T. 50 N., R. 4 W:

O1-0.5 inch to 0; partially decomposed organic matter, moss, needles, and twigs.

A11-0 to 3 inches; grayish brown (10YR 5/2) stony loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure that parts to weak fine granular; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many very fine and fine irregular pores; 25 percent rock fragments; neutral; diffuse smooth boundary.

A12-3 to 10 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; common very fine and fine tubular pores; 25 percent rock fragments; neutral; clear irregular boundary.

B2t-10 to 22 inches; brown (10YR 5/3) very stony clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure that parts to moderate fine and medium angular blocky; hard, firm, sticky, plastic; common fine and medium roots; common fine tubular pores; common thin clay films on faces of peds and in pores; about 50 percent rock fragments; slightly acid; clear irregular boundary.

B3t-22 to 35 inches; very pale brown (10YR 7/3) very stony clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; hard, firm, sticky, plastic; common fine and medium roots; many very fine tubular pores; common thin clay films on faces of peds; about 50 percent rock fragments; medium acid; clear irregular boundary.

R-35 inches; basalt fractured in upper 2 to 3 feet with soil material in the cracks.

Depth to fractured basalt is 20 to 40 inches. The mollic epipedon ranges from 7 to 12 inches thick. The mean annual soil temperature ranges from 47 to 52 degrees F.

The A1 horizon has value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3. Rock fragments make up 10 to 30 percent of the horizon.

The Bt horizon has value of 5 through 7 dry, 3 or 4 moist, and chroma of 3 or 4. Rock fragments make up 35 to 60 percent of the horizon.

Bonner series

The Bonner series consists of very deep, well drained soils on outwash terraces and plains. These soils formed in glacial outwash mantled with volcanic ash and loess. Slopes are 0 to 8 percent. The mean annual precipitation is 28 inches, and mean annual air temperature is 43 degrees F.

The Bonner soils are similar to the Kootenai and McGuire soils and are near the Avonville and Rathdrum soils. Kootenai and McGuire soils have a thin, dark brown Al horizon and less volcanic ash. Avonville soils have a dark grayish brown Al horizon. Rathdrum soils have less than 5 percent coarse fragments above a depth of 40 inches and a bulk density of less than 0.85 grams per cubic centimeter below a depth of 14 inches.

Typical pedon of Bonner silt loam, 0 to 8 percent slopes, about 1/10 mile inside the Farragut State Park entrance and 100 feet east of the road, in the SW1/4SW1/4 of sec. 8, T. 53 N., R. 2 W:

O11-2 inches to 0.5 inch; needles and twigs.

O12-0.5 inch to 0; partially decomposed needles and twigs.

B21ir-0 to 8 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium, few coarse roots; many very fine and fine interstitial pores; 10 percent gravel; neutral; clear wavy boundary.

B22ir-8 to 18 inches; brown (10YR 5/3) gravelly silt loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium, few coarse roots; common fine interstitial pores; 10 percent gravel, 10 percent cobbles; slightly acid; clear wavy boundary.

IIB3ir-18 to 26 inches; pale brown (10YR 6/3) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; few fine interstitial pores; 25 percent gravel, 5 percent cobbles; neutral; gradual wavy boundary.

IIIC-26 to 60 inches; pale brown (10YR 6/3) very gravelly loamy sand, dark brown (10YR 4/3) moist; single grain, loose, nonsticky, nonplastic; few very

fine roots; very porous; 70 percent gravel, 10 percent cobbles; neutral.

The upper part of the soil has less than 35 percent coarse fragments and is medium textured. The lower part is coarse textured and has more than 35 percent coarse fragments. Reaction in the solum is slightly acid or neutral. The mean annual soil temperature ranges from 44 to 47 degrees F.

The B2ir horizon has hue of 7.5YR or 10YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 3 or 4. Texture is silt loam and can be gravelly. Bulk density is 0.85 to 0.95 grams per cubic centimeter. Coarse fragments make up 10 to 30 percent of the B2ir horizon.

The C horizon has value of 5 through 7 dry, 4 through 6 moist, and chroma of 3 or 4. Texture is very gravelly loamy sand or very gravelly sand. Coarse fragments make up 60 to 80 percent of the C horizon.

Brickel series

The Brickel series consists of moderately deep, well drained soils on mountains. These soils formed from metasedimentary or granitic rock and a mixture of loess and volcanic ash in the upper part of the profile. Slopes are 5 to 75 percent. The mean annual precipitation is 40 inches, and mean annual air temperature is 40 degrees F.

Brickel soils are similar to the Lenz, McCrosket, and Spokane soils and are near the Ardenvoir, Divers, and Huckleberry soils. Lenz, McCrosket, and Spokane soils have a mean annual soil temperature of more than 47 degrees F. Ardenvoir soils have fractured metasedimentary bedrock at a depth of 40 to 60 inches. Divers soils have more volcanic ash and a bulk density of less than 0.95 grams per cubic centimeter in the upper 30 inches. Huckleberry soils have a bulk density of less than 0.85 grams per cubic centimeter to a depth of 14 inches or more.

Typical pedon of Brickel stony silt loam, from an area of Brickel-Rubble land association, near Twin Crags in the southeastern part of the county, in the NE1/4SE1/4 of sec. 8, T. 47 N., R. 1 E:

A1-0 to 3 inches; very dark grayish brown (10YR 3/2) stony silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine tubular pores; about 5 percent gravel, 5 percent stones; medium acid; abrupt wavy boundary.

B2-3 to 17 inches; brown (10YR 4/3) very stony silt loam, dark brown (7.5YR 3/2) moist; weak medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and common fine roots; many very fine tubular pores; 35 percent rock fragments; medium acid; abrupt wavy boundary.

C-17 to 30 inches; yellowish brown (10YR 5/4) very cobbly silt loam, dark brown (7.5YR 4/4) moist; massive; soft, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; common very fine and few fine tubular pores; 70 percent rock fragments; medium acid; abrupt wavy boundary.

R-30 inches; fractured, fine grained metasedimentary rock.

Depth to bedrock is 20 to 40 inches. The solum is 10 to 20 inches thick. The mean annual soil temperature is 39 to 46 degrees F, and mean summer soil temperature is 50 to 59 degrees F.

The A horizon has hue of 10YR or 7.5YR; value of 3 or 4 dry, 2 or 3 moist; and chroma of 2 or 3 moist and dry. It is stony silt loam or cobbly loam. Rock fragments make up 5 to 20 percent of the horizon. Reaction is medium acid or slightly acid.

The B horizon has hue of 10YR or 7.5YR and value of 4 or 5 dry. It ranges from very stony silt loam to very cobbly loam. Rock fragments make up 35 to 60 percent of the horizon.

The C horizon ranges from very cobbly silt loam to very cobbly sandy loam. Rock fragments make up 70 to 90 percent of the horizon.

Cald series

The Cald series consists of very deep, somewhat poorly drained soils on bottom lands and in drainageways. These soils formed in alluvium from loess and volcanic ash. Slopes are 0 to 2 percent. The mean annual precipitation is 20 inches, and mean annual air temperature is 47 degrees F.

Cald soils are similar to the Cougarbay, Narcisse, and Seelovers soils and are near the Latahco and Thatuna soils. Cougarbay soils are very poorly drained and have stratified silty clay and coarse sand substrata. Narcisse soils have an average of more than 15 percent fine and coarse sand and less than 18 percent clay between depths of 10 and 40 inches. Seelovers soils are poorly drained and have a mean annual soil temperature of less than 47 degrees F. Latahco and Thatuna soils have a silty clay loam B2t horizon.

Typical pedon of Cald silt loam, south of Rock Creek, about 2,400 feet east and 450 feet north of the southwest corner of sec. 18, T. 47 N., R. 5 W:

Ap-0 to 9 inches; dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure that parts to moderate fine granular; hard, friable, slightly sticky, slightly plastic; many very fine roots; many very fine and common fine tubular pores; slightly acid; clear wavy boundary.

A12-9 to 18 inches; dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine roots; many

very fine and common fine tubular pores; neutral; clear wavy boundary.

A13-18 to 28 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky, slightly plastic; few very fine roots; common very fine and few fine tubular pores; neutral; abrupt wavy boundary.

C1g-28 to 36 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common fine faint light yellowish brown (10YR 6/4) mottles, dark yellowish brown (10YR 4/4) moist; massive; very hard, firm, sticky, plastic; common very fine tubular pores; many medium and coarse manganese concretions; many large black organic stains; neutral; gradual wavy boundary.

C2g-36 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common fine distinct brownish yellow (10YR 6/6) mottles, dark yellowish brown (10YR 4/6) moist; massive; very hard, firm, sticky, plastic; common very fine tubular pores; many medium and coarse manganese concretions; many large black organic stains; neutral.

The mean annual soil temperature ranges from 47 to 51 degrees F. These soils have a water table at a depth of 3 to 5 feet from November to June and are commonly flooded for brief periods from February to April. The mollic epipedon is 24 to 36 inches thick. Organic matter content of the A horizon is an estimated 3 to 7 percent and decreases irregularly with depth. The Ap or Al horizons have hue of 10YR; value of 3 through 5 dry, 2 or 3 moist; and chroma of 1 or 2. Reaction ranges from medium acid to neutral, and base saturation is 50 to 75 percent.

The C horizon is neutral in color or has hue of 10YR or 2.5Y; value of 4 through 7 dry, 3 through 5 moist; and chroma of 1 or 2. Mottles range from few fine faint to many fine distinct. The C horizon is stratified silt loam or silty clay loam. In some pedons, a few fine basaltic pebbles make up less than 5 percent of the volume.

Chatcolet series

The Chatcolet series consists of very deep, moderately well drained soils on terraces. These soils formed in volcanic ash and loess over glaciolacustrine material. Slopes are 5 to 65 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 40 degrees F.

Chatcolet soils are similar to the Mokins soils and are near the Ardenvoir, Bobbitt, Cald, Dorb, Huckleberry, Lacy, McCrosket, and Rubson soils. Mokins soils have an average of more than 35 percent clay in the B2t horizon. Ardenvoir, Huckleberry, and McCrosket soils have metasedimentary bedrock at a depth of less than 60 inches. Bobbitt, Dorb, and Lacy soils have basalt bedrock at a depth of less than 40 inches. Rubson soils do not have a Bt horizon. Cald soils have a dark gray Al horizon more than 20 inches thick and are somewhat poorly drained.

Typical pedon of Chatcolet silt loam, from an area of Chatcolet-Rubson silt loams, 5 to 20 percent slopes, near Cave Lake, about 375 feet south and 950 feet west of the northeast corner of sec. 4, T. 47 N., R. 2 W:

Ap-0 to 8 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak thick platy structure that parts to moderate medium granular; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; common fine tubular pores; medium acid; abrupt smooth boundary.

B21ir-8 to 17 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure that parts to weak medium subangular blocky; hard, friable, slightly sticky, slightly plastic; common fine and medium roots; common fine tubular pores; medium acid; clear wavy boundary.

IIB22t-17 to 26 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; few fine roots following ped surfaces; many fine tubular pores; many medium strong brown (7.5YR 5/6) clay bands, dark brown (7.5YR 4/4) moist; neutral; clear wavy boundary.

IIB23t-26 to 44 inches; very pale brown (10YR 7/4) silty clay loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; hard, firm, sticky, plastic; few fine roots; many fine tubular pores; continuous strong brown (7.5YR 5/6) clay bands, dark brown (7.5YR 4/4) moist; many moderately thick clay films on ped surfaces and in pores; stratified layer of fine sandy loam in lower part of horizon; medium acid; clear wavy boundary.

IIB3t-44 to 60 inches; very pale brown (10YR 7/4) silty clay loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; common fine tubular pores; many thick strong brown (7.5YR 5/6) clay bands, dark brown (7.5YR 4/4) moist; medium acid.

The mean annual soil temperature ranges from 40 to 44 degrees F. The mean summer soil temperature at a depth of 20 inches ranges from 57 to 59 degrees F. Reaction ranges from medium acid to neutral. The solum is over 60 inches in depth.

In undisturbed areas, a very thin layer of recent volcanic ash is on top of the Bir horizon. The Ap horizon has hue of 10YR or 7.5YR; value of 5 through 7 dry, 4 or 5 moist; and chroma of 2 through 4. The Ap horizon is silt loam or cobbly loam. The structure is weak or moderate granular, subangular blocky, or platy.

The B2ir horizon has hue of 10YR, 7.5YR, or 5YR; value of 5 through 7 dry, 3 through 5 moist; and chroma of 3 or 4. The B2ir horizon is silt loam or cobbly loam.

The structure is weak or moderate prismatic or subangular blocky. The IIB2t horizon has value of 5 through 7 dry, 3 through 5 moist, and chroma of 3 or 4. Texture is silt loam or silty clay loam, and some profiles are gravelly or cobbly.

Cougarbay series

The Cougarbay series consists of very deep, very poorly drained soils on bottom land areas adjacent to lakes. These soils formed in recent lake-laid sediment. Slopes are 0 to 2 percent. The mean annual precipitation is 24 inches, and mean annual air temperature is 44 degrees F.

Cougarbay soils are similar to the Seelovers soils. They are near the Blinn, Kruse, Lenz, Ramsdell, and Ulricher soils. Seelovers soils have an average of less than 15 percent fine and coarser sand, and 18 to 34 percent clay between depths of 10 and 40 inches. Blinn, Kruse, Lenz, and Ulricher soils are upland soils and are well drained. Ramsdell soils have a light colored surface layer.

Typical pedon of Cougarbay silt loam, 0 to 2 percent slopes, near Cougar Creek, about 2,740 feet east and 560 feet north of the southwest corner of sec. 21, T. 50 N., R. 4 W:

Ap-0 to 10 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; few fine faint reddish brown (2.5YR 4/4) mottles; moderate medium subangular blocky structure; hard, firm, sticky, plastic; common very fine, fine, and medium roots; common fine tubular pores; slightly acid; abrupt smooth boundary.

IIC1g-10 to 14 inches; dark grayish brown (10YR 4/2) silty clay, light brownish gray (10YR 6/2) dry; common fine prominent red (2.5YR 4/6) mottles; moderate medium prismatic structure that parts to moderate medium angular blocky; hard, firm, sticky, very plastic; common very fine and fine roots; many fine tubular pores; thin patchy organic coatings on ped surfaces; neutral; abrupt smooth boundary.

IIC2g-14 to 30 inches; grayish brown (2.5Y 5/2) silty clay, light gray (2.5Y 7/2) dry; many medium prominent red (2.5YR 4/6) mottles; moderate medium prismatic structure that parts to moderate fine and medium angular blocky; very hard, very firm, sticky, very plastic; few very fine and fine roots; common fine tubular pores; thin (112 to 1 inch thick) mottled sand lenses; neutral; abrupt smooth boundary.

IIIC3g-30 to 50 inches; dark grayish brown (2.5Y 4/2) stratified coarse sand and loamy coarse sand, light brownish gray (2.5Y 6/2) dry; common fine prominent red (2.5YR 4/6) mottles; single grain; loose, nonsticky, nonplastic; micaceous; slightly acid; abrupt smooth boundary.

IVC4g-50 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay, light brownish gray (2.5Y 6/2) dry; many medium prominent red (2.5YR 4/6) mottles; moderate medium prismatic structure that parts to moderate medium angular blocky; very hard, very firm, sticky, very plastic; neutral.

The mean annual soil temperature is 44 to 47 degrees F. The soils are saturated to the surface from runoff in spring. They are frequently flooded for very long periods. Depth to the stratified sandy material is 25 to 35 inches, but the average is 30 inches. In most pedons, surface cracks are present upon drying.

The A horizon has value of 2 or 3 moist, 4 or 5 dry, and chroma of 1 or 2.

The IICg horizon has hue of 10YR or 2.5Y, value of 5 through 7 dry, and chroma of 1 or 2. It is silty clay or silty clay loam with more than 35 percent clay. Mottles have hue of 2.5YR to 7.5YR, value of 3 or 4, and chroma of 4 through 8. Mottles are common or many, distinct or prominent.

The IIICg horizon has value of 4 or 5 moist, 6 or 7 dry. It is stratified coarse sand or loamy coarse sand with very thin layers of finer textured materials. Mottles have hue of 2.5YR to 7.5YR and chroma of 4 through 6. Mottles are distinct or prominent.

The IVCg horizon has hue of 10YR or 2.5Y and value of 3 through 5 moist, 5 through 7 dry. It is silty clay or silty clay loam. Mottles have hue of 2.5YR to 7.5YR and chroma of 4 through 6. Mottles are common or many, distinct or prominent. The IVCg horizon is generally saturated.

Divers series

The Divers series consists of deep, well drained soils on mountains. These soils formed in colluvium from metasedimentary rock and a mantle of volcanic ash. Slopes are 45 to 75 percent. The mean annual precipitation is 42 inches, and mean annual air temperature is 38 degrees F.

Divers soils are similar to the Dorb, Huckleberry, and Vassar soils and are near the Ardenvoir, Brickel, and McCrosket soils. Dorb and Huckleberry soils have bedrock at a depth of 20 to 40 inches. Vassar soils have an average of less than 35 percent coarse fragments between depths of 10 and 40 inches. Ardenvoir and McCrosket soils have a bulk density of more than 0.95 grams per cubic centimeter. Brickel soils have bedrock at a depth of 20 to 40 inches and a bulk density of more than 0.95 grams per cubic centimeter.

Typical pedon of Divers silt loam, in an area of Divers-Brickel association, 45 to 75 percent slopes, near Kootenai Peak, in the southeastern part of the county, in the NE1/4SE1/4 of sec. 16, T. 47 N., R. 1 W:

O11-1.5 to 1 inch; undecomposed needles, leaves, twigs, and cones.

O12-1 inch to 0; partially decomposed needles, leaves, twigs, and cones.

A1-0 to 3 inches; dark yellowish brown (10YR 4/4) silt loam, dark brown (7.5YR 3/2) moist; moderate fine

granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine interstitial and common fine tubular pores; slightly acid; abrupt wavy boundary.

B21ir-3 to 7 inches; yellowish brown (10YR 5/4) silt loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure that parts to moderate fine granular; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine interstitial and common fine tubular pores; about 10 percent gravel; slightly acid; clear wavy boundary.

B22ir-7 to 15 inches; light yellowish brown (10YR 6/4) very gravelly silt loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine tubular pores; 35 percent gravel; slightly acid; abrupt wavy boundary.

B3ir-15 to 30 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; many fine and common medium tubular pores; 35 percent gravel; many thin, strong brown (7.5YR 5/6) clay bands, dark brown (7.5YR 4/4) moist; slightly acid; gradual wavy boundary.

