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

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Soil maps for detailed planning." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 435,000 acres in the survey area was used for crops and pasture in 1975, according to the Morrow County extension agent and the extension economist from Oregon State University. Of this total, 195,000 acres was in wheat, 30,000 acres of which was irrigated. About 20,200 acres was in potatoes, 21,800 acres in rotation hay and pasture, 10,000 acres in barley, 10,000 acres in other row crops including corn and dry beans, and 4,200 acres in other crops and grain. About 175,000 acres was summer fallowed.

Range covers several thousand acres of irrigable land in the northernmost part of the county. The potential for developing this land depends on the availability of irrigation water and the economics of delivering the water.

Irrigated cropland

Intensive irrigated farming is relatively new in this area. With more experience, farmers are likely to change many of the management and cultural practices.

The most extensively grown crop under irrigation is winter wheat. Wheat is planted in August, September, and early October at a seeding rate of 60 to 100 pounds per acre. If wheat is to be seeded following a potato crop, the vines are left on the soil for erosion control. If wheat follows wheat, the stubble is disked in and wheat is planted in the stubble mulch. Wheat responds well to nitrogen fertilizer, which is applied in soluble form through sprinklers at the rate of 200 to 300 pounds per acre. Wheat is harvested in July and August.

Potatoes usually are planted in February and March at the rate of about 25 bushels per acre. Serious disease problems can develop if they are grown in consecutive years. To reduce the hazard of wind erosion, it is desirable to avoid planting in the same direction as the prevailing wind. In Morrow County, the prevailing wind is from the southwest. If potatoes follow wheat, the stubble is turned under and the field is irrigated to bring up volunteer wheat as a cover crop. The cover crop is turned under when the soil is wet about 4 to 6 weeks before planting time. Minimum tillage or no tillage may

be feasible. Either reduces the hazard of wind erosion (*13*).

Deep plowing and a firm seedbed 5 to 7 inches deep are desirable. Potatoes require high levels of nutrients. An adequate amount of potash is essential for starch production. Potatoes respond well to high rates of nitrogen applied in bands at planting time and in soluble form as needed throughout the growing season. Phosphorus may be needed. Under irrigation, potatoes require a uniform supply of soil moisture if they are to form marketable tubers.

Vines are killed about 10 to 14 days before the tubers are machine harvested. This time allows the skins to toughen and reduces bruising during harvest. Vines are killed by chemicals or by mechanical means.

Throughout the growing cycle, weeds are controlled by pre-emergence tilling. As soon as the plants are visible, deep cultivation close to the rows loosens the soil for tuber development. Selective herbicides are also utilized.

Center-pivot irrigation is well adapted to alfalfa hay or pasture. Wheelline and handline systems also are utilized. Hay or pasture follows wheat or potatoes in the crop rotation. Hay or pasture is usually grown 3 to 5 years before it is turned under. In a field of permanent hay or pasture, reseeding every 4 to 6 years is desirable, depending on the variety of alfalfa.

Fall seeding of alfalfa hay or pasture is preferable, especially on sandy soils because they are vulnerable to blowing in spring. Seeding is usually done from August through September. If hay or pasture follows winter wheat, it is desirable to cut and remove the excess stubble and seed the alfalfa directly into the stubble. Volunteer grain can be controlled selectively with herbicides. If alfalfa is to follow a cover crop, the cover crop can be harvested as grass hay, grazed to the ground, or removed by using selective herbicides. Alfalfa can then be drill seeded and irrigated.

To obtain heavy stands and maximum yields, alfalfa should be properly innoculated before seeding. Phosphorus and sulfur may be needed. In the northern part of Morrow County, sulfur and phosphorus are the most limiting nutrients for alfalfa hay production. The rate of application should be based on soil tests.

If the water supply is inadequate, suitable grasses and legumes are alfalfa, birdsfoot trefoil, white clover, intermediate wheatgrass, crested wheatgrass, big bluegrass, pubescent wheatgrass, tall fescue, and tall wheatgrass. If water is adequate and drainage is no problem, suitable legumes and grasses for planting are alfalfa, white clover, orchardgrass, tall fescue, meadow foxtail, smooth bromegrass, tall oatgrass, and big bluegrass (*3*).

Corn for grain and silage and sweet corn are grown under irrigation. The acreage of silage corn is the most extensive. Because of the lack of local processing facilities, only a small acreage is in sweet corn. Most of the sweet corn is trucked to Milton-Freewater for processing.

Corn is planted in May or June. In sandy soils, planting at this time has the advantage of good weather conditions and quicker ground cover. Also, windspeed is lower than in March and April. Corn can be seeded into the wheat stubble and irrigated to induce germination and plant emergence. It can also be seeded into a cover crop, after the cover crop is cut for hay, or grazed, or removed with herbicides. Minimum tillage and selective weed control can be adapted to corn. Planting perpendicular to the prevailing wind direction reduces soil blowing.

Corn responds to applications of nitrogen, phosphorus, and potassium. Mixed fertilizer is applied as bands beside the corn row during planting. Later, nitrogen can be added through the irrigation water.

Currently watermelons are raised only in the Irrigon area in northern Morrow County, but there is potential for melon production throughout the northern part of the county. Protecting the soil from blowing is important in melon production. In the seedling stage, airborne soil particles can be highly destructive to tender plant tissue. Grain windbreaks reduce the hazards of soil blowing and vine erosion and trap warmth for earlier melons. For cereal windbreaks the field can be seeded to grain in the fall. In winter, alternate strips 5 feet wide are rototilled and compacted to prepare a seedbed for the melons. Late in June, the grain windbreaks are undercut and left slumped over for protection from wind.

Some sorghum is raised, mainly for erosion control. Sorghum not only provides a protective ground cover but also protects the soil after harvest because it has a dense root system. Sorghum for erosion control is planted on corners between circle systems or as a cover crop on newly broken cropland. The potential of sorghum for other uses, primarily as feed sorghum, remains to be determined.

A small acreage is used for other crops that can be grown under irrigation. Asparagus, dry beans, green beans, mint, soybeans, and sugar beets are examples.

South of the irrigated part of Morrow County, irrigation water is not generally available and crops are dryfarmed. An exception is on bottom lands along the major streams where water is available and wheel or handline systems are used. Alfalfa hay and pasture are the main crops on this bottom land. They are grown permanently or are rotated with wheat. Management needs are the same as those previously mentioned.

Nonirrigated cropland

Winter wheat is the major dryland crop. Because of the lack of sufficient precipitation, wheat is cultivated in a grain-fallow system. In this system fields are alternated for wheat production. A field is used for wheat one year and left idle—void of all vegetation—the following year, allowing the moisture supply to build up for the following

wheat crop. Land to be fallowed is usually tilled early in spring of the year after the previous crop harvest. The stubble is left intact throughout the winter to help retain snow and rain as well as to reduce the risk of wind and water erosion (fig. 11). Fall tilling of stubble provides better weed control but can adversely affect stored soil moisture, especially during a dry spring.

Winter wheat is usually seeded in October or November. Sometimes it is seeded in spring for weed control. Sometimes reseeding in spring is needed because of insufficient moisture for seed germination in the fall or because of loss of the stand as a result of winterkill from freezing or frost heaving. Normal seeding rates for winter wheat are 45 to 60 pounds per acre.

Winter wheat responds to nitrogen fertilizer. The time and rate of fertilizer application depend on adequate soil moisture, precipitation, and soil depth. Inadequate precipitation is the main factor affecting wheat yields in Morrow County.

Weeds are controlled through the use of selective herbicides and the use of rod weeders on fallowed soils. Insects are controlled by aerial spraying of insecticides.

Erosion, one of the main problems on dryland soils, can be reduced through the use of proper residue management, contour stripcropping, stubble mulch tillage, chisel plowing perpendicular to the slope, grassed waterways, and diversions laid out at proper intervals on the slope (fig. 12).

Barley is an alternative dryland crop. If planted on south-facing slopes, which are drier and warmer, barley will usually yield higher than winter wheat. Winter-hardy spring varieties are often seeded in the fall. These varieties, however, are not so hardy or vigorous as wheat. They sometimes freeze out and have to be reseeded in spring. Barley also is not so effective for erosion control as winter wheat because its straw breaks down more rapidly.

Another practical consideration is to reseed marginal cropland to a permanent mixed stand of alfalfa and grass, which protects the soil from erosion and provides grazing for livestock.

Some alfalfa hay and pasture is raised under dryland management, but yields are low. In areas where precipitation is less than 12 inches, moisture is insufficient for dryland hay production (*3*). The alfalfa seed must be properly innoculated. Hay should be reseeded every 8 to 15 years, depending on the variety.

Yields per acre

The average yields per acre that can be expected of

Figure 11.—Wheat stubble on Morrow soils, in winter, reduces the hazard of water erosion

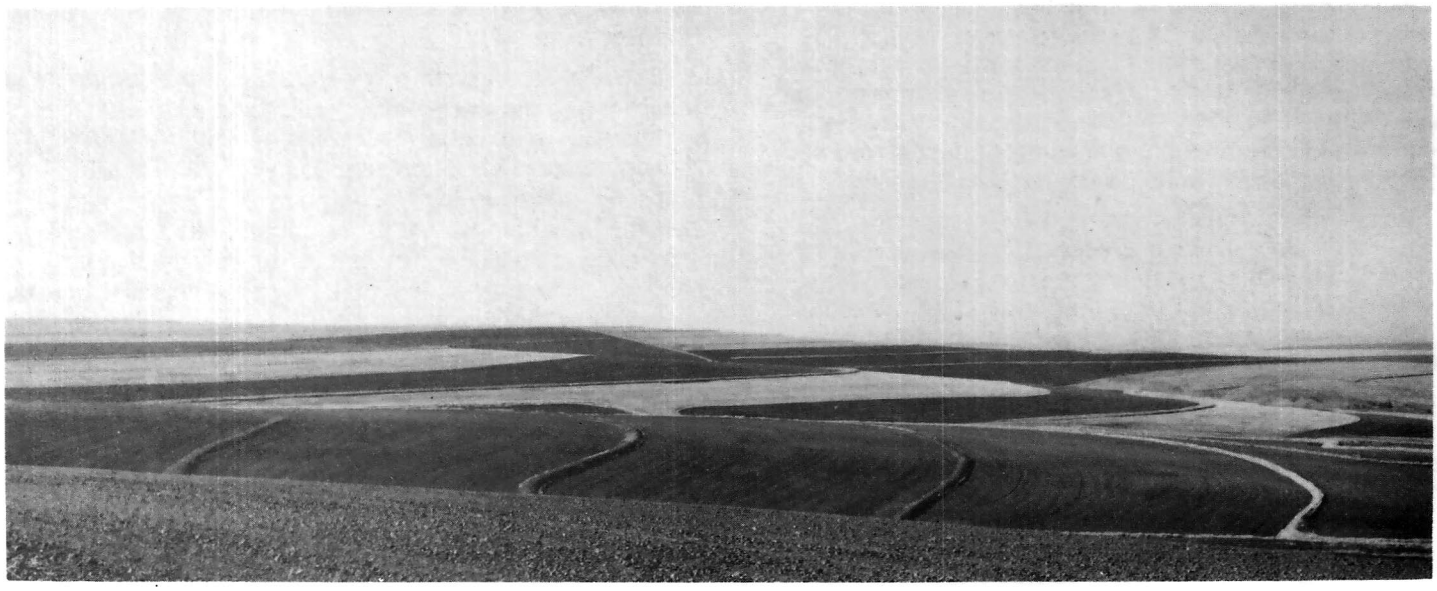

Figure 12—Moisture control on dryfarmed Morrow soils. Diversion terraces dissect summer fallowed areas in the foreground. In the distance, alternate wheat stubble and summer fallowed areas form contour stripcropping.

the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped (*11*) according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and

narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use. There are no class V soils in the survey area.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Rangeland

Samuel F Greenfield, area range conservationist, Soil Conservation Service, helped prepare this section

Approximately 536,000 acres, or 45 percent, of the Morrow County soil survey area is rangeland. Conifer forests along the southern fringe of the county make up about 19 percent of the total acreage. This area of approximately 254,000 acres provides important summer grazing for livestock.

Range in Morrow County is truly grassland. Bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass make up nearly 90 percent of the potential native vegetation. Broadleaf herbs and shrubs are insignificant as forage plants.

Natural plant communities that represent the grazing potential of the survey area are common because in many areas used for a wheat-summer fallow cropping system, cultivation is deferred every other year. Productivity of the range can be maintained, or in many areas improved, by using management that is effective for specific kinds of soil and plant communities.

On most livestock ranches, the forage produced is supplemented by wheat stubble and crop residue. In the northern third of the county, near the Columbia River, winter is the best season of use. In this area precipitation falls mostly as rain and temperatures are fairly mild. Because of the frequent strong west winds, wind erosion can be severe in spring. Protecting the area from grazing during the growing season should be considered.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to differences in the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil in the survey area, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture. Plant species that

have special value for livestock forage are mentioned in the description of each map unit.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Woodland management and productivity

In the paragraphs that follow is information on the relationship between soils and trees. Interpretations are given that are useful to landowners and operators in planning, establishing, and managing wood crops.

Forest covers about 254,000 acres, or 19 percent, of the survey area. About 160,000 acres, or 65 percent, is within the Umatilla National Forest owned by the Federal Government. The other 94,000 acres, or 35 percent, is owned by private individuals and forest industry.

The principal forest types include inland Douglas-fir, ponderosa pine, western larch, grand fir, lodgepole pine, and western juniper.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general 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 important 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 that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

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 in equipment; and *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 to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. 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* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control 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. Commonly grown 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 suited to the soils and to commercial wood production.

Woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 8 shows, for each soil suitable for woodland use, the potential for producing understory vegetation. The total production of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4 1/2 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, 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.

Table 8 also lists the common names of the characteristic vegetation on each soil and the percentage composition, by air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of woodland in which the production of wood crops is highest.

Windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs 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 depends on the erodibility of the soil. Field windbreaks 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. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial,

and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill, sand, gravel, and topsoil. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined

by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. The ratings in table 12 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 12.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water management

Table 13 gives information on the soil properties and site features that affect water management. The kinds of soil limitations are given for pond reservoir areas and embankments, dikes, and levees.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks

are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Recreation

The soils of the survey area are rated in table 14 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 14, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 14 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils 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 campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 15, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in 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* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features 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. Soil properties and features 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, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features 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 bluestem, goldenrod, beggarweed, wheatgrass, and balsamroot.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife 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 wildlife attracted to these areas include valley and mountain quail, pheasant, meadowlark, field sparrow, cottontail, and coyote.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, grouse, thrushes, woodpeckers, squirrels, coyote, raccoon, badger, deer, bear, and elk.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include mule deer, chukar, Hungarian partridge, meadowlark, valley quail, hawks, golden eagles, and owls.

Soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil Pertinent soil and water features also are given.

Engineering properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and morphology."

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

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*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 and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

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

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

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

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

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

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of

soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion 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. Crops can be grown if measures to control wind erosion are used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

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 it 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.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either rippable or hard. If the rock is rippable or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted

(indurated). Such pans cause difficulty in excavation. The hardness of pans is similar to that of bedrock. A rippable pan can be excavated, but a hard pan generally requires blasting.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*12*) Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeroll (*xer*, meaning dry, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxerolls (*Hapl*, meaning minimal horizonation, plus *xeroll*, the suborder of Mollisols that have a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Lithic* identifies the subgroup that typifies the great group except that it has a lithic contact within 20 inches of the surface. An example is Lithic Haploxerolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy-skeletal, mixed, mesic, Lithic Haploxerolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. An example is the Lickskillet series.

Soil series and morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*10*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*12*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series

The map units of each soil series are described in the section "Soil maps for detailed planning."

Aquepts

Aquepts are very deep, poorly drained soils formed in volcanic ash and recent alluvium. They are in mountain meadows in the Blue Mountains. The slope is 0 to 3 percent. The mean annual precipitation is about 24 inches, and the mean annual air temperature is about 43 degrees F.

Pedon of Aquepts, nearly level, 50 feet north of road, Brown Prairie SE1/4SW1/4SE1/4 sec. 23, T. 5 S , R. 28 E.

A11—0 to 11 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slighty plastic; many medium and fine roots; many very fine pores; slightly acid (pH 6.2); clear wavy boundary.

IIA12—11 to 15 inches; very dark brown (10YR 2/2) silt loam, gray (10YR 5/1) dry; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine pores; few fine distinct yellowish brown (10YR 5/6) mottles; slightly acid (pH 6.2); abrupt smooth boundary.

IIC1—15 to 23 inches; grayish brown (10YR 5/2) silt loam, white (10YR 8/1) dry; massive; hard, firm, nonsticky and nonplastic; many very fine pores; few roots; few distinct yellowish brown (10YR 5/6) mottles; fine black concretions; mildly alkaline (pH 7.4); smooth wavy boundary.

IIC2—23 to 27 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; brittle; few roots; many very fine pores; common medium yellowish brown (10YR 5/6) mottles; mildly alkaline (pH 7.4); abrupt smooth boundary.

IIIB2t—27 to 32 inches; dark brown (10YR 3/3) silty clay loam, grayish brown (10YR 5/2) dry; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, sticky and plastic; few roots; many very fine pores; medium nearly continuous clay films; 15 percent coarse sand (pumice); neutral (pH 7.0); abrupt smooth boundary.

IVA1b—32 to 44 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; moderate medium prismatic structure; hard, friable, very sticky and very plastic; few roots; many very fine pores; neutral (pH 7.0); abrupt smooth boundary.

IVC1—44 to 51 inches; dark grayish brown (2.5Y 4/2) silty clay loam, light gray (2.5Y 7/2) dry; massive; hard, friable, sticky and plastic; many very fine pores; neutral (pH 7.0); clear wavy boundary.

IVC2—51 to 60 inches; dark greenish gray (5GY 4/1) silty clay loam, light gray (5Y 7/2) dry; massive; hard, friable, sticky and plastic; many very fine pores; neutral (pH 7.0).

Depth to sandy loam, very gravelly sandy loam, very cobbly loam, or bedrock is 25 to 60 inches.

The A horizon has value of 2 or 3 moist, 3 through 5 dry, and chroma of 0 or 1 moist and dry. It contains layers that are more than 60 percent volcanic ash and more than 5 inches thick.

The IIA12 horizon has value of 2 or 3 moist, 4 or 5 dry, and chroma of 1 or 2 moist and dry. It is commonly mottled, particularly in the lower part.

The IIIB2t horizon has hue of 10YR to 2.5Y. In places it is mottled. Mottles are few to many and faint to prominent. In many pedons the lower part of this horizon is gleyed. This horizon is 30 to 60 percent clay. It ranges from silty clay loam to clay.

The IVC horizon is gleyed and in places is mottled. It ranges from loam to clay. Hue is 2.5Y, 5Y, or 5GY.

In spring, the water table is at the surface in some areas.

Aquolls

Aquolls are very deep, poorly drained soils formed in loess, alluvium, and small amounts of volcanic ash. They are in mountain meadows and along drainageways in the Blue Mountains. The slope is 0 to 5 percent. The mean annual precipitation is about 25 inches, and the mean annual air temperature is about 44 degrees F.

Pedon of Aquolls, nearly level, 150 feet from road, sec. 12, T. 6 S., R. 25 E.

A1—0 to 3 inches; black (2.5Y 2/0) silt loam, very dark gray (10YR 3/1) dry; strong fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; neutral (pH 6.6); abrupt smooth boundary.

B2—3 to 19 inches; black (2 5Y 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; many very fine roots; many very fine pores; neutral (pH 6.8); clear smooth boundary.

B31—19 to 33 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few fine roots; many very fine pores; common medium distinct mottles; neutral (pH 7.1); clear smooth boundary.

B32—33 to 38 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few fine roots; many very fine pores; common medium distinct mottles; neutral (pH 7.0); clear smooth boundary.

IIC1—38 to 47 inches; very dark gray (10YR 3/1) silty clay, grayish brown (10YR 5/2) dry; weak medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; many very fine pores; common medium prominent mottles; slightly acid (pH 6.4); clear smooth boundary.

IIC2—47 to 60 inches; very dark grayish brown (10YR 3/2) silty clay, brown (10YR 5/3) dry; weak medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; many very fine pores; many medium prominent mottles; slightly acid (pH 6.4).

The A horizon has value of 2 or 3 moist, 3 or 4 dry, and chroma of 0 or 1 moist and dry.

The B2 horizon is silt loam or silty clay loam. It has value of 2 or 3 moist, 3 or 4 dry, and chroma of 0 or 1 moist and dry.

The B3 horizon has moist value of 2 or 3 in the upper part and 3 or 4 in the lower part. Dry value is 4 or 5. Chroma is 1 or 2 moist and dry. Mottles are few to many and faint to prominent.

The IIC horizon is silty clay, clay loam, or sandy loam. Hue is 10YR, 2.5Y, or 5GY. Value is 3 through 5 moist, 5 or 6 dry. Chroma is 1 or 2 moist and 2 or 3 dry. In places this horizon is gleyed. Mottles range from few to many and from faint to distinct. The content of pebbles and cobbles ranges from 0 to 60 percent.

Bakeoven series

The Bakeoven series consists of shallow, well drained soils formed in loess and in residuum from basalt rock. These soils are on ridgetops and breaks into canyons. Slopes are 2 to 20 percent. The mean annual precipitation is about 13 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Bakeoven very cobbly loam, 2 to 20 percent slopes, 200 feet north of Highway 206, NW1/4SW1/4NW1/4 sec. 30, T. 3 S., R. 26 E.

A1—0 to 2 inches; dark brown (7.5YR 3/3) very cobbly loam, brown (7.5YR 5/3) dry; weak thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; 25 percent pebbles; 30 percent cobbles; 5 percent stones; neutral (pH 6.6); clear wavy boundary.

B2—2 to 7 inches; dark brown (7.5YR 3/3) extremely cobbly loam, brown (7.5YR 4/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; 30 percent pebbles; 40 percent cobbles; neutral (pH 6.6); abrupt wavy boundary.

IIR—7 inches; basalt.

The solum is 35 to 75 percent coarse fragments. Depth to bedrock is 5 to 12 inches. Hue is 7.5YR or 10YR.

The A horizon has chroma of 2 or 3 moist and hue of 7.5YR or 10YR. The B horizon has chroma mainly of 2 or 3 moist and dry. In places the chroma is 4 in the lower part.

Boardtree series

The Boardtree series consists of very deep, well drained soils formed in ashy material over clayey sediment. These soils are on north-facing slopes in the Blue Mountains. The gradient is 7 to 40 percent. The mean annual precipitation is about 23 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Boardtree loam, 7 to 40 percent slopes, 100 feet south of road in SW1/4SW1/4SW1/4 sec. 24, T. 5 S., R. 26 E.

O1—1 inch to 0; fir needles and twigs.

A1—0 to 1 inch; dark brown (7.5YR 3/2) loam, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common roots; many irregular pores; neutral (pH 6.8); gradual smooth boundary.

B21—1 inch to 14 inches; brown (7.5YR 4/2) loam, pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common roots; many irregular pores; neutral (pH 6.8); gradual smooth boundary.

IIB22—14 to 25 inches; brown (7.5YR 4/4) loam, pinkish gray (7.5YR 6/2) dry, weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common roots; many irregular pores; 5 percent pebbles; slightly acid (pH 6.4); abrupt wavy boundary.

IIIB21tb—25 to 40 inches; brown (10YR 4/3) clay, brown (10YR 5/3) dry; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common roots; many tubular pores; 5 percent pebbles; neutral (pH 6.6); gradual wavy boundary.

IIIB22tb—40 to 50 inches; brown (10YR 4/3) clay loam, brown (10YR 5/3) dry; massive; hard, firm, sticky and plastic; common roots; many tubular pores; moderately thick clay films in pores; 5 percent pebbles; neutral (pH 6.8); gradual wavy boundary.

IIIC—50 to 60 inches; brown (7.5YR 5/4) clay loam, light brown (7.5YR 6/4) dry; massive; slightly hard, friable, sticky and plastic; few roots; many tubular pores; moderately thick clay films in pores; 5 percent pebbles; neutral (pH 7.0).

Depth to partly consolidated bedrock is more than 60 inches. Depth to the clayey layer ranges from 20 to 40 inches.

The A horizon has value of 3 or 4 moist and 5 or 6 dry and chroma of 1 or 2 moist and dry.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 2 through 4 moist and dry. It is loam or silt loam that is 10 to 20 percent clay.

The IIIB2tb horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 3 or 4 moist and dry. It is clay, silty clay, heavy clay loam, or silty clay loam that is more than 35 percent clay.

The IIIC horizon has hue of 10YR or 7.5YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 2 through 4 moist and dry. It is loam, clay loam, or silt loam that is 10 to 20 percent clay In places it has pockets of clayey material.

Bocker series

The Bocker series consists of very shallow, well drained soils formed in loess and in residuum from basalt. These soils are on ridgetops. The slope is 2 to 12 percent. The mean annual precipitation is 25 inches, and the mean annual air temperature is 44 degrees F.

Typical pedon of Bocker extremely cobbly silt loam, 2 to 12 percent slopes, NW1/4SE1/4SW1/4 sec. 9, T. 6 S., R. 28 E.

A11—0 to 2 inches; dark reddish brown (5YR 3/3) extremely cobbly silt loam, reddish brown (5YR 5/4) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; 30 percent cobbles; 30 percent pebbles; 10 percent stones; neutral (pH 6.8); clear smooth boundary.

A12—2 to 8 inches; dark reddish brown (5YR 3/3) extremely cobbly silt loam, reddish brown (5YR 5/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; 30 percent cobbles; 30 percent pebbles; 10 percent stones; neutral (pH 6.8); abrupt wavy boundary.

R—8 inches; basalt.

The thickness of the mollic epipedon and depth to bedrock range from 4 to 10 inches. The solum ranges from 35 to 70 percent cobbles, pebbles, and stones. Hue is 10YR, 7.5YR, or 5YR. Chroma is 2 or 3 moist.

Burbank series

The Burbank series consists of very deep, excessively drained soils formed in gravelly alluvial deposits and wind worked material. These soils are on terraces. Slopes are 2 to 12 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Burbank loamy fine sand, 2 to 5 percent slopes, 100 feet west of the Patterson Ferry Road in SE1/4NE1/4SE1/4 sec. 16, T. 5 N., R. 26 E.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; single grained; loose, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 6.6); clear abrupt boundary.

C1—5 to 20 inches; dark brown (10YR 4/3) loamy fine sand, brown (10YR 5/3) dry; single grained; loose, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 6.6); clear wavy boundary.

IIC2—20 to 34 inches; dark brown (10YR 4/3) very cobbly loamy fine sand, brown (10YR 5/3) dry; massive; soft, friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 50 percent cobbles; 10 percent pebbles; neutral (pH 6.8); clear wavy boundary.

IIC3—34 to 60 inches; very cobbly sand; gravel, cobbles, and coarse sand intermittently weakly coated with lime.

Depth to very gravelly and very cobbly sand is 20 to 40 inches. The 10- to 40-inch control section is 45 to 75 percent coarse fragments.

This soil has value of 5 or 6 dry and 3 or 4 moist and chroma of 2 or 3 moist and dry. The 10- to 40-inch control section is dominantly very gravelly loamy sand or very gravelly loamy fine sand.

Ellum series

The Ellum series consists of moderately deep, well drained soils formed in water deposited sand and gravel. These soils are on terraces. Slopes are 2 to 12 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Ellum fine sandy loam, 2 to 5 percent slopes, 30 feet east of road, SW1/4SW1/4NW1/4 sec. 27, T. 3 N., R. 26 E.