IIC-30 to 60 inches; pale brown (10YR 6/3) very cobbly loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine and fine interstitial pores; 50 percent cobbles, 20 percent gravel; medium acid.

Depth to hard bedrock is more than 60 inches. Thickness of the solum is 25 to 40 inches. The mean annual soil temperature ranges from 35 to 40 degrees F, and mean summer soil temperature is 44 to 46 degrees F.

The A1 horizon has hue of 10YR or 7.5YR; value of 4 or 5 dry, 3 or 4 moist; and chroma of 2 through 4.

The Bir horizon has hue of 10YR through 5YR. Rock fragments make up 10 to 60 percent of the horizon but average more than 35 percent.

The C horizon contains 65 to 95 percent metasedimentary rock fragments.

Dorb series

The Dorb series consists of moderately deep, well drained soils on plateaus, terrace escarpments, and in mountain canyons. These soils formed in basalt and a mantle of volcanic ash. Slopes are 5 to 35 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 40 degrees F.

Dorb soils are similar to the Ardenvoir, Blinn, Divers, and Huckleberry soils and are near the Bobbitt, Chatcolet, and Lacy soils. Ardenvoir and Blinn soils have a mean summer soil temperature of more than 47 degrees F and have an O horizon. Divers soils are at a depth of more than 40 inches to bedrock. Huckleberry soils have a very gravelly loam substratum over weathered shale bedrock. Bobbitt and Lacy soils have a mean annual soil temperature of more than 47 degrees F. Chatcolet soils have less than 35 percent coarse fragments and are very deep.

Typical pedon of Dorb silt loam, 5 to 35 percent slopes, east of Gotham Bay on Lake Coeur d'Alene, in the SE1/4NW1/4 sec. 18, T. 49 N., R. 3 W:

O1-2.5 inches to 1 inch; undecomposed and partially decomposed needles, twigs, and moss.

O2-1 inch to 0; decomposed needles, twigs, and moss.

B21ir-0 to 2 inches; yellowish brown (10YR 5/4) silt loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; neutral; clear wavy boundary.

B22ir-2 to 7 inches; brown (10YR 5/3) silt loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine, common medium and few coarse roots; many very fine and fine interstitial pores; 5 percent gravel; neutral; clear wavy boundary.

B23ir-7 to 16 inches; light yellowish brown (10YR 6/4) very cobbly silt loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine and medium roots; many very fine, fine, and medium interstitial pores; 30 percent cobbles, 15 percent gravel; slightly acid; abrupt smooth boundary.

B3ir-16 to 28 inches; pale brown (10YR 6/3) very cobbly silt loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine and medium roots; few fine and medium interstitial pores; 50 percent cobbles, 15 percent stones, 10 percent gravel; neutral; clear wavy boundary.

R-28 inches; fractured basalt bedrock with some fines in the cracks.

The mean annual soil temperature ranges from 40 to 43 degrees F, and the mean summer soil temperature at a depth of 20 inches ranges from 44 to 47 degrees F in pedons having an O horizon. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments increase with depth and range in volume from 5 to 75 percent. The bulk density, to a depth of 14 inches, is less than 0.85 grams per cubic centimeter. The subsoil contains 35 to 60 percent volcanic ash. In undisturbed areas, pedons have a very thin layer of recent volcanic ash between the 0 horizon and the B2ir horizon. Where there is no 0 horizon, a thin A1 horizon is present.

The Bir horizon has hue of 10YR or 7.5YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 3 or 4 dry, 2

through 4 moist. It is silt loam or loam and can be very cobbly or gravelly in the lower part of the profile.

Garrison series

The Garrison series consists of very deep, somewhat excessively drained soils on glacial outwash plains, terraces, and short terrace escarpments. These soils formed in glacial outwash mixed with loess and volcanic ash in the upper part. Slopes are 0 to 7 percent. The mean annual precipitation is 24 inches, and mean annual air temperature is 48 degrees F.

Garrison soils are similar to and near the Avonville, Kootenai, McGuire, and Narcisse soils. Avonville soils have less than 50 percent base saturation in the A horizon. Kootenai and McGuire soils have a dark brown Al horizon less than 7 inches thick. Narcisse soils have an A horizon more than 20 inches thick and less than 35 percent coarse fragments above a depth of 40 inches.

Typical pedon of Garrison gravelly silt loam, 0 to 7 percent slopes, about 5 miles west of Hayden, 300 feet past of the northwest corner of sec. 19, T. 51 N., R. 4 N:

Ap-0 to 7 inches; very dark grayish brown (10YR 3/2) gravelly silt loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots; many very fine and fine tubular pores; 25 percent gravel; neutral; clear wavy boundary.

A12-7 to 12 inches; very dark grayish brown (10YR 3/2) gravelly silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots; many very fine and fine tubular pores; 30 percent gravel; neutral; clear smooth boundary.

B1-12 to 19 inches; brown (10YR 4/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure that parts to weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium roots; many very fine and fine tubular pores; 55 percent gravel; neutral; clear wavy boundary.

B2-19 to 28 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; many fine tubular pores; 65 percent coarse fragments; mildly alkaline; clear smooth boundary.

C1-28 to 38 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, olive brown (2.5Y 4/4) moist; massive; loose, nonsticky, nonplastic; few fine roots; very porous; 35 percent cobbles, 40 percent gravel; some rodent activity evident; neutral; gradual wavy boundary.

C2-38 to 60 inches; variegated colors; very gravelly coarse sand; 55 percent gravel, 30 percent cobbles.

The solum ranges from 20 to 35 inches thick. Reaction ranges from slightly acid to mildly alkaline. Forty to 75 percent coarse fragments are between a depth of 10 and 40 inches.

The A horizon has value of 3 or 4 dry, 2 or 3 moist, and chroma of 1 or 2. Texture is gravelly silt loam or very stony silt loam.

The B horizon has hue of 10YR or 7.5YR; value of 4 through 6 dry, 3 or 4 moist; and chroma of 3 or 4 dry, 2 through 4 moist. It is very gravelly loam or very stony loam.

The C1 horizon has hue of 10YR or 2.5Y; value of 5 or 6 dry, 4 or 5 moist; and chroma of 3 or 4. It is very gravelly sandy loam, very stony sandy loam, or very stony coarse sand.

Huckleberry series

The Huckleberry series consists of moderately deep, well drained soils on mountains. These soils formed in loess and volcanic ash mixed with material weathered from metasedimentary bedrock. Slopes are 20 to 75 percent. The mean annual precipitation is 35 inches, and mean annual air temperature is 41 degrees F.

Huckleberry soils are similar to the Divers and Dorb soils and are near Ardenvoir, McCrosket, and Tekoa soils. Divers soils have bedrock below a depth of 40 inches. Dorb soils have fractured basalt bedrock at a depth of 20 to 40 inches. Ardenvoir soils have less volcanic ash and a bulk density of more than 0.85 grams per cubic centimeter in the fine earth fraction. McCrosket and Tekoa soils have a dark colored surface layer and a mean annual soil temperature of more than 47 degrees F.

Typical pedon of Huckleberry silt loam, in an area of Huckleberry-Ardenvoir association, 35 to 60 percent slopes, about 1 mile west of Latour Creek, 250 feet north and 250 feet west of the southeast corner of SW1/4 of sec. 21, T. 48 N., R. 1 W:

O11-2 inches to 1 inch; undecomposed needles and twigs.

O12-1 inch to 0; partially decomposed needles and twigs.

A2-0 to 0.25 inch; thin discontinuous layer of volcanic ash.

B21ir-0.25 inch to 11 inches; brown (10YR 5/3) silt loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure that parts to weak medium granular; soft, very friable, slightly sticky, nonplastic; many fine and medium and common coarse roots; many very fine and fine tubular pores; 10 percent channery fragments; slightly acid; clear wavy boundary.

B22ir-11 to 14 inches; yellowish brown (10YR 5/4) channery silt loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many

fine, medium, and common coarse roots; many very fine and fine tubular pores; 20 percent thin flat fragments less than 6 inches in length; slightly acid; abrupt wavy boundary.

B23ir-14 to 19 inches; pale brown (10YR 6/3) channery silt loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common fine and medium roots; many fine tubular pores; 20 percent thin flat fragments less than 6 inches in length; 10 percent flagstone; medium acid; clear wavy boundary.

IIC-19 to 33 inches; pale brown (10YR 6/3) very flaggy loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine, medium, and few coarse roots; many fine tubular pores; 30 percent thin flat fragments less than 6 inches in length; 20 percent flagstone; 10 percent stones; faint iron stains on rock faces; medium acid; abrupt wavy boundary.

IICr-33 inches; fractured metasedimentary bedrock, some fines in cracks.

Depth to weathered metasedimentary bedrock is 20 to 40 inches. Thickness of the solum ranges from 14 to 28 inches. The mean annual soil temperature ranges from 38 to 44 degrees F, and the mean soil temperature in summer is 44 to 45 degrees F. Reaction is medium acid or slightly acid.

The Bir horizon has hue of 10YR through 5YR. Coarse fragments make up 5 to 30 percent of this horizon.

The IIC horizon has hue of 10YR or 7.5YR; value of 6 or 7 dry, 4 or 5 moist; and chroma of 3 or 4.

Kootenai series

The Kootenai series consists of very deep, well drained soils on outwash plains, terraces, and on recessional moraines. These soils formed in glacial outwash mantled by loess and volcanic ash. Slopes are 0 to 45 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 44 degrees F.

Kootenai soils are similar to and near the Avonville, Bonner, Garrison, McGuire, and Rathdrum soils. Avonville and Garrison soils have a dark colored Al horizon more than 7 inches thick. Bonner and Rathdrum soils have a yellowish brown and pale brown surface layer and bulk density of less than 0.95 grams per cubic centimeter in the upper part of the profile. McGuire soils have a gravelly sandy loam surface layer and a very gravelly sandy loam subsoil.

Typical pedon (fig. 18) of Kootenai gravelly silt loam, from an area of Kootenai-Bonner complex, 0 to 20 percent slopes, about 4.5 miles west of Athol, on State Highway 54, in the northwest corner of sec. 14, T. 53 N., R. 4 W:

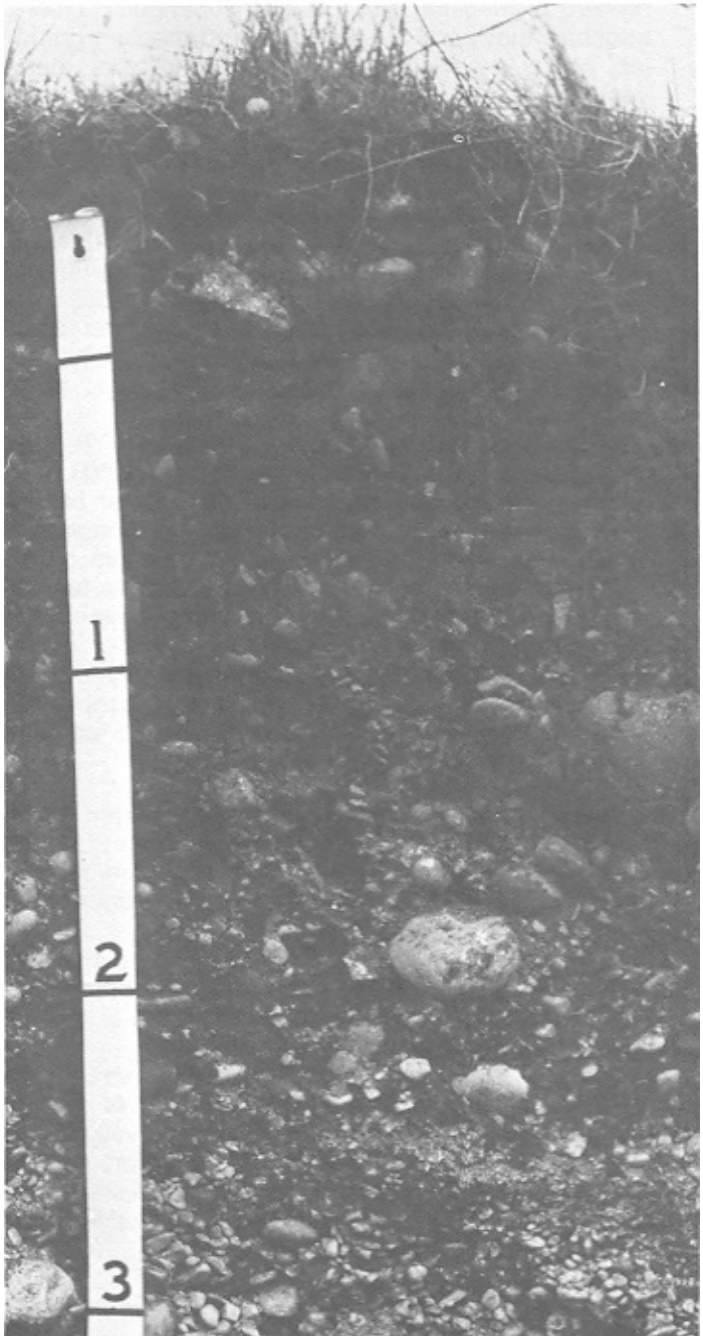

Figure 18.-Profile of Kootenai gravelly silt loam.

O1-2.5 inches to 1 inch; undecomposed and partially decomposed needles, leaves, and twigs.

O2-1 inch to 0; decomposed needles, leaves, and twigs.

A1-0 to 6 inches; dark brown (10YR 4/3) gravelly silt loam, very dark grayish brown (10YR 3/2) moist;

moderate medium and coarse subangular blocky structure that parts to weak fine and medium granular; soft, very friable, nonsticky, nonplastic; many very fine and fine common medium and few coarse roots; common very fine and few fine medium and coarse tubular pores; 20 percent gravel; slightly acid; clear wavy boundary.

B21-6 to 22 inches; yellowish brown (10YR 5/4) gravelly silt loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common very fine and fine and few medium and coarse roots; common very fine, few fine and medium tubular pores; 30 percent gravel; slightly acid; clear wavy boundary.

B22-22 to 26 inches; light yellowish brown (10YR 6/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium roots; common very fine and few fine and medium tubular pores; 40 percent gravel, 25 percent cobbles; slightly acid; abrupt smooth boundary.

IIC-26 to 60 inches; variegated very gravelly coarse sand; single grain; loose, nonsticky, nonplastic; common very fine roots; very porous; 65 percent gravel, 15 percent cobbles; neutral.

The mean annual soil temperature ranges from 45 to 47 degrees F. The solum thickness ranges from 22 to 35 inches. Coarse fragments make up 20 to 65 percent of the solum and 70 to 85 percent of the substratum. Reaction is slightly acid or neutral.

The A horizon has value of 4 or 5 dry, 3 or 4 moist, and chroma of 3 or 4 dry, 2 or 3 moist. It is commonly gravelly silt loam but ranges to cobbly silt loam or gravelly loam.

The B2 horizon has hue of 10YR or 7.5YR; value of 4 through 6 dry, 3 or 4 moist; and chroma of 3 or 4. It is gravelly silt loam, gravelly loam, and very gravelly loam.

The IIC horizon ranges from variegated colors to hue of 10YR; value of 5 through 7 dry, 4 or 5 moist; and chroma of 3 or 4 dry and moist. It is very gravelly coarse sand or very gravelly loamy coarse sand.

Kruse series

The Kruse series consists of very deep, well drained soils on mountainous areas. These soils formed in loess deposits overlying residuum and colluvium from gneiss and mica schist. Slopes are 0 to 65 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 43 degrees F.

Kruse soils are similar to Skalan soils and are near the Lenz, Vassar, Santa, and Ulricher soils. Skalan and Lenz soils have more than 35 percent coarse fragments in the B horizon and are moderately deep to bedrock. Santa soils have a dense Bx horizon. Ulricher soils have a mean annual soil temperature of more than 47 degrees F. Vassar soils do not have a B2t horizon.

Typical pedon of Kruse silt loam, from an area of Kruse-Ulricher association, 35 to 65 percent slopes, about 1.5 miles west of Mica Flats, 2,400 feet west and 200 feet north of the southeast corner of sec. 1, T. 49 N., R. 5 W:

O1-3 inches to 1 inch; partially decomposed needles and twigs.

O2-1 inch to 0; decomposed needles and twigs.

A1-0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine crumb structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine to coarse roots; common fine and very fine interstitial pores; medium acid; clear wavy boundary.

A3-6 to 13 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine to coarse roots; common very fine and fine tubular pores; medium acid; clear wavy boundary.

B1t-13 to 24 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium prismatic structure that parts to weak medium and fine subangular blocky; hard, friable, slightly sticky, slightly plastic; common fine to coarse roots; common very fine and fine interstitial and tubular pores; about 1 percent fine grave!; few thin clay films in some pores; medium acid; clear wavy boundary.

B2t-24 to 42 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure that parts to weak medium subangular blocky; hard, friable, sticky, slightly plastic; few fine to coarse roots; common very fine and fine interstitial and tubular pores; common moderately thick clay films on ped faces and in pores; two clay bands or lamellae 1/8 to 1/4 inch thick; about 5 percent fine gravel; medium acid; abrupt smooth boundary.

B3t-42 to 56 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few medium and coarse roots; few fine tubular pores; few thin clay films in pores; medium acid; gradual wavy boundary.

IIC-56 to 72 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 3/4) moist; massive; hard, friable, nonsticky, nonplastic; few thin clay films in pores and clay bands; few reddish brown and black concretions; medium acid.

The mean annual soil temperature ranges from 43 to 47 degrees F. The solum ranges from 40 to 60 inches in thickness.

The A horizon has value of 5 or 6 dry, 3 or 4 moist, and chroma of 2 or 3 dry, 2 through 4 moist. The dark upper part of the profile is 3 to 6 inches thick.

The Bt horizon has hue of 10YR or 7.5YR; value of 5 through 7 dry, and 4 or 5 moist; and chroma of 3 or 4. It is heavy loam or clay loam and contains 18 to 30 percent clay. Base saturation is less than 75 percent in part or all of the Bt horizon. Some pedons have a few uncoated silt grains on the surface of peds in the B horizon.

The IIC horizon is generally fine sandy loam but ranges to sandy loam in some pedons.

Lacy series

The Lacy series consists of shallow, well drained soils on terrace breaks and mountains. These soils formed in material weathered from basalt bedrock and a minor amount of loess in the upper part. Slopes are 5 to 65 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 48 degrees F.

Lacy soils are similar to the Bobbitt and Tekoa soils and are near the Blinn, Santa, and Taney soils. Blinn, Bobbitt, and Tekoa soils have bedrock at a depth of 20 to 40 inches. Santa soils formed in deep loess and have a fragipan. Taney soils are very deep and do not have coarse fragments.

Typical pedon of Lacy stony loam, in an area of Lacy-Rock outcrop complex, 5 to 35 percent slopes, about 1.5 miles southeast of Setters, in the SE1/4SE1/4 of sec. 33, T. 48 N., R. 5 W:

O1-1 inch to 0; undecomposed pine needles and grass.

A11-0 to 1 inch; dark brown (10YR 4/3) stony loam, very dark brown (7.5YR 2/2) moist; weak thin platy structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine irregular pores; 2 percent gravel and 3 percent stones; medium acid; abrupt smooth boundary.

A12-1 inch to 4 inches; dark brown (7.5YR 4/4) stony loam, very dark brown (7.5YR 2/2) moist; moderate thin platy structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine irregular pores; 15 percent gravel and stones; slightly acid; abrupt smooth boundary.

A13-4 to 7 inches; dark brown (7.5YR 4/4) stony loam, dark brown (7.5YR 3/2) moist; weak medium platy structure that parts to weak fine granular; slightly hard, friable, sticky, plastic; common fine and medium roots; common fine and medium pores; 20 percent gravel and stones; medium acid; clear smooth boundary.

B1t-7 to 14 inches; dark brown (7.5YR 4/4) stony clay loam, dark reddish brown (5YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky, plastic; common fine medium and few coarse roots; common fine tubular pores; thin continuous clay films on rock fragments and in pores of peds; 30 percent gravel and stones; slightly acid; clear smooth boundary.

B2t-14 to 19 inches; brown (7.5YR 4/4) very stony clay loam, dark reddish brown (5YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky, plastic; common medium and coarse roots between rock fragments; common fine tubular pores; thin continuous clay films on ped faces and in pores; 60 percent gravel and stones; strongly acid; clear irregular boundary.

R-19 inches; fractured basalt.

Depth to fractured basalt is 10 to 22 inches. The mean annual soil temperature ranges from 47 to 52 degrees F.

The A1 horizon has hue of 10YR through 5YR; value of 4 or 5 dry, 2 or 3 moist; and chroma of 2 through 4 dry, 2 or 3 moist. Rock fragments make up 5 to 25 percent of this horizon.

The Bt horizon has hue of 5YR through 10YR; value of 4 or 5 dry, 2 through 4 moist. Texture is stony clay loam, stony loam, or very stony clay loam. Rock fragments make up 25 to 80 percent of this horizon but average more than 35 percent.

Larkin series

The Larkin series consists of very deep, well drained soils on loess hills. These soils formed in deep loess and a mixture of volcanic ash. Slopes are 3 to 20 percent. The mean annual precipitation is 23 inches, and mean annual air temperature is 47 degrees F.

Larkin soils are similar to the Bobbitt, Schumacher, and Tekoa soils and are near the Southwick and Taney soils. Bobbitt, Schumacher, and Tekoa soils contain coarse fragments and have bedrock above a depth of 60 inches. Southwick and Taney soils have an A2 horizon and are moderately well drained.

Typical pedon (fig. 19) of Larkin silt loam, 3 to 12 percent slopes, about 2 miles west of Worley, 200 feet north of the southwest corner of sec. 22, T. 47 N., R. 5 W:

Ap-0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure that parts to weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; medium acid; abrupt smooth boundary.

A12-8 to 16 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; slightly acid; clear wavy boundary.

B1-16 to 23 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; slightly acid; clear wavy boundary.

B21t-23 to 30 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure that parts to moderate medium su-

Figure 19.-Profile of Larkin silt loam.

bangular blocky; hard, firm, sticky, plastic; common very fine and fine roots; common very fine and fine tubular pores; thin clay films in pores and on ped surfaces; many silt coatings on peds; slightly acid; clear *wavy* boundary.

B22t-30 to 38 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure that parts to moderate medium subangular blocky; very hard, firm, sticky, plastic; common very fine and fine roots; common very fine and fine tubular pores; thin continuous clay films in pores and on ped surfaces; many very pale brown (10YR 7/3) silt coatings on peds, grayish brown (10YR 5/2) moist; slightly acid; clear wavy boundary.

B23t-38 to 48 inches; yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 3/4) moist; moderate coarse prismatic structure; very hard, firm, sticky, plastic; few fine roots; common very fine and fine tubular pores; thick continuous clay films in pores and on ped surfaces; many iron-manganese concretions; neutral; gradual wavy boundary.

B3t-48 to 52 inches; yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 3/4) moist; moderate coarse subangular blocky structure; very hard, firm, sticky, plastic; few fine roots; common very fine and fine tubular pores; many thick clay films in pores and on ped surfaces; many iron-manganese concretions; neutral.

Thickness of the solum ranges from 42 to more than 60 inches. The mean annual soil temperature ranges from 47 to 52 degrees F. Base saturation in the upper 30 inches of the solum ranges from 52 to 74 percent.

The A horizon has value of 2 or 3 moist. Reaction is medium acid or slightly acid.

The B1 horizon has value of 5 or 6 dry, 3 or 4 moist, and chroma of 3 or 4. Reaction ranges from medium acid to neutral.

The B2t horizon has hue of 10YR or 7.5YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 3 or 4 moist and dry. It averages from 20 to 34 percent clay and 5 to 10 percent sand.

The Bat horizon has hue of 10YR or 7.5YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 3 or 4 moist and dry. Reaction ranges from slightly acid to mildly alkaline.

Latahco series

The Latahco series consists of very deep, somewhat poorly drained soils on low terraces, bottom lands, and drainageways. These soils formed in alluvium from surrounding loess hills. Slopes are 0 to 2 percent. The mean annual precipitation is 20 inches, and mean annual air temperature is 43 degrees F.

Latahco soils are similar to the Southwick and Thatuna soils and are near the Cald and Larkin soils. Southwick and Thatuna soils have a mean annual soil temperature of more than 47 degrees F and are moderately well drained. Cald soils do not have A2 and B2t horizons. Larkin soils do not have an A2 horizon and are well drained.

Typical pedon of Latahco silt loam, from an area of Latahco-Thatuna silt loams, 0 to 7 percent slopes, near Rose Creek, in the southwest corner of the county, 1,000 feet east and 180 feet north of the southwest corner of sec. 31, T. 47 N., R. 5 W:

Ap-0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure that parts to moderate fine granular; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; many very

fine interstitial pores; slightly acid; abrupt wavy boundary.

A12-6 to 13 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure that parts to moderate medium granular; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; many very fine and fine tubular pores; slightly acid; clear wavy boundary.

A21-13 to 18 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine and medium roots; many very fine tubular pores; neutral; clear wavy boundary.

A22-18 to 22 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; very few fine yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable, slightly sticky, nonplastic; few fine and medium roots; many very fine and fine tubular pores; neutral; abrupt irregular boundary.

B21t-22 to 29 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate coarse prismatic structure that parts to moderate coarse angular blocky; extremely hard, very firm, sticky, plastic; few fine roots on ped surfaces; many very fine and fine tubular pores; thick continuous brown (7.5YR 4/4) clay films on ped surfaces, dark brown (7.5YR 3/2) moist; very few faint discontinuous iron mottles on ped surfaces; few fine and medium iron-manganese concretions; mildly alkaline; clear wavy boundary.

B22t-29 to 43 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure that parts to moderate medium angular blocky; very hard, very firm, sticky, plastic; many very fine and fine tubular pores; many moderately thick brown (7.5YR 4/4) clay films in pores and on ped surfaces, dark brown (7.5YR 3/2) moist; few fine faint iron mottles; few fine iron-manganese concretions; mildly alkaline; clear wavy boundary.

B3t-43 to 53 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; very hard, very firm, sticky, plastic; few fine and medium tubular pores; many moderately thick strong brown (7.5YR 5/6) clay films in pores and on ped surfaces, dark brown (7.5YR 4/4) moist; few medium distinct iron mottles on ped surfaces; mildly alkaline; clear wavy boundary.

C-53 to 62 inches; very pale brown (10YR 7/3) silty clay loam, yellowish brown (10YR 5/4) moist; massive; very hard, very firm, sticky, plastic; few fine and medium tubular pores; few fine iron-manganese concretions; mildly alkaline.

These soils have a water table at a depth of 6 to 30 inches from April to May and are occasionally flooded for brief periods from February to April. The mean annual soil temperature ranges from 43 to 47 degrees F. Thickness of the solum ranges from 40 to 60 inches. Depth to the B2t horizon is 18 to 30 inches.

The Ap or A1 horizon has value of 3 through 5 dry, 2 or 3 moist. It is 3 to 7 percent organic matter content. The A2 horizon has value of 6 or 7 dry, 4 or 5 moist, and chroma of 1 or 2. It has few fine mottles or iron-manganese concretions. It is commonly thicker than 3 inches.

In the peds of the B2t horizon, hue is mainly 2.5Y but ranges to 10YR; value is 4 through 6 dry, 3 or 4 moist; and chroma is 1 through 4. Texture of the B2t horizon is silty clay loam or silt loam, with 25 to 35 percent clay and less than 15 percent fine sand or coarser sand. The B2t horizon is neutral or mildly alkaline. A few pedons have some lime seams along ped surfaces in the Bt horizon.

The C horizon is mildly alkaline or moderately alkaline.

Lenz series

The Lenz series consists of moderately deep, well drained soils that formed in residuum from gneiss and other metamorphic rocks on mountains. They have small amounts of loess in the upper part of the profile. Slopes are 5 to 65 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 47 degrees F.

Lenz soils are similar to the McCrosket and Spokane soils and are near the Kruse, Schumacher, Skalan, Ulricher, and Vassar soils. McCrosket soils are more than 40 inches deep to bedrock. Spokane soils have less than 35 percent coarse fragments. Kruse, Schumacher, and Skalan soils have a B2t horizon. Vassar soils are more than 60 inches deep to bedrock and have a bulk density of less than 0.95 grams per cubic centimeter in the upper layers. Ulricher soils are deep and have less than 35 percent coarse fragments.

Typical pedon of Lenz loam, from an area of Lenz complex, 35 to 65 percent slopes, near Blossom Mountain, 1,300 feet north and 2,400 feet east of the southwest corner of sec. 28, T. 50 N., R. 5 W:

A1-0 to 7 inches; dark brown (10YR 3/3) loam, very dark brown (10YR 2/2) moist; moderate medium and coarse granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, medium and few coarse roots; many very fine and fine interstitial pores; 5 percent fine gravel; slightly acid; clear wavy boundary.

B1-7 to 12 inches; yellowish brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure that parts to moderate fine and medium granular; soft, very friable, slightly sticky, slightly plastic; many very fine and fine, common medium and few coarse roots; many very fine and fine interstitial pores; 10 percent fine gravel; slightly acid; clear wavy boundary.

B2-12 to 23 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine, few medium and coarse roots; common very fine and fine tubular and interstitial pores; few thin clay films in pores; 25 percent gravel, 10 percent cobbles; slightly acid; clear wavy boundary.

C-23 to 36 inches; light yellowish brown (10YR 6/4) very stony sandy loam, dark yellowish brown (10YR 4/4) moist; massive; loose, nonsticky, nonplastic; few very fine and fine roots; common fine interstitial and few fine tubular pores; 75 percent stones; very few thin clay films; medium acid; gradual *wavy* boundary.

R-36 inches; fractured gneiss with few fines in cracks.

Depth to bedrock ranges from 20 to 40 inches. The mean annual soil temperature ranges from 47 to 50 degrees F. The soil contains an average of more than 35 percent coarse fragments below a depth of 10 inches. Reaction is slightly acid or medium acid throughout. Base saturation is less than 75 percent in all or part of the soil.

The A horizon has value of 3 or 4 dry, 2 or 3 moist, and chroma of 2 or 3 moist and dry. It contains 5 to 15 percent rock fragments and is loam or sandy loam. Some pedons are very stony.

The B2 horizon has value of 5 or 6 dry, 3 or 4 moist, and chroma of 3 or 4. It has 35 to 50 percent rock fragments and is very gravelly sandy loam or very gravelly loam with less than 18 percent clay.

The C horizon has value of 4 or 5 moist. It has 35 -to 80 percent rock fragments and is very stony sandy loam or very stony loamy sand.

Marble series

The Marble series consists of very deep, excessively drained soils on outwash terraces. These soils formed in wind- and water-worked sandy outwash materials. Slopes are 0 to 45 percent. The mean annual precipitation is 22 inches, and mean annual air temperature is 48 degrees F.

Marble soils are similar to the Selle and Rubson soils and are near the Avonville, Garrison, McGuire, and Narcisse soils. Selle soils have a fine sandy loam B2ir horizon. Rubson soils have a silt loam B horizon. Avonville, Garrison, and McGuire soils have an average of more than 55 percent coarse fragments. Narcisse soils have an Al horizon that is more than 20 inches thick and a silt loam B horizon.

Typical pedon of Marble sandy loam, from an area of McGuire-Marble association, 0 to 7 percent slopes, about 300 feet west and 100 feet north of the southeast corner of sec. 6, T. 50 N., R. 4 W:

O1-2.5 to 1.5 inches; undecomposed and partially decomposed needles, leaves, and twigs.

O2-1.5 inches to 0; decomposed needles, leaves, and twigs.

A1-0 to 6 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine and few fine tubular pores; slightly acid; clear wavy boundary.

C1-6 to 9 inches; pale brown (10YR 6/3) loamy sand, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots; common very fine and few fine tubular pores; 5 percent gravel; three 1/3-inch discontinuous clay bands; slightly acid; gradual wavy boundary.

C2-9 to 18 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine and few fine roots; common very fine and fine tubular pores; 5 percent gravel; neutral; gradual wavy boundary.

C3-18 to 60 inches; pale brown (10YR 6/3) coarse sand, brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; very porous; 10 percent gravel; slightly acid.

Reaction is slightly acid or neutral. The C horizon has hue of 10YR and 2.5Y; value of 5 through 7 dry, 4 or 5 moist; and chroma of 2 through 4 dry and moist.

McCrosket series

The McCrosket series consists of deep, well drained soils on mountains. These soils formed from metasedimentary rock and a mantle of loess. Slopes are 20 to 65 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 47 degrees F.

McCrosket soils are similar to the Bobbitt, Lenz, and Tekoa soils and are near the Ardenvoir and Huckleberry soils. Bobbitt soils have a very stony clay loam B horizon. Lenz and Tekoa soils have bedrock at a depth of 20 to 40 inches. Ardenvoir and Huckleberry soils have a light colored surface layer and a mean annual soil temperature of less than 47 degrees F.

Typical pedon of McCrosket gravelly silt loam, from an area of McCrosket-Tekoa association, 35 to 65 percent slopes, about 1 mile northeast of the Cataldo Mission in the NE1/4NW1/4 of sec. 33, T. 49 N., R. 1 E:

O11-1.5 inches to 0.5 inch; undecomposed needles and twigs.

O12-0.5 inch to 0; partially decomposed needles and twigs.

A11-0 to 5 inches; dark grayish brown (10YR 4/2) gravelly silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very

friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine interstitial and tubular pores; 15 percent gravel; medium acid; clear wavy boundary.

A12-5 to 10 inches; dark grayish brown (10YR 4/2) gravelly silt loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure that parts to weak fine granular; soft, friable, slightly sticky, slightly plastic; many very fine, fine, and common medium roots; common very fine and fine interstitial and tubular pores; 10 percent gravel, 5 percent cobbles, 1 percent stones; slightly acid; clear *wavy* boundary.

B1-10 to 16 inches; brown (10YR 5/3) gravelly silt loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine and common medium roots; common very fine, fine, and few medium interstitial and tubular pores; 25 percent gravel, 5 percent cobbles, 1 percent stones; medium acid; clear wavy boundary.

B2-16 to 24 inches; brown (10YR 5/3) very gravelly silt loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine, fine and medium roots; few very fine, fine and medium interstitial and tubular pores; 35 percent gravel, 20 percent cobbles, 1 percent stones; thin silt coatings on ped surfaces; slightly acid; clear wavy boundary.

B3-24 to 41 inches; pale brown (10YR 6/3) very gravelly silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine and medium roots; many very fine interstitial and tubular pores; 35 percent gravel, 30 percent cobbles, 5 percent stones; medium acid.

C-41 to 48 inches; very pale brown (10YR 7/3) very gravelly silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; 50 percent gravel, 30 percent cobbles, 5 percent stones; medium acid.

Cr-48 inches; fractured metasedimentary rock.

The mean annual soil temperature ranges from 47 to 51 degrees F. The mollic epipedon is 12 to 20 inches thick, and the solum is 40 to 56 inches thick. The depth to fractured bedrock is 40 to 60 inches, and consolidated bedrock is deeper than 5 feet. Reaction ranges from neutral to medium acid. Base saturation is less than 75 percent in all or part of the soil.

The A horizon has value of 3 through 5 dry, 2 or 3 moist, and chroma of 2 or 3. The B horizon has value of 5 through 7 dry, 3 through 5 moist, and chroma of 3 through 6. It is silt loam or loam and is very gravelly or very stony. Rock fragments average from 50 to 80 percent.

McGuire series

The McGuire series consists of very deep, somewhat excessively drained soils on outwash terraces and terrace escarpments. These soils formed in glacial outwash materials mixed with loess and volcanic ash. Slopes are 0 to 45 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 47 degrees F.

McGuire soils are similar to the Bonner and Kootenai soils and are near the Avonville, Garrison, Marble, and Narcisse soils. Bonner and Kootenai soils have a mean annual soil temperature of less than 47 degrees F. Avonville, Garrison, and Narcisse soils have an Al horizon more than 7 inches thick. Marble soils are loamy sand and sand below a depth of 6 inches.

Typical pedon of McGuire gravelly sandy loam, from an area of McGuire-Marble association, 0 to 7 percent slopes, about 1.5 miles southeast of Post Falls, 3,200 feet east and 150 feet north of the southwest corner of sec. 1, T. 50 N., R. 5 W:

O1-1 inch to 0; needles, twigs, moss, and grass.

A1-0 to 2 inches; dark brown (10YR 4/3) gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; 30 percent gravel; neutral; abrupt smooth boundary.

A3-2 to 8 inches; pale brown (10YR 6/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine tubular and interstitial pores; mycelium present on ped surfaces; 35 percent gravel; neutral; clear smooth boundary.

B21-8 to 14 inches; pale brown (10YR 6/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine, fine and medium roots; common very fine and fine interstitial pores; krotovinas present in horizon; thin clay films bridging mineral grains; some mycelium on ped surfaces; 50 percent gravel; neutral; clear smooth boundary.

B22-14 to 22 inches; light yellowish brown (10YR 6/4) very gravelly coarse sandy loam; dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine, fine, and coarse and common medium roots; common fine and medium, few coarse interstitial pores; thin clay films bridging mineral grains; krotovinas present in horizon; 50 percent gravel; neutral; clear wavy boundary.