A1—0 to 5 inches; dark brown (10YR 3/3) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; mildly alkaline (pH 7.6); clear smooth boundary.

C1—5 to 13 inches; dark brown (10YR 4/3) fine sandy loam, light brownish gray (10YR 6/2) dry; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; mildly alkaline (pH 7.6); clear wavy boundary.

IIC2—13 to 23 inches; dark brown (10YR 4/3) very gravelly fine sandy loam, pale brown (10YR 6/3) dry; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; 60 percent pebbles; mildly alkaline (pH 7.6); clear wavy boundary.

IIC3ca—23 to 28 inches; dark brown (10YR 4/3) extremely gravelly fine sandy loam, light brownish gray (10YR 6/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; 60 percent pebbles; 5 percent cobbles; moderately calcareous; pebbles and cobbles coated with lime; moderately alkaline (pH 8.0); abrupt wavy boundary.

IIIC4casim—28 to 36 inches; very gravelly duripan; massive; strongly cemented, very firm, very hard; silica and lime coatings on undersides of pebbles; root mat on surface of pan.

Depth to the calcareous, gravelly duripan is 20 to 40 inches. The pan ranges from weakly cemented to strongly cemented. Depth to lime is 10 to 24 inches.

The A horizon has chroma of 2 or 3 moist and dry.

The C horizon has value of 6 dry and 4 moist and chroma of 2 or 3 moist and dry. The C1 horizon ranges from fine sandy loam to gravelly fine sandy loam, the IIC2 horizon is very gravelly fine sandy loam or very gravelly sandy loam, and the IIC3ca horizon is extremely gravelly fine sandy loam or extremely gravelly sandy loam.

Endersby series

The Endersby series consists of very deep, somewhat excessively drained soils formed in alluvium from loess and volcanic ash. These soils are on alluvial bottom lands. Slopes are 0 to 3 percent. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Endersby fine sandy loam, at the mouth of Rhea Creek where it enters Willow Creek, along Highway 74, SW1/4SE1/4NW1/4 sec. 12, T. 1 S , R. 24 E.

Ap—0 to 6 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic, many very fine roots; many very fine irregular pores; mildly alkaline (pH 7.4); abrupt smooth boundary.

A12—6 to 12 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine and fine tubular pores; mildly alkaline (pH 7.4); many wormcasts; clear smooth boundary

C1—12 to 21 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; massive; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine and fine tubular pores; mildly alkaline (pH 7.4); many wormcasts; abrupt smooth boundary.

C2—21 to 36 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry, massive; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine and common fine tubular pores; mildly alkaline (pH 7.4), clear wavy boundary.

Ab—36 to 60 inches; black (10YR 2/1) heavy silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline (pH 7.4).

Depth to gravel or partly consolidated bedrock is more than 60 inches. The mollic epipedon ranges from 20 to 38 inches in thickness.

The A horizon has value of 4 or 5 dry and chroma of 2 or 3 moist and dry.

The C horizon has value of 4 through 6 dry and 3 or 4 moist. Values of 5 or 6 dry and 3 or 4 moist are at a depth of more than 20 inches. The horizon is mainly loam or fine sandy loam. The lower part is stratified silt to loamy sand in places.

Esquatzel series

The Esquatzel series consists of very deep, well drained soils formed in alluvium from loess and volcanic ash. These soils are on alluvial bottom lands. Slopes are 0 to 3 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Esquatzel silt loam, 210 feet north of farm road past barn, SW1/4SE1/4SE1/4 sec. 14, T. 2 N., R. 23 E.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure parting to weak fine platy; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and common medium and large roots; many very fine irregular pores; neutral (pH 7.0); abrupt smooth boundary.

A12—5 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; neutral (pH 7.2); clear wavy boundary.

B2—17 to 25 inches; dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; weakly calcareous; mildly alkaline (pH 7.4); clear wavy boundary.

C1ca—25 to 41 inches; dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine tubular pores; strongly calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

C2ca—41 to 60 inches; dark brown (10YR 3/3) coarse silt loam, pale brown (10YR 6/3) dry; massive; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; few firm calcareous nodules one-eighth to one-half inch in diameter; strongly calcareous; moderately alkaline (pH 8.2).

Depth to secondary carbonates is 12 to 40 inches. The mollic epipedon is 10 to 20 inches thick.

The A1 horizon has chroma of 2 or 3 moist and dry. The C horizon has value of 5 or 6 dry and chroma of 2 or 3 moist and dry. It is silt loam, but thin lenses of fine sandy loam are below the control section in places.

Gravden series

The Gravden series consists of shallow, well drained soils formed in wind laid material mixed with gravelly alluvium and colluvium. Slopes are 5 to 40 percent. The mean annual precipitation is about 11 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Gravden very gravelly loam, 5 to 20 percent slopes, about 55 feet south of a farm road, NE1/4NE1/4SW1/4 sec. 19, T. 2 N., R. 27 E.

A11—0 to 3 inches; dark brown (10YR 3/3) very gravelly loam, pale brown (10YR 6/3) dry; weak fine to medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; 25 percent pebbles; 10 percent cobbles; moderately alkaline (pH 8.0); clear wavy boundary.

A12—3 to 7 inches; dark brown (10YR 3/3) very gravelly loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 30 percent gravel; 10 percent cobbles; one-eighth inch lime coatings on undersides of gravel; moderately alkaline (pH 8.0); clear wavy boundary.

C1ca—7 to 14 inches; brown (10YR 4/3) extremely gravelly loam, light yellowish brown (10YR 6/4) dry; massive; soft, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; 55 percent gravel; 10 percent cobbles; gravel lime coated on all surfaces; one-eighth to one-fourth inch lime coatings on underside of gravel; moderately calcareous; moderately alkaline (pH 8.2); clear irregular boundary.

IIC2casim—14 to 20 inches; very gravelly duripan; massive; strongly cemented, very hard, very firm; 1- to 2-millimeter silica laminar capping on surface; strongly calcareous; root mat on pan surface.

IIC3sim—20 to 60 inches; similar to IIC2casim but stratified and strongly and weakly cemented.

Depth to the duripan is 10 to 20 inches. The pan is weakly cemented to strongly cemented, and it is 35 to 50 percent pebbles.

The A horizon has value of 3 or 4 moist and chroma of 2 or 3 moist and dry. The C horizon has value of 5 or 6 dry and 4 or 5 moist and chroma of 3 or 4 moist and dry. It is very gravelly or extremely gravelly loam that is 50 to 80 percent pebbles.

Gwin series

The Gwin series consists of shallow, well drained soils formed in loess and volcanic ash and in residuum and colluvium from basalt. These soils have south-facing slopes. The gradient is 12 to 70 percent. The mean annual precipitation is about 21 inches, and the mean annual air temperature is about 47 degrees F.

Typical pedon of Gwin extremely stony silt loam, 12 to 40 percent slopes, NE1/4SE1/4SE1/4 sec. 15, T. 6 S., R. 27 E.

A11—0 to 3 inches; very dark brown (7.5YR 2/2) extremely stony silt loam, dark brown (7.5YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; 35 percent pebbles; 20 percent cobbles and stones; neutral (pH 6.6); clear smooth boundary.

B1t—3 to 9 inches; very dark brown (7.5YR 2/2) very cobbly silt loam, dark brown (7.5YR 4/3) dry; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; many very fine tubular pores; 15 percent pebbles; 30 percent cobbles and stones; neutral (pH 6.6); clear wavy boundary.

B2t—9 to 15 inches; dark brown (7.5YR 3/2) extremely cobbly clay loam, brown (7.5YR 4/3) dry; moderate and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common roots; common very fine tubular pores; few thin clay films; 70 percent pebbles and cobbles; neutral (pH 6.6); abrupt irregular boundary.

R—15 inches; basalt.

Depth to basalt bedrock is 10 to 20 inches. The control section is 50 to 80 percent pebbles, cobbles, and stones.

The A horizon has hue of 10YR or 7.5YR. The B2t horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist and dry. It is silty clay loam or clay loam that is very cobbly or extremely cobbly.

Hall Ranch series

The Hall Ranch series consists of moderately deep, well drained soils formed in mixed volcanic ash, loess, and colluvium from andesite and rhyolite. These soils are in the Blue Mountains. Slopes are 2 to 30 percent. The

mean annual precipitation is about 23 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Hall Ranch loam, 2 to 12 percent slopes, SE1/4NE1/4NE1/4 sec. 22, T. 6 S., R. 29 E.

O1—1 inch to 0; Douglas-fir and ponderosa pine needles and twigs.

A11—0 to 3 inches; dark reddish brown (5YR 2/2) loam, dark reddish gray (5YR 4/2) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots, many very fine tubular pores; 5 percent pebbles; slightly acid (pH 6.4); clear smooth boundary.

A12—3 to 7 inches; dark reddish brown (5YR 3/2) loam, dark reddish gray (5YR 4/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine tubular pores; 5 percent pebbles; slightly acid (pH 6.4); gradual smooth boundary.

B21—7 to 17 inches, dark reddish brown (5YR 3/3) loam, reddish brown (5YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine tubular pores; 5 percent pebbles; neutral (pH 6 6); gradual smooth boundary.

B22—17 to 23 inches; dark reddish brown (5YR 3/4) loam, reddish brown (5YR 5/4) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine tubular pores; 5 percent pebbles; neutral (pH 6.6); abrupt smooth boundary.

Cr—23 to 27 inches; partly weathered andesite.

The solum ranges from 5 to 35 percent rock fragments. Depth to soft andesite or rhyolitelike rock ranges from 20 to 40 inches.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, chroma of 2 or 3 moist and dry, and hue of 10YR, 7.5YR, or 5YR. It is loam or gravelly loam.

The B horizon has value of 3 or 4 moist and 5 or 6 dry, chroma of 2 through 4 moist and dry, and hue of 10YR, 7.5YR, or 5YR. It is loam or gravelly loam that is 18 to 27 percent clay.

Hankins series

The Hankins series consists of very deep, well drained soils formed in colluvium from volcanic ash and fine textured sediment. These soils are on south-facing slopes in the Blue Mountains. The gradient is 5 to 35 percent. The mean annual precipitation is about 21 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Hankins silt loam, 5 to 30 percent south slopes, in roadcut above Wilson Creek Road, about 3 miles east of junction with Rhea Creek Road, SW1/4NW1/4SW1/4 sec 25, T. 4 S., R. 27 E.

O1—1 inch to 0; pine needles and twigs.

A11—0 to 6 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; many irregular pores; neutral (pH 6.6); clear wavy boundary.

A12—6 to 12 inches; very dark grayish brown (10YR 3/2) heavy silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; many irregular pores; 2 percent pebbles; neutral (pH 6.6); abrupt wavy boundary.

IIB2t—12 to 27 inches; dark brown (10YR 3/3) clay, brown (10YR 5/3) dry; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky and blocky; very hard, very firm, very sticky and very plastic; common roots; 2 percent pebbles; 2 percent cobbles; common moderately thick clay films; slightly acid (pH 6.4); clear wavy boundary.

IIB31t—27 to 37 inches; yellowish brown (10YR 5/4) clay, light yellowish brown (10YR 6/4) dry; moderate medium and coarse subangular blocky and blocky structure; extremely hard, very firm, very sticky and very plastic; common roots; few tubular pores; 2 percent pebbles; 5 percent cobbles; common moderately thick patchy clay films; neutral (pH 7.0); clear wavy boundary.

IIB32t—37 to 47 inches; yellowish brown (10YR 5/4) clay, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky and blocky structure; very hard, very firm, very sticky and very plastic; few roots; few tubular pores; 2 percent pebbles; 5 percent cobbles; common moderately thick clay films; mildly alkaline (pH 7.4); abrupt wavy boundary.

IIC1—47 to 56 inches; yellowish brown (10YR 5/6) clay loam, brownish yellow (10YR 6/6) dry; massive; hard, friable, sticky and plastic; few roots; few pores; 2 percent pebbles; 5 percent cobbles; slightly calcareous in spots; mildly alkaline (pH 7.4); abrupt wavy boundary.

IIC2—56 to 60 inches; light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/6) clay loam, very pale brown (10YR 7/3) and yellow (10YR 7/6) dry; massive; hard, friable, sticky and plastic; few roots; few tubular pores; 2 percent pebbles; 5 percent cobbles; mildly alkaline (pH 7.6).

The solum contains few to 15 percent rock fragments. Depth to semiconsolidated water laid sediment is more

than 60 inches. The mollic epipedon ranges from 15 to 30 inches in thickness.

The A horizon has value of 2 or 3 moist and 3 through 5 dry and chroma of 1 through 3 moist and dry.

The upper part of the Bt horizon has moist value of 3 or 4, and the lower part has moist value of 4 or 5. Dry value is 4 through 6. Chroma is 2 through 4 moist and dry. This horizon is clay that is 45 to 60 percent clay. Hue is 10YR or 7.5YR.

The C horizon has value of 4 or 5 moist and 5 or 6 dry and chroma of 2 through 6 moist and dry. It ranges from heavy silty clay loam to clay.

Helter series

The Helter series consists of deep, well drained soils formed in volcanic ash and loess. These soils are on plateaus and north-facing slopes. The gradient is 3 to 60 percent. The mean annual precipitation is about 25 inches, and the mean annual air temperature is about 42 degrees F.

Typical pedon of Helter silt loam, bedrock substratum, 3 to 15 percent slopes, NE1/4NW1/4SE1/4 sec. 4, T. 5 S., R. 28 E.

O1—1 inch to 0; litter and duff composed of needles, leaves, wood fragments, and moss.

A1—0 to 3 inches; dark grayish brown (10YR 3/2) silt loam, light brown (10YR 6/3) dry; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many roots; neutral (pH 6.6); clear wavy boundary.

B21—3 to 13 inches; yellowish brown (10YR 5/4) silt loam, very pale brown (10YR 7/3) dry; weak fine blocky structure; soft, very friable, nonsticky and nonplastic; many roots; neutral (pH 6.6); clear wavy boundary.

B22—13 to 26 inches; light yellowish brown (10YR 7/4) silt loam, very pale brown (10YR 8/3) dry; massive; slightly hard, very friable, nonsticky and nonplastic; common roots; neutral (pH 6.8); abrupt smooth boundary.

IIB21b—26 to 37 inches; dark yellowish brown (10YR 4/4) loam, pale brown (10YR 6/3) dry; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few roots; 5 percent pebbles; neutral (pH 6.8); clear wavy boundary.

IIB22b—37 to 55 inches; yellowish brown (10YR 5/4) very gravelly loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few roots; 35 percent pebbles; 5 percent cobbles; neutral (pH 6.8); abrupt wavy boundary.

R—55 inches; andesite.

Depth to bedrock is 40 to 60 inches. The ash is 20 to 40 inches thick over the buried soil.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 2 or 3 moist and dry.

The B2 horizon has value of 4 to 7 moist and 7 or 8 dry and chroma of 3 to 6 moist and dry. It has weak structure or is massive. The IIB2b horizon has hue of 10YR or 7.5YR, value of 3 to 5 moist and 5 or 6 dry, and chroma of 3 or 4 moist and dry. It is loam, silt loam, or silty clay loam in the upper part and is very gravelly loam below 37 inches.

Hezel series

The Hezel series consists of very deep, somewhat excessively drained soils formed in water and wind laid material. These soils are on terraces and uplands. Slope gradient ranges from 2 to 12 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Hezel loamy fine sand, 2 to 5 percent slopes, 300 feet south of the canal and farm road, SW1/4NE1/4NW1/4 sec. 22, T. 4 N., R. 25 E.

A1—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; single grained; soft, friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 7.2); clear smooth boundary.

C1—9 to 24 inches; dark brown (10YR 3/3) loamy fine sand, pale brown (10YR 6/3) dry; massive; loose, friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 7.3); clear smooth boundary.

C2ca—24 to 30 inches; dark brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; massive; loose, friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; slightly calcareous; mildly alkaline (pH 7.8); abrupt wavy boundary.

IIC3ca—30 to 51 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium platy structure; hard, firm, slightly sticky and slightly plastic; common to few very fine roots; few very fine tubular pores; strongly calcareous hard laminated silt loam; common horizontal and vertical lens of fine sand and fine sandy loam; moderately alkaline (pH 8.4); abrupt smooth boundary.

IIC4ca—51 to 62 inches; brown (10YR 5/3) and yellowish brown (10YR 5/4) silt loam, light gray (10YR 7/2) dry; moderate medium platy structure, very hard, firm, slightly sticky and slightly plastic; few very fine tubular pores; common horizontal and vertical lens of fine sand and fine sandy loam; strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

Depth to lacustrine material is 15 to 36 inches. Depth to secondary lime is 10 to 30 inches.

The A horizon is single grained or has weak subangular blocky structure.

The C1 horizon has value of 3 or 4 moist and 5 or 6 dry and chroma of 2 or 3 moist and dry. The Cca horizon has value of 3 through 5 moist and 6 or 7 dry and chroma of 2 or 3 moist and dry. It is silt loam, fine sand, or fine sandy loam and is stratified. This horizon is moderately alkaline or strongly alkaline.

Irrigon series

The Irrigon series consists of moderately deep, well drained soils formed in alluvial sand derived from basalt and quartzite. These soils are on terraces. Slopes are 2 to 12 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Irrigon fine sandy loam, 2 to 5 percent slopes, NE1/4NW1/4SW1/4 sec. 15, T. 3 N., R. 26 E.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 6.6); abrupt smooth boundary.

B21—3 to 18 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak coarse prismatic structure; slightly hard, very friable, slightly plastic and slightly sticky; common very fine roots; many very fine tubular pores; neutral (pH 6.6); clear wavy boundary.

B22—18 to 23 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; neutral (pH 6.6); abrupt wavy boundary.

IIR—23 inches; semiconsolidated tuffaceous sandstone.

The profile is noncalcareous throughout. Depth to sandstone is 20 to 40 inches. The solum is up to 5 percent pebbles and 5 percent cobbles.

The A horizon has chroma of 2 or 3 moist and dry. The B2 horizon has value of 5 or 6 dry and 3 or 4 moist. It is fine sandy loam or loam.

Kimberly series

The Kimberly series consists of very deep, well drained soils formed in mixed loess, silty alluvium, and volcanic ash. These soils are on alluvial bottom lands. Slopes are 0 to 3 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Kimberly fine sandy loam, one-half mile north of Cecil, SE1/4SE1/4NE1/4 sec. 29, T. 2 N., R. 23 E.

Ap—0 to 4 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak fine platy to weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 7.0); abrupt smooth boundary.

A12—4 to 15 inches; very dark grayish brown (10YR 3/2) fine sandy loam, brown (10YR 5/3) dry; weak fine to medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; neutral (pH 7.0); gradual smooth boundary.

B22—15 to 23 inches; dark brown (10YR 3/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; neutral (pH 7.3); clear wavy boundary.

B3—23 to 33 inches; brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; moderately calcareous, mildly alkaline (pH 7.8); abrupt wavy boundary.

Cca—33 to 40 inches; brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; massive; hard, firm, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; moderately calcareous; 15 percent one-half inch nodules; moderately alkaline (pH 8.0); abrupt discontinuous boundary.

C3—40 to 60 inches; dark grayish brown (10YR 4/2) sandy loam, pale brown (10YR 6/3) dry; massive; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; moderately calcareous; moderately alkaline (pH 8.2).

Depth to bedrock is more than 60 inches. Depth to secondary lime is 10 to 30 inches. The mollic epipedon is 10 to 20 inches thick.

The A horizon has value of 2 or 3 moist and 4 or 5 dry and chroma of 2 or 3 moist and dry. The B horizon has value of 3 or 4 moist and 4 through 6 dry and chroma of 2 or 3 moist and dry. The C horizon has value of 3 or 4 moist and 5 or 6 dry and chroma of 2 or 3 moist and dry.

Klicker series

The Klicker series consists of moderately deep, well drained soils formed in wind laid silt and volcanic ash mixed with basalt colluvium. These soils are in the Blue Mountains. Slopes are 2 to 75 percent. The mean annual

precipitation is about 24 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Klicker stony silt loam, 2 to 20 percent slopes, near Fire Road no. 20, NE1/4NW1/4SE1/4 sec. 27, T. 6 S., R. 26 E.

A11—0 to 4 inches; dark reddish brown (5YR 2/3) stony silt loam, reddish brown (5YR 4/3) dry; weak very fine and fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many roots; 15 percent cobbles and stones; 10 percent pebbles; neutral (pH 6.6); clear smooth boundary.

A12—4 to 11 inches; dark reddish brown (5YR 3/3) cobbly silt loam, reddish brown (5YR 4/3) dry; weak very fine and fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many roots; many very fine tubular pores; 35 percent pebbles, cobbles, and stones; neutral (pH 6.6); clear wavy boundary.

B2t—11 to 19 inches; dark reddish brown (5YR 3/4) very cobbly silty clay loam, dark brown (7.5YR 4/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common roots; few very fine tubular pores; 50 percent pebbles and cobbles; common thin clay films, especially on rock fragments; slightly acid (pH 6.4); clear wavy boundary.

B3—19 to 26 inches; dark brown (7.5YR 4/3) very cobbly silty clay loam, dark brown (7.5YR 4/4) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common roots; 70 percent pebbles and cobbles; slightly acid (pH 6.4); abrupt irregular boundary.

R—26 inches; fractured basalt.

The weighted average of rock fragments in the 10- to 40-inch control section ranges from 35 to 60 percent. Depth to bedrock ranges from 20 to 40 inches. Hue ranges from 5YR to 10YR.

The A1 horizon has value of 2 or 3 moist and 4 or 5 dry and chroma of 2 or 3 moist or dry.

The B2t horizon has value of 3 or 4 moist and dry and chroma of 2 to 4 moist and dry. It is dominantly silty clay loam but ranges to silt loam that is about 35 to 50 percent angular gravel, cobbles, or stones.

Koehler series

The Koehler series consists of moderately deep, excessively drained soils formed in mixed sand. These soils are on terraces Slopes are 2 to 12 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Koehler loamy fine sand, 2 to 5 percent slopes, 300 feet east of a gravel road, SE1/4NW1/4SE1/4 sec. 22, T. 4 N., R. 24 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) loamy fine sand, brown (10YR 5/3) dry; single grained; very soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 3 percent pan fragments 2 to 10 millimeters in diameter; mildly alkaline (pH 7.6); gradual wavy boundary.

C1—4 to 15 inches; dark brown (10YR 3/3) loamy fine sand, pale brown (10YR 6/3) dry; single grained; very soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 3 percent pan fragments 2 to 10 millimeters in diameter; mildly alkaline (pH 7.8); gradual wavy boundary.

C2ca—15 to 24 inches; brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; single grained; soft, friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; moderately calcareous; 5 percent pan fragments 2 to 10 millimeters in diameter; moderately alkaline (pH 8.4); abrupt wavy boundary.

IIC3ca—24 to 28 inches; dark grayish brown (10YR 4/2) loamy fine sand, light brownish gray (10YR 6/2) dry; massive; soft, friable, nonsticky and nonplastic; few very fine roots; few very fine irregular pores; moderately calcareous; 50 percent pan fragments 2 to 10 millimeters in diameter, 20 percent pan fragments more than 3 inches in diameter; moderately alkaline (pH 8.4); gradual wavy boundary.

IIC4casim—28 inches; light gray (10YR 7/2) duripan, white (10YR 8/1) dry.

Depth to the duripan is 20 to 40 inches.

The A1 horizon has value of 5 or 6 dry and 3 or 4 moist.

The C and Cca horizons have value of 6 through 8 dry and 3 through 5 moist. These horizons are loamy sand, loamy fine sand, or fine sand. Thin sandy loam lenses are immediately above the duripan in some places.

Labuck series

The Labuck series consists of moderately deep, well drained soils that formed in colluvium and residuum from granodiorite. These soils are in the Blue Mountains. The slope is south facing. The gradient is 5 to 35 percent. The mean annual precipitation is about 22 inches, and mean annual air temperature is about 44 degrees F.

Typical pedon of Labuck loam, 5 to 35 percent slopes, 50 feet north of road, SE1/4SE1/4NE1/4 sec. 9, T. 4 S., R. 29 E.

O1—1 inch to 0; pine needles and twigs.

A1—0 to 6 inches; dark brown (10YR 4/3) loam, light brownish gray (10YR 6/2) dry; weak fine granular and weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine roots; many very fine tubular pores; 10 percent pebbles 2 to 5 millimeters in diameter; slightly acid (pH 6.4); gradual wavy boundary.

B21—6 to 14 inches; yellowish brown (10YR 5/4) loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine roots; many very fine tubular pores; 10 percent pebbles 2 to 5 millimeters in diameter; slightly acid (pH 6.2); gradual wavy boundary.

B22—14 to 21 inches; yellowish brown (10YR 5/4) gravelly loam, pale brown (10YR 6/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine irregular pores; 20 percent pebbles 2 to 5 millimeters in diameter; medium acid (pH 6.0); gradual wavy boundary.

C1—21 to 31 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, yellowish brown (10YR 5/4) dry; massive; slightly hard, friable, nonsticky and nonplastic; few roots; many very fine pores, 35 percent pebbles; medium acid (pH 6.0); abrupt wavy boundary.

C2r—31 inches; yellowish brown (10YR 5/4) partly decomposed granodiorite, light yellowish brown (10YR 6/4) dry.

Depth to paralithic contact is 20 to 40 inches. Hue is 10YR to 7.5YR.

The A horizon has value of 3 or 4 moist, 5 or 6 dry, and chroma of 2 or 3 moist and dry. It has weak granular or subangular blocky structure. It is 5 to 15 percent rock fragments.

The B22 horizon has value of 3 through 5 moist, 6 or 7 dry, and chroma of 2 through 4 moist and dry. It is 15 to 35 percent rock fragments.

The C horizon has value of 4 or 5 moist, 5 through 7 dry, and chroma of 2 through 4 moist or dry. The content of rock fragments in the C horizon is 15 to 35 percent.

Lickskillet series

The Lickskillet series consists of shallow, well drained soils formed in shallow, stony colluvium from loess and in residuum from basalt. These soils are on west- and south-facing slopes of canyon and river breaks. The gradient is 7 to 70 percent. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Lickskillet very stony loam, 7 to 40 percent slopes, about 300 feet north of Highway 206, SE1/4SE1/4SW1/4 sec. 26, T. 3 S., R. 24 E.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) very stony loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; about 35 percent cobbles; 20 percent pebbles; 5 percent stones; neutral (pH 6.8); clear wavy boundary.

B21—2 to 8 inches; dark brown (10YR 3/3) extremely cobbly heavy loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; about 35 percent pebbles; 30 percent cobbles; 5 percent stones; neutral (pH 6.8); gradual wavy boundary.

B22—8 to 17 inches; dark brown (10YR 3/3) extremely cobbly heavy loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; about 35 percent cobbles; 35 percent pebbles; neutral (pH 6.8); abrupt wavy boundary.

IIR—17 inches; fractured basalt.

Depth to bedrock is 12 to 20 inches. In some places the A1 horizon is as little as 5 percent rock fragments, but the B2 horizon ranges from 40 to 85 percent. The mollic epipedon ranges from 10 to 19 inches in thickness. Hue is 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and chroma of 2 or 3 moist and dry. The B2 horizon mainly has the same value as that of the A horizon, but in the lower part of some thicker pedons, the value is 4 and the chroma is 3 or 4 moist and dry. This horizon is heavy loam or clay loam that is very cobbly or extremely cobbly.

Mikkalo series

The Mikkalo series consists of moderately deep, well drained soils formed in wind laid materials. These soils are on uplands. Slopes are 2 to 20 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Mikkalo silt loam, 7 to 12 percent slopes, 100 feet east of Ione-Gooseberry Road, NE1/4NW1/4NW1/4 sec. 29, T. 1 S., R. 24 E.

Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine to very fine subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many very fine tubular pores; neutral (pH 7.4); gradual smooth boundary.

A3—6 to 13 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine to medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; mildly alkaline (pH 7.6); gradual smooth boundary.

B2—13 to 24 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak moderate prismatic and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; mildly alkaline (pH 7.8); clear smooth boundary.

B3—24 to 30 inches; pale brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine to medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

C1ca—30 to 35 inches; pale brown (10YR 6/3) silt loam, light gray (10YR 7/2) dry; massive; hard, very firm, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; 15 percent coarse fragments 2 to 10 millimeters in diameter; strongly calcareous; moderately alkaline (pH 8.4); abrupt wavy boundary.

IIR—35 inches; lime coated basalt.

Depth to bedrock is 20 to 40 inches. The mollic epipedon is 7 to 15 inches thick. The control section is silt loam that is 8 to 12 percent clay and less than 15 percent material coarser textured than very fine sand.

The Ap horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 2 or 3 moist and dry.

The B2 horizon has value of 5 or 6 dry and 3 or 4 moist and chroma of 3 or 4 moist and dry. The B3 horizon has value of 6 or 7 dry and 4 or 5 moist and chroma of 2 or 3 moist and dry.

The Cca horizon has value of 7 or 8 dry and 4 to 6 moist and chroma of 2 or 3 moist and dry. It is moderately calcareous to strongly calcareous.

Morrow series

The Morrow series consists of moderately deep, well drained soils formed in wind laid silt. These soils are on uplands. Slopes are 1 to 35 percent. The mean annual precipitation is about 13 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Morrow silt loam, 1 to 7 percent slopes, 110 feet west of gravel road, NE1/4SE1/4SE1/4 sec. 17, T. 3 S., R. 26 E.

Ap—0 to 9 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure, slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; upper one-fourth to one-half inch crusted and very vesicular; neutral (pH 6.8); abrupt smooth boundary.

IIB2t—9 to 14 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; very dark grayish brown (10YR 3/2) coatings on peds; weak fine prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky and plastic; common very fine roots; many very fine tubular pores; many moderately thick clay films; neutral (pH 7.0); clear smooth boundary.

IIB3tca—14 to 19 inches; dark brown (10YR 3/3) heavy silt loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; few thin clay films; common light gray (10YR 7/2) lime seams; moderately calcareous; moderately alkaline (pH 8.0); abrupt smooth boundary.

IICca—19 to 26 inches; dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; massive; hard, friable, slightly sticky and slightly plastic; no roots; many to few fine tubular pores; very strongly calcareous seams of light brownish gray (10YR 6/2) soft segregated lime; moderately alkaline (pH 8.3); abrupt wavy boundary.

IIIR—26 inches; fractured basalt, fragments lime coated.

Depth to bedrock is 20 to 40 inches. The mollic epipedon is 13 to 20 inches thick.

The A horizon has value of 4 or 5 dry and 2 or 3 moist.

The IIB2t horizon is silty clay loam that is 27 to 35 percent clay. It has value of 4 or 5 dry and 2 or 3 moist and chroma of 2 or 3 moist and dry. The IIB3tca horizon has value of 5 or 6 dry and 3 or 4 moist and chroma of 2 or 3 moist and dry. It is 18 to 30 percent clay.

The Cca horizon has value of 6 or 7 dry and chroma of 2 or 3 moist or dry.

Nansene series

The Nansene series consists of deep, well drained soils formed in reworked loess. These soils are on north-facing slopes on uplands. The gradient is 35 to 70 percent. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Nansene silt loam, 35 to 70 percent slopes, one-half mile east of Lexington, SE1/4SW1/4SW1/4 sec. 26, T. 1 S., R. 25 E.

A11—0 to 2 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate coarse platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 6.8); abrupt smooth boundary.

A12—2 to 11 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 6.8); clear smooth boundary.

A13—11 to 25 inches; very dark brown (10YR 2/2) coarse silt loam, dark grayish brown (10YR 4/2) dry; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 7.2); gradual wavy boundary.

AC—25 to 38 inches; dark brown (10YR 3/3) silt loam, dark brown (10YR 4/3) dry; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; mildly alkaline (pH 7.4); clear wavy boundary.

C—38 to 45 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately alkaline (pH 8.0); abrupt wavy boundary.

IIR—45 inches; fractured basalt, lime in fractures.

The control section is 0 to 5 percent basalt fragments 1 inch or less in diameter. The surface is up to 5 percent large pebbles and cobbles. Depth to basalt is 40 to 60 inches. The mollic epipedon ranges from 30 to 50 inches in thickness.

The A11 horizon has weak fine platy or granular structure. The AC horizon has value of 4 or 5 dry and 2 or 3 moist. The C horizon has value of 4 through 7 dry and 3 through 5 moist. Some pedons are calcareous below 43 inches.

Onyx series

The Onyx series consists of very deep, well drained soils formed in alluvium from loess and volcanic ash. These soils are on alluvial bottom lands. Slopes are 0 to 3 percent. The mean annual precipitation is about 13 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Onyx silt loam, NE1/4SW1/4SW1/4 sec. 34, T. 3 S., R. 25 E.

A11—0 to 11 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; many very fine and fine and few medium tubular pores; neutral (pH 7.0); clear smooth boundary.

A12—11 to 26 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak medium prismatic structure; soft, very friable, nonsticky and nonplastic; many fine roots; many very fine and fine and few medium tubular pores; neutral (pH 7.2); gradual smooth boundary.

AC—26 to 32 inches; very dark brown (10YR 2/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak fine prismatic structure; soft, very friable, nonsticky and nonplastic; many fine roots; many fine and very fine tubular pores; neutral (pH 7.0); abrupt wavy boundary.

C1—32 to 39 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; massive; soft, very friable, nonsticky and nonplastic, many fine roots; neutral (pH 7.0); abrupt wavy boundary.

C2—39 to 60 inches; very dark grayish brown (10YR 3/2) gravelly very fine sandy loam, grayish brown (10YR 5/2) dry; massive; soft, very friable, nonsticky and nonplastic; many fine roots; 20 percent pebbles; neutral (pH 7.0); abrupt wavy boundary.

Depth to bedrock is more than 60 inches. The mollic epipedon is 20 to more than 40 inches thick. The control section is dominantly silt loam and very fine sandy loam that is 12 to 18 percent clay. In many pedons there are thin lenses less than 1 inch thick of very fine sandy loam, fine sandy loam, sandy loam, or medium sand. The A horizon has value of 2 or 3 moist and 4 or 5 dry and chroma of 2 or 3 moist and 2 through 4 dry

Pedigo series

The Pedigo series consists of very deep, somewhat poorly drained soils formed in water laid silt mixed with volcanic ash. These soils are on alluvial bottom lands. Slopes are 0 to 3 percent. The mean annual precipitation is about 13 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Pedigo silt loam about 60 feet northwest of a fence corner post, SE1/4SE1/4SE1/4 sec. 21, T. 2 N., R. 27 E.

A11—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; weakly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

A12—4 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately calcareous, moderately alkaline (pH 8.2); clear wavy boundary.

B1—10 to 21 inches; dark brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately calcareous; moderately alkaline (pH 8.3); clear smooth boundary.

B21—21 to 31 inches; dark brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak fine prismatic; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; strongly calcareous; strongly alkaline (pH 8.6); gradual wavy boundary.

C1—31 to 38 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; massive; hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine irregular pores; strongly calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary.

C2—38 to 42 inches; dark brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry; massive; hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine irregular pores; few faint mottles; neutral (pH 7.0); abrupt wavy boundary.

C3—42 to 66 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine irregular pores; few faint mottles; neutral (pH 6.8).

Depth to bedrock is more than 60 inches. The mollic epipedon is 20 inches to more than 40 inches thick.

The A horizon has value of 2 or 3 moist and 4 through 6 dry and chroma of 1 through 3 moist and dry. The C horizon has hue of 10YR or 2.5Y, value of 3 or 4 moist and 5 or 6 dry, and chroma of 1 through 3 moist and dry.

Prosser series

The Prosser series consists of moderately deep, well drained soils formed in wind laid silts. These soils are on terraces. Slopes are 0 to 20 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Prosser silt loam, 0 to 2 percent slopes, about 150 feet south of telephone pole road and pole guide wires, NE1/4SW1/4SW1/4 sec. 29, T. 4 N., R. 23 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; neutral (pH 6.8); clear smooth boundary.

B1—4 to 16 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 6.8); clear wavy boundary.

B21—16 to 29 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; 5 percent pebbles 2 millimeters in diameter; neutral (pH 7.2); clear smooth boundary.

IIR—29 inches; lime coated basalt.

Depth to consolidated bedrock is 20 to 40 inches.

The C horizon contains a few pebbles or cobbles in some pedons. It is very fine sandy loam or silt loam throughout.

Quincy series

The Quincy series consists of very deep, excessively drained soils formed in mixed sand. These soils are on uplands and terraces that have a ridged, hummocky, or duny microrelief. Slopes are 2 to 12 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Quincy loamy fine sand, 2 to 12 percent slopes, 120 feet east of Pole road, NW1/4SW1/4NW1/4 sec. 11, T. 3 N., R. 26 E.

C1—0 to 6 inches; dark brown (10YR 3/3) loamy fine sand, brown (10YR 5/3) dry; single grained; loose; many very fine roots; many very fine irregular pores; neutral (pH 6.8); gradual wavy boundary.

C2—6 to 55 inches; dark brown (10YR 4/3) loamy fine sand, brown (10YR 5/3) dry; single grained; loose; few very fine roots; common very fine irregular pores; neutral (pH 6.8); gradual wavy boundary.

C3ca—55 to 60 inches; brown (10YR 4/3) loamy fine sand, light brownish gray (10YR 6/2) dry; massive; slightly hard, friable; few very fine roots; few very fine irregular pores; strongly calcareous; moderately alkaline (pH 8.4); abrupt wavy boundary.

Depth to bedrock is more than 60 inches. The upper 20 inches is generally free of lime, but some small particles are brought up by insects and animals. The matrix below 20 inches is slightly calcareous in places. The 10- to 40-inch control section is sand to loamy fine sand. Less than 75 percent of the sand is very coarse, coarse, or medium, and the clay content is less than 5 percent.

The surface layer has hue of 7.5YR, 10YR, or 2.5Y; value of 4 through 6 dry and 3 through 5 moist; and chroma of 2 or 3 moist and dry. It is loamy fine sand or fine sand. The subsoil and substratum are similar to the

surface layer in color but are as much as 1 unit higher in value.

Quinton series

The Quinton series consists of moderately deep, excessively drained soils that formed in mixed sand over basalt bedrock. These soils are on terraces. Slopes are 2 to 20 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Quinton loamy fine sand, 2 to 20 percent slopes, 20 feet west of road NE1/4SE1/4NE1/4 sec. 22, T. 4 N., R. 24 E.

C1—0 to 7 inches; dark brown (10YR 3/3) loamy fine sand, brown (10YR 5/3) dry; single grained; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; 5 percent pebbles and pan fragments; neutral (pH 7.0); gradual wavy boundary.

C2—7 to 30 inches; dark brown (10YR 3/3) loamy fine sand, brown (10YR 5/3) dry; single grained; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine pores; neutral (pH 7.0); gradual wavy boundary.

C3—30 to 37 inches; dark brown (10YR 3/3) gravelly loamy fine sand, brown (10YR 5/3) dry; single grained; loose, nonsticky and nonplastic, common very fine and fine roots; many very fine irregular pores; 25 percent pebbles; neutral (pH 7.0); abrupt smooth boundary.

IIR—37 inches; basalt.

Depth to bedrock ranges from 20 to 40 inches. The control section is sand to loamy fine sand. These soils have hue of 10YR, 7.5YR, or 2.5Y; value of 3 through 5 moist and 4 through 7 dry; and chroma of 2 or 3 moist and dry.

Rhea series

The Rhea series consists of very deep, well drained soils formed in material from wind laid silt mixed with small amounts of volcanic ash. These soils are on uplands. Slopes are 1 to 35 percent. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Rhea silt loam, 20 to 35 percent slopes, 300 feet west of gate and 30 feet south of road, NE1/4SE1/4SW1/4 sec. 19, T. 3 S., R. 24 E.

Ap—0 to 7 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular to weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular and tubular pores; neutral (pH 6.6); abrupt smooth boundary.

A12—7 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 6.8); clear wavy boundary.

B21—14 to 22 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 7.0); clear smooth boundary.

B22—22 to 33 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 7.2); clear wavy boundary.

C1ca—33 to 45 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common to few very fine roots; many very fine tubular pores; moderately calcareous seams of soft segregated lime; moderately alkaline (pH 8.0); abrupt wavy boundary.

C2ca—45 to 76 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; very few very fine roots; many very fine tubular pores; strongly calcareous; common mycelium lime accumulations; moderately alkaline (pH 8.4); gradual wavy boundary.

Depth to partly consolidated bedrock is more than 60 inches. Depth to secondary carbonates ranges from 20 to 43 inches. The mollic epipedon is 7 to 20 inches thick. The control section is silt loam that is 18 to 24 percent clay and less than 15 percent material coarser textured than very fine sand.

The A horizon has value or 4 or 5 dry and 2 or 3 moist and chroma or 2 or 3 moist and dry. The B2 horizon has value of 4 or 5 dry and 3 or 4 moist and chroma of 2 or 3 moist and dry. The Cca horizon has value of 6 or 7 dry and 4 or 5 moist and chroma of 2 or 3 moist and dry.

Ritzville series

The Ritzville series consists of very deep, well drained soils formed in materials from wind laid silt and volcanic ash. These soils are on uplands on south- and west-facing slopes. The gradient is 0 to 40 percent. The mean annual precipitation is about 11 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Ritzville silt loam, 0 to 2 percent slopes, 50 feet north, 10 feet west of quarter corner, and about 100 feet east of gravel road NE1/4NE1/4SW1/4 sec. 17, T. 2 N., R. 27 E.

Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; neutral (pH 7.2); clear smooth boundary.

A12—6 to 13 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; mildly alkaline (pH 7.4); clear wavy boundary.

B21—13 to 25 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; mildly alkaline (pH 7.6); clear wavy boundary.

B22—25 to 33 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; moderately alkaline (pH 8.0); clear smooth boundary.

Clca—33 to 44 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; common very fine irregular pores; strongly calcareous; mycelium form of free lime; moderately alkaline (pH 8.2); abrupt wavy boundary.

C2ca—44 to 52 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; few roots; common very fine irregular pores; moderately calcareous; mycelium form of free lime; strongly alkaline (pH 8.6); gradual wavy boundary.

C3ca—52 to 70 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; massive; hard, firm, slightly sticky and slightly plastic; few roots; few irregular pores; strongly calcareous; mycelium form of free lime; strongly alkaline (pH 8.6); abrupt wavy boundary.

Depth to secondary carbonates is 24 to 40 inches. The mollic epipedon is 8 to 14 inches thick.

The Ap horizon has value of 4 or 5 dry and chroma of 2 or 3 moist and dry. It is silt loam or very fine sandy loam. The B2 horizon has value of 4 through 6 dry and 3 or 4 moist. The Cca horizon has value or 6 or 7 dry and 4 or 5 moist.

Rockly series

The Rockly series consists of very shallow, well drained soils formed in loess, volcanic ash, and basalt residuum. These soils are on uplands. Slopes are 2 to 20 percent. The mean annual precipitation is about 21 inches, and the mean annual air temperature is about 47 degrees F.

Typical pedon of Rockly very gravelly loam, 2 to 20 percent slopes, SW1/4SE1/4SW1/4 sec. 35, T. 3 S., R. 28 E.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) very gravelly loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; 45 percent pebbles; 5 percent cobbles; neutral (pH 6.8); clear wavy boundary.

B21—2 to 6 inches; very dark grayish brown (10YR 3/2) very gravelly loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 55 percent pebbles; 5 percent cobbles; slightly acid (pH 6.6); clear wavy boundary.

B22—6 to 9 inches; dark brown (10YR 3/3) very gravelly heavy loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many very fine roots; many very fine tubular pores; 5 percent cobbles; 65 percent pebbles; slightly acid (pH 6.4); abrupt wavy boundary.

IIR—9 inches; basalt.

The thickness of the mollic epipedon and depth to bedrock range from 5 to 12 inches. The solum is 35 to 60 percent rock fragments consisting of pebbles, cobbles, and stones. The control section is loam, heavy loam, silt loam, or clay loam. Hue is 10YR, 7.5YR, or 5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry and chroma of 2 or 3 moist and dry. The B2 horizon has value of 3 or 4 moist and chroma of 2 or 3 moist and dry.

Royal series

The Royal series consists of very deep, well drained soils formed in wind laid material. These soils are on foot slopes and terraces. Slopes are 0 to 20 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Royal loamy fine sand, 2 to 5 percent slopes, 100 feet north of Homestead Road, about 10 miles southeast of Boardman SE1/4SE1/4SE1/4 sec. 8, T. 3 N., R. 26 E.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; moderately alkaline (pH 8.2); gradual smooth boundary.

B2—6 to 14 inches; dark brown (10YR 4/3) fine sandy loam, light brownish gray (10YR 6/2) dry; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; moderately calcareous; moderately alkaline (pH 8.2); gradual smooth boundary.

C1ca—14 to 22 inches; dark brown (10YR 4/3) fine sandy loam, light brownish gray (10YR 6/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; strongly calcareous; moderately alkaline (pH 8.3); clear wavy boundary.

C2ca—22 to 31 inches; dark grayish brown (10YR 4/2) fine sandy loam, light gray (10YR 7/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine irregular pores; strongly calcareous; moderately alkaline (pH 8.4); gradual wavy boundary.

C3ca—31 to 46 inches; dark grayish brown (10YR 4/2) loamy fine sand, light gray (10YR 7/2) dry; single grained; soft, nonsticky and nonplastic; strongly calcareous; moderately alkaline (pH 8.4); abrupt wavy boundary.

IIC4ca—46 to 60 inches; very dark gray (10YR 3/1) fine sand, dark gray (10YR 4/1) dry; single grained; basaltic and quartzitic sand; strongly calcareous; moderately alkaline (pH 8.2).

Depth to lime is 10 to 24 inches. Depth to bedrock is more than 60 inches.

The A horizon has value of 3 to 5 moist and chroma of 2 or 3 moist and dry. It is fine sandy loam, loamy fine sand, or silt loam.

The B2 horizon has value of 6 or 7 dry and 4 or 5 moist and chroma of 2 or 3 dry or moist.

The C horizon has value of 6 or 7 dry and 4 or 5 moist and chroma of 1 through 3 moist and dry It is stratified fine sandy loam, loamy fine sand, and fine sand.

Sagehill series

The Sagehill series consists of very deep, well drained soils formed in wind laid material and calcareous lacustrine sediment. These soils are on terraces. Slopes are 2 to 20 percent. The mean annual precipitation is about 9 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Sagehill fine sandy loam, 2 to 5 percent slopes, SW1/4SW1/4NW1/4 sec. 30, T. 3 N., R. 26 E.

A11—0 to 2 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 7.2); abrupt smooth boundary.

A12—2 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine platy structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; mildly alkaline (pH 7.6); abrupt smooth boundary.

B2—5 to 21 inches; dark brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; mildly alkaline (pH 7.8); clear wavy boundary.

C1—21 to 28 inches; dark brown (10YR 4/3) fine sandy loam, very pale brown (10YR 7/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately alkaline (pH 8.2); clear wavy boundary.

IIC2ca—28 to 49 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; moderately calcareous; few firm brown (10YR 5/3) dry nodules one-half inch to 2 inches in diameter; mycelium form of lime in nodules; moderately alkaline (pH 8.4); clear wavy boundary.

IIC3ca—49 to 60 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; massive; very hard, firm, slightly sticky and slightly plastic laminated silt; few very fine roots; common very fine tubular pores; strongly calcareous; strongly alkaline (pH 8.8).

Depth to bedrock is more than 60 inches. Depth to lime is 15 to 30 inches.

The A horizon has value of 5 or 6 dry and chroma of 2 or 3 moist and dry.

The B2 horizon has value of 5 or 6 dry and chroma of 2 or 3 moist and dry. It is very fine sandy loam, loamy very fine sand, or fine sandy loam.

The IIC horizon has value of 4 or 5 moist and 6 or 7 dry and chroma of 2 or 3 moist and dry. It is stratified silt loam, very fine sandy loam, and fine sandy loam.

Snell series

The Snell series consists of moderately deep, well drained soils formed in wind laid silt mixed with basalt colluvium. These soils are on north-facing slopes near the fringe of timbered areas. The gradient is 35 to 70 percent. The mean annual precipitation is about 17 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Snell very stony loam, 35 to 70 percent north slopes, one-fourth mile east of Willow Creek road in SW1/4NW1/4SW1/4 sec. 28, T. 3 S., R. 28 E.

A11—0 to 4 inches; very dark brown (10YR 2/2) very stony loam, very dark grayish brown (10YR 3/2) dry; moderate very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; 1 percent of surface covered with stones; 5 percent pebbles; slightly acid (pH 6.4); clear smooth boundary.

A12—4 to 14 inches; black (10YR 2/1) light silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate very fine granular structure; slightly hard, very friable, sticky and plastic; many very fine roots; many very fine irregular pores; 5 percent pebbles; slightly acid (pH 6.4); clear wavy boundary.

B21t—14 to 22 inches; very dark brown (10YR 2/2) very cobbly silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; 30 percent cobbles; 20 percent pebbles; many very fine roots; many very fine tubular pores; slightly acid (pH 6.4); few thin clay films and cutans; clear smooth boundary.

B22t—22 to 30 inches; dark yellowish brown (10YR 3/4) extremely cobbly silty clay loam, brown (10YR 4/3) dry; moderate fine subangular blocky structure; very hard, friable, very sticky and very plastic; 40 percent cobbles; 25 percent pebbles; many very fine roots; many very fine tubular pores; slightly acid (pH 6.4); few thin clay films and cutans; abrupt wavy boundary.

R—30 inches; basalt.

Depth to bedrock is 20 to 40 inches.

The A horizon has value of 2 or 3 moist and 3 or 4 dry and chroma of 1 or 2 moist and dry. Stones cover 1 to 3 percent of the surface.

The B2t horizon has value of 2 or 3 moist and 3 or 4 dry and chroma of 2 through 4. It is silty clay loam or clay. It is 35 to 45 percent clay and 40 to 65 percent rock fragments, mainly cobbles and stones.

Snow series

The Snow series consists of very deep, well drained soils formed in alluvium from loess and volcanic ash. These soils are on alluvial bottom lands. Slopes are 0 to 3 percent. The mean annual precipitation is about 17 inches, and the mean annual air temperature is about 47 degrees F.

Typical pedon of Snow silt loam SW1/4SE1/4SW1/4 sec 5, T. 3 S., R. 28 E.

A11—0 to 4 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine irregular pores; neutral (pH 6.8); abrupt smooth boundary.

A12—4 to 18 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; neutral (pH 6.8); gradual wavy boundary.

A13—18 to 33 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; neutral (pH 6.8); gradual wavy boundary.

B2—33 to 46 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; neutral (pH 6.8); gradual wavy boundary.

C—46 to 60 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; neutral (pH 6.8);

Depth to bedrock is more than 60 inches. The mollic epipedon ranges from 30 to 48 inches in thickness. The A horizon has value of 2 or 3 moist and 4 or 5 dry and chroma of 1 or 2 moist and dry. The B horizon has value of 3 or 4 moist and 4 or 5 dry and chroma of 2 or 3 moist and dry. It is 18 to 27 percent clay.

Taunton series

The Taunton series consists of moderately deep, well drained soils formed in wind laid alluvium. These soils are on high terraces. Slopes are 0 to 12 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Taunton fine sandy loam, 0 to 2 percent slopes, 20 feet west of road in NE1/4NE1/4NE1/4 sec. 30, T. 3 N., R. 27 E.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 6.8); abrupt smooth boundary.

B2—5 to 15 inches; dark brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately alkaline (pH 8.2); clear wavy boundary.

C1ca—15 to 32 inches; dark brown (10YR 4/3) fine sandy loam, light gray (10YR 7/2) dry; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; moderately calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

IIC2casim—32 inches; light gray (10YR 7/2) indurated duripan, white (10YR 8/1) dry; strongly calcareous.

Depth to the duripan is 20 to 40 inches. The A horizon has value of 5 or 6 dry and chroma of 2 or 3 moist and dry. The B2 and C1ca horizons have value of 6 or 7 dry and 4 or 5 moist and chroma of 2 or 3 moist and dry.

Tolo series

The Tolo series consists of very deep, well drained soils formed in volcanic ash and wind laid silt overlying colluvium from basalt and granite. These soils are on tops of plateaus and on north-facing slopes of the Blue Mountains. The gradient is 3 to 60 percent. The mean annual precipitation is about 23 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Tolo silt loam, 15 to 35 percent slopes, 30 feet south of road in NE1/4NE1/4NE1/4 sec. 7, T. 6 S., R. 28 E.

O1—1 1/2 inches to 0; fir needles and twigs.

A1—0 to 3 inches; very dark brown (10YR 2/2) silt loam, brown (10YR 5/3) dry; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many medium and fine roots; many very fine pores; neutral (pH 6.6); clear smooth boundary.

B21—3 to 10 inches; yellowish brown (10YR 5/4) silt loam, very pale brown (10YR 7/3) dry; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many medium and fine roots; many very fine pores; neutral (pH 6.6); gradual smooth boundary.

B22—10 to 16 inches; yellowish brown (10YR 5/6) silt loam, very pale brown (10YR 7/4) dry; massive; soft, very friable, nonsticky and nonplastic; many medium and fine roots; many very fine pores; neutral (pH 6.6); clear smooth boundary.

B23—16 to 25 inches; very pale brown (10YR 7/3) silt loam, white (10YR 8/1) dry; massive; soft, very friable, nonsticky and nonplastic; many medium and fine roots; many very fine pores; neutral (pH 6.6); abrupt irregular boundary.

IIB21b—25 to 41 inches; dark brown (7.5YR 3/3) loam, brown (7.5YR 5/4) dry; very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and fine roots; many very fine pores; neutral (pH 6.6); clear smooth boundary.

IIB22b—41 to 60 inches; dark brown (7.5YR 4/4) cobbly clay loam, brown (7.5YR 5/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic, few roots; many very fine tubular pores; 30 percent cobbles; 5 percent pebbles; neutral (pH 6.6).

Depth to bedrock is more than 60 inches. The ashy material is 20 to 40 inches thick.

The A horizon has value of 3 or 4 moist and 5 or 6 dry and chroma of 2 or 3 moist and dry.

The B horizon has value of 4 or 5 moist and 6 through 8 dry and chroma of 2 through 4 moist and dry. It is silt loam or loam. The IIB2 horizon has hue of 7.5YR or 10YR, value of 3 through 5 moist and 5 or 6 dry, and chroma of 2 through 4 moist and dry. It ranges from loam to silty clay loam that is 18 to 35 percent clay. The lower part is up to 35 percent rock fragments.

Ukiah series

The Ukiah series consists of moderately deep, well drained soils formed in colluvium from volcanic tuff and loess. These soils are on south-facing slopes. The gradient is 5 to 30 percent. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 47 degrees F.