C1-22 to 26 inches; very pale brown (10YR 7/4) very gravelly coarse sandy loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular

blocky structure; loose, nonsticky, nonplastic; common very fine and fine roots; common fine and medium interstitial pores; 70 percent gravel and 3 percent cobbles; neutral; abrupt smooth boundary.

IIC2-26 to 60 inches; variegated colors; very gravelly coarse sand; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; 85 percent gravel; neutral.

Depth to loose sand and gravel is about 25 to 40 inches. Mean annual soil temperature ranges from 48 to 50 degrees F. The solum has 25 to 60 percent coarse fragments. Reaction is slightly acid or neutral throughout.

The A horizon has value of 4 through 6 dry, 2 or 3 moist, and chroma of 1 through 3 moist and dry.

The B2 horizon has hue of 10YR or 7.5YR; value of 5 or 6 dry, 4 or 5 moist; and chroma of 3 or 4 dry, 2 through 4 moist.

The C1 horizon has value of 6 or 7 dry, 3 through 5 moist, and chroma of 4 through 6 moist and dry. It contains 70 to 80 percent coarse fragments. The IIC2 horizon has variegated colors. The C1 horizon is coarse sand and gravel with 75 to 85 percent coarse fragments.

Mokins series

The Mokins series consists of very deep, moderately well drained soils on glaciolacustrine terraces. These soils formed in a thin mantle of loess and volcanic ash over glaciolacustrine sediment. Slopes are 5 to 65 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 43 degrees F.

Mokins soils are similar to the Chatcolet and Potlatch soils and are near the Bonner, Rubson, and Seelovers soils. Chatcolet soils have an average of less than 35 percent clay in the B2t horizon. Potlatch and Seelovers soils are poorly drained. Rubson soils have an average of less than 18 percent clay in the B horizon. Bonner soils have very gravelly loamy sand substrata above a depth of 40 inches.

Typical pedon of Mokins silt loam, 5 to 20 percent slopes, about 2 miles north of Hayden Lake, 1,800 feet west of the northeast corner of sec. 5, T. 51 N., R. 3 W:

O1-1.5 inches to 0; needles, twigs, and grass.

A1-0 to 3 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, nonplastic; many fine and medium roots; common very fine and fine irregular pores; 5 percent gravel; neutral; abrupt wavy boundary.

B21ir-3 to 6 inches; light yellowish brown (10YR 6/4) silt loam, strong brown (7.5YR 5/6) moist; weak thick platy structure that parts to moderate medium subangular blocky; soft, very friable, slightly sticky, nonplastic; many fine, medium, and few coarse roots; common very fine and fine irregular pores; 5 percent gravel; slightly acid; clear wavy boundary.

B22ir-6 to 14 inches; very pale brown (10YR 7/4) gravelly silt loam, strong brown (7.5YR 5/6) moist; moderate and coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine and medium roots; many very fine and fine irregular pores; 25 percent gravel; medium acid; abrupt wavy boundary.

A2b-14 to 20 inches; white (10YR 8/2) silt loam, light yellowish brown (10YR 6/4) moist; common faint to distinct reddish yellow (7.5YR 6/6) iron stains on ped surfaces; weak medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; many fine roots; many very fine and fine tubular pores; 5 percent gravel; very strongly acid; abrupt irregular boundary.

B21tb-20 to 28 inches; reddish yellow (7.5YR 6/8) silty clay loam, strong brown (7.5YR 5/8) moist; common distinct reddish yellow (7.5YR 6/6) iron mottles on ped surfaces; moderate medium prismatic structure that parts to strong fine and medium angular blocky; very hard, very firm, very sticky, very plastic; few fine and medium roots; common very fine and fine tubular and vesicular pores; thick A2 coatings on ped surfaces; continuous thin yellowish red (5YR 5/8) clay films on ped surfaces; very strongly acid; clear wavy boundary.

B22tb-28 to 49 inches; brownish yellow (10YR 6/8) silty clay, yellowish brown (10YR 5/8) moist; common prominent fine and medium reddish yellow (7.5YR 6/8) iron mottles; moderate coarse prismatic structure (with plates in prisms) that parts to strong fine angular blocky; very hard, very firm, very sticky, very plastic; few fine and medium roots that are matted on surfaces of peds; common very fine and fine tubular and vesicular pores; continuous thick yellowish red (5YR 4/6) clay films; thin very pale brown (10YR 8/3) A2 coatings on ped surfaces; very strongly acid; diffuse wavy boundary.

B3tb-49 to 60 inches; brownish yellow (10YR 6/8) silty clay, yellowish brown (10YR 5/8) moist; many prominent medium and coarse strong brown (7.5YR 5/8) iron mottles; moderate coarse prismatic structure that parts to weak medium angular blocky; very hard, very firm, very sticky, very plastic; few fine and medium roots matted on ped surfaces; common very fine and fine tubular and vesicular pores; continuous thin yellowish red (5YR 4/8) and dark reddish brown (5YR 3/3) clay films; thin patchy white (10YR 8/1) A2 coatings on ped surfaces; very strongly acid.

Mean annual soil temperature ranges from 43 to 45 degrees F, and the mean summer soil temperature is 45 to 47 degrees F. The solum ranges from 40 to more than 60 inches in thickness. It contains up to 30 percent coarse fragments. Reaction ranges from neutral to very strongly acid.

The A horizon has value 4 or 5 dry, 3 or 4 moist, and chroma 2 or 3 dry and moist.

The Bir horizon has hue of 7.5YR or 10YR; value of 5 through 8 dry, 4 through 6 moist; and chroma of 3 through 6 dry and moist. The Bir horizon is gravelly silt loam or silt loam.

The A2b horizon has value of 7 or 8 dry, 5 or 6 moist, and chroma of 2 through 4 dry and moist.

The Btb horizon has hue of 7.5YR or 10YR; value of 5 through 7 dry, 4 or 5 moist; and chroma of 6 through 8 dry and moist. Mottles are faint to prominent and have hue of 7.5YR or 5YR. Clay films are thin to thick and have hue of 7.5YR or 5YR, value of 3 through 6, and chroma of 3 through 8. The Btb horizon ranges from silty clay loam to silty clay with 35 to 50 percent clay.

Moscow series

The Moscow series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from granite, gneiss, and schist rocks and a mantle of loess and volcanic ash. Slopes are 5 to 65 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 44 degrees F.

Moscow soils are similar to Treble and Ulricher soils and are near the Lenz, Spokane, and Vassar soils. Treble and Lenz soils have more than 35 percent coarse fragments below a depth of 10 inches. Ulricher soils are deep and have a mean annual soil temperature of more than 47 degrees F. Vassar soils have a bulk density in the upper part of the profile of less than 0.85 grams per cubic centimeter. Spokane soils have an Al horizon of more than 7 inches and a mean annual soil temperature of more than 47 degrees F.

Typical pedon of Moscow loam, 5 to 35 percent slopes, about 4 miles southeast of Athol, 2,600 feet north and 900 feet west of the southeast corner of sec. 35, T. 53 N., R. 3 W:

O1-2.5 inches to 1 inch; needles, twigs, leaves, and moss.

O2-1 inch to 0; decomposed needles, leaves, and twigs.

A1-0 to 1 inch; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; weak, very fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine roots; many very fine interstitial pores; slightly acid; clear smooth boundary.

B21-1 to 14 inches; yellowish brown (10YR 5/4) loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine common medium and few coarse roots; many very fine, common fine and medium interstitial and tubular pores; 5 percent gravel; slightly acid; clear wavy boundary.

B22-14 to 23 inches; light yellowish brown (10YR 6/4) loam, dark brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky slightly plastic; many medium common very fine, fine and coarse roots; common very fine and fine interstitial pores; 5 percent gravel; slightly acid; clear smooth boundary.

B3-23 to 26 inches; pale brown (10YR 6/3) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, slightly sticky, non-plastic; common fine and very fine few medium roots; common very fine and fine interstitial pores; 20 percent gravel, 10 percent cobbles; slightly acid; abrupt wavy boundary.

Cr-26 inches; weathered granitic bedrock.

Depth to weathered bedrock ranges from 20 to 40 inches. Reaction is medium acid or slightly acid, and the mean annual soil temperature ranges from 44 to 47 degrees F. A thin, discontinuous volcanic ash layer is on the surface of some pedons.

The B2 horizon has hue of 10YR and 7.5YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 3 or 4. Texture ranges from loam to silt loam. Coarse fragments make up 5 to 15 percent of the horizon. The B3 horizon has 10 to 30 percent coarse fragments. It is loam or gravelly sandy loam.

Narcisse series

The Narcisse series consists of very deep, moderately well drained soils in long, narrow drainageways on outwash plains. These soils formed in alluvium. Slopes are 0 to 5 percent. The mean annual precipitation is 24 inches, and mean annual air temperature is 46 degrees F.

Narcisse soils are similar to Cald soils and are near the Avonville, Garrison, Marble, and McGuire soils. Cald soils have an average of more than 18 percent clay and less than 15 percent fine or coarser sand between a depth of 10 and 40 inches. Avonville, Garrison, and McGuire soils have more than 35 percent coarse fragments between a depth of 10 and 40 inches. Marble soils have sandy texture throughout.

Typical pedon of Narcisse silt loam, 0 to 5 percent slopes, about 2.5 miles northeast of Post Falls, 2,400 feet north and 1,250 feet west of the southeast corner of sec. 25, T. 51 N., R. 5 W:

Ap-0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, black (10YR 2/1) moist; weak fine and medium granular structure; soft, very friable, slightly sticky, nonplastic; many fine roots; common very fine and fine tubular pores; neutral; clear smooth boundary.

A12-8 to 18 inches; dark grayish brown (10YR 4/2) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many fine roots; common very fine and fine tubular pores; neutral; gradual wavy boundary.

A3-18 to 25 inches; grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak

medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many fine roots; many very fine and fine tubular pores; neutral; clear wavy boundary.

B2-25 to 36 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; many very fine and fine tubular pores; few fine manganese concretions; slightly acid; abrupt smooth boundary.

C1-36 to 51 inches; very pale brown (10YR 8/4) very fine sandy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable, nonsticky, nonplastic; few fine roots; many very fine and fine tubular pores; common fine manganese concretions; many 1/32- to 1/16-inch dark brown (7.5YR 4/4) moist clay bands; slightly acid; abrupt smooth boundary.

C2-51 to 64 inches; very pale brown (10YR 8/3) very cobbly fine sandy loam, light yellowish brown (10YR 6/4) moist; common faint red mottles; massive; slightly hard, friable, nonsticky, nonplastic; many very fine and fine tubular pores; 30 percent cobbles, 10 percent stones, 15 percent gravel; neutral.

The solum ranges from 30 to 46 inches in thickness. Reaction is slightly acid or neutral. These soils have a water table at a depth of 3 to 5 feet in spring. The mollic epipedon ranges from 22 to 32 inches in thickness.

The A horizon has value of 4 or 5 dry, 2 or 3 moist; and chroma of 1 or 2. There may be up to 10 percent gravel.

The B2 horizon has value of 5 through 7 dry, 3 through 5 moist, and chroma of 3 or 4 dry, 2 through 4 moist. Texture is silt loam or loam. Coarse fragments range from 2 to 10 percent.

The C horizon has value of 6 through 8 dry, 4 through 6 moist, and chroma of 3 or 4. Texture is very fine sandy loam, very gravelly sandy loam, or very cobbly fine sandy loam. There is 5 to 60 percent coarse fragments. Thin clay bands are in some pedons.

Porrett series

The Porrett series consists of very deep, very poorly drained soils on alluvial bottom lands. These soils formed in a mixture of loess and volcanic ash. Slopes are 0 to 2 percent. The mean annual precipitation is 30 inches, and mean annual temperature is 42 degrees F.

Porrett soils are similar to the Potlatch soils and are near the Cald and Santa soils. Potlatch soils have an Al horizon 7 or more inches thick and an average of more than 35 percent clay in the B2t horizon. Cald soils have an A1 horizon more than 20 inches thick. Santa soils have a fragipan and are moderately well drained.

Typical pedon of Porrett silt loam, about 0.5 mile south of Squaw Bay on Lake Coeur d'Alene, along U.S. Highway 95A, 900 feet east and 200 feet south of the northwest corner of sec. 9, T. 49 N., R. 3 W:

Ap-0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; few fine faint brown (10YR 4/3) mottles; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and common medium roots; many very fine tubular pores; slightly acid; clear wavy boundary.

A21-3 to 7 inches; dark grayish brown (2.5Y 4/2) silt loam; light brownish gray (2.5Y 6/2) dry; common fine distinct dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine tubular pores; few fine manganese concretions; many mica flakes; neutral; clear wavy boundary.

A22-7 to 16 inches; dark grayish brown (2.5Y 4/2) silt loam, light gray (2.5Y 7/2) dry; common medium and coarse prominent dark brown (7.5YR 4/4) moist mottles; massive; soft, very friable, nonsticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; few fine manganese concretions; many mica flakes; neutral; clear smooth boundary.

A23-16 to 28 inches; grayish brown (2.5Y 5/2) silt loam, light gray (2.5Y 7/2) dry; many medium and coarse dark brown (7.5YR 4/4) moist prominent mottles; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; few black organic stains; neutral; clear wavy boundary.

B21tg-28 to 50 inches; dark grayish brown (2.5Y 4/2) silty clay loam, light brownish gray (2.5Y 6/2) dry; many medium and coarse distinct and prominent dark brown (7.5YR 4/4) moist mottles; moderate medium angular blocky structure; hard, firm, sticky, plastic; few very fine roots; few very fine and medium tubular pores; few black organic stains; common moderately thick clay films on ped faces; neutral; gradual wavy boundary.

B22tg-50 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay loam, light gray (2.5Y 7/2) dry; many medium and coarse distinct and prominent dark brown (7.5YR 4/4) mottles; moderate medium angular blocky structure; hard, firm, sticky, plastic; few very fine roots; few very fine and medium tubular pores; common moderately thick clay films on ped faces; neutral; clear wavy boundary.

These soils have a water table from the surface to a depth of 12 inches from April to June, and are frequently flooded for brief periods from February to April. The mean annual soil temperature ranges from 43 to 45 degrees F. Thickness of the solum ranges from 54 to 60 inches.

A thin O horizon is in undisturbed areas. The Ap horizon has hue of 10YR or 2.5Y and chroma of 1 or 2. The A2 horizon has hue of 10YR or 2.5Y; value of 6 or 7 dry, 4 or 5 moist; and chroma of 1 through 3 dry, 2 or 3

moist. The B2tg horizon has hue of 10YR or 2.5Y; value of 5 through 7 dry, 4 through 6 moist; and chroma of 1 through 3.

Potlatch series

The Potlatch series consists of very deep, poorly drained soils on alluvial fans and terraces. These soils formed in mixed alluvium. Slopes are 0 to 2 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 42 degrees F.

Potlatch soils are similar to the Chatcolet, Mokins, and Porrett soils and are near the Santa, Seelovers, and Taney soils. Chatcolet and Mokins soils are moderately well drained soils on terraces. Porrett soils have an average of less than 35 percent clay in the B2t horizon. Santa and Taney soils are moderately well drained soils on loess plains. Seelovers soils do not have an A2 or B2t horizon.

Typical pedon of Potlatch silt loam, 0 to 2 percent slopes, about 9 miles northwest of Worley, 1,750 feet south and 1,450 feet west of the northeast corner of sec. 17, T. 48 N., R. 5 W:

A11-0 to 4 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure that parts to moderate fine and medium granular; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium roots; common fine and very fine tubular pores; few faint iron stains; medium acid; clear wavy boundary.

A12-4 to 7 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; many fine and medium roots; common very fine and fine tubular pores; few faint iron stains; medium acid; abrupt wavy boundary.

A13-7 to 12 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; few faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine and medium roots; many very fine and common fine tubular pores; few faint iron stains; medium acid; clear wavy boundary.

A21g-12 to 16 inches; light gray (10YR 7/1) silt loam, dark gray (10YR 4/1) moist; few distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine and medium roots; many fine and medium tubular pores; few mica flakes; few black concretions; medium acid; abrupt wavy boundary.

A22g-16 to 22 inches; light gray (10YR 7/1) silt loam, dark gray (10YR 4/1) moist; few distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine and medium roots; common fine and few medium tubular pores; few mica flakes; few black concretions; few thin clay films in pores and on ped faces; medium acid; abrupt smooth boundary.

B21tg-22 to 31 inches; light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) moist; few distinct yellowish brown (10YR 5/6) mottles; strong medium and coarse prismatic structure that parts to strong medium angular blocky; very hard, very firm, very sticky, very plastic; few very fine and fine roots that follow ped surfaces; many very fine and fine tubular pores; many very dark gray (10YR 3/1) stains covering ped surfaces; common moderately thick clay films in pores and on ped faces; few distinct iron stains; neutral; clear smooth boundary.

B22tg-31 to 38 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; many fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure that parts to moderate medium angular blocky; very hard, very firm, very sticky, very plastic; few very fine and fine roots following ped surfaces; common very fine, fine and medium tubular pores; common very dark gray (10YR 3/1) stains on ped faces; few mica flakes; few black concretions; common moderately thick clay films in pores and on ped faces; neutral; clear *wavy* boundary.

B3tg-38 to 44 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; very hard, very firm, sticky, plastic; few very fine and fine tubular pores; few black stains on ped faces; common moderately thick clay films in pores; neutral; clear wavy boundary.

Cg-44 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct yellowish brown (10YR 5/6) mottles; massive; very hard, very firm, sticky, plastic; few very fine tubular pores; few thin clay films in pores; many distinct iron stains; few black concretions; many mica flakes; neutral.

These soils have a water table that fluctuates between a depth of 18 to 42 inches from February through July. They are also subject to flooding from February to May. The mean annual soil temperature ranges from 43 to 46 degrees F, and the mean soil temperature in summer ranges from 52 to 54 degrees F. Thickness of the solum ranges from 36 to 60 inches.

The upper part of the A1 horizon has value of 2 or 3 moist, 3 through 5 dry, and chroma of 1 or 2 moist and dry. Some pedons have faint mottles. Reaction ranges from strongly acid to medium acid, and base saturation is less than 50 percent. The lower part of the Al horizon has value of 3 or 4 moist, 4 through 6 dry, and chroma of 1 through 3. There are few to many faint or distinct mottles. The A2g horizon has hue of 5Y through 10YR;

value of 4 through 6 moist, 5 through 7 dry; and chroma of 1 or 2. Mottles are distinct or prominent and have hue of 10YR or 7.5YR; value of 4 or 5 moist, 5 or 6 dry; and chroma of 4 through 6. The A2g horizon is silt or silt loam.