Typical pedon of Ukiah stony silty clay loam, 5 to 30 percent slopes, 75 feet south of road near head of Johnson Creek in NW1/4NE1/4 sec. 3, T. 4 S., R. 29 E.

A11—0 to 3 inches; black (10YR 2/1) stony silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium platy structure; slightly hard, friable, sticky and plastic; many fine and very fine roots; many very fine tubular pores; 10 percent cobbles, 5 percent pebbles; neutral (pH 6.6); clear smooth boundary.

A12—3 to 7 inches; very dark brown (10YR 2/2) cobbly silty clay, dark grayish brown (10YR 4/2) dry; moderate fine to medium subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; many very fine tubular pores; 10 percent cobbles, 5 percent pebbles; neutral (pH 6.8); abrupt wavy boundary.

B21t—7 to 21 inches; dark brown (10YR 3/3) cobbly clay, dark grayish brown (10YR 4/2) dry; moderate medium to coarse prismatic structure parting to strong medium subangular blocky; very hard, very friable, very sticky and very plastic; few very fine and fine roots; many very fine tubular pores; 10 percent cobbles, 5 percent pebbles; many pressure faces; many cracks one-fourth to one-half inch wide; neutral (pH 7.0); clear smooth boundary.

B22t—21 to 26 inches; brown (10YR 4/3) cobbly clay, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; 10 percent cobbles, 5 percent pebbles; neutral (pH 7.0); clear wavy boundary.

Cr—26 inches; weathered volcanic tuff.

The mollic epipedon is 15 to 30 inches thick. Depth to the paralithic contact is 20 to 40 inches. In summer cracks at least 1 centimeter wide form at a depth of 20 inches and extend to the surface. Stones cover 1 to 15 percent of the surface.

The A horizon has value of 2 or 3 moist and chroma of 1 or 2 moist and dry.

The B2t horizon has value of 4 or 5 dry and 2 or 3 moist in the upper part and 5 or 6 dry and 3 or 4 moist in the lower part. Chroma is 2 or 3 moist and dry. This horizon is 50 to 60 percent clay and 15 to 35 percent rock fragments.

Utley series

The Utley series consists of very deep, well drained soils formed in materials from basalt and soft volcanic rock. Utley soils are on foot slopes. Slopes are 8 to 20 percent. The mean annual precipitation is about 21 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Utley loam, 8 to 20 percent slopes, on east side of logging road, one-fourth mile north of Rhea Creek Road, SW1/4NW1/4SE1/4 sec. 2, T. 5 S., R. 27 E.

A11—0 to 6 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; 10 percent pebbles; slightly acid (pH 6.4); clear smooth boundary.

A12—6 to 16 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; many very fine tubular pores; 15 percent pebbles; slightly acid (pH 6.5); abrupt wavy boundary.

B21—16 to 26 inches; dark grayish brown (2.5Y 3/2) shaly loam, grayish brown (2.5Y 5/2) dry; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few roots; common very fine tubular pores; 30 percent pebbles; neutral (pH 6.6); abrupt wavy boundary.

B22—26 to 38 inches; dark grayish brown (2.5Y 3/2) shaly loam, grayish brown (2.5Y 5/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few roots; common very fine tubular pores; 20 percent pebbles; slightly acid (pH 6.4); abrupt irregular boundary.

C—38 to 60 inches; dark grayish brown (2.5Y 3/2) very shaly loam, grayish brown (2.5Y 5/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; few roots; 50 percent pebbles; slightly acid (pH 6.4).

The solum is 30 to 40 inches thick. Depth to consolidated bedrock is more than 60 inches. The mollic epipedon is 10 to 20 inches thick. These soils have hue of 2.5Y or 10YR.

The B horizon is loam or shaly loam. It is 20 to 35 percent pebbles. The C horizon is very shaly sandy loam or very shaly loam. It is 35 to 60 percent pebbles.

Valby series

The Valby series consists of moderately deep, well drained soils that formed in loess over basalt. Valby soils are on uplands of the Columbia Plateau. Slopes range from 1 to 30 percent. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Valby silt loam, 1 to 7 percent slopes, 110 feet east of Valby Road in NE1/4NW1/4SW1/4 sec. 28 T. 3 S., R. 24 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; neutral (pH 6.8); clear smooth boundary.

B21—8 to 14 inches; very dark grayish brown (10YR 3/2) heavy silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; neutral (pH 6.8); clear smooth boundary.

B22—14 to 25 inches; dark brown (10YR 4/3) heavy silt loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; neutral (pH 7.2); clear wavy boundary.

IICca—25 to 30 inches; dark brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; strongly calcareous mycelium lime on peds and in pores; 5 percent pebbles; moderately alkaline (pH 8.3); abrupt wavy boundary.

IIIR—30 inches; fractured basalt; fragments lime coated.

Depth to bedrock ranges from 20 to 40 inches. Coarse fragments in the Cca horizon range up to 10 percent.

The A horizon has value of 2 or 3 moist and 4 or 5 dry and chroma of 2 or 3 moist and dry. The B2 horizon has value of 3 or 4 moist and 4 or 5 dry and chroma of 2 or 3 moist and dry. The Cca horizon has value of 4 or 5 moist and 6 or 7 dry. Chroma is 2 or 3 moist and dry.

Waha series

The Waha series consists of moderately deep, well drained soils formed in wind laid silt. These soils are on north-facing slopes of uplands. The gradient is 1 to 40 percent. The mean annual precipitation is about 16 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Waha silt loam, 7 to 25 percent north slopes, SW1/4NE1/4NW1/4 sec. 7, T. 4 S., R. 27 E.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium to fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; neutral (pH 6.6); abrupt smooth boundary.

A12—7 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 6.9); clear smooth boundary.

B21t—12 to 19 inches, very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 4/3) dry; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; 2 percent pebbles; neutral (pH 6.9); clear smooth boundary.

B22t—19 to 27 inches, dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; 2 percent pebbles, neutral (pH 6.9); abrupt wavy boundary.

B3t—27 to 29 inches; dark brown (7.5YR 4/4) very gravelly clay loam, brown (7.5YR 5/4) dry; massive; slightly hard, friable, sticky and plastic; common very fine roots; few very fine tubular pores; 60 percent pebbles; neutral (pH 6.9); abrupt wavy boundary.

IIR—29 inches; basalt.

Depth to bedrock ranges from 20 to 40 inches. The mollic epipedon is 20 to 30 inches thick. The content of rock fragments is 5 to 25 percent.

The A1 horizon has value of 3 or 4 dry and 2 moist and chroma of 1 or 2 moist and dry. The B2t horizon has value of 4 or 5 dry and 3 or 4 moist and chroma of 2 or 3 moist and dry. It is heavy silt loam or silty clay loam.

Warden series

The Warden series consists of very deep, well drained soils formed in wind laid silt over calcareous lacustrine silt. These soils are on terraces and uplands. Slopes are 0 to 40 percent. The mean annual precipitation is about 8 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Warden silt loam, 2 to 5 percent slopes, about 150 feet south of paved road and 40 feet west of a gravel road in NE1/4NE1/4NE1/4 sec. 29, T. 2 N., R. 26 E.

Ap—0 to 5 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak thin platy to weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many very fine irregular pores, neutral (pH 7.2); clear wavy boundary.

B21—5 to 15 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; mildly alkaline (pH 7.4); clear smooth boundary.

B22ca—15 to 25 inches; brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

C1ca—25 to 38 inches; brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine irregular pores; moderately calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

IIC2ca—38 to 45 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine irregular pores; strongly calcareous; moderately alkaline (pH 8.4); abrupt wavy boundary.

IIC3ca—45 to 60 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; massive; very hard, friable, slightly sticky and slightly plastic; common very fine irregular pores; strongly calcareous; strongly alkaline (pH 8.6).

Depth to lime is 15 to 30 inches. Depth to bedrock is more than 60 inches. Hue is 10YR or 2.5Y.

The Ap horizon has value of 5 or 6 dry and chroma of 2 or 3 moist and dry. It is silt loam or very fine sandy loam.

The B2 horizon has value of 5 or 6 dry and chroma of 2 or 3 moist and dry. It is silt loam or very fine sandy loam.

The C horizon has value of 4 or 5 moist and 6 or 7 dry and chroma of 2 or 3 moist and dry. It is silt loam or very fine sandy loam.

Waterbury series

The Waterbury series consists of shallow, well drained soils formed in colluvium from basalt. These soils are on west- and south-facing slopes. The gradient is 7 to 70 percent. The mean annual precipitation is about 16 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Waterbury extremely stony silt loam, 7 to 40 percent slopes, one-fourth mile from Willow Creek Road in SE1/4SW1/4NW1/4 sec. 28, T. 3 S., R. 28 E.

A11—0 to 3 inches; black (10YR 2/1) extremely stony silt loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine irregular pores; 40 percent cobbles; 15 percent pebbles; 10 percent stones; neutral (pH 6.6); clear smooth boundary.

A12—3 to 9 inches; black (10YR 2/1) very cobbly silt loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; 35 percent cobbles; 10 percent pebbles; neutral (pH 6.8); clear smooth boundary.

B21t—9 to 15 inches; black (10YR 2/1) very cobbly clay, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; many very fine roots; many very fine tubular pores; 30 percent cobbles; 10 percent pebbles; neutral (pH 6.8); clear smooth boundary.

B22t—15 to 17 inches; dark brown (10YR 3/3) very cobbly clay, very dark grayish brown (10YR 4/2) dry; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; 30 percent cobbles; 15 percent pebbles; neutral (pH 6.8); abrupt wavy boundary.

R—17 inches; basalt.

Depth to basalt bedrock ranges from 12 to 20 inches. The solum ranges from 35 to 80 percent rock fragments, mainly of basalt stones and cobbles and some pebble-sized volcanic tuff.

The A horizon has value of 3 or 4 dry and chroma of 1 or 2 moist and dry. The surface is 3 to 15 percent stones. The B2t horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 through 3 moist and dry.

Willis series

The Willis series consists of moderately deep, well drained soils formed in loess. These soils are on ridgetops. Slopes are 2 to 40 percent. The mean annual precipitation is about 10 inches, and the mean annual temperature is about 50 degrees F.

Typical pedon of Willis silt loam, 2 to 5 percent slopes, 75 feet north of Strawberry Road and 65 feet northwest of grain bin in SE1/4SE1/4SE1/4 sec. 17, T. 1 N., R. 25 E.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; neutral (pH 6.8); clear smooth boundary.

A12—8 to 12 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak moderate subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 6.8); clear wavy boundary.

B2—12 to 21 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium to coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately alkaline (pH 7.0); abrupt wavy boundary.

C1—21 to 27 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; weakly calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

C2ca—27 to 35 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine irregular pores; strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

IICcasim—35 to 39 inches; light gray (10YR 7/2), duripan, white (10YR 8/1) dry; massive; indurated.

Depth to the lime-silica cemented hardpan ranges from 20 to 40 inches. The mollic epipedon is 12 to 18

inches thick. Pan fragments are common throughout the profile.

The A horizon has value of 2 or 3 moist and 4 or 5 dry and chroma of 2 or 3 moist and dry. The B horizon has value of 3 or 4 moist and 5 or 6 dry and chroma of 3 or 4 moist and dry. The C and Csim horizons have value of 5 through 8 dry and 3 through 6 moist and chroma of 1 through 4 moist and dry.

Winchester series

The Winchester series consists of very deep, excessively drained soils formed in alluvial sand. These soils are on hummocky or dunelike terraces. Slopes are 0 to 12 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Winchester sand, 0 to 12 percent slopes, about 300 feet east of Eighth Street West, NE1/4SW1/4SW1/4 sec. 26, T. 5 N., R 26 E.

C1—0 to 18 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; single grained; loose, nonsticky and nonplastic; many fine and very fine roots; many very fine irregular pores; 5 percent rock fragments 2 millimeters to 3 inches in diameter; neutral (pH 6.8); gradual wavy boundary.

C2—18 to 36 inches; very dark grayish brown (10YR 3/2) coarse sand, dark grayish brown (10YR 4/2) dry; single grained; loose, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; neutral (pH 7.0); clear wavy boundary.

C3—36 to 60 inches; very dark gray (10YR 3/1) coarse sand, dark gray (10YR 4/1) dry; single grained; loose, nonsticky and nonplastic; common very fine roots; common very fine irregular pores; weakly calcareous; mildly alkaline (pH 8.0)

Depth to bedrock is more than 60 inches. The soils are free of lime in the upper 20 inches, but some pedons are slightly calcareous in the matrix below 20 inches. The 40-inch control section is more than 75 percent sand that is very coarse, coarse, and medium. It is less than 5 percent clay and from 0 to 15 percent coarse fragments.

The C1 and C2 horizons have hue ranging from 7.5YR to 2.5Y, value of 4 to 7 dry and 3 to 5 moist, and chroma of 1 through 3 moist and dry.

Wrentham series

The Wrentham series consists of moderately deep, well drained soils formed in wind laid silt and basalt colluvium. These soils are on north-facing slopes. The gradient is 35 to 70 percent. The mean annual precipitation is about 13 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Wrentham-Rock outcrop complex, 35 to 70 percent slopes, SE1/4NE1/4NE1/4 sec. 27, T. 4 S., R. 26 E.

A11—0 to 4 inches; black (10YR 2/1) silt loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots, many very fine tubular pores; 10 percent gravel; neutral (pH 7.0); clear smooth boundary.

A12—4 to 9 inches; black (10YR 2/1) gravelly silt loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many very fine tubular pores; 15 percent gravel; neutral (pH 6.8); clear smooth boundary.

A13—9 to 14 inches; black (10YR 2/1) gravelly silt loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic, many fine roots; many very fine tubular pores; 20 percent gravel; neutral (pH 6.8); clear wavy boundary.

A3—14 to 20 inches; very dark brown (10YR 2/2) very cobbly silt loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores, 25 percent pebbles; 15 percent cobbles; neutral (pH 6.6); clear smooth boundary.

B2—20 to 32 inches; dark brown (10YR 3/3) very cobbly silt loam, brown (10YR 4/3) dry; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; 30 percent pebbles; 20 percent cobbles; neutral (pH 6 6); abrupt wavy boundary.

IIR—32 inches; fractured basalt.

Depth to bedrock ranges from 20 to 40 inches. The mollic epipedon is 20 to 36 inches thick.

The A horizon has value of 2 or 3 moist and 3 through 5 dry and chroma of 1 or 2 moist and dry. It is 0 to 25 percent pebbles and 0 to 20 percent cobbles.

The B horizon has value of 3 or 4 moist and 4 or 5 dry and chroma of 2 through 4 moist and dry. It is loam, silt loam, or silty clay loam that is 35 to 60 percent cobbles and 5 to 25 percent pebbles.

Wrightman series

The Wrightman series consists of moderately deep, well drained soils formed in material weathered from basalt rock and in reworked loess. These soils are on ridgetops in the Blue Mountains. Slopes are 2 to 12 percent. The mean annual precipitation is 25 inches, and the mean annual air temperature is 44 degrees F.

Typical pedon of Wrightman silt loam, 2 to 12 percent slopes, NE1/4SE1/4SW1/4 sec. 14, T. 6 S., R. 29 E.

A11—0 to 3 inches; dark brown (7.5YR 3/3) silt loam, brown (7.5YR 5/3) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; 5 percent pebbles; neutral (pH 6.8); clear smooth boundary.

A12—3 to 12 inches; dark brown (7.5YR 3/3) silt loam, brown (7.5YR 5/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; 5 percent pebbles; neutral (pH 6.8); clear smooth boundary.

B22—12 to 21 inches; dark brown (7.5YR 3/3) silt loam, brown (7.5YR 5/3) dry; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; many fine tubular pores; 5 percent pebbles; neutral (pH 6.6); gradual smooth boundary.

B23—21 to 26 inches; dark brown (7.5YR 4/3) gravelly silt loam, light brown (7.5YR 6/3) dry; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; 20 percent pebbles; neutral (pH 6.6); abrupt wavy boundary.

R—26 inches; fractured basalt.

The control section averages less than 15 percent pebbles. The horizon over the bedrock is gravelly in most pedons. Depth to bedrock is 20 to 40 inches. The mollic epipedon is 20 to 30 inches thick. The solum has hue ranging from 10YR through 5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry and chroma of 2 or 3 moist and dry. The B horizon has value of 3 or 4 moist and 5 or 6 dry and chroma of 3 or 4 moist and dry. It is loam, silt loam, or clay loam that is 18 to 30 percent clay.

Xeric Torriorthents

Xeric Torriorthents consist of deep, somewhat excessively drained soils formed in water laid and wind laid material. These soils generally are in canyon bottoms. Slopes are 0 to 2 percent. The mean annual precipitation is 8 to 9 inches, and the mean annual air temperature is about 51 degrees F.

Pedon of Xeric Torriorthents, nearly level, 250 feet north of fence in canyon bottom in SW1/4NW1/4SE1/4 sec. 26, T. 2 N., R. 26 E.

A1—0 to 6 inches; dark brown (10YR 3/3) sandy loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many roots; 10 percent pebbles; neutral (pH 6.6); clear smooth boundary.

C1—6 to 15 inches; dark brown (10YR 3/3) fine sandy loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many roots; many fine tubular pores; 15 percent pebbles; neutral (pH 6.8); clear smooth boundary.

C2—15 to 19 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, pale brown (10YR 6/3) dry; massive; slightly hard, friable, nonsticky and nonplastic; few roots, few pores; 30 percent pebbles; neutral (pH 7.0); abrupt wavy boundary.

C3—19 to 30 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, light brownish gray (10YR 6/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; 35 percent pebbles and cobbles; mildly alkaline (pH 7.4); abrupt wavy boundary.

IIC4—30 to 60 inches; dark grayish brown (10YR 4/2) very gravelly loamy sand, light brownish gray (10YR 6/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; 55 percent cobbles and pebbles; moderately alkaline (pH 7.9).

The A horizon is sandy loam or fine sandy loam. It is 0 to 15 percent pebbles.

The C horizon is fine sandy loam, sandy loam, loamy sand, gravelly fine sandy loam, gravelly sandy loam, or gravelly loamy sand. It is 10 to 30 percent pebbles. It has value of 3 or 4 dry and chroma of 2 or 3 dry.

The IIC horizon is gravelly loamy sand, very gravelly loamy sand, cobbly loamy sand, or very cobbly loamy sand. It is 10 to 30 percent cobbles and 15 to 30 percent pebbles.

Formation of the soils

The paragraphs that follow describe the factors of soil formation and relate them to the formation of the soils of the area.

Factors of soil formation

Soil is a segment of landscape that consists of unconsolidated material capable of supporting plants, such as trees, shrubs, and grasses. The factors and processes that formed the soils in the Morrow County Area and contributed to many of their distinctive characteristics are described on the pages that follow.

Soil forms through the interaction of five major factors (*7*): climate, plant and animal life, parent material, relief, and time. The relative influence of each factor varies from place to place. In some cases, a single factor can determine most properties of a soil.

Because of major differences in parent material, plant and animal life, relief, and climate, the area has been divided into three zones.

The first of these zones is adjacent to the Columbia River. It extends across the area from east to west and south about 12 miles from the Columbia River. On the general soil map, it includes map units 1 through 5. No perennial streams cross this zone.

Parent material, climate, and vegetation are the dominant factors in determining the characteristics of the soils of this zone.

The zone is underlain by Columbia River basalt, which was deposited during the Miocene epoch. These deposits built up to a maximum thickness of 4,000 feet. The weight of these basalt layers caused faulting throughout the zone, the most important of which is the Columbia River fault. This fault helped form the present drainage pattern of the Columbia River. Geologic events near the end of the ice age in the Pleistocene epoch greatly influenced the characteristics of the soils in the zone. As melt waters from receding glaciers to the north rushed down the Columbia River, they carried debris that dammed the Columbia River gorge, probably at least three times. See "The Geography, Morphology, and Environmental Relationships of the Walla Walla Soil Series in Oregon," by Luther Henry Robinson, Jr , unpublished Master's thesis, issued June 1961, [pp. 4-11, illus]. In the lakes that formed behind these dams, lacustrine silts were deposited to an elevation of about 1,000 feet During intermediate periods the floodwater scoured away the lacustrine deposits nearest the river and deposited sandy and gravelly alluvium. The then prevailing winds from the north reworked the sandy material and deposited a sandy layer over the lacustrine deposits farther south of the Columbia River. See "Distribution and Characteristics of Loess-Like Soil Parent Material in Northwestern Oregon," by Arthur Albert Theison, unpublished Master's thesis, issued June 1958, [pp. 58-60, illus]. In more recent times, the prevailing winds from the west and southwest reoriented the sandy deposits in a southwest to northeast direction. Soils formed in these sandy materials show little profile development because the sand resists weathering.

The climate in this zone is dry. The average annual precipitation is 7 to 8 inches. Consequently, the vegetation is sparse.

Nearly all soils in this zone are sandy, at least in the upper part. Some are sandy throughout Near the Columbia River the very deep sandy soils overlying basalt or river gravel are the Quincy, Royal, and Winchester soils. Quinton soils are moderately deep over basalt. Koehler, Ellum, and Taunton soils are underlain by a hardpan. Burbank and Irrigon soils consist of wind reworked sandy material over sandy and gravelly alluvial outwash. Hezel and Sagehill soils are eolian sands, from near the Columbia River, over lacustrine silts. Warden soils, which are southernmost in this zone, are on terraces of eolian sands and silts over lacustrine sediments. Throughout this zone where plant cover has been removed, long, active sand dunes are oriented in a southwest to northeast direction.

The zone to the south of the sandy northern zone and extending to the Blue Mountains is dominantly loess or wind laid deposits. See map units 6 through 14 on the general soil map. The loess probably originated from glacial outwash from the receding glaciers and the material deposited by the Columbia River in the Pleistocene epoch. The interglacial periods, accompanied by warmer climate, produced maximum sedimentation. Concurrently, when the ground was not frozen and not snow covered, these deposits were exposed to the prevailing northeast winds.

Wind is capable of moving soil particles up to the size of coarse sand. Such particles are rolled or bounced along the surface. Because of this type of movement and the size of such particles, they are carried only a short distance and are the first to be deposited. The bouncing of these larger sand particles also dislodges

other particles and subjects them to the force of the wind. Fine and very fine sands and coarse silts are carried by the wind in suspension for short distances. These are the next particles to be deposited downwind from the source. Finally, because of their size and weight, the fine silts and clays are carried in suspension for a considerable distance and are deposited farthest from the source. Also wind laid deposits are deepest near the source and thinner farther from it. Precipitation in the zone increases to the southward. These facts explain much of the development of the soils in this loess zone.

All the loess soils are underlain by basalt bedrock. Ritzville, Mikkalo, Willis, and Nansene soils, in the northern part of the loess zone, are dominated by coarse silts. Ritzville and Nansene soils are deep. Nansene soils are on north exposures. Ritzville soils are near the source of loess and on ridgetops and north exposures. The moderately deep Mikkalo soils formed farther from the source of loess where it is thinner and on south exposures. Willis soils, in level and slightly concave areas, have a hardpan.

The loess soils in the rest of this zone are farther from the source and are dominantly fine silts. They are under heavier precipitation and have a darker colored surface layer. Rhea soils have north exposures and are deep. Valby soils, on ridgetops and south-facing slopes, are moderately deep. Morrow and Waha soils are on older surfaces at the higher elevations in the southern part of the zone. They are moderately deep and have a distinct argillic horizon. Bakeoven and Rockly soils, formed on rocky ridgetops and near the edge of ridgetops, are very shallow and show little soil development. Bakeoven soils are often interspersed with Valby and Morrow soils as patterned land, locally known as biscuit scabland. The origin of these biscuits or mounds is not definitely known, but it is commonly thought that they originated as frost wedges and were then eroded to mounds. Rockly soils are similarly related to Waha soils. The light colored Lickskillet soil, in the northern two-thirds of this zone, is shallow because the low moisture results in sparse vegetation, making the soil more susceptible to erosion. South-facing slopes in the southern part of the zone are dominantly Waterbury soils. The higher precipitation and increased vegetation caused them to develop a darker surface horizon and an argillic horizon. Wrentham and Snell soils, on steep north exposures, formed a thick dark surface layer.

Three main streams—Willow Creek, Rhea Creek, and Butter Creek—cross this zone. Relief and parent material are highly significant in the formation of these soils because the soils formed in alluvial deposits eroded from the upland soils in this zone and in the Blue Mountains. Pedigo soils, in slightly concave areas, have impeded drainage. Esquatzel and Kimberly soils, in the drier northern part of the zone, are lighter colored and have extensive lime zones. Onyx, Endersby, and Snow soils, receiving more precipitation than these soils, are darker colored and free of lime.

The third zone, in the southern part of the area, includes the western extension of the Blue Mountains. See map units 15 through 18 on the general soil map. Except for the flats and steep slopes that break into the North Fork of the John Day River and the scattered high mountain meadows, all this zone is timbered. The Blue Mountains in this zone were formed by the uplifting and folding of Columbia River basalt. There are some intrusions of granite and granodiorite.

This zone has the highest precipitation in the county, which accounts for the forest-type vegetation in most areas. The average annual precipitation ranges from 18 to 30 inches.

Most of the soils above 4,600 feet formed in material derived from basalt buried by a 20- to 40-inch overlay of volcanic ash. This ash originated from volcanic eruptions of Mt. Mazama in the Cascade Range (*4*). An example is the Helter soil.

Relief plays an important role in the deposition of the ash in areas where the fall was minimal. In these areas the ash accumulated almost exclusively on north-facing slopes, mainly below elevations of 4,600 feet. The Tolo soil is an example. Because of deposition of the volcanic ash in the Recent geologic period, about 6,500 years ago, there has been little soil development (*4*).

Small amounts of volcanic ash accumulated in depressions and along drainageways throughout the forest. These areas have a high water table. In places where there is a large influence of ash, Aquepts formed. In other areas, particularly along streams, the deposited ash was removed by water and thus did not influence the development of the soil profile. Aquolls are examples of such soils. Both Aquolls and Aquepts, formed under a grass-sedge vegetation, have a very dark, well structured surface horizon.

Most of the soils on south-facing slopes, particularly below 4,600 feet elevation, are derived from clayey sediments, granodiorite, and basalt and other basic igneous rocks. Because of their south or southwest aspect, they did not receive deposits of volcanic ash. Thus, soil development was not interrupted. Klicker and Hankins soils, for example, formed a distinct, well structured argillic horizon.

Soils derived from granodiorite do not show much development, mainly because of the slow weathering of the parent material. An example is the Labuck soil.

The nontimbered soils on the flats and steep breaks near the North Fork John Day River are shallow. They received little volcanic ash from the Cascades or loess from glacial outwash areas, mainly along the Columbia River. Because they are shallow and have a high content of rock fragments, little plant cover was established, resulting in little soil development. Such soils are the Bocker and Gwin soils.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Anderson, E. William. 1975. The Oregon interagency guide for conservation and forage plantings. U.S. Dep. Agric. Handb., pp. 49-58.

(4) Baldwin, Ewart M. 1964. Geology of Oregon. Edwards Brothers, Inc. Ed. 2, 165 pp., illus.

(5) Brickell, James E. 1968. A method for constructing site index curves from measurements of tree age and height—its application to Douglas-fir. U.S. Forest Service Intermountain Forest and Range Experiment Station. 23 pp., illus.

(6) French, Giles. 1971. Homesteads and heritages—A history of Morrow County, Oregon. Binsfords and Mort, Portland, Ore. 127 pp., illus.

(7) Jenny, Hans. 1941. Factors of soil formation. McGraw-Hill Book Company, Inc., 281 pp., illus.

(8) Meyer, W. H. 1938. Yield of even-aged stands of ponderosa pine. U.S. Dep. Agric. Tech. Bull. 630, 59 pp., illus.

(9) Myers, Clifford A. 1967. Yield tables for managed stands of lodgepole pine in Colorado and Wyoming. U.S. Dep. Agric. For. Serv. Res. pap.

(10) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(11) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(12) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(13) Vomocil, James A. and R. E. Ramig. 1976. Wind erosion control on irrigated Columbia Basin land—a handbook of practices. U.S. Dep. Agric. and Ore. State Univ. Ext. Ser., Spec. Rep. 466, 24 pp.

Glossary

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

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

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	9 to 12
Very high	More than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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 coating, clay skin.

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 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, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

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.

Consumptive use. The quantity of water used and transpired by vegetation plus that evaporated.

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.

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.

Depth to rock. Bedrock is too near the surface for the specified use.

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.

Drainage, surface. Runoff, or surface flow of water, from an area.

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 the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

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.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

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.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Center-pivot.—An automatically rotating sprinkler pipe, or boom, that supplies water to the sprinkler heads or nozzles from the center or pivot point of the system.
Hand line.—A sprinkler system in which the pipes containing the sprinkler heads are carried by hand to each new setting.
Wheel line.—A sprinkler system in which the pipes containing the sprinkler heads are supported on wheels and are rolled to each new setting.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

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

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

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

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

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

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

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

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

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

Miscellaneous areas. Areas that have little or no natural soil and support little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

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

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

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

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.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 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

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The 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

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

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

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.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

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.

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. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind 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.

Substratum. The part of the soil below the solum.

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.

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. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by 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."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the low lands along streams.

Water supplying capacity. Water stored in the soil at the beginning of plant growth in spring, plus rainfall during the growing season, less evaporation and runoff.

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.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-73]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Arlington, Oregon											
January----	41.5	27.7	34.6	61	-2	115	1.60	.73	2.30	5	4.6
February---	49.6	32.2	40.9	68	12	101	.94	.23	1.49	3	.9
March------	57.1	34.7	45.9	74	16	194	.76	.30	1.13	3	.3
April------	65.9	39.8	52.8	84	24	384	.49	.10	.79	2	.0
May--------	76.4	47.3	61.9	97	31	679	.56	.19	.86	2	.0
June-------	83.6	54.6	69.1	104	41	873	.45	.09	.72	1	.0
July-------	92.3	60.4	76.4	109	46	1,128	.20	.00	.36	1	.0
August-----	90.1	59.5	74.8	107	46	1,079	.17	.00	.31	1	.0
September--	81.1	51.0	66.1	98	34	783	.44	.14	.67	1	.0
October----	66.5	41.7	54.1	84	23	437	.57	.21	.85	2	.0
November---	50.7	33.7	42.2	66	13	142	1.38	.57	2.03	5	.5
December---	42.6	29.6	36.2	61	6	57	1.66	.75	2.39	6	3.1
Year-------	66.5	42.7	54.6	109	-8	5,972	9.22	7.53	10.82	32	9.4

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Heppner, Oregon											
January----	42.1	26.0	34.0	65	-5	97	1.49	.83	2.02	5	6.2
February---	48.0	29.9	38.9	68	9	83	1.06	.51	1.49	4	2.7
March------	52.8	31.6	42.2	72	17	111	1.31	.75	1.76	4	1.5
April------	59.9	35.3	47.6	80	22	234	1.08	.39	1.61	4	.5
May--------	68.7	41.8	55.3	89	29	474	1.48	.58	2.20	4	.0
June-------	76.7	47.9	62.3	95	35	669	1.07	.40	1.61	3	.0
July-------	85.5	52.0	68.8	102	39	893	.35	.03	.59	1	.0
August-----	83.8	51.6	67.7	101	39	859	.54	.04	.91	2	.0
September--	75.7	45.8	60.8	95	31	624	.77	.24	1.19	2	.0
October----	64.0	38.4	51.2	83	23	347	1.13	.53	1.61	4	.2
November---	50.6	31.8	41.3	71	12	122	1.60	.74	2.28	5	1.4
December---	43.6	27.5	35.6	64	2	51	1.67	.85	2.34	6	4.0
Year-------	62.6	38.3	50.5	103	-12	4,564	13.55	11.65	15.37	44	16.5

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-73]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Arlington, Oregon			
Last freezing temperature in spring:			
1 year in 10 later than--	April 11	April 26	May 11
2 years in 10 later than--	April 1	April 19	May 5
5 years in 10 later than--	March 14	April 7	April 24
First freezing temperature in fall:			
1 year in 10 earlier than--	October 15	October 15	September 21
2 years in 10 earlier than--	October 23	October 21	September 29
5 years in 10 earlier than--	November 16	November 3	October 13
Heppner, Oregon			
Last freezing temperature in spring:			
1 year in 10 later than--	April 25	May 8	May 30
2 years in 10 later than--	April 16	May 2	May 25
5 years in 10 later than--	March 29	April 20	May 14
First freezing temperature in fall:			
1 year in 10 earlier than--	October 19	September 30	September 19
2 years in 10 earlier than--	October 27	October 7	September 24
5 years in 10 earlier than--	November 11	October 21	October 4

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-73]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
Arlington, Oregon			
9 years in 10	200	185	143
8 years in 10	216	194	153
5 years in 10	246	209	171
2 years in 10	277	225	189
1 year in 10	293	234	198
Heppner, Oregon			
9 years in 10	198	154	123
8 years in 10	207	164	129
5 years in 10	226	183	142
2 years in 10	244	203	155
1 year in 10	253	213	162

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Aquepts and Aquolls, nearly level	4,898	0.4
2D	Bakeoven very cobbly loam, 2 to 20 percent slopes	3,374	0.3
3D	Bakeoven-Morrow complex, 2 to 20 percent slopes	31,822	2.4
4D	Bakeoven-Valby complex, 2 to 20 percent slopes	14,603	1.1
5E	Boardtree loam, 7 to 40 percent slopes	14,340	1.1
6C	Bocker extremely cobbly silt loam, 2 to 12 percent slopes	11,068	0.8
7C	Bocker-Wrightman complex, 2 to 12 percent slopes	12,818	1.0
8B	Burbank loamy fine sand, 2 to 5 percent slopes	4,523	0.3
8C	Burbank loamy fine sand, 5 to 12 percent slopes	252	*
9	Dune land	6,858	0.5
10B	Ellum fine sandy loam, 2 to 5 percent slopes	1,040	0.1
10C	Ellum fine sandy loam, 5 to 12 percent slopes	978	0.1
11	Endersby fine sandy loam	3,164	0.2
12	Esquatzel silt loam	663	0.1
13D	Gravden very gravelly loam, 5 to 20 percent slopes	960	0.1
13E	Gravden very gravelly loam, 20 to 40 percent slopes	2,756	0.2
14E	Gwin extremely stony silt loam, 12 to 40 percent slopes	1,922	0.1
15F	Gwin-Rock outcrop complex, 40 to 70 percent slopes	8,331	0.6
16C	Hall Ranch loam, 2 to 12 percent slopes	8,736	0.7
17E	Hall Ranch gravelly loam, 12 to 35 percent slopes	16,140	1.2
18E	Hankins silt loam, 5 to 35 percent south slopes	24,307	1.9
19C	Helter silt loam, bedrock substratum, 3 to 15 percent slopes	30,022	2.3
19E	Helter silt loam, bedrock substratum, 15 to 35 percent slopes	28,124	2.1
19F	Helter silt loam, bedrock substratum, 35 to 60 percent slopes	1,736	0.1
20B	Hezel loamy fine sand, 2 to 5 percent slopes	3,133	0.2
20C	Hezel loamy fine sand, 5 to 12 percent slopes	524	*
21B	Irrigon fine sandy loam, 2 to 5 percent slopes	1,383	0.1
21C	Irrigon fine sandy loam, 5 to 12 percent slopes	703	0.1
22	Kimberly fine sandy loam	2,762	0.2
23D	Klicker stony silt loam, 2 to 20 percent slopes	35,406	2.7
24E	Klicker stony silt loam, 20 to 40 percent north slopes	8,307	0.6
24F	Klicker stony silt loam, 40 to 75 percent north slopes	7,180	0.5
25E	Klicker very stony silt loam, 20 to 40 percent south slopes	11,843	0.9
25F	Klicker very stony silt loam, 40 to 75 percent south slopes	970	0.1
26B	Koehler loamy fine sand, 2 to 5 percent slopes	29,203	2.2
26C	Koehler loamy fine sand, 5 to 12 percent slopes	1,834	0.1
27E	Labuck loam, 5 to 35 percent slopes	5,924	0.5
28E	Lickskillet very stony loam, 7 to 40 percent slopes	87,495	6.7
29F	Lickskillet-Rock outcrop complex, 40 to 70 percent slopes	17,303	1.3
30B	Mikkalo silt loam, 2 to 7 percent slopes	20,557	1.6
30C	Mikkalo silt loam, 7 to 12 percent slopes	20,774	1.6
30D	Mikkalo silt loam, 12 to 20 percent slopes	4,094	0.3
31B	Morrow silt loam, 1 to 7 percent slopes	17,707	1.4
31C	Morrow silt loam, 7 to 12 percent slopes	16,948	1.3
32D	Morrow silt loam, 12 to 20 percent north slopes	15,068	1.2
32E	Morrow silt loam, 20 to 35 percent north slopes	21,577	1.6
33D	Morrow silt loam, 12 to 20 percent south slopes	3,255	0.2
33E	Morrow silt loam, 20 to 30 percent south slopes	6,640	0.5
34F	Nansene silt loam, 35 to 70 percent slopes	3,024	0.2
35	Onyx silt loam	3,515	0.3
36	Pedigo silt loam	2,358	0.2
37A	Prosser silt loam, 0 to 2 percent slopes	2,898	0.2
37B	Prosser silt loam, 2 to 7 percent slopes	478	*
38D	Prosser-Rock outcrop complex, 1 to 20 percent slopes	7,861	0.6
39C	Quincy fine sand, 2 to 12 percent slopes	6,759	0.5
40C	Quincy loamy fine sand, 2 to 12 percent slopes	82,852	6.2
41B	Quinton loamy fine sand, 2 to 5 percent slopes	2,982	0.2
42D	Quinton-Rock outcrop complex, 2 to 20 percent slopes	894	0.1
43B	Rhea silt loam, 1 to 7 percent slopes	900	0.1
43C	Rhea silt loam, 7 to 12 percent slopes	6,373	0.5
43D	Rhea silt loam, 12 to 20 percent slopes	7,364	0.6
43E	Rhea silt loam, 20 to 35 percent slopes	7,676	0.6
43F	Rhea silt loam, 35 to 50 percent slopes	7,388	0.6
44B	Ritzville very fine sandy loam, 2 to 7 percent slopes	4,428	0.3
44C	Ritzville very fine sandy loam, 7 to 12 percent slopes	1,024	0.1
44D	Ritzville very fine sandy loam, 12 to 25 percent slopes	309	*
45A	Ritzville silt loam, 0 to 2 percent slopes	6,864	0.5

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
45B	Ritzville silt loam, 2 to 7 percent slopes	74,241	5.7
45C	Ritzville silt loam, 7 to 12 percent slopes	44,026	3.4
45D	Ritzville silt loam, 12 to 20 percent slopes	13,096	1.0
46E	Ritzville silt loam, 20 to 40 percent north slopes	6,987	0.5
47E	Ritzville silt loam, 20 to 40 percent south slopes	1,833	0.1
48	Riverwash	214	*
49F	Rock outcrop-Rubble land complex, very steep	1,153	0.1
50D	Rockly very gravelly loam, 2 to 20 percent slopes	8,069	0.6
51B	Royal loamy fine sand, 2 to 5 percent slopes	3,787	0.3
51C	Royal loamy fine sand, 5 to 12 percent slopes	293	*
52B	Royal fine sandy loam, 2 to 5 percent slopes	579	*
52C	Royal fine sandy loam, 5 to 12 percent slopes	1,046	0.1
52D	Royal fine sandy loam, 12 to 20 percent slopes	464	*
53A	Royal silt loam, 0 to 3 percent slopes	829	0.1
54B	Sagehill fine sandy loam, 2 to 5 percent slopes	16,343	1.2
54C	Sagehill fine sandy loam, 5 to 12 percent slopes	5,604	0.4
54D	Sagehill fine sandy loam, 12 to 20 percent slopes	3,131	0.2
55B	Sagehill fine sandy loam, hummocky, 2 to 5 percent slopes	8,123	0.6
55C	Sagehill fine sandy loam, hummocky, 5 to 12 percent slopes	4,827	0.4
56F	Snell very stony loam, 35 to 70 percent north slopes	5,891	0.4
57	Snow silt loam	2,163	0.2
58A	Taunton fine sandy loam, 0 to 2 percent slopes	1,526	0.1
58B	Taunton fine sandy loam, 2 to 5 percent slopes	7,060	0.5
58C	Taunton fine sandy loam, 5 to 12 percent slopes	1,603	0.1
59B	Taunton fine sandy loam, hummocky, 0 to 5 percent slopes	640	*
60C	Tolo silt loam, 3 to 15 percent slopes	5,387	0.4
60E	Tolo silt loam, 15 to 35 percent slopes	16,795	1.3
60F	Tolo silt loam, 35 to 60 percent slopes	1,989	0.2
61E	Ukiah stony silty clay loam, 5 to 30 percent slopes	1,426	0.1
62D	Utley loam, 8 to 20 percent slopes	541	*
63B	Valby silt loam, 1 to 7 percent slopes	44,005	3.4
63C	Valby silt loam, 7 to 12 percent slopes	33,364	2.5
64D	Valby silt loam, 12 to 20 percent north slopes	14,680	1.1
65D	Valby silt loam, 12 to 20 percent south slopes	3,938	0.3
65E	Valby silt loam, 20 to 30 percent south slopes	5,995	0.5
66B	Waha silt loam, 1 to 7 percent slopes	7,709	0.6
67D	Waha silt loam, 7 to 25 percent north slopes	11,979	0.9
67E	Waha silt loam, 25 to 40 percent north slopes	22,293	1.7
68D	Waha silt loam, 7 to 25 percent south slopes	2,385	0.2
69D	Waha-Rockly complex, 2 to 20 percent slopes	44,990	3.4
70B	Warden very fine sandy loam, 2 to 5 percent slopes	6,190	0.5
70C	Warden very fine sandy loam, 5 to 12 percent slopes	2,315	0.2
70D	Warden very fine sandy loam, 12 to 20 percent slopes	2,431	0.2
71A	Warden silt loam, 0 to 2 percent slopes	3,771	0.3
71B	Warden silt loam, 2 to 5 percent slopes	24,439	1.9
71C	Warden silt loam, 5 to 12 percent slopes	7,023	0.5
71D	Warden silt loam, 12 to 20 percent slopes	5,828	0.4
71E	Warden silt loam, 20 to 40 percent slopes	3,528	0.3
72C	Warden silt loam, 3 to 12 percent slopes, eroded	465	*
72D	Warden silt loam, 12 to 20 percent slopes, eroded	602	*
73E	Waterbury extremely stony silt loam, 7 to 40 percent slopes	37,904	2.9
74F	Waterbury-Rock outcrop complex, 40 to 70 percent slopes	11,034	0.8
75B	Willis silt loam, 2 to 5 percent slopes	14,076	1.1
75C	Willis silt loam, 5 to 12 percent slopes	7,744	0.6
75D	Willis silt loam, 12 to 20 percent slopes	1,443	0.1
76C	Winchester sand, 0 to 12 percent slopes	6,000	0.5
77F	Wrentham-Rock outcrop complex, 35 to 70 percent slopes	11,278	0.9
78	Xeric Torriorthents, nearly level	3,416	0.3
	Water	680	0.1
	Total	1,311,143	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Winter wheat		Barley	Irish potatoes	Alfalfa hay	Pasture		Corn silage
	N	I	N	I	I	N	I	I
	Bu	Bu	Bu	Cwt	Ton	AUM*	AUM*	Ton
8B, 8C--Burbank	---	80	---	400	4	---	12	25
9**. Dune land								
11--Endersby	25	100	---	---	4	---	12	---
12--Esquatzel	25	100	---	---	5	---	12	---
20B--Hezel	---	100	---	500	5	---	12	30
20C--Hezel	---	100	---	500	5	---	12	30
21B--Irrigon	---	80	---	400	5	---	12	25
21C--Irrigon	---	80	---	400	5	---	12	25
22--Kimberly	---	100	---	---	6	---	16	---
26B, 26C--Koehler	---	90	---	500	4	---	12	25
30B--Mikkalo	25	---	30	---	---	3	12	---
30C--Mikkalo	25	---	30	---	---	3	12	---
30D--Mikkalo	25	---	30	---	---	3	12	---
31B, 31C, 32D, 32E, 33D, 33E--Morrow	25	---	35	---	---	3	---	---
35--Onyx	35	80	---	---	---	6	18	---
36--Pedigo	25	80	---	---	---	---	---	---
37A--Prosser	---	---	---	---	4	---	12	---
37B--Prosser	---	---	---	---	4	---	12	---
39C, 40C--Quincy	---	100	---	500	6	---	18	30
41B--Quinton	---	80	---	400	4	---	12	25

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Winter wheat		Barley	Irish potatoes	Alfalfa hay	Pasture		Corn silage
	N	I	N	I	I	N	I	I
	Bu	Bu	Bu	Cwt	Ton	AUM*	AUM*	Ton
43B---------- Rhea	40	---	40	---	---	3	---	---
43C, 43D---------- Rhea	40	---	40	---	---	3	---	---
43E---------- Rhea	40	---	40	---	---	3	---	---
43F---------- Rhea	---	---	---	---	---	3	---	---
44B---------- Ritzville	25	100	35	---	6	---	---	---
44C, 44D---------- Ritzville	25	100	35	---	6	---	---	---
45A---------- Ritzville	25	100	35	---	6	---	---	---
45B---------- Ritzville	25	100	35	---	6	---	---	---
45C, 45D---------- Ritzville	25	---	35	---	6	---	---	---
46E, 47E---------- Ritzville	20	---	30	---	---	---	---	---
48**. Riverwash								
51B, 51C---------- Royal	---	100	---	500	6	---	18	30
52B, 52C, 52D---------- Royal	---	100	---	500	6	---	18	30
53A---------- Royal	---	100	---	500	6	---	18	---
54B---------- Sagehill	---	100	---	600	7	---	21	30
54C---------- Sagehill	---	100	---	600	7	---	21	30
54D---------- Sagehill	---	100	---	600	7	---	21	30
57---------- Snow	40	90	---	---	5	3	12	---
58A, 58B, 58C---------- Taunton	---	90	---	400	5	---	15	20
63B---------- Valby	30	---	40	---	---	3	---	---
63C, 64D, 65D---------- Valby	30	---	40	---	---	3	---	---
66B---------- Waha	25	---	35	---	---	3	---	---
67D---------- Waha	25	---	35	---	---	3	---	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Winter wheat		Barley	Irish potatoes	Alfalfa hay	Pasture		Corn silage
	N	I	N	I	I	N	I	I
	Bu	Bu	Bu	Cwt	Ton	AUM*	AUM*	Ton
68D---------- Waha	15	---	30	---	---	3	---	---
70B---------- Warden	20	100	30	500	6	---	---	30
70C---------- Warden	20	100	30	500	6	---	---	30
70D---------- Warden	20	100	30	500	6	---	---	30
71A---------- Warden	20	100	30	500	6	---	---	30
71B---------- Warden	20	100	30	500	6	---	---	30
71C---------- Warden	20	100	30	500	6	---	---	30
71D---------- Warden	20	100	30	500	6	---	---	30
75B---------- Willis	20	---	30	---	---	---	---	---
75C---------- Willis	20	---	30	---	---	---	---	---
75D---------- Willis	20	---	30	---	---	---	---	---
76C---------- Winchester	---	100	---	500	6	---	18	30

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
2D---- Bakeoven	Shrubby Scabland----	Favorable	500	Stiff sagebrush----	70
		Normal	400	Sandberg bluegrass----	20
		Unfavorable	300		
3D*:					
Bakeoven----	Shrubby Scabland----	Favorable	500	Stiff sagebrush----	70
		Normal	400	Sandberg bluegrass----	20
		Unfavorable	300		
Morrow----	Biscuit----	Favorable	900	Bluebunch wheatgrass----	45
		Normal	750	Idaho fescue----	35
		Unfavorable	400	Sandberg bluegrass----	10
4D*:					
Bakeoven----	Shrubby Scabland----	Favorable	500	Stiff sagebrush----	70
		Normal	400	Sandberg bluegrass----	20
		Unfavorable	300		
Valby----	Biscuit----	Favorable	900	Bluebunch wheatgrass----	45
		Normal	750	Idaho fescue----	35
		Unfavorable	400	Sandberg bluegrass----	10
6C---- Bocker	Scabland----	Favorable	400	Sandberg bluegrass----	80
		Normal	300	Douglas eriogonum----	5
		Unfavorable	200	Bluebunch wheatgrass----	5
7C*:					
Bocker----	Scabland----	Favorable	400	Sandberg bluegrass----	80
		Normal	300	Douglas eriogonum----	5
		Unfavorable	200	Bluebunch wheatgrass----	5
Wrightman----	Biscuit (moist)----	Favorable	1,500	Idaho fescue----	70
		Normal	1,400	Bluebunch wheatgrass----	10
		Unfavorable	700	Sandberg bluegrass----	5
8B, 8C---- Burbank	Loamy Sand Terrace----	Favorable	900	Needleandthread----	60
		Normal	700	Indian ricegrass----	20
		Unfavorable	475	Antelope bitterbrush----	5
10B, 10C---- Ellum	Light Loamy Terrace----	Favorable	900	Needleandthread----	55
		Normal	700	Bluebunch wheatgrass----	20
		Unfavorable	300	Indian ricegrass----	10
13D---- Gravden	Droughty Rolling Hills----	Favorable	700	Bluebunch wheatgrass----	65
		Normal	650	Sandberg bluegrass----	25
		Unfavorable	200		
13E---- Gravden	Droughty South Exposure----	Favorable	600	Bluebunch wheatgrass----	75
		Normal	400	Sandberg bluegrass----	10
		Unfavorable	200	Thurber needlegrass----	5
14E---- Gwin	South Exposure----	Favorable	1,400	Bluebunch wheatgrass----	55
		Normal	1,300	Idaho fescue----	20
		Unfavorable	600	Sandberg bluegrass----	10
15F*:					
Gwin----	Steep South----	Favorable	900	Bluebunch wheatgrass----	80
		Normal	750	Sandberg bluegrass----	10
		Unfavorable	325		
Rock outcrop.					

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
20B, 20C Hezel	Sand Loam Terrace	Favorable Normal Unfavorable	850 700 450	Bluebunch wheatgrass Sandberg bluegrass Needleandthread Big sagebrush	60 15 10 5
21B, 21C Irrigon	Sand Loam Terrace	Favorable Normal Unfavorable	850 700 450	Bluebunch wheatgrass Sandberg bluegrass Needleandthread Big sagebrush	60 15 10 5
26B, 26C Koehler	Loamy Sand Terrace	Favorable Normal Unfavorable	900 700 475	Needleandthread Indian ricegrass Antelope bitterbrush	60 20 5
28E Lickskillet	Droughty South Exposure	Favorable Normal Unfavorable	850 700 350	Bluebunch wheatgrass Sandberg bluegrass Thurber needlegrass Phlox	75 10 5 5
29F*: Lickskillet	Droughty South Exposure	Favorable Normal Unfavorable	850 700 350	Bluebunch wheatgrass Sandberg bluegrass Thurber needlegrass Phlox	75 10 5 5
Rock outcrop.					
30B, 30C, 30D Mikkalo	Droughty Rolling Hills	Favorable Normal Unfavorable	700 650 200	Bluebunch wheatgrass Sandberg bluegrass	65 25
31B, 31C Morrow	Rolling Hills	Favorable Normal Unfavorable	900 750 400	Bluebunch wheatgrass Idaho fescue Sandberg bluegrass	45 35 10
32D, 32E Morrow	North Exposure	Favorable Normal Unfavorable	1,300 1,000 650	Idaho fescue Bluebunch wheatgrass Cusick bluegrass	70 15 5
33D, 33E Morrow	South Exposure	Favorable Normal Unfavorable	1,400 1,300 600	Bluebunch wheatgrass Idaho fescue Sandberg bluegrass	55 20 10
34F Nansene	North Exposure	Favorable Normal Unfavorable	1,400 1,300 700	Idaho fescue Bluebunch wheatgrass Cusick bluegrass	70 15 5
37A, 37B Prosser	Light Loamy Terrace	Favorable Normal Unfavorable	900 700 300	Needleandthread Bluebunch wheatgrass Indian ricegrass	55 20 10
38D*: Prosser	Light Loamy Terrace	Favorable Normal Unfavorable	900 700 300	Needleandthread Bluebunch wheatgrass Indian ricegrass	55 20 10
Rock outcrop.					
39C, 40C Quincy	Loamy Sand Terrace	Favorable Normal Unfavorable	900 700 475	Needleandthread Indian ricegrass Antelope bitterbrush	60 20 5
41B Quinton	Loamy Sand Terrace	Favorable Normal Unfavorable	900 700 475	Needleandthread Indian ricegrass Antelope bitterbrush	60 20 5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
42D*:					
Quinton	Loamy Sand Terrace	Favorable	900	Needleandthread	60
		Normal	700	Indian ricegrass	20
		Unfavorable	475	Antelope bitterbrush	5
Rock outcrop.					
43B, 43C Rhea	Rolling Hills	Favorable	1,000	Bluebunch wheatgrass	45
		Normal	800	Idaho fescue	35
		Unfavorable	350	Sandberg bluegrass	10
43D, 43E Rhea	Droughty North Exposure	Favorable	950	Bluebunch wheatgrass	45
		Normal	800	Idaho fescue	30
		Unfavorable	300	Sandberg bluegrass	10
43F Rhea	Steep North	Favorable	1,450	Idaho fescue	70
		Normal	1,300	Bluebunch wheatgrass	15
		Unfavorable	700	Cusick bluegrass	5
44B, 44C, 44D Ritzville	Droughty Rolling Hills	Favorable	700	Bluebunch wheatgrass	65
		Normal	650	Sandberg bluegrass	25
		Unfavorable	200		
45A Ritzville	Droughty Rolling Hills	Favorable	700	Bluebunch wheatgrass	65
		Normal	650	Sandberg bluegrass	25
		Unfavorable	200		
45B, 45C, 45D Ritzville	Droughty Rolling Hills	Favorable	700	Bluebunch wheatgrass	65
		Normal	650	Sandberg bluegrass	25
		Unfavorable	200		
46E Ritzville	Droughty North Exposure	Favorable	950	Bluebunch wheatgrass	45
		Normal	800	Idaho fescue	30
		Unfavorable	300	Sandberg bluegrass	10
47E Ritzville	Droughty South Exposure	Favorable	850	Bluebunch wheatgrass	75
		Normal	700	Sandberg bluegrass	10
		Unfavorable	350	Thurber needlegrass	5
50D Rockly	Scabland	Favorable	400	Sandberg bluegrass	80
		Normal	350	Bluebunch wheatgrass	5
		Unfavorable	150		
51B, 51C Royal	Light Loamy Terrace	Favorable	900	Needleandthread	55
		Normal	700	Bluebunch wheatgrass	20
		Unfavorable	300	Indian ricegrass	10
52B, 52C, 52D, 53A- Royal	Light Loamy Terrace	Favorable	900	Needleandthread	55
		Normal	700	Bluebunch wheatgrass	20
		Unfavorable	300	Indian ricegrass	10
54B, 54C, 54D, 55B, 55C Sagehill	Sand Loam Terrace	Favorable	850	Bluebunch wheatgrass	60
		Normal	700	Sandberg bluegrass	15
		Unfavorable	450	Needleandthread	10
56F Snell	North Exposure	Favorable	1,450	Idaho fescue	70
		Normal	1,300	Bluebunch wheatgrass	15
		Unfavorable	700	Cusick bluegrass	5
58A, 58B, 58C, 59B- Taunton	Light Loamy Terrace	Favorable	900	Needleandthread	55
		Normal	700	Bluebunch wheatgrass	20
		Unfavorable	300	Indian ricegrass	10
61E Ukiah	South Exposure	Favorable	1,300	Bluebunch wheatgrass	55
		Normal	1,200	Idaho fescue	20
		Unfavorable	550	Sandberg bluegrass	10