The B2tg horizon has hue of 10YR through 5Y; value of 4 through 6 moist, 6 or 7 dry; and chroma of 1 or 2. Few to many distinct or prominent mottles have hue of 5YR through 10YR; value of 4 or 5 moist, 5 or 6 dry; and chroma of 4 through 6 moist and dry. Texture is silty clay loam or silty clay and averages from 36 to 45 percent clay.

The Cg horizon is silt loam or silty clay loam. It has hue of 2.5Y or 5Y and value of 6 or 7 dry.

Pywell series

The Pywell series consists of very deep, very poorly drained soils in level depressions of flood plains and bottom lands. These soils formed in organic material. The mean annual precipitation is 25 inches, and mean annual air temperature is 43 degrees F.

Pywell soils are near the Cougarbay, Porrett, Ramsdell, and Seelovers soils. These are all mineral soils.

Typical pedon of Pywell muck, about 2 miles northeast of Rose Lake, 1,200 feet west and 50 feet north of the southeast corner of sec. 26, T. 49 N., R. 1 W:

Oap-0 to 11 inches; very dark brown (10YR 2/2) on broken face, rubbed and pressed, sapric material; about 15 percent fibers, about 5 percent after rubbing; moderate fine granular structure; many fine roots; strongly acid; abrupt smooth boundary.

Oa2-11 to 26 inches; very dark brown (10YR 2/2) on broken face, black (10YR 2/1) rubbed and pressed, sapric material; about 15 percent fibers, about 5 percent after rubbing; weak thin platy structure; many fine roots; thin volcanic ash layers; strongly acid; abrupt smooth boundary.

Oa3-26 to 42 inches; black (10YR 2/1) on broken face, very dark brown (10YR 2/2) rubbed and pressed, sapric material; about 50 percent fibers, about 15 percent after rubbing; massive; medium acid; abrupt smooth boundary.

Oa4-42 to 60 inches; black (10YR 2/1) on broken face, very dark brown (10YR 2/2) rubbed and pressed, sapric material; about 30 percent fibers, about 10 percent after rubbing; massive; medium acid.

The organic layers are more than 52 inches thick. They are commonly derived from herbaceous plants, but in some pedons a moderate amount of the material is woody. These soils have a high water table at e~ depth of 24 inches in spring and are subject to flooding if not protected by dikes or levees. The mean annual soil temperature ranges from 44 to 46 degrees F.

The surface tier is dominated by sapric material, but some pedons have fibric material in thin layers. The subsurface and bottom tiers have thin layers of mineral soil, volcanic ash, or fibric material. Reaction ranges from strongly acid to neutral. This soil has cracks 1/4 inch to 1 inch wide when dry.

Ramsdell series

The Ramsdell series consists of very deep, very poorly drained soils that formed in river and stream alluvium. Ramsdell soils are on low terraces and have slopes of 0 to 2 percent. Mean annual precipitation is 29 inches, and mean annual air temperature is 44 degrees F.

Ramsdell soils are similar to the Porrett and Seelovers soils and are near the Chatcolet, Cougarbay, and Pywell soils. Porrett soils have a silty clay loam B horizon. Seelovers soils have a black surface layer and average 18 to 35 percent clay. Chatcolet soils are moderately well drained soils on glaciolacustrine terraces. Cougarbay soils have a very dark gray surface layer and stratified silty clay and coarse sand substrata. Pywell soils are organic soils.

Typical pedon of Ramsdell silt loam, about 2.5 miles southwest of Cougar Bay, on Lake Coeur d'Alene, 800 feet east and 2,300 feet north of the southwest corner of sec. 29, T. 50 N., R. 4 W:

Ap-0 to 8 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure that parts to weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; many very fine, fine and medium roots; common very fine and fine tubular pores; slightly acid; clear wavy boundary.

B2-8 to 15 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; common very fine and fine tubular pores; neutral; clear smooth boundary.

C1g-15 to 38 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common medium distinct dark brown (7.5YR 4/4) moist mottles; massive; slightly hard, very friable, slightly sticky, nonplastic; common fine and medium roots; common fine tubular pores; neutral; clear smooth boundary.

C2g-38 to 51 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; many large prominent dark brown (7.5YR 4/4) moist mottles; massive; slightly hard, very friable, slightly sticky, nonplastic; few fine and medium roots; few fine tubular pores; neutral; clear smooth boundary.

C3g-51 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; many large prominent dark brown (7.5YR 4/4) moist mottles; massive; hard, friable, sticky, plastic; neutral.

These soils have a high water table at a depth of 1 to 2 feet from February to April. They are frequently flooded

for long periods during spring, unless protected by levees. The mean annual soil temperature ranges from 45 to 47 degrees F.

A buried A1 horizon is present in some pedons. The Ap horizon has hue of 10YR or 2.5Y and value of 6 or 7 dry, 3 through 5 moist.

The B2 horizon has hue of 10YR or 2.5Y and value of 5 through 7 dry, 4 or 5 moist.

The Cg horizon has value of 5 through 7 dry and 4 or 5 moist.

Rathdrum series

The Rathdrum series consists of very deep, well drained soils on glacial outwash plains and terraces in depressional areas. These soils formed in deep volcanic ash and loess over glacial outwash material. Slopes are 0 to 7 percent. The mean annual precipitation is 28 inches, and mean annual air temperature is 43 degrees F.

Rathdrum soils are near the Bonner, Kootenai, and McGuire soils. These soils have very gravelly loamy sand or very gravelly coarse sand substrata above a depth of 40 inches.

Typical pedon of Rathdrum silt loam, 0 to 7 percent slopes, south of Spirit Lake, about 1.4 miles north of the railroad overpass on State Highway 41, 300 feet west of the highway in NE1/4SE1/4 of sec. 20, T. 53 N., R. 4 W:

O11-2 inches to 1 inch; fresh needles, leaves, and twigs.

O12-1 inch to 0; partially decomposed needles, twigs, and roots.

B21ir-0 to 4 inches; pale brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/4) moist; weak medium platy structure that parts to weak fine subangular blocky; soft, very friable, nonsticky, nonplastic; many very fine, fine, medium and few coarse roots; common very fine, fine and medium tubular pores; 2 percent gravel; many small pieces of charcoal; slightly acid; clear wavy boundary.

B22ir-4 to 22 inches; pale brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure that parts to weak fine granular; soft, very friable, nonsticky, nonplastic; many very fine, fine, medium and common coarse roots; many fine and medium tubular pores; 3 percent gravel; few pieces of charcoal; slightly acid; gradual wavy boundary.

C1-22 to 44 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; weak medium and coarse subangular blocky structure that parts to weak fine granular; soft, very friable, nonsticky, nonplastic; common fine and medium, few very fine and coarse roots; many fine and medium tubular pores; 5 percent gravel; few black concretions; few pieces of charcoal; slightly acid; abrupt wavy boundary.

C2-44 to 54 inches; very pale brown (10YR 8/3 and 10YR 7/4) very fine sandy loam, pale brown (10YR 6/3) and yellowish brown (10YR 5/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium and coarse roots; few fine and medium tubular pores; reddish bands 1 /2 inch to 1 inch thick; 5 percent stones and 5 percent gravel; slightly acid; clear wavy boundary.

IIC3-54 to 70 inches; pale brown (10YR 6/3) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky, nonplastic; few fine and medium roots; few fine and medium tubular pores; 15 percent gravel, 5 percent cobbles, 5 percent stones; slightly acid.

The mean annual soil temperature ranges from 44 to 47 degrees F. The bulk density is estimated to be less than 0.85 grams per cubic centimeter, and the exchange complex is dominated by amorphous material. A thin, discontinuous, more recent layer of white volcanic ash is on the surface of some undisturbed pedons.

The Bir horizon has hue of 10YR and 7.5YR and value of 5 through 7 dry, 3 through 5 moist.

The C horizon has value of 6 through 8 dry, 4 through 6 moist. Content of coarse fragments increases in the lower part of this horizon.

Rubson series

The Rubson series consists of very deep, well drained soils on terraces. These soils formed in silty, glaciolacustrine sediment having a thin mantle of volcanic ash. Slopes are 0 to 20 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 42 degrees F.

Rubson soils are near the Chatcolet and Mokins soils. Chatcolet soils have a silty clay loam B2t horizon. Mokins soils have a silty clay B2t horizon.

Typical pedon of Rubson silt loam, from an area of Rubson-Mokins complex, 0 to 20 percent slopes, about 2.5 miles east of Rose Lake, 2,400 feet north and 1,600 feet east of the southwest corner of sec. 36, T. 49 N., R. 1 W:

Ap-0 to 6 inches; pale brown (10YR 6/3) silt loam, dark grayish brown (10YR 4/2) moist; weak medium platy structure that parts to moderate fine granular; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and few medium tubular pores; medium acid; abrupt wavy boundary.

B2ir-6 to 16 inches; pale brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure that parts to weak medium subangular blocky; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine tubular pores; slightly acid; clear wavy boundary.

C1-16 to 33 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky, nonplastic; few very fine roots; many very fine and fine tubular pores; two 1/16-inch to 1/4-inch thick dark reddish brown (5YR 3/4) moist clay bands; medium acid; abrupt wavy boundary.

C2-33 to 36 inches; brown (7.5YR 5/4) silt loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; many very fine and fine tubular pores; many thin clay films on ped faces and in pores; medium acid; clear wavy boundary.

C3-36 to 57 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine tubular pores; two 1/16-inch to 1/4-inch dark yellowish brown (10YR 4/4) moist clay bands; medium acid; abrupt wavy boundary.

C4-57 to 60 inches; brown (10YR 5/3) silt loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine tubular pores; common thin clay films in pores; slightly acid.

The mean annual soil temperature ranges from 42 to 44 degrees F. Reaction is medium acid or slightly acid. The Ap horizon has value of 5 or 6 dry, 3 or 4 moist, and chroma of 2 or 3 dry, 1 through 3 moist. The Bir horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry, and chroma of 3 or 4. Texture is silt loam or loam.

The C horizon has value of 5, 6, or 7 dry and 3, 4, or 5 moist. It is silt loam or very fine sandy loam. In some pedons, a IIC horizon is present, but it normally is below a depth of 60 inches. When present, it is loamy very fine sand having hue of 10YR to 2.5Y; value of 7 or 8 dry, 5 or 6 moist; and chroma of 2 or 3.

Santa series

The Santa series consists of moderately well drained soils on dissected loess plains. These soils formed in loess and a minor amount of volcanic ash. Slopes are 3 to 35 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 43 degrees F.

Santa soils are near the Kruse and Taney soils. These soils do not have a fragipan.

Typical pedon of Santa silt loam, 5 to 20 percent slopes, about 1 mile southwest of Black Lake, in the Harrison Flats area, 75 feet south and 100 feet east of the northwest corner of sec. 14, T. 47 N., R. 3 W:

Ap-0 to 10 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine and fine tubular pores; faint organic stainings in root channels; medium acid; abrupt smooth boundary.

A12-10 to 15 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 3/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine and fine tubular pores; slightly acid; clear wavy boundary.

A13-15 to 21 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak medium prismatic structure that parts to weak medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine and fine, and few medium tubular pores; rounded krotovinas at 20 inches that are 2 inches in diameter; slightly acid; clear wavy boundary.

A14-21 to 27 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak fine and medium prismatic structure that parts to weak medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; common very fine, fine and few medium tubular pores; slightly acid; clear wavy boundary.

A2-27 to 34 inches; very pale brown (10YR 7/3) silt, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; common very fine and fine tubular pores; many black concretions less than 2 millimeters in diameter; medium acid; abrupt smooth boundary.

Bx1-34 to 44 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse prismatic structure that parts to moderate medium angular blocky; very hard, firm, sticky, plastic; few fine roots; common fine vesicular pores and few fine tubular pores; many organic stains on peds; many thick clay films on ped surfaces; bleached silt cap on top of peds; medium acid; gradual wavy boundary.

Bx2-44 to 65 inches; yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 3/4) moist; weak medium and coarse prismatic structure that parts to moderate medium angular blocky; very hard, firm, sticky, plastic; few fine roots; common fine vesicular pores and few fine tubular pores; many organic stains on peds; many thick clay films on ped surfaces; medium acid.

Depth to the fragipan ranges from 24 to 36 inches. The mean annual soil temperature ranges from 44 to 46 degrees F. Reaction is medium acid or slightly acid.

The A horizon has value of 5 through 7 dry, 3 or 4 moist, and chroma of 2 through 4 dry and moist. The A2 horizon has hue of 7.5YR, 10YR, or 2.5Y and chroma of 2 or 3 moist and dry.

The Bx horizon has hue of 10YR or 7.5YR; value of 4 through 6 dry, 3 or 4 moist; and chroma of 3 or 4. It is dense, brittle silt loam or silty clay loam. The upper part of the solum averages 6 to 14 percent clay and 5 to 14 percent sand.

Santa Variant

The Santa Variant consists of moderately deep, moderately well drained soils on loess-covered hills. These soils formed in loess deposits over fractured basalt or metasedimentary rocks. Slopes are 5 to 20 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 43 degrees F.

Santa Variant soils are similar to the Santa soils and are near the Kruse and Taney soils. Santa soils do not have bedrock above a depth of 60 inches. Kruse and Taney soils do not have a fragipan.

Typical pedon of Santa Variant silt loam, located about 2,000 feet west and 1,100 feet north of the southeast corner of sec. 30, T. 46 N., R. 2 W:

O1-1 inch to 0; partially decomposed pine needles.

A1-0 to 3 inches; light brownish gray (10YR 6/2) silt loam, dark brown (10YR 4/3) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine and few medium and coarse roots; many very fine and fine tubular pores; medium acid; clear wavy boundary.

A3-3 to 9 inches; light gray (10YR 7/2) silt loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; medium acid; clear wavy boundary.

A21-9 to 15 inches; light gray (10YR 7/2) silt loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine, fine, and few medium roots; many very fine, fine and few medium tubular pores; medium acid; clear wavy boundary.

A22-15 to 23 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; hard, friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots; common very fine and fine tubular pores; many fine black concretions; many medium distinct mottles; medium acid; abrupt wavy boundary.

Bx-23 to 36 inches; yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure that parts to strong medium angular blocky; very hard, very firm, sticky, plastic; few fine, medium, and coarse roots matted on ped surfaces; few fine and medium vesicular pores; common thin clay films on ped faces and in pores; bleached silt coatings on ped faces; strongly acid; clear wavy boundary.

R-36 inches; fractured basalt bedrock.

Depth to the fragipan ranges from 16 to 25 inches and depth to hard bedrock is 20 to 40 inches. Mean annual soil temperature ranges from 44 to 46 degrees F. Reaction of the solum ranges from strongly acid to slightly acid.

The A horizon has value of 5 through 7 dry and chroma of 2 through 4 dry and moist. The A2 horizon has hue of 10YR or 2.5Y.

The Bx horizon has hue of 10YR or 7.5YR and value of 3 through 5 moist. It is dense, brittle silt loam or silty clay loam. The upper part of the solum averages 6 to 14 percent clay and 5 to 14 percent sand.

Schumacher series

The Schumacher series consists of deep, well drained soils on mountain foothills. These soils formed in loess and material weathered from metasedimentary rock. Slopes are 3 to 65 percent. The mean annual precipitation is 22 inches, and mean annual air temperature is 47 degrees F.

Schumacher soils are similar to the Bobbitt, Larkin, and Tekoa soils, and are near the McCrosket, Skalan, and Southwick soils. Bobbitt, McCrosket, Skalan, and Tekoa soils have an average of more than 35 percent rock fragments in the B horizon. Larkin and Southwick soils are very deep and do not have coarse fragments.

Typical pedon of Schumacher silt loam, 3 to 7 percent slopes, about 3 miles southwest of Worley, 1,800 feet east and 1,360 feet north of the southwest corner of sec. 28, T. 47 N., R. 5 W:

O1-0.5 inch to 0; undecomposed needles, leaves, and twigs.

A11-0 to 4 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate thin and medium platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many fine and medium tubular pores; 5 percent medium gravel; slightly acid; abrupt smooth boundary.

A12-4 to 13 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; strong fine and medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine and medium tubular pores; 5 percent medium gravel; slightly acid; clear smooth boundary.

A13-13 to 19 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure that parts to moderate medium and coarse granular; hard, friable, slightly sticky, slightly plastic; common fine, medium and few coarse roots; many fine and medium tubular pores; 10 percent medium gravel; slightly acid; clear smooth boundary.

B1-19 to 25 inches; brown (10YR 5/3) gravelly silt loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine and medium roots; common fine and medium tubular pores; 20 percent medium gravel; slightly acid; clear smooth boundary.

B2t-25 to 32 inches; yellowish brown (10YR 5/4) gravelly silty clay loam, dark brown (10YR 4/3) moist;

moderate fine and medium subangular blocky structure; very hard, firm, sticky, plastic; few fine and medium roots; few fine and medium tubular pores; 20 percent gravel, 10 percent cobbles; thin silt coats on ped surfaces; common thin clay films on ped surfaces and in pores; slightly acid; clear smooth boundary.

B3-32 to 40 inches; yellowish brown (10YR 5/4) gravelly silt loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky, plastic; few fine and medium roots; few fine and medium tubular pores; 20 percent gravel, 10 percent cobbles; thin silt coats on ped surfaces; few thin clay films on ped surfaces and in pores; slightly acid; abrupt wavy boundary.

R-40 inches; fractured metasedimentary bedrock.

Depth to weathered metasedimentary bedrock is 40 to 60 inches. The mollic epipedon ranges from 16 to 20 inches in thickness. The mean annual soil temperature ranges from 47 to 52 degrees F. Reaction of the solum is slightly acid or neutral.

The A horizon has value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3. Coarse fragments make up 5 to 15 percent of the horizon.

The B horizon has 10 to 30 percent coarse fragments. It has hue of 10YR or 7.5YR and value of 5 or 6 dry.

Seelovers series

The Seelovers series consists of very deep, poorly drained soils in nearly level basins and drainageways. These soils formed in local alluvium. Slopes are 0 to 2 percent. The mean annual precipitation is 26 inches, and mean annual air temperature is 42 degrees F.

Seelovers soils are similar to the Cougarbay soils and are near the Chatcolet, Mokins, and Potlatch soils. Cougarbay soils have stratified silty clay and coarse sand substrata. Chatcolet and Mokins soils are moderately well drained. Potlatch soils have a silty clay B2t horizon.

Typical pedon of Seelovers silt loam, located in an area of Seelovers-Potlatch complex, about 6 miles southeast of Athol, 1,700 feet north and 100 feet east of the southwest corner of sec. 32, T. 53 N., R. 2 W:

O1-2 to 1.5 inches; undecomposed and partially decomposed needles, leaves, and twigs.

O2-1.5 inches to 0; decomposed needles, leaves, and twigs.

A1-0 to 9 inches; black (10YR 2/1) silt loam, very dark grayish brown (10YR 3/2) dry; moderate coarse granular structure; slightly hard, friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; many very fine and fine tubular pores; slightly acid; abrupt wavy boundary.

B21g-9 to 15 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium and coarse subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine and medium roots; many very fine and fine tubular pores; few mica flakes; slightly acid; clear wavy boundary.

B22g-15 to 26 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; many medium and large prominent dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; few fine roots; many very fine and fine tubular pores; many mica flakes; slightly acid; abrupt wavy boundary.

C1g-26 to 28 inches; dark grayish brown (10YR 4/2) sandy loam, light brownish gray (10YR 6/2) dry; many medium prominent dark brown (7.5YR 4/4) mottles; massive; hard, firm, slightly sticky, slightly plastic; few fine roots; many very fine and fine tubular pores; many mica flakes; 5 percent gravel; slightly acid; abrupt wavy boundary.

C2g-28 to 32 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; many medium dark brown (7.5YR 4/4) mottles; massive; very hard, very firm, sticky, plastic; few fine roots; many very fine and fine tubular pores; many large black stains; many mica flakes; slightly acid; clear wavy boundary.

C3-32 to 38 inches; brown (10YR 5/3) silty clay loam, very pale brown (10YR 7/3) dry; many medium prominent dark brown (7.5YR 4/4) mottles; massive; very hard, very firm, sticky, plastic; few fine roots; many very fine and fine tubular pores; many mica flakes; some partially decomposed organic matter present; slightly acid; abrupt wavy boundary.

C4g-38 to 40 inches; dark gray (2.5Y 4/0) sandy loam, light gray (2.5Y 6/0) dry; many medium and large prominent dark brown (7.5YR 4/4) mottles; massive; hard, firm, slightly sticky, slightly plastic; many very fine interstitial and fine tubular pores; many mica flakes; slightly acid; abrupt wavy boundary.

C5g-40 to 60 inches; dark gray (2.5Y 4/0) silty clay loam, light gray (2.5Y 6/0) dry; many medium and large prominent dark brown (7.5YR 4/4) mottles; massive; very hard, very firm, sticky, plastic; many very fine and fine interstitial pores; many mica flakes; slightly acid.

These soils have a high water table that fluctuates from the surface to a depth of 18 inches in winter and spring. They are frequently flooded for very long periods. The mean annual soil temperature ranges from 42 to 44 degrees F. Reaction is slightly acid or neutral.

The A horizon has value of 2 or 3 moist, 3 or 4 dry, and chroma of 1 or 2. The B2g horizon has value of 4 or 5 moist, 6 or 7 dry. The Cg horizon has hue of 10YR through 5Y; value of 4 or 5 moist, 5 through 7 dry; and chroma of 0 through 3. Texture is stratified silt loam or silty clay loam with thin layers of sandy loam.

Selle series

The Selle series consists of very deep, well drained soils on glaciolacustrine terraces or outwash terraces. These soils formed in sandy lacustrine sediment or shoreline deposits. Slopes are 0 to 7 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 43 degrees F.

Selle soils are similar to the Marble soils and are near the Chatcolet, Mokins, Rubson, Kootenai, and Bonner soils. Marble soils do not have a B2ir horizon. Chatcolet soils have a silty clay loam B2t horizon. Mokins soils have a silty clay B2t horizon. Rubson soils have a silt loam B horizon. Bonner and Kootenai soils have a very gravelly loamy sand and a very gravelly coarse sand substratum.

Typical pedon of Selle fine sandy loam, 0 to 7 percent slopes, 0.5 mile west of the southern tip of Twin Lakes, 1,000 feet west and 1,300 feet south of the northeast corner of sec. 18, T. 52 N., R. 4 W:

O11-1.5 inches to 1 inch; undecomposed needles, leaves, and twigs.

O12-1 inch to 0; partially decomposed needles, leaves, and twigs.

B21ir-0 to 6 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure that parts to weak fine and medium granular; soft, very friable, nonsticky, nonplastic; many fine and medium and few coarse roots; common fine and medium tubular pores; about 2 percent fine gravel; slightly acid; clear wavy boundary.

B22ir-6 to 12 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine and medium roots; common fine and medium tubular pores; about 2 percent fine gravel; slightly acid; clear wavy boundary.

B3ir-12 to 17 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure that parts to weak fine granular; soft, very friable, nonsticky, nonplastic; many fine and medium and few coarse roots; few fine and medium tubular pores; about 5 percent fine gravel; few charcoal pieces; slightly acid; clear wavy boundary.

C1-17 to 24 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; common fine and medium tubular pores; 10 percent fine gravel; few soft black manganese concretions; slightly acid; clear wavy boundary.

C2-24 to 46 inches; light yellowish brown (10YR 6/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; massive; loose, nonsticky, nonplastic; few fine and medium roots; few fine tubular pores; 10 percent fine gravel; common hard black manganese concretions; very faint red stains; slightly acid; clear wavy boundary.

C3-46 to 60 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; massive; loose, nonsticky, nonplastic; very porous; 10 percent gravel; slightly acid.

The mean annual soil temperature ranges from 44 to 47 degrees F. Reaction is medium acid or slightly acid. Base saturation is less than 60 percent above a depth of 30 inches.

In some pedons, there is a thin A1 horizon having hue of 10YR or 7.5YR; value of 4 or 5 dry, 2 through 4 moist; and chroma of 2 or 3. Texture is fine sandy loam.

The B2ir horizon has hue of 10YR or 7.5YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 3 or 4.

The C horizon has value of 6 or 7 dry, 4 through 6 moist, and chroma of 3 or 4. Some faint iron stains are present, as well as thin, wavy clay bands in some pedons. Texture ranges from fine sandy loam to sand but averages loamy fine sand.

Setters series

The Setters series consists of very deep, moderately well drained soils on loess hills. These soils formed in deep loess. Slopes are 3 to 20 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 44 degrees F.

Setters soils are similar to the Worley soils and are near the Taney soils. Worley soils have a mean annual soil temperature of more than 47 degrees F. Taney soils have an average of less than 35 percent clay in the B horizon.

Typical pedon of Setters silt loam, 3 to 20 percent slopes, about 4 miles northwest of Worley, 1,450 feet south and 1,600 feet east of the northwest corner of sec. 5, T. 47 N., R. 5 W:

Ap-0 to 7 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak very fine and fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine and fine tubular pores; slightly acid; abrupt smooth boundary.

A12-7 to 11 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate very fine and fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; few very fine and fine tubular pores; few very fine black concretions; medium acid; abrupt smooth boundary.

A13-11 to 16 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure that parts to moderate medium subangular blocky; hard, friable, slightly sticky, slightly plastic;

few fine roots; many very fine, fine, and few medium tubular pores; few thin clay films in pores and on vertical and horizontal faces of peds; thin silt coats on peds; many very fine black concretions; medium acid; abrupt smooth boundary.

A2-16 to 17 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots; many very fine tubular pores; many very fine black concretions; medium acid; abrupt smooth boundary.

B21t-17 to 22 inches; yellowish brown (10YR 5/4) silty clay, dark yellowish brown (10YR 3/4) moist; moderate medium prismatic structure that parts to moderate very fine angular blocky; extremely hard, extremely firm, sticky, plastic; few fine roots; common very fine tubular pores; continuous dark brown (7.5YR 3/2) clay films on vertical and horizontal faces of peds; upper part of prisms have thin coatings of A2 material on faces of peds; many fine black concretions, few 2 millimeters in size; slightly acid; gradual wavy boundary.

B22t-22 to 27 inches; pale brown (10YR 6/3) silty clay, yellowish brown (10YR 5/4) moist; moderate coarse and medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; many very fine tubular pores; common brown (7.5YR 3/4) clay films on vertical and horizontal faces of peds; many fine black concretions, few 2 millimeters in size; neutral; gradual wavy boundary.

B23t-27 to 60 inches; pale brown (10YR 6/3) silty clay, yellowish brown (10YR 5/4) moist; moderate coarse and medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; many very fine and few medium tubular pores; continuous thick dark brown (7.5YR 3/2) clay films; many fine black concretions, few 2 millimeters in size; neutral.

Thickness of the solum is 60 inches or more. The mean annual soil temperature ranges from 45 to 47 degrees F. There is a perched water table at a depth of 12 to 18 inches from February to April. Reaction of the solum ranges from medium acid to neutral.

An 0 horizon is in undisturbed areas. The Al horizon has value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3. The B2 horizon has value of 4 through 6 dry, 2 through 4 moist. The A12 horizon has value of 6 through 8 dry, 4 through 6 moist, and chroma of 3 or 4. The B12t horizon has hue of 10YR or 7.5YR, value of 4 through 6 moist, and chroma of 3 or 4 dry and moist. Some pedons have a silty clay loam B3t horizon.

Skalan series

The Skalan series consists of moderately deep, well drained soils on mountains. These soils formed in residuum weathered from gneiss and other related metamorphic rocks mantled with a thin layer of volcanic ash and loess. Slopes are 5 to 65 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 47 degrees F.

Skalan soils are similar to the Kruse and Tekoa soils and are near the Lenz, Schumacher, Ulricher, and Vassar soils. Kruse, Vassar, and Ulricher soils are more than 40 inches deep to bedrock and have less than 35 percent coarse fragments. Lenz and Tekoa soils have an A1 horizon 7 inches or more thick. Schumacher soils have less than 35 percent coarse fragments.

Typical pedon of Skalan gravelly loam, from an area of Skalan-Rock outcrop complex, 5 to 30 percent slopes, about 1 mile southwest of Post Falls, in the SE1/4NW1/4 of sec. 9, T. 50 N., R. 5 W:

O11-2 to 1.5 inches; decomposed needles, twigs, leaves, and cones.

O12-1.5 inches to 0; partially decomposed needles, twigs, leaves, and cones.

A1-0 to 3 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine common medium and few coarse roots; common very fine and fine interstitial pores; 25 percent gravel; slightly acid; clear wavy boundary.

B1t-3 to 8 inches; brown (10YR 5/3) gravelly loam, dark brown (7.5YR 4/2) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine, common medium, and few coarse roots; common very fine and fine interstitial pores; few thin clay films; 25 percent gravel; medium acid; abrupt wavy boundary.

B2t-8 to 12 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, sticky, slightly plastic; common fine, few medium and coarse roots; common very fine and fine tubular and interstitial pores; few thin clay films on ped faces and in pores; 75 percent gravel; medium acid; clear wavy boundary.

B3t-12 to 18 inches; light yellowish brown (10YR 6/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky, slightly plastic; few fine medium and coarse roots; common very fine and fine tubular pores; few thin clay films in pores; 75 percent gravel; medium acid; clear wavy boundary.

C-18 to 30 inches; light yellowish brown (10YR 6/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; massive; hard, friable, slightly sticky, slightly plastic; few medium and coarse roots; common very fine and fine tubular pores; 80 percent gravel; medium acid; clear wavy boundary.

R-30 inches; fractured gneiss.

Depth to gneiss ranges from 20 to 40 inches. The mean annual soil temperature ranges from 47 to 51 degrees F. The solum has 25 to 80 percent coarse fragments and has an average of more than 35 percent.

The A horizon has value of 3 through 5 dry, 2 or 3 moist, and chroma of 2 or 3. It ranges from gravelly loam to gravelly silt loam.

The B2t horizon has hue of 10YR or 7.5YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 2 through 4. Texture is very gravelly heavy loam or very gravelly clay loam.

The C horizon ranges from variegated colors to value of 5 or 6 dry, 4 or 5 moist, and chroma of 3 or 4. Texture is very gravelly loam or very gravelly coarse sandy loam.

Southwick series

The Southwick series consists of very deep, moderately well drained soils on loess-covered hills. These soils formed in loess. Slopes are 3 to 20 percent. The mean annual precipitation is 23 inches, and mean annual air temperature is 46 degrees F.

Southwick soils are similar to the Latahco and Thatuna soils and are near the Larkin, Taney, and Worley soils. Latahco soils are somewhat poorly drained. Thatuna soils have a mollic epipedon more than 24 inches thick. Larkin soils do not have an A2 horizon. Taney soils have a mean annual soil temperature less than 47 degrees F. Worley soils have a silty clay B2t horizon.

Typical pedon of Southwick silt loam, 3 to 12 percent slopes, about 2 miles west of Worley, 800 feet west and 50 feet south of the northeast corner of sec. 28, T. 47 N., R. 5 W:

Ap-0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine tubular pores; common bleached sand and silt grains; slightly acid; clear wavy boundary.

A12-7 to 10 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure that parts to moderate fine and medium granular; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores and common very fine and fine tubular pores; common bleached sand and silt grains; slightly acid; clear smooth boundary.

A13-10 to 21 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure that parts to weak fine granular; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine and fine tubular pores; common bleached sand and silt grains; slightly acid; clear wavy boundary.

A21-21 to 28 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure that parts to weak medium subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine and fine, and few medium tubular pores; fingers of A13 material extend into horizon; many bleached sand and silt grains; common fine soft and slightly hard iron concretions; slightly acid; clear smooth boundary.

A22-28 to 34 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak medium and coarse prismatic structure that parts to weak coarse angular blocky; very hard, firm, slightly sticky, slightly plastic; many very fine and fine roots between peds; very few very fine and fine roots in peds; common very fine and fine tubular pores; common slightly hard manganese concretions; slightly acid; clear wavy boundary.

B2t-34 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure that parts to moderate medium angular blocky; very hard, very firm, sticky, plastic; few very fine and fine roots mainly between peds; common very fine and fine and few medium tubular pores; thick continuous dark reddish brown (5YR 3/4) clay films; few fine manganese concretions; neutral.

These soils have a perched water table at a depth of 30 to 42 inches from February to April. The mean annual soil temperature ranges from 47 to 49 degrees F. Reaction of the solum ranges from medium acid to neutral.

A very thin 0 horizon is in undisturbed areas. The Ap and A1 horizons have value of 2 or 3 moist, 4 or 5 dry. The A2 horizon has value of 4 or 5 moist, 6 or 7 dry, and chroma of 2 or 3. It is silt or silt loam. The B2t horizon has hue of 10YR or 7.5YR, and value of 4 or 5 moist, 5 or 6 dry.

Spokane series

The Spokane series consists of moderately deep, well drained soils on mountainous uplands. These soils formed in material weathered from gneiss, schist, or granite with a mantle of loess. Slopes are 5 to 65 percent. The mean annual precipitation is 22 inches, and mean annual air temperature is 47 degrees F.

Spokane soils are similar to the Lenz and McCrosket soils and are near the Kruse, Moscow, Ulricher, and Vassar soils. Lenz and McCrosket soils have more than 35 percent coarse fragments in the B horizon. Kruse soils have a clay loam B2t horizon. Vassar soils have a silt loam surface layer with a bulk density of less than 0.85 grams per cubic centimeter. Moscow and Ulricher soils have an Al horizon less than 7 inches thick.

Typical pedon of Spokane loam, 6 to 30 percent slopes, about 3.5 miles west of Spirit Lake, 2,500 feet

north and 300 feet west of the southeast corner of sec. 19, T. 53 N., R. 5 W:

O1-0.5 inch to 0; undecomposed and partially decomposed grass, twigs, and moss.

A11-0 to 8 inches; dark brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, and nonplastic; many fine and medium roots; many very fine tubular pores; 10 percent gravel; slightly acid; clear wavy boundary.

A12-8 to 14 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; many fine and medium and few coarse roots; many very fine tubular pores; 25 percent gravel; slightly acid; clear smooth boundary.

B2-14 to 23 inches; yellowish brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 3/4) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine and medium and few coarse roots; many very fine tubular pores; 25 percent gravel; slightly acid; clear wavy boundary.

C1-23 to 27 inches; light yellowish brown (10YR 6/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky, nonplastic; common fine and medium roots; many very fine tubular pores; 20 percent gravel, 10 percent cobbles; slightly acid; clear wavy boundary.

C2r-27 inches; light yellowish brown (10YR 6/4) weathered schist bedrock.

Depth to bedrock ranges from 20 to 40 inches. The soil contains 10 to 30 percent coarse fragments that increase with depth. Mean annual soil temperature ranges from 47 to 53 degrees F.

The A1 horizon has value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3. The B2 horizon has value of 5 or 6 dry, 3 or 4 moist, and chroma of 3 or 4. The C horizon has value of 6 or 7 dry, 4 or 5 moist, and chroma of 3 or 4.

Taney series

The Taney series consists of very deep, moderately well drained soils on loess-covered hills. These soils formed in deep loess with a minor amount of volcanic ash. Slopes are 3 to 25 percent. The mean annual precipitation is 25 inches, and mean annual air temperature is 43 degrees F.

Taney soils are similar to the Larkin and Thatuna soils and are near the Santa, Setters, and Southwick soils. Larkin, Thatuna, and Southwick soils have a mean annual soil temperature greater than 47 degrees F. Setters soils have a silty clay B2t horizon. Santa soils have a fragipan.

Typical pedon of Taney silt loam, 7 to 25 percent slopes, about 4 miles northwest of Worley, 400 feet east and 900 feet south of the northwest corner of sec. 3, T. 47 N., R. 5 W:

Ap1-0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine roots; many very fine and fine interstitial pores; 1/4- to 1/2-inch thick slightly decomposed straw layer in lower part; medium acid; abrupt smooth boundary.

Ap2-5 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure that parts to moderate very fine and fine granular; soft, very friable, slightly sticky, slightly plastic; common fine roots; many fine tubular and interstitial pores; contains partly decom posed straw layer; medium acid; abrupt smooth boundary.

A13-9 to 14 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine roots; many fine tubular and interstitial pores; contains 2-inch diameter krotovinas with strong medium granular structure; slightly acid; clear smooth boundary.

A14-14 to 21 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; many fine and few coarse tubular pores; silt coatings and streakings on ped faces; slightly acid; clear smooth boundary.

A2-21 to 26 inches; light gray (10YR 7/2) silt loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; few fine roots; many fine tubular pores; many manganese concretions; medium acid; abrupt smooth boundary.

B21t-26 to 37 inches; yellowish brown (10YR 5/4) silty clay loam, dark brown (10YR 4/3) moist; moderate medium and coarse prismatic structure; extremely hard, extremely firm, very sticky, plastic; few fine roots mainly on prism faces; few fine tubular pores; many thick clay films; common manganese concretions; silt specks in interior and siliceous coatings on prism faces in upper part; medium acid; clear smooth boundary.

B22t-37 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure; very hard, very firm, sticky, plastic; few fine tubular pores; continuous moderately thick clay films; common manganese concretions; medium acid.