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
62D---------- Utley	Moist Rolling Hills----------	Favorable	1,500	Idaho fescue----------	70
		Normal	1,400	Bluebunch wheatgrass----------	10
		Unfavorable	700	Sandberg bluegrass----------	5
63B, 63C---------- Valby	Rolling Hills----------	Favorable	1,000	Bluebunch wheatgrass----------	65
		Normal	800	Idaho fescue----------	20
		Unfavorable	350	Sandberg bluegrass----------	10
64D---------- Valby	Droughty North Exposure-------	Favorable	950	Bluebunch wheatgrass----------	45
		Normal	800	Idaho fescue----------	20
		Unfavorable	300	Sandberg bluegrass----------	10
65D, 65E---------- Valby	Droughty South Exposure-------	Favorable	850	Bluebunch wheatgrass----------	75
		Normal	700	Sandberg bluegrass----------	10
		Unfavorable	350	Thurber needlegrass----------	5
66B---------- Waha	Moist Rolling Hills----------	Favorable	1,500	Idaho fescue----------	70
		Normal	1,400	Bluebunch wheatgrass----------	10
		Unfavorable	700	Sandberg bluegrass----------	5
67D, 67E---------- Waha	North Exposure----------	Favorable	1,300	Idaho fescue----------	70
		Normal	1,000	Bluebunch wheatgrass----------	15
		Unfavorable	650	Cusick bluegrass----------	5
68D---------- Waha	South Exposure----------	Favorable	1,400	Bluebunch wheatgrass----------	55
		Normal	1,300	Idaho fescue----------	20
		Unfavorable	600	Sandberg bluegrass----------	10
69D*:					
Waha----------	Biscuit (moist)----------	Favorable	1,500	Idaho fescue----------	70
		Normal	1,400	Bluebunch wheatgrass----------	10
		Unfavorable	700	Sandberg bluegrass----------	5
Rockly----------	Scabland----------	Favorable	400	Sandberg bluegrass----------	80
		Normal	350	Bluebunch wheatgrass----------	5
		Unfavorable	150		
70B, 70C, 70D, 71A, 71B, 71C, 71D, 71E, 72C, 72D----- Warden	Silty Terrace----------	Favorable	650	Bluebunch wheatgrass----------	70
		Normal	500	Sandberg bluegrass----------	20
		Unfavorable	200		
73E---------- Waterbury	South Exposure----------	Favorable	1,400	Bluebunch wheatgrass----------	55
		Normal	1,300	Idaho fescue----------	20
		Unfavorable	600	Sandberg bluegrass----------	10
74F*:					
Waterbury---------	Droughty South Exposure-------	Favorable	700	Bluebunch wheatgrass----------	80
		Normal	600	Sandberg bluegrass----------	10
		Unfavorable	250	Thurber needlegrass----------	5
Rock outcrop.					
75B, 75C, 75D------ Willis	Droughty Rolling Hills--------	Favorable	700	Bluebunch wheatgrass----------	65
		Normal	650	Sandberg bluegrass----------	25
		Unfavorable	200		
76C---------- Winchester	Sand Terrace----------	Favorable	600	Indian ricegrass----------	45
		Normal	450	Antelope bitterbrush----------	20
		Unfavorable	250	Yellow wildrye----------	10
				Buckwheat----------	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
77F*:					
Wrentham	North Exposure	Favorable	1,450	Idaho fescue	70
		Normal	1,300	Bluebunch wheatgrass	15
		Unfavorable	700	Sandberg bluegrass	5
Rock outcrop.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
5E---------- Boardtree	3r	Moderate	Slight	Slight	Moderate	Douglas-fir--------- Ponderosa pine------	70 ---	Douglas-fir, ponderosa pine.
16C, 17E---------- Hall Ranch	3o	Slight	Slight	Slight	Slight	Douglas-fir--------- Ponderosa pine------ Douglas-fir---------	66 79 ---	Douglas-fir, ponderosa pine.
18E---------- Hankins	4o	Moderate	Moderate	Slight	Slight	Ponderosa pine------	71	Ponderosa pine.
19C, 19E---------- Helter	2o	Moderate	Slight	Slight	Moderate	Western larch------- Douglas-fir--------- Grand fir----------- Lodgepole pine------	60 78 --- 80	Douglas-fir.
19F---------- Helter	2r	Severe	Slight	Slight	Moderate	Western larch------- Douglas-fir--------- Grand fir----------- Lodgepole pine------	60 78 --- 80	Douglas-fir.
23D---------- Klicker	5o	Moderate	Severe	Moderate	Slight	Ponderosa pine------	68	Ponderosa pine.
24E---------- Klicker	4o	Moderate	Moderate	Moderate	Moderate	Ponderosa pine------ Douglas-fir---------	79 ---	Ponderosa pine, Douglas-fir.
24F---------- Klicker	4r	Severe	Moderate	Moderate	Moderate	Ponderosa pine------ Douglas-for---------	79 ---	Ponderosa pine, Douglas-fir.
25E---------- Klicker	5o	Moderate	Severe	Moderate	Slight	Ponderosa pine------ Douglas-fir---------	68 ---	Ponderosa pine.
25F---------- Klicker	5r	Severe	Severe	Moderate	Slight	Ponderosa pine------ Douglas-fir---------	68 ---	Ponderosa pine.
27E---------- Labuck	5o	Slight	Moderate	Moderate	Slight	Ponderosa pine------ Douglas-fir---------	61 56	Ponderosa pine.
60C, 60E---------- Tolo	2o	Slight	Slight	Slight	Slight	Douglas-fir--------- Western larch------- Grand fir----------- Lodgepole pine------ Ponderosa pine------	76 --- --- --- 100	Douglas-fir.
60F---------- Tolo	2r	Severe	Slight	Slight	Slight	Douglas-fir--------- Western larch------- Grand fir----------- Lodgepole pine------ Ponderosa pine------	76 --- --- --- 100	Douglas-fir.

TABLE 8.--WOODLAND UNDERSTORY VEGETATION

[Only the soils suitable for production of commercial trees are listed]

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
5E---------- Boardtree	Favorable	900	Pinegrass----------	55
	Normal	800	Elk sedge----------	25
	Unfavorable	650	Peavine----------	5
16C, 17E---------- Hall Ranch	Favorable	900	Pinegrass----------	55
	Normal	800	Elk sedge----------	25
	Unfavorable	650	Peavine----------	5
18E---------- Hankins	Favorable	900	Elksedge----------	45
	Normal	750	Pinegrass----------	20
	Unfavorable	450	Idaho fescue----------	5
19C, 19E, 19F------ Helter	Favorable	---	Bearberry----------	5
	Normal	---	Pinegrass----------	5
	Unfavorable	---	Peavine----------	5
23D---------- Klicker	Favorable	1,700	Idaho fescue----------	45
	Normal	1,400	Bluebunch wheatgrass----------	20
	Unfavorable	750	Sandberg bluegrass----------	5
24E, 24F---------- Klicker	Favorable	---	Elk sedge----------	40
	Normal	---	Pinegrass----------	10
	Unfavorable	---	Peavine----------	5
25E, 25F---------- Klicker	Favorable	1,700	Idaho fescue----------	45
	Normal	1,400	Bluebunch wheatgrass----------	20
	Unfavorable	750	Sandberg bluegrass----------	5
27E---------- Labuck	Favorable	875	Elk sedge----------	40
	Normal	700	Pinegrass----------	10
	Unfavorable	450	Idaho fescue----------	5
			Bearberry----------	5
60C, 60E, 60F------ Tolo	Favorable	---	Common snowberry----------	15
	Normal	---	Elk sedge----------	10
	Unfavorable	---	Pinegrass----------	5
			Bearberry----------	5
			Peavine----------	5

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
8E, 8C---------- Burbank	---	---	Russian-olive-----	Black locust------	Idahybrid poplar.
10B, 10C---------- Ellum	---	Russian-olive-----	Black locust------	---	---
20B, 20C---------- Hezel	---	Siberian peashrub, Nanking cherry, northern whitecedar, multiflora rose.	Russian-olive-----	Austrian pine, ponderosa pine, scotch pine, Douglas-fir, green ash, blue spruce.	Idahybrid poplar.
21B, 21C---------- Irrigon	---	Russian-olive-----	Black locust------	---	---
39C, 40C---------- Quincy	---	Siberian peashrub, Nanking cherry, multiflora rose.	Russian-olive-----	Austrian pine, ponderosa pine, scotch pine, Douglas-fir, green ash.	Lombardy poplar.
41B---------- Quinton	---	Siberian peashrub, Nanking cherry, multiflora rose.	Russian-olive-----	Black locust, Russian mulberry.	Idahybrid poplar.
42D*: Quinton---------- Rock outcrop.	---	Siberian peashrub, Nanking cherry, multiflora rose.	Russian-olive-----	Black locust, Russian mulberry.	Idahybrid poplar.
44B, 44C, 44D, 45A, 45B, 45C, 45D, 46E, 47E---- Ritzville	Lilac----------	Green ash, Rocky Mountain juniper, Siberian peashrub, Russian-olive.	Black locust------	---	---
51B, 51C, 52B, 52C, 52D, 53A---- Royal	---	---	Black locust------	Russian mulberry	Idahybrid poplar.
54B, 54C, 54D, 55B, 55C--------- Sagehill	---	---	Black locust------	Russian mulberry	Idahybrid poplar.
58A, 58B, 58C, 59B---------- Taunton	---	---	---	Black locust, Russian mulberry.	Idahybrid poplar.
76C---------- Winchester	---	Siberian peashrub, Nanking cherry, northern whitecedar, multiflora rose.	Russian-olive-----	Austrian pine, ponderosa pine, scotch pine, Douglas-fir, green ash, blue spruce.	Lombardy poplar.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1*: Aquepts. Aquolls.					
2D---- Bakeoven	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
3D*: Bakeoven----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
Morrow----	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope.	Severe: frost action.
4D*: Bakeoven----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
Valby----	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: frost action.
5E---- Boardtree	Severe: slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, slope, low strength.	Severe: low strength, slope, shrink-swell.
6C---- Bocker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
7C*: Bocker----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Wrightman----	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action, low strength.
8B---- Burbank	Severe: cutbanks cave.	Slight----	Slight----	Slight----	Slight.
8C---- Burbank	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
9*. Dune land					
10B---- Ellum	Moderate: cemented pan.	Slight----	Moderate: cemented pan.	Slight----	Moderate: frost action.
10C---- Ellum	Moderate: slope, cemented pan.	Moderate: slope.	Moderate: slope, cemented pan.	Severe: slope.	Moderate: slope, frost action.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
11---------- Endersby	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength, frost action.
12---------- Esquatzel	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
13D---------- Gravden	Severe: cemented pan.	Moderate: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Moderate: slope, frost action, cemented pan.
13E---------- Gravden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
14E---------- Gwin	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.
15F*: Gwin---------- Rock outcrop.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.
16C---------- Hall Ranch	Moderate: depth to rock.	Slight----------	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength, frost action.
17E---------- Hall Ranch	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
18E---------- Hankins	Severe: slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
19C---------- Helter	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Severe: frost action.
19E, 19F---------- Helter	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope.
20B---------- Hezel	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength.
20C---------- Hezel	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.
21B---------- Irrigon	Moderate: depth to rock.	Moderate: low strength.	Moderate: depth to rock, low strength.	Moderate: low strength.	Moderate: low strength, frost action.
21C---------- Irrigon	Moderate: slope, depth to rock.	Moderate: slope, low strength.	Moderate: slope, depth to rock, low strength.	Severe: slope.	Moderate: slope, frost action, low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
22--Kimberly	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
23D--Klicker	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.
24E, 24F, 25E, 25F--Klicker	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.
26B--Koehler	Severe: cutbanks cave.	Slight	Moderate: cemented pan.	Slight	Slight.
26C--Koehler	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, cemented pan.	Severe: slope.	Moderate: slope.
27E--Labuck	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
28E--Lickskillet	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.
29F*: Lickskillet	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.
Rock outcrop.					
30B--Mikkalo	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, low strength.
30C--Mikkalo	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, low strength, slope.
30D--Mikkalo	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
31B--Morrow	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: frost action.
31C--Morrow	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope.	Severe: frost action.
32D, 32E, 33D, 33E--Morrow	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, frost action.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
34F---------- Nansene	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.
35---------- Onyx	Slight----------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.
36---------- Pedigo	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action.
37A---------- Prosser	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock, frost action, low strength.
37B---------- Prosser	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action, low strength.
38D*: Prosser----------	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.
Rock outcrop.					
39C, 40C---------- Quincy	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
41B---------- Quinton	Severe: depth to rock, cutbanks cave.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
42D*: Quinton----------	Severe: depth to rock, cutbanks cave.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.
Rock outcrop.					
43B---------- Rhea	Slight----------	Slight----------	Slight----------	Moderate: slope.	Severe: frost action.
43C---------- Rhea	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.
43D, 43E, 43F----- Rhea	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.
44B---------- Ritzville	Slight----------	Slight----------	Slight----------	Moderate: slope.	Severe: frost action.
44C---------- Ritzville	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.
44D---------- Ritzville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.
45A---------- Ritzville	Slight----------	Slight----------	Slight----------	Slight----------	Severe: frost action.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
45B---------- Ritzville	Slight----------	Slight----------	Slight----------	Moderate: slope.	Severe: frost action.
45C---------- Ritzville	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.
45D, 46E, 47E----- Ritzville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.
48*. Riverwash					
49F*: Rock outcrop.					
Rubble land.					
50D---------- Rockly	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
51B---------- Royal	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.
51C---------- Royal	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.
52B---------- Royal	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.
52C---------- Royal	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.
52D---------- Royal	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
53A---------- Royal	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.
54B---------- Sagehill	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength, frost action.
54C---------- Sagehill	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.
54D---------- Sagehill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
55B---------- Sagehill	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength, frost action.
55C---------- Sagehill	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
56F---------- Snell	Severe: slope, depth to rock.	Severe: slope, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope, shrink-swell.
57---------- Snow	Slight----------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.
58A, 58B---------- Taunton	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.
58C---------- Taunton	Severe: cemented pan.	Moderate: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Moderate: slope, cemented pan.
59B---------- Taunton	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.
60C---------- Tolo	Moderate: slope.	Moderate: slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: frost action.
60E, 60F---------- Tolo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.
61E---------- Ukiah	Severe: slope, depth to rock.	Severe: slope, low strength, shrink-swell.	Severe: slope, depth to rock, low strength.	Severe: slope, depth to rock, low strength.	Severe: slope, low strength, shrink-swell.
62D---------- Utley	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, low strength.
63B---------- Valby	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: frost action.
63C---------- Valby	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: frost action.
64D, 65D, 65E----- Valby	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, frost action.
66B---------- Waha	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Moderate: depth to rock, low strength, frost action.
67D, 67E, 68D----- Waha	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
69D*: Waha----------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.
Rockly----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
70B---------- Warden	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength, frost action.
70C---------- Warden	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength, frost action.
70D---------- Warden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
71A, 71B---------- Warden	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength, frost action.
71C---------- Warden	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength, frost action.
71D, 71E---------- Warden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
72C---------- Warden	Slight----------	Slight----------	Slight----------	Moderate: slope.	Moderate: low strength, frost action.
72D---------- Warden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
73E---------- Waterbury	Severe: depth to rock, large stones, slope.	Severe: large stones, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.
74F*: Waterbury--------	Severe: depth to rock, large stones, slope.	Severe: large stones, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.
Rock outcrop.					
75B---------- Willis	Moderate: cemented pan.	Slight----------	Moderate: cemented pan.	Slight----------	Moderate: low strength, frost action.
75C---------- Willis	Moderate: cemented pan, slope.	Moderate: slope.	Moderate: cemented pan, slope.	Severe: slope.	Moderate: slope, low strength, frost action.
75D---------- Willis	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
76B---------- Winchester	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
77F*: Wrentham---------	Severe: slope, depth to rock, large stones.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, large stones.
Rock outcrop.					