Mean annual soil temperature ranges from 44 to 46 degrees F. The solum ranges from 45 to over 60 inches thick. These soils have a perched water table during spring. Where undisturbed, a thin 0 horizon is present.

The upper part of the A1 or Ap horizon has value of 4 or 5 dry and chroma of 2 or 3. The lower part of the A1 horizon has value of 5 or 6 dry, 3 or 4 moist, and chroma of 2 or 3. The A2 horizon has value of 6 through 8 dry, 4 or 5 moist, and chroma of 2 or 3. The B2t horizon has value of 5 or 6 dry, 4 or 5 moist, and chroma of 3 or 4. Some pedons have a silt loam B3t horizon.

Tekoa series

The Tekoa series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from shale or sandstone bedrock and a mixture of loess and volcanic ash in the upper part of the profile. Slopes are 5 to 65 percent. The mean annual precipitation is 22 inches, and mean annual air temperature is 47 degrees F.

Tekoa soils are similar to the Bobbitt and Schumacher soils and are near the Ardenvoir, Huckleberry, McCrosket, and Southwick soils. Bobbitt soils have hard fractured basalt bedrock at a depth of 20 to 40 inches. Schumacher soils have an average of less than 35 percent coarse fragments in the B horizon. Ardenvoir and McCrosket soils have fractured medasedimentary bedrock at a depth of 40 to 60 inches. Huckleberry soils have a yellowish brown silt loam surface layer. Southwick soils are very deep and do not have coarse fragments.

Typical pedon (fig. 20) of Tekoa gravelly silt loam, from an area of McCrosket-Tekoa association, 35 to 65 percent slopes, about 1 mile east of Cataldo Mission, 2,000 feet north and 2,100 feet east of the southwest corner of sec. 33, T. 49 N., R. 1 E:

O11-2 inches to 0.5 inch; undecomposed needles and twigs.

O12-0.5 inch to 0; partially decomposed needles and twigs.

A1-0 to 7 inches; brown (10YR 5/3) gravelly silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many very fine tubular pores; 15 percent gravel, 1 percent cobbles; slightly acid; clear wavy boundary.

B2t-7 to 14 inches; brown (10YR 5/3) very gravelly heavy silt loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky, slightly plastic; many very fine, fine, and medium roots; many very fine and common fine tubular pores; 25 percent gravel, 15 percent cobbles, 1 percent stones; common thin clay films on ped faces and in pores; slightly acid; clear wavy boundary.

B3-14 to 30 inches; light yellowish brown (10YR 6/4) very gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine and medium roots; many very fine and fine tubular pores; 40 percent gravel, 20 percent cobbles, 2 percent stones; medium acid; clear wavy boundary.

Cr-30 inches; fractured sandstone.

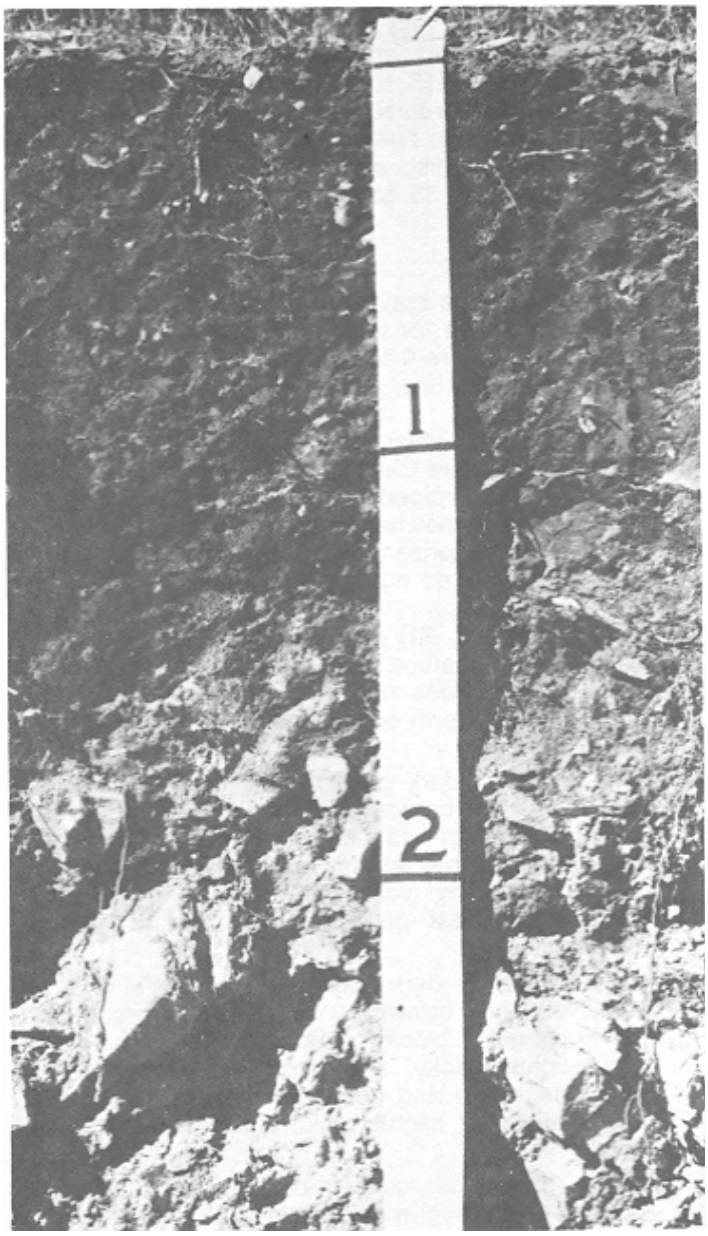

Figure 20.-Profile of Tekoa gravelly silt loam.

Depth to shale or sandstone is 20 to 40 inches. The mean annual soil temperature ranges from 47 to 50 degrees F. Reaction of the solum is medium acid or slightly acid.

The A horizon has hue of 10YR to 7.5YR; value of 4 or 5 dry, 2 or 3 moist; and chroma of 2 or 3. Coarse fragments make up 15 to 30 percent of the horizon. Some pedons are extremely stony.

The B2t horizon has hue of 10YR or 7.5YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 3 or 4. Rock fragments make up 35 to 65 percent of the horizon.

Thatuna series

The Thatuna series consists of very deep, moderately well drained soils on loess hills. These soils formed in deep loess. Slopes are 0 to 7 percent. The mean annual precipitation is 20 inches, and mean annual air temperature is 47 degrees F.

Thatuna soils are similar to the Southwick and Latahco soils and are near the Cald and Larkin soils. Southwick soils have a mollic epipedon less than 24 inches thick. Latahco soils are somewhat poorly drained. Cald soils do not have a B2t horizon and are somewhat poorly drained. Larkin soils do not have an A2 horizon and are well drained.

Typical pedon (fig. 21) of Thatuna silt loam, from an area of Latahco-Thatuna silt foams, 0 to 7 percent slopes, about 3.5 miles northwest of Worley, 100 feet west and 400 feet north of the southeast corner of sec. 8, T. 47 N., R. 5 W:

Ap-0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; many very fine, fine, and common medium interstitial pores; neutral; abrupt smooth boundary.

A12-9 to 15 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; many fine and common medium tubular and interstitial pores; slightly acid; clear smooth boundary.

A3-15 to 19 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine prismatic structure that parts to moderate fine subangular blocky; slightly hard, firm, slightly sticky, slightly plastic; common fine roots; many very fine and fine tubular pores; slightly acid; clear smooth boundary.

B2-19 to 25 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; few fine roots; many very fine and fine tubular pores; few silt coatings on surfaces of peds; slightly acid; clear smooth boundary.

A2-25 to 33 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; many very fine and fine tubular pores; streaks

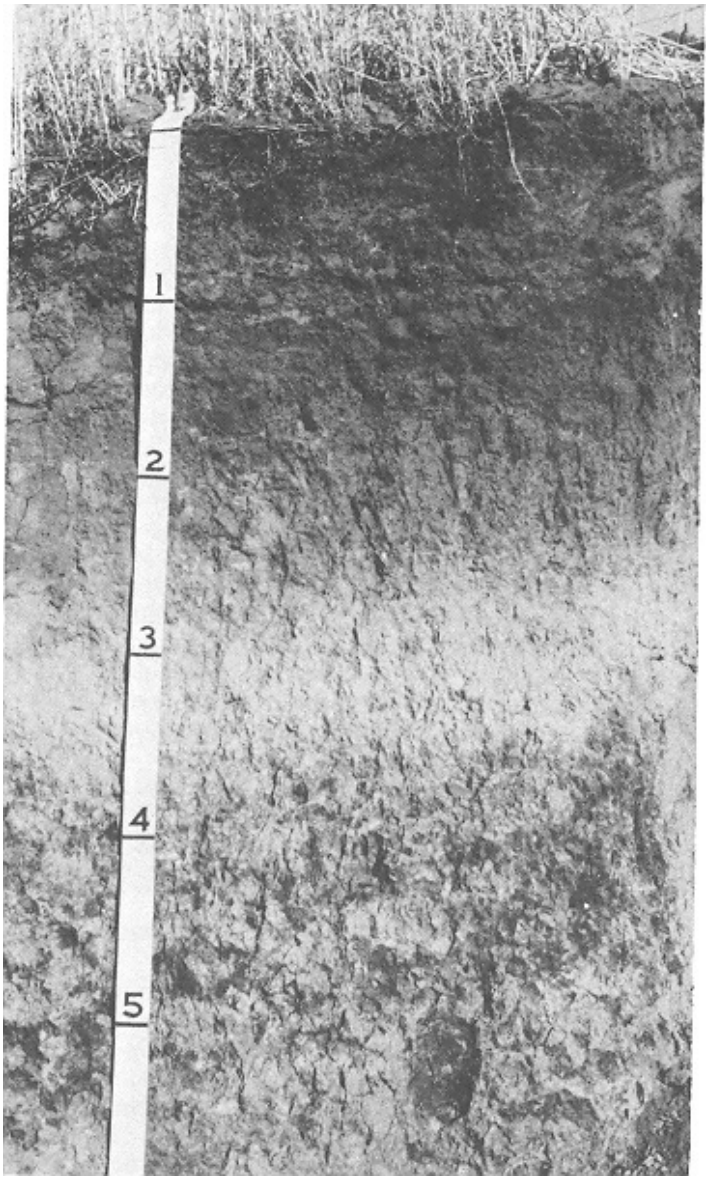

Figure 21.-Profile of Thatuna silt loam.

of B2 material present; neutral; clear smooth boundary.

B21 t-33 to 41 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, firm, sticky, plastic; few fine roots; many very fine and fine tubular pores; thick coats of A2 material on peds; few thin clay films on ped faces and in. pores; common fine iron-manganese concretions; slightly acid; clear smooth boundary.

B22t-41 to 60 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate coarse pris-

matic structure; hard, firm, sticky, plastic; few fine roots mainly on prism faces; many very fine tubular pores; many moderately thick clay films on ped faces and in pores; some silt specks in ped interiors; few fine iron-manganese concretions; some A2 material coating peds; slightly acid.

The mean annual soil temperature ranges from 47 to 50 degrees F. The mollic epipedon is 24 to 36 inches thick. Reaction ranges from medium acid to neutral. The soil is slightly calcareous below a depth of 43 inches in some pedons.

The Ap or A1 horizon has value of 4 or 5 dry, 2 or 3 moist. The B2 horizon has value of 4 or 5 dry. The A2 horizon has value of 6 or 7 dry, 5 or 6 moist, and chroma of 2 or 3 moist and dry. The B2t horizon has hue of 10YR or 7.5YR, value of 5 or 6 dry, and chroma of 3 or 4 moist and dry.

Treble series

The Treble series consists of very deep, well drained soils on mountainous uplands. These soils formed in glacial till mantled with a thin layer of volcanic ash. Slopes are 20 to 65 percent. The mean annual precipitation is 26 inches, and the mean annual air temperature is 43 degrees F.

The Treble soils are similar to the Moscow and Ulricher soils and are near the Spokane and Vassar soils. Moscow, Spokane, and Ulricher soils have less than 35 percent coarse fragments. Vassar soils have a silt loam surface layer with a bulk density of less than 0.85 grams per cubic centimeter.

Typical pedon of Treble gravelly fine sandy loam, 20 to 55 percent slopes, about 2 miles south of Farragut State Park, 950 feet north and 1,300 feet west of the southeast corner of sec. 17, T. 53 N., R. 2 W:

O11-1 to 0.5 inch; undecomposed needles, twigs, and roots.

O12-0.5 inch to 0; partially decomposed needles, twigs, and roots.

A1-0 to 3 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure that parts to moderate fine granular; soft, very friable, nonsticky, slightly plastic; many fine and medium, and few coarse roots; many fine tubular pores; 25 percent gravel; neutral; abrupt wavy boundary.

B21ir-3 to 9 inches; light yellowish brown (10YR 6/4) gravelly fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium and fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many fine and medium and few coarse roots; common fine tubular pores; 30 percent gravel; neutral; clear wavy boundary.

B22ir-9 to 17 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many very fine interstitial pores; 60 percent gravel; slightly acid; clear wavy boundary.

C1-17 to 27 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, loose, nonsticky, nonplastic; common fine and medium roots; many very fine interstitial and few fine tubular pores; 75 percent gravel; slightly acid; gradual wavy boundary.

C2-27 to 60 inches; very pale brown (10YR 7/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, loose, nonsticky, nonplastic; few fine and medium roots; many very fine interstitial pores; 75 percent gravel; slightly acid.

The mean annual soil temperature ranges from 44 to 46 degrees F. Coarse fragments make up 25 to 80 percent of the soil. Reaction ranges from medium acid to neutral. The A1 horizon has value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3. Texture ranges from gravelly fine sandy loam to gravelly sandy loam.

The B2ir horizon has value of 5 or 6 dry, 3 or 4 moist, and chroma of 3 or 4. Texture is gravelly sandy loam or very gravelly sandy loam.

The C horizon has value of 6 or 7 dry, 4 or 5 moist, and chroma of 3 or 4. Texture is very gravelly sandy loam or very gravelly loamy sand below a depth of 40 inches.

Ulricher series

The Ulricher series consists of deep, well drained soils on mountains. These soils formed in residuum from gneiss and other metamorphic rocks mixed with small amounts of loess and volcanic ash in the upper part of the profile. Slopes are 5 to 65 percent. The mean annual precipitation is 27 inches, and mean annual air temperature is 46 degrees F.

Ulricher soils are similar to the Moscow, Selle, and Treble soils and are near the Kruse, Lenz, Schumacher, Skalan, Spokane, and Vassar soils. Moscow, Lenz, Skalan, and Spokane soils have bedrock at a depth of 20 to 40 inches. Selle soils are very deep soils on terraces. Treble soils have an average of more than 35 percent coarse fragments. Kruse soils have a clay loam B2t horizon. Schumacher soils have an Al horizon more than 10 inches thick and a gravelly silty clay loam B2t horizon. Vassar soils have a bulk density in the upper part of the profile of less than 0.85 grams per cubic centimeter.

Typical pedon of Ulricher loam, 20 to 35 percent slopes, about 1 mile north of Cougar Creek in the NW1/4NE1/4 of sec. 25, T. 50 N., R. 5 W:

O1-1 inch to 0; undecomposed and partially decomposed needles and twigs.

A11-0 to 1 inch; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate thick platy structure that parts to moderate fine granular; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine interstitial pores; scattered small pieces of charcoal from past fires; common mica flakes; slightly acid; abrupt smooth boundary.

A12-1 inch to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine, few medium and coarse roots; common very fine interstitial pores; 3 percent gravel; common mica flakes; slightly acid; abrupt smooth boundary.

B1-3 to 9 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure that parts to moderate fine and medium granular; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine, few medium and coarse roots; common very fine interstitial and few fine continuous tubular pores; 5 percent gravel, 2 percent cobbles; many mica flakes; medium acid; clear smooth boundary.

B21-9 to 17 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine, few medium and coarse roots; common very fine interstitial and few fine continuous tubular pores; 8 percent cobbles, 6 percent gravel; common thin clay films in pores; many mica flakes; medium acid; clear smooth boundary.

B22-17 to 24 inches; very pale brown (10YR 7/4) cobbly sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine to coarse roots; common very fine interstitial and few fine continuous tubular pores; 12 percent cobbles, 6 percent gravel; few thin clay films in pores; many mica flakes; medium acid; clear wavy boundary.

B3-24 to 31 inches; very pale brown (10YR 7/4) cobbly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots; common very fine interstitial and few very fine and fine tubular pores; 15 percent cobbles, 10 percent gravel; few thin clay films on ped surfaces; many mica flakes; medium acid; clear wavy boundary.

C1-31 to 42 inches; yellow (10YR 7/6) cobbly loamy sand, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, nonsticky, nonplastic; few very fine, fine and medium roots; many very fine interstitial and few very fine tubular pores; 20 percent cobbles, 10 percent gravel; many mica flakes; medium acid; clear wavy boundary.

C2r-42 inches; weathered gneiss.

Depth to weathered gneiss ranges from 40 to 60 inches. The mean annual soil temperature ranges from 47 to 50 degrees F. The solum has base saturation of less than 60 percent in all parts between a depth of 10 and 30 inches. It contains up to 35 percent coarse fragments by volume but generally has less than 20 percent.

The A horizon has value of 4 through 6 dry, 3 or 4 moist, and chroma of 2 or 3. Texture is loam or silt loam. Some pedons are stony. Reaction ranges from medium acid to neutral. Structure is granular, platy, or subangular blocky.

The B2 horizon has value of 5 through 7 dry, 3 through 5 moist, and chroma of 3 or 4. Texture is loam or sandy loam and is gravelly or cobbly in most pedons. Some pedons are stony.

The C horizon has value of 5 through 7 dry, 4 or 5 moist, and chroma of 3 through 6 dry, 3 or 4 moist. Texture is sandy loam or loamy sand. Most pedons are gravelly or cobbly, but some are stony. Reaction is medium acid or slightly acid.

Vassar series

The Vassar series consists of very deep, well drained soils on mountains. These soils formed in material weathered from schist, gneiss, and granitic rocks mantled with loess and volcanic ash. Slopes are 5 to 65 percent. The mean annual precipitation is 35 inches, and mean annual air temperature is 42 degrees F.

Vassar soils are similar to the Divers, Dorb, and Huckleberry soils and are near the Kruse, Lenz, Moscow, Spokane, and Ulricher soils. Divers and Dorb soils have more than 35 percent coarse fragments below a depth of 10 inches. Huckleberry soils are moderately deep to bedrock and have more than 35 percent coarse fragments in the lower part of the profile. Kruse soils have a clay loam B2t horizon. Lenz and Spokane soils have a dark colored surface horizon. Moscow soils have less volcanic ash and are moderately deep to bedrock. Ulricher soils have a bulk density of more than 0.95 grams per cubic centimeter and a mean annual soil temperature of more than 47 degrees F.

Typical pedon of Vassar silt loam, 30 to 65 percent slopes, about 1 mile east of Mica Peak, 2,600 feet south and 1,600 feet west of the northeast corner of sec. 3, T. 49 N., R. 5 W:

O1-1.5 inches to 1 inch; undecomposed to partially decomposed needles, leaves, and twigs.

O2-1 inch to 0; decomposed needles, leaves, and twigs.

B21ir-0 to 4 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure that parts to weak fine granular; soft, very friable, nonsticky, nonplastic; many fine roots; few discontinuous interstitial pores; slightly acid; gradual wavy boundary.

B22ir-4 to 20 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (7.5YR 4/4) moist; weak fine

and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine, medium and coarse roots; few very fine tubular and interstitial pores; neutral; clear smooth boundary.

IIC1-20 to 38 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots; few very fine tubular pores; slightly acid; diffuse smooth boundary.

IIC2-38 to 53 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine tubular pores; slightly acid; clear smooth boundary.

IIC3-53 to 60 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/6) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine tubular pores; slightly acid.

The solum ranges from 14 to 26 inches in thickness. Reaction ranges from medium acid to neutral. A very thin A1 horizon is present in some pedons.

The Bir horizon has hue of 10YR or 7.5YR; value of 5 or 6 dry, 3 or 4 moist; and chroma of 3 or 4. It has a bulk density of less than 0.85 grams per cubic centimeter.

The IIC horizon has hue of 10YR or 7.5YR; value of 6 or 7 dry, 4 or 5 moist; and chroma of 2 through 4 dry and moist. It is sandy loam or coarse sandy loam and loamy sand in the lower part of some pedons. Some pedons are gravelly.

Worley series

The Worley series consists of very deep, moderately well drained soils on loess-covered hills. These soils formed in deep loess. Slopes are 10 to 25 percent. The mean annual precipitation is 23 inches, and mean annual air temperature is 48 degrees F.

Worley soils are similar to the Setters soils and are near the Cald, Larkin, Southwick, and Thatuna soils. Setters soils have a mean annual soil temperature less than 47 degrees F. Cald soils are somewhat poorly drained soils on bottom lands and drainageways. Larkin, Southwick, and Thatuna soils have an average of less than 35 percent clay in the B2t horizon.

Typical pedon of Worley silt loam, 10 to 25 percent slopes, about 2 miles northwest of Worley, 700 feet east and 1,320 feet north of the southwest corner of sec. 15, T. 47 N., R. 5 W:

O1-1.5 inches to 0.25 inch; undecomposed and partially decomposed needles and twigs.

O2-0.25 inch to 0; decomposed needles and twigs.

A11 -0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate thin platy structure that parts to moderate fine granular; slightly hard, friable, slightly sticky, plastic; many very fine and fine and few medium roots; many very fine and few fine tubular pores; medium acid; clear smooth boundary.

A12-5 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure that parts to moderate fine granular; slightly hard, friable, slightly sticky, plastic; many very fine, fine and few medium roots; many very fine and few fine tubular pores; medium acid; clear wavy boundary.

A13-9 to 14 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, plastic; many very fine, fine, medium, and few coarse roots; many very fine and few fine tubular pores; medium acid; abrupt wavy boundary.

A2-14 to 16 inches; pale brown (10YR 7/3) silt loam, dark brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many very fine and common fine tubular pores; medium acid; abrupt wavy boundary.

B21t-16 to 37 inches; brown (7.5YR 5/4) silty clay, dark brown (7.5YR 4/4) moist; strong medium and coarse prismatic structure that parts to strong medium and coarse angular blocky; extremely hard, extremely firm, very sticky, very plastic; common very fine, fine, medium, and few coarse roots; common very fine interstitial and few fine tubular pores; common fine soft manganese concretions; many thick clay films on ped faces and in pores; medium acid; clear wavy boundary.

B22t-37 to 58 inches; light yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; strong medium prismatic structure that parts to strong medium angular blocky; extremely hard, extremely firm, very sticky, very plastic; few very fine and fine roots; few very fine interstitial pores; many thick clay films on ped faces and in pores; thick lime coatings covering clay films, primarily on vertical faces of peds; many fine manganese concretions; neutral; gradual irregular boundary.

B23t-58 to 80 inches; brown (7.5YR 5/4) silty clay loam, dark brown (7.5YR 4/4) moist; strong fine and medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; many thick clay films on ped faces and in pores; thick lime coatings covering clay films, mainly on vertical faces; neutral.

The mean annual soil temperature ranges from 49 to 51 degrees F. The umbric epipedon is 12 to 20 inches thick. Base saturation is 30 to 50 percent in the upper part of the solum and 60 to 80 percent in the lower part.

The A1 horizon has value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3. The A2 horizon has value of 6 or

7 dry. The B2t horizon has hue of 7.5YR and 10YR and value of 5 or 6 dry, 4 or 5 moist.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (7).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in so/. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to 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 expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haplaquents *(Hapl,* meaning simple horizons, plus *aquent,* the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups 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 is thought to typify the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, nonacid, mesic, Typic Haplaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Formation of the soils

This section describes the factors of soil formation in the Kootenai County Soil Survey Area.

Factors of soil formation

Each soil is considered a natural body that has morphology resulting from combined effects of climate, living matter, parent material, relief, and time. The morphology of each soil, as expressed in its profile, reflects the effect of the particular set of genetic factors responsible for its formation (7).

Soils differ in various parts of the survey area, because different factors are dominant. For example, sandy soils have very little profile development because the parent material is of relatively recent deposition and contains large grains of quartz that are highly resistant to weathering. Other soils have distinct profile development because they had finer-textured parent material that had been in place for a longer time and contained only a few large grains of quartz. As shown by this example, soil-forming factors commonly interact with one another. Relief also interacts with other factors and changes the microclimate. This can cause changes in the kind and amount of organic matter. Thus, relief, climate, and living matter can all be changing at the same time. How the five soil-forming factors have influenced soil formation in the Kootenai County Soil Survey Area is discussed in the paragraphs that follow.

Parent material

Parent material is the unconsolidated layer on the earth's surface in which soils form. Most of the chemical and minerological composition of the soils is attributed to it.

Parent material from which soils in Kootenai County Area have developed include eolian deposits, both loess

and volcanic ash, glacial outwash, alluvium, glaciolacustrine sediment, and residuum from metamorphic and metasedimentary rocks mainly from the Precambrian era.

Flows of essentially flat-lying basalt are throughout the area. In most places, this basalt is mantled with loess. On terrace escarpments and foot slopes the loess has been eroded away, exposing the basalt. Soils such as the Lacy, Bobbitt, Blinn, and Dorb formed in these areas. The basalt is highly fractured, and these soils consequently have high amounts of coarse fragments and are influenced by surface deposits of loess and volcanic ash.

Thick loess deposits of differing ages mantle the basalt plateaus and the lower, gentler slopes of adjacent hills and ridges. These thick loess areas are mainly in the southwestern part of the county. The soils that formed in these areas are very deep and have a silt loam surface layer and a silt loam to silty clay subsoil. Some soils in this group are the Santa, Southwick, Taney, and Thatuna soils.

Glacial outwash soils are located throughout the Rathdrum Prairie. This area was carved out by several catastrophic floods during the Pleistocene epoch of geological history, and the rounded and smooth underlying coarse fragments reflect the continual action of water. Soils containing many coarse fragments, such as the Garrison, Avonville, Kootenai, and Bonner soils, are examples of glacial outwash soils. These soils have also been influenced by loess and volcanic ash in varying amounts.

Glaciolacustrine terraces are scattered throughout the county. The soils on these terraces formed in silty and sandy material deposited mainly by glacial lakes. Mokins and Chatcolet are examples of the silty soils. Selle soils are those formed in the more sandy, lake-laid deposits.

Probably the largest geological units in the area of residual soils are included in the Belt Series of Precambrian rocks. These metasedimentary rocks are throughout the area and include siltite, argillite, and quartzite. They are highly fractured rocks, and the soils that formed in material from them have a high percentage of coarse fragments. The Huckleberry, McCrosket, Ardenvoir, and Tekoa soils are typical of this group. During the recent Quaternary period, these soils were also influenced by surface deposits of loess blown in from central Washington and volcanic ash from volcanic vents in the Cascade Mountains to the west.

The other type of residual soils are formed in the metamorphosed, coarse or medium grained igneous rocks. These soils are also influenced by the loess and volcanic ash. Vassar, Spokane, Lenz, and Skalan soils are typical examples of soils formed from these metamorphic rocks.

Alluvial parent material is generally of local origin. It is washed from geological formations of the mountains that surround the valleys. Because of the wide variety of sedimentary, metamorphic, and igneous rock formations in the mountains, the alluvium is mixed.

Alluvial materials differ in texture mainly because they were deposited in different ways. Alluvium on fans and toe slopes generally has texture and other characteristics similar to that in the hills or on steeper slopes above it. Cald soils are mainly formed from the loess washed down from surrounding loess hills. Recent alluvium deposited along the Coeur d'Alene River, and recent lake sediments have formed soils such as the Cougarbay. These soils on the flood plain formed from silty material being carried in and deposited by the floodwater. Peat soils, such as the Pywell soils, formed in areas of old ponds and lakes in the flood plains.

Climate

Climate functions directly in the accumulation of parent material and in the differentiation of soil horizons in the Kootenai County Area. Temperature and rainfall govern rates of weathering of rocks and the decomposition of minerals and organic matter. They also influence leaching, eluviation, and illuviation. The climate in the Kootenai County Area is generally subhumid, characterized by warm, dry summers and cold, wet winters. Mountainous areas have cooler summers and colder winters than the valleys. Differences in annual rainfall and temperature are associated with changes in elevation. The greatest amount of precipitation is in the higher mountains, where the season average is 50 inches or more in some places. Average annual precipitation in the Coeur d'Alene area is about 26 inches but decreases to about 20 inches farther west across the Rathdrum Prairie. This area is generally the warmest, having an average annual temperature of about 47 degrees F. The coldest areas are in the higher mountains where the average annual temperature is 38 to 42 degrees F.

Organic matter content is highest in the soils on the loess plains in the southwestern part of the county and on the Rathdrum Prairie in the western part. In these areas the climate is warmer and dryer, and grass vegetation predominates. Loess soils such as the Southwick and Thatuna soils have a thick, dark surface layer high in humus content from the abundance of decaying, fibrous grass roots. These soils are also higher in exchangeable bases because of less leaching. Soils such as the Garrison, Narcisse, and Avonville soils in the Rathdrum Prairie also have a dark surface layer high in content of organic matter. Soils in the colder, wetter mountains have a lighter colored surface layer and are lower in humus and bases. These soils, such as the Ardenvoir, Huckleberry, Moscow, and Ulricher soils, have vegetation of coniferous trees. The high precipitation on these soils is evidenced by the leaching down and accumulation of iron and aluminum oxides.

Relief

Relief of the Kootenai County Area was mainly determined by the past geological history. The area has four predominant physiographic units: the Selkirk and Coeur d'Alene Mountains, the Rathdrum Prairie, the Palouse

hills, and the Coeur d'Alene River Valley. Relief influences the formation of soils in the county by its effect on drainage, erosion, air drainage, and variation in exposure to the sun and wind.

The mountains are deeply dissected by drainageways. This dissection has formed long, winding ridges that have relatively steep side slopes. Some of the ridgetops are broad and have slopes ranging from 5 to 25 percent. Some ridgetops are narrower and have slopes of more than 25 percent. Because of the steep and very steep slopes, most of the soils are well drained to somewhat excessively drained. Geological erosion is active, and accelerated erosion has followed logging, fires, or other disturbances. Consequently, most of the soils are only moderately deep. Examples of moderately deep, steep, and very steep soils are those of the Huckleberry, Blinn, Lenz, Spokane, Moscow, and Tekoa soils.

Relief causes variations in rainfall or effective moisture. Soils at the higher elevations on north-facing slopes, such as Ardenvoir soils, receive less direct sunlight, have colder soil temperatures, and retain moisture longer. Soils on south-facing slopes, such as the McCrosket soils, receive more sunlight, have warmer soil temperatures, and dry out faster. These differences determine the kind of vegetation that grows on the soil and, consequently, its organic matter. Generally, there is more leaching of exchangeable bases from the soils that have moisture.

Relief in the Rathdrum Prairie is nearly level to undulating. The western end of the Prairie or outwash plain is broad, and the soils in this area are warmer. The outwash plain curves north and narrows, and the soils there have a colder temperature, increased precipitation, and more coniferous vegetation.

The Coeur d'Alene River Valley is flat and has slopes of less than 2 percent. Because of level topography, drainage is poor and drainage outlets are lacking. This causes a high or fluctuating water table in the soils. The Cougarbay and Ramsdell soils formed along the flood plain. They have underlying horizons that are gleyed and mottled because of the poor drainage.

Several alluvial soils are throughout the Kootenai County Area. They formed in nearly level, narrow drainageways and drainage basins. Water tables are often high, and drainage is poor. The Porrett, Cald, and Potlatch soils are examples.

Living matter

Living matter consisting of plant and animal life has a significant function in the process of soil formation. The kind and amount of vegetation that grows on a soil over a long period of time has a strong influence on the kind, amount, and position of the organic matter in the soil.

Some of the soils on the loess-covered hills in the southwestern part of the county formed under grass vegetation. The abundance of fibrous roots adds much humus to the soil, and the organic matter content can be as high as 5 percent. Micro-organisms are very active in these soils and have influenced the dark color, structure, and physical condition of the Thatuna, Southwick, and Larkin soils. The soils in the western end of the Rathdrum Prairie also formed under grassland. The deep, dark colored surface layer of the Garrison and Avonville soils indicates the abundance of organic matter.

The poorly drained soils of the flood plains and drainageways, such as the Cougarbay, Seelovers, and Cald soils, formed under water-loving grasses, sedges, and forbs. These soils are generally high in organic matter because of the abundance of plants growing on them. They provide good habitat for micro-organisms, which leads to decomposition of the organic matter and its incorporation into the soil. The dark surface layer of these soils indicates that this soil-forming process is actively at work.

The living matter in the soils of the higher mountains is generally not decomposing as rapidly. This is mainly because of the colder temperatures.

Time

Time is required for soil formation, which proceeds in stages, none of which is distinct. It is not possible to be sure when one stage in soil formation ends and another begins. Studying soil formation in stages, however, is simply a way of looking at the continuous process one part at a time. In Kootenai County Area, stages of these processes are expressed by horizon differentiation within each soil.

In general, soils on the flood plains are young. Soils such as the Cald and Cougarbay soils have developed in unconsolidated sediment that was recently laid down. These soils have been influenced enough by soil-forming processes to have an A horizon and leaching of bases.

Such soils as the Setters and Worley soils are on old, loess-covered hills and are the oldest and most strongly developed soils in the survey area. They had time for the translocation of silicate clays, which is indicated by the abrupt change in texture from the A horizon to the B2t horizon.

Soils in the mountains and foothills differ somewhat in degree of development. Young soils, such as the Brickel soils, have steep and very steep slopes. They are shallow to moderately deep over bedrock and have a thin A horizon, because soils in this position lose soil material by geological erosion nearly as fast as it forms. McCrosket soils are also relatively young, but are less susceptible to erosion. They have had enough time for accumulation of more organic matter in the surface and some chemical alteration of primary minerals. Soils such as the Schumacher, Skalan, and Tekoa soils are intermediate in age. They have had enough time for translocation of silicate clays, which is indicated by changes in color, texture, structure, and consistence of the B2t horizon.

Soils of the outwash plains in the Rathdrum Prairie are intermediate to young in age. The dark surface layer of

the grassland soils, such as Garrison and Avonville soils, and the chemical alteration in the subsoil indicate enough time for the soil-forming processes to influence their development.

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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.

Alkalinity, soil. The degree or intensity of alkalinity in a soil, expressed by a value>7.0 for the soil pH.

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

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

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

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

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

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.

Bottom land. The normal flood plain of a stream, subject to flooding.

Bulk density, soil. The weight of a unit volume of soil.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce (fizz) visibly when treated with *cold, dilute hydrochloric acid. A soil having measur*able amounts of calcium carbonate or magnesium carbonate.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

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 coat, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles up to 10 inches (2 millimeters to 25 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 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.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

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. Manganese 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.-When dry,breaks into powder or individual grains under very slight pressure.

Cemented.-Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earth-moving equipment. The soil sloughs easily.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. A delay in grazing until range plants have reached a specified stage in growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Con strasts with continuous grazing and rotation grazing.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

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 for 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.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

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 a bare surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

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 (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. None means that flooding is not probable; rare that is unlikely but possible under unusual weather conditions; common that it is likely under normal conditions; occasional that it occurs on an average of once or less in 2 years; and frequent that it occurs on an average of more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water as it flows from glacial ice.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and 'deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. 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, formed or forming 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.

A2 horizon.-A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.-The mineral horizon below an A horizon. The B horizon is in part a layer of change 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 are generally 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.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

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

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

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

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

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

Krotovinas. -Burrows of animals, especially rodents, that modify the soil.

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

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

Light textured soil. Sand and loamy sand.

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

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

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

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

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.

Metasedimentary. Refers to metamorphic rock of sedimentary origin.

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

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Montmorillonite. A fine, platy, alumino-silicate clay mineral that expands and contracts with the absorption and loss of water. It has a high cation-exchange capacity and is plastic and sticky when wet.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

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 pro file.

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 con*trast-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).

Muck. Dark colored, finely divided, well decomposed or ganic soil material mixed with mineral soil material. The content of organic matter is more than 20 per cent.

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.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley drains, outwash terraces, eskers, kame terraces, kames, outwash pans, or deltas.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, 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 0.20 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 or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the basis of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

Piping. Moving water forms subsurface tunnels or pipelike cavities in 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 a plastic state.

Poorly graded. Refers to a 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.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under specific management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range. (or rangeland). Land that for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

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

	pH
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

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream chan nels from a drainage area. The water that flows off the surface of the land without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral frag ments from 0.05 millimeter to 2.0 millimeters in di ameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

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.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

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.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

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.

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.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the

steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

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.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

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

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A 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.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, 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."

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Trace elements. The chemical elements in soils, in only extremely small amounts, essential to plant growth. Examples are zinc, cobalt, manganese, copper, and iron.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill. Risk of caving or sloughing on banks of fill material.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams emerging from hills or mountains and spreading sediments onto the lowland as a series of adjacent alluvial fans.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water. *Water table, apparent.* A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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.