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
78*. Xeric Torriorthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1*: Aquepts. Aquolls.					
2D---- Bakeoven	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, small stones, area reclaim.
3D*: Bakeoven----	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, small stones, area reclaim.
Morrow----	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
4D*: Bakeoven----	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, small stones, area reclaim.
Valby----	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
5E---- Boardtree	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
6C---- Bocker	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Slight----	Poor: thin layer, small stones, area reclaim.
7C*: Bocker----	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Slight----	Poor: thin layer, small stones, area reclaim.
Wrightman----	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Slight----	Fair: thin layer.
8B---- Burbank	Slight----	Severe: seepage.	Severe: too sandy.	Slight----	Poor: seepage, too sandy, small stones.
8C---- Burbank	Moderate: slope.	Severe: slope, seepage.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy, small stones.
9*. Dune land					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10B--Ellum	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Poor: thin layer, area reclaim.
10C--Ellum	Severe: cemented pan.	Severe: slope, cemented pan.	Severe: cemented pan.	Slight	Poor: thin layer, area reclaim.
11--Endersby	Moderate: floods.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Good.
12--Esquatzel	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
13D--Gravden	Severe: cemented pan.	Severe: slope, cemented pan.	Severe: cemented pan.	Moderate: slope.	Poor: thin layer.
13E--Gravden	Severe: slope, cemented pan.	Severe: slope, cemented pan.	Severe: slope, cemented pan.	Severe: slope.	Poor: slope, thin layer.
14E--Gwin	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope.	Poor: slope, thin layer, large stones.
15F*: Gwin	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope.	Poor: slope, thin layer, large stones.
Rock outcrop.					
16C--Hall Ranch	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, area reclaim.
17E--Hall Ranch	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, area reclaim, slope.
18E--Hankins	Severe: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: too clayey, slope.
19C--Helter	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer, area reclaim, slope.
19E, 19F--Helter	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
20B--Hezel	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
20C--Hezel	Severe: percs slowly.	Severe: slope, seepage.	Slight	Moderate: slope.	Fair: slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
21B---------- Irrigon	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Fair: thin layer.
21C---------- Irrigon	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: slope, thin layer.
22---------- Kimberly	Moderate: floods.	Severe: floods, seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
23D---------- Klicker	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
24E, 24F, 25E, 25F-- Klicker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: thin layer, area reclaim, slope.
26B---------- Koehler	Severe: cemented pan.	Severe: cemented pan, seepage.	Severe: cemented pan.	Slight----------	Fair: too sandy, thin layer.
26C---------- Koehler	Severe: cemented pan.	Severe: cemented pan, seepage, slope.	Severe: cemented pan.	Moderate: slope.	Fair: slope, too sandy, thin layer.
27E---------- Labuck	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, area reclaim, slope.
28E---------- Lickskillet	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope.	Poor: slope, large stones, thin layer.
29F*: Lickskillet--------	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope.	Poor: slope, large stones, thin layer.
Rock outcrop.					
30B---------- Mikkalo	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer, area reclaim.
30C---------- Mikkalo	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
30D---------- Mikkalo	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, area reclaim, slope.
31B---------- Morrow	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer, area reclaim.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
31C---------- Morrow	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: slope, thin layer, area reclaim.
32D---------- Morrow	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
32E---------- Morrow	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
33D---------- Morrow	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
33E---------- Morrow	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
34F---------- Nansene	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
35---------- Onyx	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
36---------- Pedigo	Moderate: floods, wetness.	Severe: floods.	Severe: wetness.	Moderate: floods, wetness.	Fair: wetness.
37A, 37B---------- Prosser	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer.
38D*: Prosser----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer.
Rock outcrop.					
39C, 40C---------- Quincy	Slight----------	Severe: slope, seepage.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
41B---------- Quinton	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Severe: seepage.	Poor: thin layer, too sandy.
42D*: Quinton----------	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: seepage.	Poor: thin layer, too sandy.
Rock outcrop.					
43B---------- Rhea	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----------	Slight----------	Good.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
43C---------- Rhea	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope.
43D---------- Rhea	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
43E, 43F---------- Rhea	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
44B---------- Ritzville	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----------	Slight----------	Good.
44C---------- Ritzville	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope.
44D---------- Ritzville	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
45A---------- Ritzville	Moderate: percs slowly.	Moderate: seepage.	Slight----------	Slight----------	Good.
45B---------- Ritzville	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----------	Slight----------	Good.
45C---------- Ritzville	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope.
45D---------- Ritzville	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
46E, 47E---------- Ritzville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
48*. Riverwash					
49F*: Rock outcrop.					
Rubble land.					
50D---------- Rockly	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, small stones, area reclaim.
51B---------- Royal	Slight----------	Severe: seepage.	Moderate: too sandy.	Slight----------	Fair: too sandy.
51C---------- Royal	Moderate: slope.	Severe: seepage, slope.	Moderate: too sandy.	Moderate: slope.	Fair: slope, too sandy.
52B---------- Royal	Slight----------	Severe: seepage.	Moderate: too sandy.	Slight----------	Fair: too sandy.
52C---------- Royal	Moderate: slope.	Severe: seepage, slope.	Moderate: too sandy.	Moderate: slope.	Fair: slope, too sandy.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
52D---------- Royal	Severe: slope.	Severe: seepage, slope.	Moderate: slope, too sandy.	Severe: slope.	Poor: slope.
53A---------- Royal	Slight----------	Severe: seepage.	Moderate: too sandy.	Slight----------	Fair: too sandy.
54B---------- Sagehill	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----------	Slight----------	Good.
54C---------- Sagehill	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope.
54D---------- Sagehill	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
55B---------- Sagehill	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----------	Slight----------	Good.
55C---------- Sagehill	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope.
56F---------- Snell	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, large stones, thin layer.
57---------- Snow	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
58A, 58B---------- Taunton	Severe: cemented pan.	Severe: cemented pan, seepage.	Severe: cemented pan.	Slight----------	Poor: thin layer.
58C---------- Taunton	Severe: cemented pan.	Severe: slope, seepage, cemented pan.	Severe: cemented pan.	Moderate: slope.	Poor: thin layer.
59B---------- Taunton	Severe: cemented pan.	Severe: cemented pan, seepage.	Severe: cemented pan.	Slight----------	Poor: thin layer.
60C---------- Tolo	Severe: percs slowly.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope.
60E, 60F---------- Tolo	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
61E---------- Ukiah	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, thin layer, area reclaim.
62D---------- Utley	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope, small stones.
63B---------- Valby	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer, area reclaim.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
63C---------- Valby	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
64D, 65D---------- Valby	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
65E---------- Valby	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
66B---------- Waha	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer, area reclaim.
67D---------- Waha	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
67E---------- Waha	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
68D---------- Waha	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
69D*: Waha----------	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, too clayey.
Rockly----------	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, small stones, area reclaim.
70B---------- Warden	Slight----------	Moderate: slope, seepage.	Slight----------	Slight----------	Good.
70C---------- Warden	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope.
70D---------- Warden	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
71A---------- Warden	Slight----------	Moderate: seepage.	Slight----------	Slight----------	Good.
71B---------- Warden	Slight----------	Moderate: slope, seepage.	Slight----------	Slight----------	Good.
71C---------- Warden	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.	Fair: slope.
71D---------- Warden	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
71E---------- Warden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
72C---------- Warden	Slight----------	Severe: slope.	Slight----------	Slight----------	Good.
72D---------- Warden	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
73E---------- Waterbury	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: slope.	Poor: thin layer, large stones, slope.
74F*: Waterbury----------	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope.	Poor: thin layer, large stones, slope.
Rock outcrop.					
75B---------- Willis	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight----------	Poor: thin layer, area reclaim.
75C---------- Willis	Severe: cemented pan.	Severe: slope, cemented pan.	Severe: cemented pan.	Moderate: slope.	Poor: thin layer, area reclaim.
75D---------- Willis	Severe: cemented pan.	Severe: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Poor: slope, thin layer, area reclaim.
76B---------- Winchester	Slight----------	Severe: seepage.	Severe: too sandy.	Slight----------	Poor: too sandy.
77F*: Wrentham----------	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope.	Poor: slope, large stones, thin layer.
Rock outcrop.					
78*. Xeric Torriorthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1*: Aquepts. Aquolls.				
2D---- Bakeoven	Poor: area reclaim, thin layer.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: thin layer, large stones, area reclaim.
3D*: Bakeoven----	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Morrow----	Poor: thin layer, frost action.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Fair: slope, too clayey, thin layer.
4D*: Bakeoven----	Poor: area reclaim, thin layer.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: thin layer, large stones, area reclaim.
Valby----	Poor: area reclaim, frost action, thin layer.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Fair: slope, thin layer, area reclaim.
5E---- Boardtree	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
6C---- Bocker	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: thin layer, small stones, area reclaim.
7C*: Bocker----	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: thin layer, small stones, area reclaim.
Wrightman----	Fair: thin layer, low strength, frost action.	Unsuited: thin layer.	Unsuited: thin layer.	Fair: thin layer, area reclaim.
8B, 8C---- Burbank	Good----	Fair: small stones.	Good----	Poor: too sandy, small stones.
9*. Dune land				
10B, 10C---- Ellum	Poor: thin layer.	Poor: excess fines.	Poor: thin layer.	Poor: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11--- Endersby	Fair: low strength, frost action.	Poor: excess fines.	Poor: excess fines.	Good.
12--- Esquatzel	Fair: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
13D--- Gravden	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: thin layer, small stones.
13E--- Gravden	Poor: slope, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, thin layer, small stones.
14E--- Gwin	Poor: thin layer, large stones, slope.	Unsuited: thin layer.	Unsuited: large stones, thin layer.	Poor: thin layer, large stones, slope.
15F*: Gwin---	Poor: thin layer, large stones, slope.	Unsuited: thin layer.	Unsuited: large stones, thin layer.	Poor: thin layer, large stones, slope.
Rock outcrop.				
16C--- Hall Ranch	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, area reclaim.
17E--- Hall Ranch	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.
18E--- Hankins	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
19C--- Helter	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
19E, 19F--- Helter	Poor: slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
20B--- Hezel	Fair: low strength.	Poor: thin layer.	Unsuited: excess fines.	Fair: too sandy.
20C--- Hezel	Fair: low strength.	Poor: thin layer.	Unsuited: excess fines.	Fair: slope, too sandy.
21B--- Irrigon	Poor: thin layer.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
21C--- Irrigon	Poor: thin layer.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
22--- Kimberly	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
23D---------- Klicker	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
24E, 24F, 25E, 25F---- Klicker	Poor: thin layer, area reclaim, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, slope.
26B, 26C---------- Koehler	Poor: thin layer.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: thin layer, too sandy.
27E---------- Labuck	Poor: thin layer, area reclaim.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Poor: slope.
28E---------- Lickskillet	Poor: large stones, thin layer, area reclaim.	Unsuited: excess fines, thin layer.	Unsuited: thin layer, excess fines.	Poor: thin layer, area reclaim, large stones.
29F*: Lickskillet----------	Poor: slope, large stones, thin layer.	Unsuited: excess fines, thin layer.	Unsuited: thin layer, excess fines.	Poor: thin layer, area reclaim, large stones.
Rock outcrop.				
30B---------- Mikkalo	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
30C---------- Mikkalo	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim, slope.
30D---------- Mikkalo	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
31B---------- Morrow	Poor: thin layer, frost action, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
31C---------- Morrow	Poor: thin layer, frost action, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.
32D---------- Morrow	Poor: thin layer, frost action, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
32E---------- Morrow	Poor: slope, thin layer, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
33D---------- Morrow	Poor: thin layer, frost action, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
33E---------- Morrow	Poor: slope, thin layer, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
34F---------- Nansene	Poor: slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
35---------- Onyx	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
36---------- Pedigo	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
37A, 37B---------- Prosser	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
38D*: Prosser----------	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Rock outcrop.				
39C, 40C---------- Quincy	Good----------	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
41B---------- Quinton	Poor: thin layer.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer, too sandy.
42D*: Quinton----------	Poor: thin layer.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope, too sandy.
Rock outcrop.				
43B---------- Rhea	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
43C---------- Rhea	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
43D---------- Rhea	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
43E, 43F---------- Rhea	Poor: slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
44B---------- Ritzville	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
44C---------- Ritzville	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
44D---------- Ritzville	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
45A, 45B---------- Ritzville	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
45C---------- Ritzville	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
45D---------- Ritzville	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
46E, 47E---------- Ritzville	Poor: frost action, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
48*. Riverwash				
49F*: Rock outcrop.				
Rubble land.				
50D---------- Rockly	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: thin layer, small stones.
51B---------- Royal	Fair: frost action.	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
51C---------- Royal	Fair: frost action.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, too sandy.
52B---------- Royal	Fair: frost action.	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
52C---------- Royal	Fair: frost action.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, too sandy.
52D---------- Royal	Fair: frost action, slope.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
53A---------- Royal	Fair: frost action.	Poor: excess fines.	Unsuited; excess fines.	Fair: too sandy.
54B---------- Sagehill	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
54C---------- Sagehill	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
54D---------- Sagehill	Fair: low strength, frost action, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
55B---------- Sagehill	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
55C---------- Sagehill	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
56F---------- Snell	Poor: slope, thin layer, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines, thin layer.	Poor: large stones, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
57--- Snow	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
58A, 58B--- Taunton	Poor: thin layer.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: thin layer.
58C--- Taunton	Poor: thin layer.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: slope, thin layer.
59B--- Taunton	Poor: thin layer.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: thin layer.
60C--- Tolo	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
60E, 60F--- Tolo	Poor: slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
61E--- Ukiah	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
62D--- Utley	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, slope.
63B--- Valby	Poor: area reclaim, frost action, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
63C--- Valby	Poor: area reclaim, frost action, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, area reclaim.
64D, 65D--- Valby	Poor: area reclaim, frost action, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
65E--- Valby	Poor: slope, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
66B--- Waha	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
67D--- Waha	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
67E--- Waha	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
68D--- Waha	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
69D*:				
Waha	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, area reclaim.
Rockly	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: thin layer, small stones.
70B	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Warden				
70C	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Warden				
70D	Fair: low strength, slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Warden				
71A, 71B	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Warden				
71C	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Warden				
71D	Fair: low strength, slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Warden				
71E	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Warden				
72C	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Warden				
72D	Fair: low strength, slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Warden				
73E	Poor: thin layer, low strength, shrink-swell.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, large stones, too clayey.
Waterbury				
74F*:				
Waterbury	Poor: thin layer, shrink-swell, slope.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, large stones, too clayey.
Rock outcrop.				
75B	Poor: thin layer, area reclaim.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Fair: area reclaim, thin layer.
Willis				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
75C---------- Willis	Poor: thin layer, area reclaim.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Fair: slope, area reclaim, thin layer.
75D---------- Willis	Poor: thin layer, area reclaim.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope.
76B---------- Winchester	Good----------	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
77F*: Wrentham----------	Poor: slope, thin layer, large stones.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
Rock outcrop.				
78*. Xeric Torriorthents				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1*: Aquepts. Aquolls.						
2D---- Bakeoven	Slope, depth to rock.	Thin layer-----			Depth to rock, slope.	Rooting depth, slope.
3D*: Bakeoven----	Slope, depth to rock.	Thin layer-----			Depth to rock, slope.	Rooting depth, slope.
Morrow----	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Depth to rock	Droughty, erodes easily, rooting depth.
4D*: Bakeoven----	Slope, depth to rock.	Thin layer-----			Depth to rock, slope.	Rooting depth, slope.
Valby----	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Depth to rock	Rooting depth.
5E---- Boardtree	Slope----	Piping----			Slope, percs slowly.	Slope, percs slowly.
6C---- Bocker	Depth to rock	Thin layer-----			Depth to rock	Rooting depth, droughty.
7C*: Bocker----	Depth to rock	Thin layer-----			Depth to rock	Rooting depth, droughty.
Wrightman----	Depth to rock, slope.	Thin layer-----	Depth to rock, slope.	Rooting depth, slope.	Rooting depth	Slope, rooting depth.
8B---- Burbank	Seepage----	Seepage----	Slope, cutbanks cave.	Slope, droughty, soil blowing.	Soil blowing, droughty.	Droughty.
8C---- Burbank	Slope, seepage.	Seepage----	Slope, cutbanks cave.	Slope, droughty, soil blowing.	Slope, soil blowing, droughty.	Droughty.
9*. Dune land						
10B---- Ellum	Seepage----	Seepage----	Slope, cemented pan.	Slope, rooting depth, droughty.	Cemented pan---	Rooting depth, droughty.
10C---- Ellum	Slope, seepage.	Seepage----	Slope, cemented pan.	Slope, rooting depth, droughty.	Cemented pan---	Rooting depth, droughty.
11---- Endersby	Seepage----	Piping, seepage.	Favorable------	Droughty-------	Favorable------	Favorable.
12---- Esquatzel	Seepage----	Piping----	Favorable------	Favorable------	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
13D, 13E---------- Gravden	Slope, cemented pan.	Seepage, thin layer.			Slope, cemented pan.	Slope, droughty, rooting depth.
14E---------- Gwin	Slope, depth to rock.	Thin layer, large stones.			Slope, large stones, depth to rock.	Slope, large stones, rooting depth.
15F*: Gwin----------	Slope, depth to rock.	Thin layer, large stones.			Slope, large stones, depth to rock.	Slope, large stones, rooting depth.
Rock outcrop.						
16C---------- Hall Ranch	Seepage, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth.	Depth to rock	Rooting depth.
17E---------- Hall Ranch	Seepage, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Rooting depth, slope.
18E---------- Hankins	Slope----------	Hard to pack---	Percs slowly, slope.	Percs slowly, slope.	Percs slowly, slope.	Percs slowly, slope.
19C---------- Helter	Seepage, depth to rock.	Piping---------	Depth to rock, frost action, slope.	Erodes easily, slope.	Erodes easily	Erodes easily, slope.
19E, 19F---------- Helter	Seepage, depth to rock.	Piping---------	Depth to rock, frost action, slope.	Erodes easily, slope.	Erodes easily, slope.	Erodes easily, slope.
20B---------- Hezel	Favorable------	Piping---------	Slope----------	Slope, soil blowing, too sandy.	Soil blowing---	Favorable.
20C---------- Hezel	Slope----------	Piping---------	Slope----------	Slope, soil blowing, too sandy.	Slope, soil blowing.	Slope.
21B---------- Irrigon	Depth to rock	Piping---------	Slope, depth to rock.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, rooting depth.
21C---------- Irrigon	Slope, depth to rock.	Piping---------	Slope, depth to rock.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, rooting depth.
22---------- Kimberly	Seepage--------	Seepage, piping.	Cutbanks cave	Favorable------	Favorable------	Favorable.
23D---------- Klicker	Depth to rock	Thin layer, piping.	Depth to rock, slope.	Rooting depth, large stones, slope.	Large stones---	Slope, large stones, rooting depth.
24E, 24F, 25E, 25F---------- Klicker	Depth to rock	Thin layer, piping.	Depth to rock, slope.	Rooting depth, large stones, slope.	Large stones, slope.	Slope, large stones, rooting depth.
26B---------- Koehler	Cemented pan, seepage.	Piping, seepage.	Slope, cemented pan, poor outlets.	Slope, droughty.	Cemented pan---	Droughty, rooting depth.
26C---------- Koehler	Slope, cemented pan, seepage.	Piping, seepage.	Slope, cemented pan, poor outlets.	Slope, droughty.	Slope, cemented pan.	Droughty, rooting depth.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
27E---------- Labuck	Slope, seepage, depth to rock.	Thin layer-----	Depth to rock, slope.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, rooting depth.
28E---------- Lickskillet	Slope, depth to rock.	Thin layer, large stones.			Depth to rock, large stones, slope.	Rooting depth, large stones, slope.
29F*: Lickskillet------	Slope, depth to rock.	Thin layer, large stones.			Depth to rock, large stones, slope.	Rooting depth, large stones, slope.
Rock outcrop.						
30B, 30C---------- Mikkalo	Depth to rock, seepage.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Depth to rock, erodes easily.	Rooting depth.
30D---------- Mikkalo	Depth to rock, seepage.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Slope, rooting depth.
31B---------- Morrow	Depth to rock	Piping, thin layer.	Depth to rock	Slope, rooting depth, erodes easily.	Depth to rock	Droughty, erodes easily, rooting depth.
31C---------- Morrow	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Depth to rock	Droughty, erodes easily, rooting depth.
32D, 32E, 33D, 33E---------- Morrow	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Slope, rooting depth, erodes easily.
34F---------- Nansene	Slope----------	Piping---------			Slope, erodes easily.	Slope, erodes easily.
35---------- Onyx	Seepage--------	Piping---------	Floods, frost action.	Erodes easily, floods.	Favorable------	Erodes easily.
36---------- Pedigo	Seepage--------	Piping---------	Wetness--------	Wetness--------	Wetness--------	Favorable.
37A---------- Prosser	Depth to rock	Piping, thin layer.	Depth to rock	Rooting depth, erodes easily.	Depth to rock, erodes easily.	Erodes easily.
37B---------- Prosser	Depth to rock	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Depth to rock, erodes easily.	Erodes easily.
38D*: Prosser----------	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily.
Rock outcrop.						
39C, 40C---------- Quincy	Slope, seepage.	Piping, seepage.	Slope, cutbanks cave.	Complex slope, soil blowing, droughty.	Soil blowing, too sandy.	Droughty.
41B---------- Quinton	Seepage--------	Piping---------	Slope, depth to rock, cutbanks cave.	Droughty, fast intake, soil blowing.	Soil blowing, too sandy.	Depth to rock, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
42D*: Quinton	Seepage	Piping	Slope, depth to rock, cutbanks cave.	Droughty, fast intake, soil blowing.	Soil blowing, too sandy.	Depth to rock, droughty.
Rock outcrop.						
43B Rhea	Seepage	Piping	Frost action	Slope, erodes easily.	Erodes easily	Erodes easily.
43C Rhea	Slope, seepage.	Piping	Slope, frost action.	Slope, erodes easily.	Erodes easily	Erodes easily.
43D, 43E, 43F Rhea	Slope, seepage.	Piping	Slope, frost action.	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
44B Ritzville	Seepage	Piping	Slope, frost action.	Complex slope, erodes easily.	Erodes easily	Erodes easily.
44C, 44D Ritzville	Slope, seepage.	Piping	Slope, frost action.	Complex slope, erodes easily.	Complex slope, erodes easily.	Complex slope, erodes easily.
45A, 45B Ritzville	Seepage	Piping	Slope, frost action.	Complex slope, erodes easily.	Erodes easily	Erodes easily.
45C, 45D, 46E, 47E Ritzville	Slope, seepage.	Piping	Slope, frost action.	Complex slope, erodes easily.	Complex slope, erodes easily.	Complex slope, erodes easily.
48*. Riverwash						
49F*: Rock outcrop.						
Rubble land.						
50D Rockly	Slope, depth to rock.	Thin layer			Large stones, depth to rock.	Large stones, rooting depth, slope.
51B Royal	Seepage	Piping, seepage.	Slope, cutbanks cave.	Slope, erodes easily.	Soil blowing	Erodes easily.
51C Royal	Slope, seepage.	Piping, seepage.	Slope, cutbanks cave.	Slope, erodes easily.	Slope, soil blowing.	Erodes easily.
52B Royal	Seepage	Piping, seepage.	Slope, cutbanks cave.	Slope, erodes easily.	Soil blowing	Erodes easily.
52C, 52D Royal	Slope, seepage.	Piping, seepage.	Slope, cutbanks cave.	Slope, erodes easily.	Slope, soil blowing.	Slope, erodes easily.
53A Royal	Seepage	Piping, seepage.	Cutbanks cave	Droughty, erodes easily.	Soil blowing	Erodes easily.
54B Sagehill	Slope, seepage.	Piping	Slope	Slope, erodes easily, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
54C, 54D Sagehill	Slope, seepage.	Piping	Slope	Slope, erodes easily, soil blowing.	Slope, erodes easily, soil blowing.	Slope, erodes easily.
55B Sagehill	Slope, seepage.	Piping	Slope	Slope, erodes easily, soil blowing.	Erodes easily, soil blowing.	Erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
55C---------- Sagehill	Slope, seepage.	Piping---------	Slope----------	Slope, erodes easily, soil blowing.	Slope, erodes easily, soil blowing.	Slope, erodes easily.
56F---------- Snell	Slope, depth to rock.	Large stones, thin layer.			Depth to rock, large stones.	Rooting depth, large stones.
57---------- Snow	Seepage--------	Piping---------	Favorable------	Favorable------	Favorable------	Favorable.
58A---------- Taunton	Cemented pan, seepage.	Thin layer, piping.	Cemented pan---	Rooting depth, droughty.	Cemented pan, rooting depth.	Rooting depth.
58B---------- Taunton	Cemented pan, seepage.	Thin layer, piping.	Slope, cemented pan.	Slope, rooting depth, erodes easily.	Cemented pan, rooting depth.	Rooting depth, erodes easily.
58C---------- Taunton	Slope, cemented pan, seepage.	Thin layer, piping.	Slope, cemented pan.	Slope, rooting depth, erodes easily.	Slope, cemented pan, erodes easily.	Slope, rooting depth, erodes easily.
59B---------- Taunton	Cemented pan, seepage.	Thin layer, piping.	Slope, cemented pan.	Slope, rooting depth, erodes easily.	Cemented pan, rooting depth.	Rooting depth, erodes easily.
60C, 60E, 60F----- Tolo	Slope, seepage.	Piping---------	Slope, frost action.	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
61E---------- Ukiah	Slope, depth to rock.	Thin layer-----	Slope, percs slowly, large stones.	Slope, percs slowly, slow intake.	Slope, percs slowly, large stones.	Slope, percs slowly, large stones.
62D---------- Utley	Seepage, slope.	Piping---------	Slope----------	Slope----------	Slope----------	Slope.
63B---------- Valby	Depth to rock	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Depth to rock	Rooting depth.
63C---------- Valby	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Depth to rock	Rooting depth.
64D, 65D, 65E----- Valby	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth.
66B---------- Waha	Depth to rock	Thin layer-----	Slope, depth to rock.	Slope, rooting depth.	Depth to rock	Rooting depth.
67D, 67E, 68D----- Waha	Slope, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth.
69D*:						
Waha----------	Slope, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth.
Rockly----------	Slope, depth to rock.	Thin layer-----			Large stones, depth to rock.	Large stones, rooting depth, slope.
70B---------- Warden	Favorable------	Piping---------	Slope----------	Slope, erodes easily.	Erodes easily	Erodes easily.
70C, 70D---------- Warden	Slope----------	Slope, piping.	Slope----------	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
71A---------- Warden	Favorable------	Piping---------	Favorable------	Favorable------	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
71B---------- Warden	Favorable------	Piping---------	Slope----------	Slope, erodes easily.	Erodes easily	Erodes easily.
71C, 71D, 71E----- Warden	Slope----------	Slope, piping.	Slope----------	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
72C---------- Warden	Favorable------	Piping---------	Slope----------	Slope, erodes easily.	Erodes easily	Erodes easily.
72D---------- Warden	Slope----------	Slope, piping.	Slope----------	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
73E---------- Waterbury	Depth to rock, slope.	Thin layer-----			Depth to rock, large stones, slope.	Large stones, rooting depth, slope.
74F*: Waterbury--------	Depth to rock, slope.	Thin layer-----			Depth to rock, large stones, slope.	Large stones, rooting depth, slope.
Rock outcrop.						
75B---------- Willis	Cemented pan---	Thin layer, piping.	Slope, cemented pan.	Slope, rooting depth, erodes easily.	Cemented pan---	Rooting depth, erodes easily.
75C, 75D---------- Willis	Slope, cemented pan.	Thin layer, piping.	Slope, cemented pan.	Slope, rooting depth, erodes easily.	Slope, cemented pan, erodes easily.	Slope, rooting depth, erodes easily.
76B---------- Winchester	Slope, seepage.	Piping, seepage.	Slope, cutbanks cave.	Complex slope, soil blowing, droughty.	Soil blowing, too sandy.	Droughty.
77F*: Wrentham---------	Slope----------	Large stones, piping.			Slope, large stones, depth to rock.	Slope, large stones.
Rock outcrop.						
78*. Xeric Torriorthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1*: Aquepts. Aquolls.				
2D---- Bakeoven	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: slope, depth to rock, large stones.	Severe: large stones.
3D*:				
Bakeoven----	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: slope, depth to rock, large stones.	Severe: large stones.
Morrow----	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
4D*:				
Bakeoven----	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: slope, depth to rock, large stones.	Severe: large stones.
Valby----	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
5E---- Boardtree	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Moderate: slope.
6C---- Bocker	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: depth to rock, small stones, slope.	Severe: small stones.
7C*:				
Bocker----	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: depth to rock, small stones, slope.	Severe: small stones.
Wrightman----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
8B---- Burbank	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy, small stones.	Moderate: too sandy.
8C---- Burbank	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.
9*. Dune land				
10B---- Ellum	Slight----	Slight----	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
10C---------- Ellum	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
11---------- Endersby	Severe: floods.	Slight----------	Slight----------	Slight.
12---------- Esquatzel	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
13D---------- Gravden	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: slope, small stones, cemented pan.	Severe: small stones.
13E---------- Gravden	Severe: slope, small stones, cemented pan.	Severe: slope, small stones, cemented pan.	Severe: slope, small stones, cemented pan.	Severe: slope, small stones.
14E---------- Gwin	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: depth to rock, slope, large stones.	Severe: slope, large stones.
15F*: Gwin----------	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: depth to rock, slope, large stones.	Severe: slope, large stones.
Rock outcrop.				
16C---------- Hall Ranch	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
17E---------- Hall Ranch	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones, dusty.
18E---------- Hankins	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
19C---------- Helter	Moderate: slope, percs slowly, dusty.	Moderate: slope, percs slowly, dusty.	Severe: slope.	Moderate: dusty.
19E, 19F---------- Helter	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
20B---------- Hezel	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
20C---------- Hezel	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.
21B---------- Irrigon	Slight----------	Slight----------	Moderate: slope, depth to rock.	Slight.
21C---------- Irrigon	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
22--Kimberly	Severe: floods.	Slight	Slight	Slight.
23D--Klicker	Severe: large stones.	Moderate: slope, large stones.	Severe: slope, large stones.	Severe: large stones.
24E, 24F, 25E, 25F--Klicker	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: large stones, slope.
26B--Koehler	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
26C--Koehler	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.
27E--Labuck	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
28E--Lickskillet	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, depth to rock.
29F*: Lickskillet	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.
Rock outcrop.				
30B--Mikkalo	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.
30C--Mikkalo	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
30D--Mikkalo	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
31B--Morrow	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
31C--Morrow	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
32D--Morrow	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
32E--Morrow	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
33D--Morrow	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
33E---------- Morrow	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
34F---------- Nansene	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
35---------- Onyx	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
36---------- Pedigo	Severe: floods.	Moderate: wetness, dusty.	Moderate: wetness, dusty.	Moderate: wetness, dusty.
37A---------- Prosser	Moderate: dusty.	Moderate: dusty.	Moderate: dusty, depth to rock.	Moderate: dusty.
37B---------- Prosser	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty, depth to rock.	Moderate: dusty.
38D*: Prosser----------	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
Rock outcrop.				
39C, 40C---------- Quincy	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Moderate: too sandy.
41B---------- Quinton	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, depth to rock, slope.	Moderate: too sandy.
42D*: Quinton----------	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.
Rock outcrop.				
43B---------- Rhea	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
43C---------- Rhea	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
43D---------- Rhea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
43E, 43F---------- Rhea	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
44B---------- Ritzville	Moderate: dusty.	Moderate: dusty.	Moderate: dusty, slope.	Moderate: dusty.
44C---------- Ritzville	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
44D--- Ritzville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
45A, 45B--- Ritzville	Moderate: dusty.	Moderate: dusty.	Moderate: dusty, slope.	Moderate: dusty.
45C--- Ritzville	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
45D--- Ritzville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
46E, 47E--- Ritzville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
48*. Riverwash				
49F*: Rock outcrop.				
Rubble land.				
50D--- Rockly	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.
51B--- Royal	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
51C--- Royal	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.
52B--- Royal	Slight---	Slight---	Moderate: slope.	Slight.
52C--- Royal	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
52D--- Royal	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
53A--- Royal	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
54B--- Sagehill	Slight---	Slight---	Moderate: slope.	Slight.
54C--- Sagehill	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
54D--- Sagehill	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
55B--- Sagehill	Slight---	Slight---	Moderate: slope.	Slight.
55C--- Sagehill	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
56F Snell	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
57 Snow	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
58A Taunton	Slight	Slight	Slight	Slight.
58B Taunton	Slight	Slight	Moderate: slope, cemented pan.	Slight.
58C Taunton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
59B Taunton	Slight	Slight	Moderate: slope, cemented pan.	Slight.
60C Tolo	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
60E, 60F Tolo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
61E Ukiah	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Moderate: slope, large stones.
62D Utley	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
63B Valby	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.
63C Valby	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
64D, 65D Valby	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
65E Valby	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
66B Waha	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.
67D Waha	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
67E Waha	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
68D Waha	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
69D*:				
Waha	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
Rockly	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.
70B Warden	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
70C Warden	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
70D Warden	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
71A Warden	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
71B Warden	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
71C Warden	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
71D Warden	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
71E Warden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
72C Warden	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
72D Warden	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
73E Waterbury	Severe: large stones, depth to rock, slope.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones.
74F*:				
Waterbury	Severe: large stones, depth to rock, slope.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones, slope.
Rock outcrop.				
75B Willis	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty, cemented pan.	Moderate: dusty.

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
75C---------- Willis	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
75D---------- Willis	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: slope, dusty.
76B---------- Winchester	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Moderate: too sandy.
77F*: Wrentham----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
78*. Xeric Torriorthents				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1*: Aquepts. Aquolls.											
2D---------- Bakeoven	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
3D*: Bakeoven----------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Morrow----------	Poor	Fair	Good	---	Very poor.	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
4D*: Bakeoven----------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Valby----------	Fair	Good	Good	---	Very poor.	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
5E---------- Boardtree	Very poor.	Very poor.	Fair	Good	Poor	Very poor.	Very poor.	Very poor.	Fair	Very poor.	---
6C---------- Bocker	Very poor.	Very poor.	Poor	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
7C*: Bocker----------	Very poor.	Very poor.	Poor	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Wrightman----------	Poor	Poor	Good	Very poor.	Good	Very poor.	Very poor.	Poor	---	Very poor.	Good.
8B, 8C---------- Burbank	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
9*. Dune land											
10B, 10C---------- Ellum	Very poor.	Very poor.	Poor	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.
11---------- Endersby	Good	Good	Good	---	Fair	Very poor.	Very poor.	Good	---	Very poor.	Fair.
12---------- Esquatzel	Fair	Fair	Good	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Good.
13D, 13E---------- Gravden	Very poor.	Very poor.	Fair	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
14E---------- Gwin	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
15F*: Gwin----------	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Rock outcrop.											

See footnote at end of table.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
16C, 17E---------- Hall Ranch	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
18E---------- Hankins	Poor	Fair	Fair	Good	Poor	Very poor.	Very poor.	---	Good	Very poor.	Poor.
19C, 19E, 19F------ Helter	Very poor.	Very poor.	Fair	Good	Fair	Very poor.	Very poor.	Very poor.	Good	Very poor.	---
20B, 20C---------- Hezel	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.
21B, 21C---------- Irrigon	Poor	Poor	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
22---------- Kimberly	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Fair	Poor	---
23D, 24E, 24F, 25E, 25F---------- Klicker	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Very poor.	Fair	Very poor.	---
26B, 26C---------- Koehler	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
27E---------- Labuck	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
28E---------- Lickskillet	Very poor.	Very poor.	Fair	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
29F*: Lickskillet------- Rock outcrop.	Very poor.	Very poor.	Fair	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
30B, 30C, 30D------ Mikkalo	Fair	Good	Fair	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
31B, 31C, 32D, 32E, 33D, 33E---------- Morrow	Poor	Fair	Good	---	Very poor.	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
34F---------- Nansene	Very poor.	Very poor.	Good	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
35---------- Onyx	Good	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
36---------- Pedigo	Good	Good	Fair	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
37A, 37B---------- Prosser	Poor	Poor	Good	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Good.
38D*: Prosser---------- Rock outcrop.	Poor	Poor	Good	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Good.
39C, 40C---------- Quincy	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.

See footnote at end of table.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
41B---------- Quinton	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
42D*: Quinton----------	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Rock outcrop.											
43B---------- Rhea	Fair	Good	Good	---	Very poor.	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
43C, 43D, 43E------ Rhea	Poor	Fair	Good	---	Very poor.	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
43F---------- Rhea	Very poor.	Fair	Good	---	Very poor.	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
44B, 44C, 44D, 45A, 45B, 45C, 45D----- Ritzville	Fair	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
46E, 47E---------- Ritzville	Fair	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
48*. Riverwash											
49F*: Rock outcrop.											
Rubble land.											
50D---------- Rockly	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
51B, 51C, 52B, 52C, 52D, 53A---------- Royal	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
54B, 54C, 54D, 55B, 55C---------- Sagehill	Very poor.	Very poor.	Good	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Good.
56F---------- Snell	Very poor.	Poor	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
57---------- Snow	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
58A, 58B, 58C, 59B- Taunton	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
60C, 60E---------- Tolo	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
60F---------- Tolo	Very poor.	Poor	Poor	Good	Fair	Very poor.	Very poor.	Very poor.	Good	Very poor.	---
61E---------- Ukiah	Poor	Fair	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
62D---------- Utley	Poor	Good	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.

See footnote at end of table.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
63B, 63C---------- Valby	Fair	Good	Good	---	Very poor.	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
64D, 65D, 65E. Valby											
66B, 67D---------- Waha	Fair	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
67E---------- Waha	Poor	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
68D---------- Waha	Fair	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
69D*: Waha----------	Fair	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
Rockly----------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
70B, 70C, 70D, 71A, 71B, 71C, 71D----- Warden	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
71E---------- Warden	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
72C, 72D---------- Warden	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
73E---------- Waterbury	Very poor.	Very poor.	Fair	Very poor.	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
74F*: Waterbury---------	Very poor.	Very poor.	Fair	Very poor.	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Rock outcrop.											
75B, 75C---------- Willis	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
75D. Willis											
76B---------- Winchester	Very poor.	Very poor.	Fair	---	Poor	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
77F*: Wrentham----------	Very poor.	Very poor.	Good	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Rock outcrop.											
78*. Xeric Torriorthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1*:											
Aquepts.											
Aquolls.											
2D----------	0-2	Very cobbly loam	GM-GC, GM, SM-SC, SM	A-4	25-55	65-80	60-75	50-70	35-50	25-35	5-10
Bakeoven	2-7	Very gravelly clay loam, very cobbly loam, very gravelly loam.	GM	A-6	15-55	50-65	45-60	40-55	35-50	35-40	10-15
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
3D*:											
Bakeoven----------	0-2	Very cobbly loam	GM-GC, GM, SM-SC, SM	A-4	25-55	65-80	60-75	50-70	35-50	25-35	5-10
	2-7	Very gravelly clay loam, very cobbly loam, very gravelly loam.	GM	A-6	15-55	50-65	45-60	40-55	35-50	35-40	10-15
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Morrow----------	0-9	Silt loam-------	ML	A-4	0	95-100	95-100	90-100	80-90	30-35	5-10
	9-14	Silty clay loam	CL	A-6	0	95-100	95-100	90-100	80-95	35-40	15-20
	14-26	Silt loam, silty clay loam.	ML	A-4	0	95-100	95-100	90-100	80-90	30-35	5-10
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
4D*:											
Bakeoven----------	0-2	Very cobbly loam	GM-GC, GM, SM-SC, SM	A-4	25-55	65-80	60-75	50-70	35-50	25-35	5-10
	2-7	Very gravelly clay loam, very cobbly loam, very gravelly loam.	GM	A-6	15-55	50-65	45-60	40-55	35-50	35-40	10-15
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Valby----------	0-8	Silt loam-------	ML, CL-ML	A-4	0	95-100	95-100	85-100	80-90	25-35	5-10
	8-30	Silt loam-------	ML, CL-ML	A-4	0	95-100	95-100	85-100	80-90	25-35	5-10
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
5E----------	0-14	Loam----------	ML	A-4	0	90-100	85-100	75-95	60-75	30-40	NP-5
Boardtree	14-25	Loam, silt loam	ML	A-4	0	90-100	85-100	75-95	60-80	30-40	NP-5
	25-60	Clay, silty clay, clay loam.	CH	A-7	0	80-90	75-90	70-85	50-85	50-65	30-40

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
6C---------- Bocker	0-2	Very cobbly silt loam.	GM	A-4	25-40	55-65	45-55	40-50	35-45	20-30	NP-5
	2-8	Very gravelly loam, very cobbly silt loam.	GM	A-2	0-40	50-60	40-50	35-45	25-35	20-30	NP-5
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
7C*: Bocker-----------	0-2	Very cobbly silt loam.	GM	A-4	25-40	55-65	45-55	40-50	35-45	20-30	NP-5
	2-8	Very gravelly loam, very cobbly silt loam.	GM	A-2	0-40	50-60	40-50	35-45	25-35	20-30	NP-5
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wrightman---------	0-12	Silt loam-------	ML, CL-ML	A-4	0-10	95-100	90-100	75-95	55-85	25-35	5-10
	12-26	Loam, silt loam, clay loam.	ML, CL-ML	A-4	0-10	95-100	75-90	70-85	50-75	25-35	5-10
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8B, 8C---------- Burbank	0-5	Loamy fine sand	SM	A-2	0-5	95-100	80-95	60-80	15-35	---	NP
	5-20	Loamy sand, loamy fine sand, gravelly loamy sand.	SM	A-2	0-5	85-95	70-90	60-80	15-35	---	NP
	20-34	Very gravelly loamy sand, very gravelly loamy fine sand, very cobbly loamy fine sand.	SM, SP-SM, GM, GP-GM	A-1	5-40	50-75	20-45	15-35	5-15	---	NP
	34-60	Very gravelly sand, very cobbly coarse sand.	GP	A-1	15-50	35-45	10-40	5-15	0-5	---	NP
9*. Dune land											
10B, 10C---------- Ellum	0-13	Fine sandy loam	SM, ML	A-4	0	95-100	95-100	65-85	40-55	---	NP
	13-28	Very gravelly fine sandy loam.	GM	A-1	5-15	35-40	25-35	20-30	10-20	---	NP
	28	Cemented--------	---	---	---	---	---	---	---	---	---
11---------- Endersby	0-12	Fine sandy loam	SM	A-4	0	75-100	75-100	50-65	35-50	20-25	NP-5
	12-36	Fine sandy loam, loam.	SM, ML	A-4	0	75-100	75-100	50-85	35-55	20-25	NP-5
	36-60	Stratified silt loam to loamy sand.	SM, ML	A-2, A-4	0	90-100	80-100	30-60	25-55	20-25	NP-5
12---------- Esquatzel	0-17	Silt loam-------	ML	A-4	0	100	100	90-100	75-95	20-30	NP-5
	17-60	Silt loam-------	ML	A-4	0	100	100	95-100	75-85	20-30	NP-5
13D, 13E---------- Gravden	0-7	Very gravelly loam.	GM	A-1, A-2	0-20	40-55	35-50	20-40	20-35	---	NP
	7-14	Very gravelly loam.	GM	A-1	10-30	30-50	20-40	15-35	10-20	---	NP
	14	Cemented--------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
14E---------- Gwin	0-3	Extremely stony silt loam.	GM	A-2, A-4	45-70	45-60	35-55	35-55	30-50	25-30	NP-5
	3-15	Very cobbly silty clay loam, very cobbly clay loam, very cobbly silt loam.	GM	A-2, A-4	50-70	45-60	35-55	35-55	30-50	30-40	5-15
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
15F*: Gwin----------	0-3	Extremely stony silt loam.	GM	A-2, A-4	45-70	45-60	35-55	35-55	30-50	25-30	NP-5
	3-15	Very cobbly silty clay loam, very cobbly clay loam, very cobbly silt loam.	GM	A-2, A-4	50-70	45-60	35-55	35-55	30-50	30-40	5-15
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
16C---------- Hall Ranch	0-7	Loam----------	ML	A-4	0	80-95	75-90	65-85	50-75	30-40	5-10
	7-23	Loam, gravelly loam, gravelly silt loam.	ML	A-4	0-5	70-95	55-90	55-85	50-75	30-40	5-10
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---
17E---------- Hall Ranch	0-7	Gravelly loam---	ML	A-4	0	70-90	55-80	55-70	50-60	30-40	5-10
	7-23	Loam, gravelly loam, gravelly silt loam.	ML	A-4	0-5	70-95	55-90	55-85	50-75	30-40	5-10
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---
18E---------- Hankins	0-12	Silt loam-------	ML	A-6, A-4	0-5	90-100	85-100	85-100	70-95	30-40	5-15
	12-60	Clay, clay loam, silty clay loam.	CH	A-7	0-15	90-100	85-100	85-100	65-95	50-65	25-35
19C, 19E, 19F------ Helter	0-26	Silt loam-------	ML	A-4, A-5	0	100	100	95-100	85-95	35-45	NP-5
	26-37	Silt loam, loam, silty clay loam.	ML	A-4	0	95-100	90-100	75-100	60-95	30-40	5-10
	37-55	Very gravelly loam, gravelly silt loam.	ML, GM, SM	A-4	0-25	50-80	45-75	40-70	35-65	25-30	NP-5
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
20B, 20C---------- Hezel	0-9	Loamy fine sand	SM	A-2	0	100	100	50-85	15-35	---	NP
	9-30	Loamy fine sand, loamy sand, loamy very fine sand.	SM	A-2	0	100	100	50-75	15-35	---	NP
	30-60	Stratified silt loam to fine sandy loam.	ML	A-4	0	100	100	80-100	50-90	20-25	NP-5

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
21B, 21C---------- Irrigon	0-3	Fine sandy loam	SM, ML	A-4	0	95-100	95-100	65-85	40-55	---	NP
	3-23	Loam, fine sandy loam.	ML	A-4	0	95-100	95-100	80-95	55-75	---	NP
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---
22---------- Kimberly	0-15	Fine sandy loam	ML, SM	A-4, A-2	0	100	100	60-90	30-70	---	NP
	15-60	Sandy loam, fine sandy loam.	SM	A-4, A-2	0	100	100	60-80	30-50	---	NP
23D---------- Klicker	0-11	Stony silt loam	ML	A-4	10-20	80-95	70-90	55-85	55-80	30-40	5-10
	11-26	Very cobbly silt loam, very cobbly silty clay loam.	ML, SM, GM	A-7	40-50	70-80	65-75	60-70	40-65	40-50	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
24E, 24F---------- Klicker	0-11	Stony silt loam	ML	A-4	10-20	80-95	70-90	55-85	55-80	30-40	5-10
	11-26	Very cobbly silt loam, very cobbly silty clay loam.	ML, SM, GM	A-7	40-50	70-80	65-75	60-70	40-65	40-50	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
25E, 25F---------- Klicker	0-11	Very stony silt loam.	ML	A-4	15-25	75-90	65-85	50-80	50-75	30-40	5-10
	11-26	Very cobbly silt loam, very cobbly silty clay loam.	ML, SM, GM	A-7	40-50	70-80	65-75	60-70	40-65	40-50	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
26B, 26C---------- Koehler	0-4	Loamy fine sand	SM	A-2	0-5	85-95	80-90	70-80	15-30	---	NP
	4-28	Loamy fine sand, loamy sand, fine sand.	SM	A-2	0-5	80-90	80-90	65-80	15-25	---	NP
	28	Indurated-------	---	---	---	---	---	---	---	---	---
27E---------- Labuck	0-14	Loam----------	ML	A-4	0	100	75-90	65-80	50-70	---	NP
	14-31	Gravelly loam, gravelly sandy loam.	SM	A-4	0	100	50-75	40-70	35-50	---	NP
	31	Weathered bedrock.	---	---	---	---	---	---	---	---	---
28E---------- Lickskillet	0-2	Very stony loam	GM-GC, CL-ML	A-4	20-50	60-90	60-85	50-80	35-65	25-30	5-10
	2-17	Very cobbly clay loam, very gravelly loam, very cobbly loam.	GC	A-2, A-6, A-7	15-50	40-65	25-50	20-50	15-40	35-45	15-20
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
29F*:											
Lickskillet	0-2	Extremely stony loam.	GM-GC, CL-ML	A-4	20-50	60-90	60-85	50-80	35-65	25-30	5-10
	2-17	Very cobbly clay loam, very gravelly loam, very cobbly loam.	GC	A-2, A-6, A-7	15-50	40-65	25-50	20-50	15-40	35-45	15-20
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
30B, 30C, 30D-----	0-13	Silt loam-------	ML	A-4	0	100	95-100	95-100	80-95	20-30	NP-5
Mikkalo	13-35	Silt loam-------	ML	A-4	0	100	95-100	95-100	80-90	20-30	NP-5
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
31B, 31C, 32D, 32E, 33D, 33E----------	0-9	Silt loam-------	ML	A-4	0	95-100	95-100	90-100	80-90	30-35	5-10
Morrow	9-14	Silty clay loam	CL	A-6	0	95-100	95-100	90-100	80-95	35-40	15-20
	14-26	Silt loam, silty clay loam.	ML	A-4	0	95-100	95-100	90-100	80-90	30-35	5-10
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
34F----------	0-25	Silt loam-------	ML	A-4	0	95-100	95-100	90-100	85-90	20-25	NP-5
Nansene	25-45	Silt loam-------	ML	A-4	0	95-100	95-100	90-100	85-90	20-25	NP-5
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
35----------	0-26	Silt loam-------	ML	A-4	0	100	100	90-100	75-100	20-30	NP-5
Onyx	26-39	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	90-100	75-100	20-30	NP-5
	39-60	Gravelly silt loam, gravelly very fine sandy loam.	SM, GM	A-2, A-4	0-5	60-80	50-75	40-65	30-50	20-30	NP-5
36----------	0-10	Silt loam-------	ML	A-4	0	100	100	95-100	80-95	20-40	NP-10
Pedigo	10-66	Silt loam-------	ML	A-4	0	100	100	95-100	80-95	20-40	NP-10
37A, 37B----------	0-4	Silt loam-------	ML	A-4	0	100	95-100	85-95	50-90	20-30	NP-5
Prosser	4-29	Very fine sandy loam, silt loam.	ML	A-4	0-5	95-100	90-100	80-90	50-85	20-30	NP-5
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
38D*:											
Prosser----------	0-4	Silt loam-------	ML	A-4	0	100	95-100	85-95	50-90	20-30	NP-5
	4-29	Very fine sandy loam, silt loam.	ML	A-4	0-5	95-100	90-100	80-90	50-85	20-30	NP-5
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
39C----------	0-6	Fine sand-------	SM	A-2	0	100	100	90-100	15-30	---	NP
Quincy	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	100	90-100	15-30	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
40C---------- Quincy	0-6	Loamy fine sand	SM	A-2	0	100	100	90-100	15-30	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	100	90-100	15-30	---	NP
41B---------- Quinton	0-30	Loamy fine sand	SM	A-2	0	95-100	95-100	50-80	20-35	---	NP
	30-37	Gravelly loamy fine sand, sand.	SM	A-1, A-2	0	75-100	65-100	40-80	15-30	---	NP
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
42D*: Quinton----------	0-30	Loamy fine sand	SM	A-2	0	95-100	95-100	50-80	20-35	---	NP
	30-37	Gravelly loamy fine sand, sand.	SM	A-1, A-2	0	75-100	65-100	40-80	15-30	---	NP
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
42D*: Rock outcrop.											
43B, 43C, 43D, 43E, 43F---------- Rhea	0-14	Silt loam-------	ML	A-4	0	100	90-100	80-100	75-90	25-30	NP-5
	14-60	Silt loam-------	ML, CL-ML	A-4	0	95-100	90-100	80-100	80-90	25-35	5-10
44B, 44C, 44D------ Ritzville	0-13	Very fine sandy loam.	ML	A-4	0	100	95-100	95-100	75-100	20-30	NP-5
	13-33	Silt loam-------	ML, CL-ML	A-4	0	100	100	95-100	80-100	20-30	NP-10
	33-70	Silt loam-------	ML	A-4	0	100	100	95-100	80-100	20-30	NP-5
45A, 45B, 45C, 45D, 46E, 47E---------- Ritzville	0-13	Silt loam-------	ML	A-4	0	100	95-100	95-100	75-100	20-30	NP-5
	13-33	Silt loam-------	ML, CL-ML	A-4	0	100	100	95-100	80-100	20-30	NP-10
	33-70	Silt loam-------	ML	A-4	0	100	100	95-100	80-100	20-30	NP-5
48*. Riverwash											
49F*: Rock outcrop.											
Rubble land.											
50D---------- Rockly	0-6	Very gravelly loam.	GM	A-4, A-2	5-20	50-60	45-55	35-50	25-40	25-30	NP-5
	6-9	Very cobbly clay loam, very gravelly loam.	GM, GC	A-2, A-6	5-60	20-60	25-55	25-50	20-40	35-40	10-15
	9	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
51B, 51C---------- Royal	0-6	Loamy fine sand	SM	A-2, A-4	0-5	95-100	95-100	80-90	30-40	---	NP
	6-14	Fine sandy loam	SM	A-4	0-5	95-100	95-100	80-95	35-50	20-30	NP-5
	14-60	Stratified fine sandy loam to fine sand.	SM	A-2, A-4	0-5	95-100	95-100	80-95	30-45	20-30	NP-5
52B, 52C, 52D------ Royal	0-6	Fine sandy loam	SM	A-4	0-5	95-100	95-100	80-95	35-50	20-30	NP-5
	6-17	Fine sandy loam	SM	A-4	0-5	95-100	95-100	80-95	35-50	20-30	NP-5
	17-60	Stratified fine sandy loam to fine sand.	SM	A-2, A-4	0-5	95-100	95-100	80-95	30-45	20-30	NP-5

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
53A----------	0-6	Silt loam-------	ML	A-4	0-5	95-100	95-100	85-95	60-70	25-30	NP-5
Royal	6-33	Fine sandy loam	SM	A-4	0-5	95-100	95-100	80-95	35-50	20-30	NP-5
	33-60	Stratified fine sandy loam to fine sand.	SM	A-2, A-4	0-5	95-100	95-100	80-95	30-45	20-30	NP-5
54B, 54C, 54D, 55B, 55C----------	0-5	Fine sandy loam	ML, SM	A-4	0-5	95-100	95-100	80-95	45-60	15-25	NP-5
Sagehill	5-28	Very fine sandy loam, fine sandy loam, loamy very fine sand.	ML, SM	A-4	0-5	95-100	95-100	80-95	45-60	15-25	NP-5
	28-60	Stratified silt loam to fine sandy loam.	ML	A-4	0-5	95-100	95-100	80-95	50-90	15-25	NP-5
56F----------	0-14	Very stony loam	ML, SM	A-5	15-30	75-90	70-85	60-80	40-60	40-50	5-10
Snell	14-30	Very stony clay loam, very stony clay, very cobbly silty clay loam.	SM, SC, GC, GM	A-7	15-30	65-80	50-60	40-50	35-50	65-75	30-45
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
57----------	0-33	Silt loam-------	ML	A-4	0	100	100	95-100	80-90	20-40	NP-10
Snow	33-46	Silt loam-------	ML	A-4	0	100	100	95-100	80-90	20-40	NP-10
	46-60	Silt loam, loam	ML	A-4	0	100	100	90-95	75-85	20-40	NP-10
58A, 58B, 58C, 59B-	0-5	Fine sandy loam	SM	A-4	0	95-100	90-100	80-90	40-50	15-25	NP-5
Taunton	5-32	Fine sandy loam, very fine sandy loam.	SM, ML	A-4	0	95-100	90-100	80-95	40-60	15-25	NP-5
	32	Indurated-------	---	---	---	---	---	---	---	---	---
60C, 60E, 60F------	0-25	Silt loam-------	ML	A-4, A-5	0	100	100	95-100	85-90	35-45	NP
Tolo	25-41	Silt loam, silty clay loam, loam.	ML	A-6	0	95-100	90-100	85-100	75-90	35-40	10-15
	41-60	Cobbly clay loam	CL	A-6	20-45	80-90	80-90	60-80	50-70	25-30	10-15
61E----------	0-3	Stony silty clay loam.	ML	A-7	25-40	80-100	75-100	70-100	65-95	40-50	10-15
Ukiah	3-26	Cobbly clay, cobbly silty clay.	CH	A-7	15-40	80-100	70-85	60-80	50-70	50-60	25-35
	26	Weathered bedrock.	---	---	---	---	---	---	---	---	---
62D----------	0-16	Loam----------	ML	A-4	0	90-100	85-95	70-90	50-70	25-35	NP-10
Utley	16-38	Loam, shaly loam, silt loam.	ML, SM	A-4	0	80-95	65-90	55-85	40-70	25-35	NP-10
	38-60	Very shaly loam, very shaly sandy loam.	SM	A-4, A-1, A-2	0	40-60	35-50	25-50	20-40	25-35	NP-10
63B, 63C, 64D, 65D, 65E----------	0-8	Silt loam-------	ML, CL-ML	A-4	0	95-100	95-100	85-100	80-90	25-35	5-10
Valby	8-30	Silt loam-------	ML, CL-ML	A-4	0	95-100	95-100	85-100	80-90	25-35	5-10
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
66B, 67D, 67E, 68D-Waha	0-12	Silt loam	ML, CL-ML	A-4	0	100	100	95-100	90-95	20-30	NP-10
	12-27	Silty clay loam, silt loam.	CL	A-6	0	100	95-100	95-100	85-95	30-40	10-20
	27-29	Very gravelly clay loam, very cobbly silt loam.	GC	A-2	30-40	25-35	15-35	15-30	15-25	30-40	10-20
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
69D*:											
Waha	0-12	Silt loam	ML, CL-ML	A-4	0	100	100	95-100	90-95	20-30	NP-10
	12-27	Silty clay loam, silt loam.	CL	A-6	0	100	95-100	95-100	85-95	30-40	10-20
	27-29	Very gravelly clay loam, very cobbly silt loam.	GC	A-2	30-40	25-35	15-35	15-30	15-25	30-40	10-20
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rockly	0-2	Very gravelly loam.	GM	A-4, A-2	5-20	50-60	40-55	35-50	25-40	25-30	NP-5
	2-9	Very cobbly clay loam, very gravelly loam.	GM, GC	A-2, A-6	5-60	20-60	25-55	25-50	20-40	35-40	10-15
	9	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
70B, 70C, 70D-Warden	0-5	Very fine sandy loam.	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
	5-20	Very fine sandy loam, silt loam.	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
	20-60	Silt loam, very fine sandy loam.	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
71A, 71B, 71C, 71D, 71E-Warden	0-5	Silt loam	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
	5-25	Very fine sandy loam, silt loam.	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
	25-60	Silt loam, very fine sandy loam.	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
72C, 72D-Warden	0-1	Silt loam	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
	1-21	Very fine sandy loam, silt loam.	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
	21-60	Silt loam, very fine sandy loam.	ML	A-4	0	95-100	95-100	85-100	70-90	25-30	NP-5
73E-Waterbury	0-9	Extremely stony silt loam.	ML	A-6	25-70	80-95	75-90	70-90	55-80	35-40	10-15
	9-17	Very cobbly clay	CH	A-7	40-75	65-90	60-85	55-85	50-80	50-60	25-35
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
74F*:											
Waterbury	0-9	Extremely stony silt loam.	ML	A-6	25-70	80-95	75-90	70-90	55-80	35-40	10-15
	9-17	Very cobbly clay	CH	A-7	40-75	65-90	60-85	55-85	50-80	50-60	25-35
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
75B, 75C, 75D	0-12	Silt loam	ML	A-4	0	100	100	90-100	75-90	20-30	NP-5
Willis	12-35	Silt loam	ML	A-4	0	100	100	90-100	75-90	20-30	NP-5
	35	Indurated	---	---	---	---	---	---	---	---	---
76B	0-18	Sand	SM	A-1, A-2	0-5	95-100	95-100	35-55	10-20	---	NP
Winchester	18-60	Coarse sand, sand.	SM, SP-SM	A-1, A-3	0-5	95-100	95-100	30-55	0-10	---	NP
77F*:											
Wrentham	0-4	Silt loam	ML	A-4	0-10	90-100	85-100	85-100	75-90	30-35	NP-5
	4-32	Very cobbly silt loam, very gravelly silt loam, very cobbly silty clay loam.	GM, ML	A-2, A-4	30-65	35-90	25-85	20-85	20-75	30-35	NP-5
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
78*. Xeric Torriorthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
1*:											
Aquepts.											
Aquolls.											
2D----------	0-2	15-25	1.25-1.35	0.2-0.6	0.06-0.14	6.1-7.3	Low----------	0.15	1	---	---
Bakeoven	2-7	18-33	1.30-1.40	0.2-0.6	0.05-0.14	6.6-7.8	Moderate-----	0.20			
	7	---	---	---	---	---	----------	----			
3D*:											
Bakeoven--------	0-2	15-25	1.25-1.35	0.2-0.6	0.06-0.14	6.1-7.3	Low----------	0.15	1	---	---
	2-7	18-33	1.30-1.40	0.2-0.6	0.05-0.14	6.6-7.8	Moderate-----	0.20			
	7	---	---	---	---	---	----------	----			
Morrow----------	0-9	18-25	1.25-1.35	0.6-2.0	0.19-0.21	6.6-7.3	Low----------	0.37	2	---	1-2
	9-14	27-35	1.30-1.40	0.2-0.6	0.19-0.21	6.6-7.8	Moderate-----	0.43			
	14-26	18-30	1.30-1.50	0.6-2.0	0.19-0.21	7.9-8.4	Low----------	0.43			
	26	---	---	---	---	---	----------	----			
4D*:											
Bakeoven--------	0-2	15-25	1.25-1.35	0.2-0.6	0.06-0.14	6.1-7.3	Low----------	0.15	1	---	---
	2-7	18-33	1.30-1.40	0.2-0.6	0.05-0.14	6.6-7.8	Moderate-----	0.20			
	7	---	---	---	---	---	----------	----			
Valby----------	0-8	15-20	1.25-1.35	0.6-2.0	0.19-0.21	6.6-7.8	Low----------	0.43	2	---	<2
	8-30	18-24	1.30-1.40	0.6-2.0	0.19-0.21	6.6-8.4	Low----------	0.49			
	30	---	---	---	---	---	----------	----			
5E----------	0-14	10-20	0.75-0.85	2.0-6.0	0.23-0.25	6.1-7.3	Low----------	0.37	5	---	---
Boardtree	14-25	10-20	0.75-0.85	2.0-6.0	0.23-0.25	6.1-7.3	Low----------	0.37			
	25-60	35-60	1.15-1.25	<0.06	0.13-0.16	6.1-7.3	High---------	0.20			
6C----------	0-2	18-22	---	0.6-2.0	0.10-0.12	6.1-6.5	Low----------	0.24	1	---	1-2
Bocker	2-8	20-24	---	0.6-2.0	0.09-0.11	6.6-7.3	Low----------	0.20			
	8	---	---	---	---	---	----------	----			
7C*:											
Bocker----------	0-2	18-22	---	0.6-2.0	0.10-0.12	6.1-6.5	Low----------	0.24	1	---	1-2
	2-8	20-24	---	0.6-2.0	0.09-0.11	6.6-7.3	Low----------	0.20			
	8	---	---	---	---	---	----------	----			
Wrightman-------	0-12	18-25	1.25-1.35	0.6-2.0	0.15-0.21	6.1-7.3	Moderate-----	0.37	2	---	---
	12-26	18-30	1.25-1.40	0.6-2.0	0.15-0.21	6.1-7.3	Moderate-----	0.37			
	26	---	---	---	---	---	----------	----			
8B, 8C----------	0-5	0-5	---	6.0-20	0.11-0.15	6.6-7.8	Low----------	0.24	2	2	.5-1
Burbank	5-20	0-5	---	6.0-20	0.10-0.14	6.6-8.4	Low----------	0.24			
	20-34	0-4	---	6.0-20	0.04-0.07	6.6-8.4	Low----------	0.20			
	34-60	0-2	---	>20	0.01-0.03	7.4-8.4	Low----------	0.10			
9*.											
Dune land											
10B, 10C---------	0-13	2-8	1.35-1.50	0.6-2.0	0.13-0.15	7.4-7.8	Low----------	0.32	2	3	.5-1
Ellum	13-28	2-8	1.35-1.50	2.0-6.0	0.07-0.09	7.4-8.4	Low----------	0.17			
	28	---	---	---	---	---	----------	----			
11----------	0-12	8-17	1.30-1.40	2.0-6.0	0.14-0.16	6.6-8.4	Low----------	0.32	3	---	1-3
Endersby	12-36	8-17	1.30-1.40	2.0-6.0	0.14-0.18	6.6-8.4	Low----------	0.32			
	36-60	5-15	1.40-1.50	2.0-6.0	0.10-0.14	6.6-8.4	Low----------	0.28			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
12----------	0-17	2-6	---	0.6-2.0	0.19-0.25	6.6-7.8	Low----------	0.43	5	5	1-2
Esquatzel	17-60	3-7	---	0.6-2.0	0.19-0.23	7.4-8.4	Low----------	0.43			
13D, 13E----------	0-7	8-17	1.25-1.35	0.06-2.0	0.06-0.10	7.9-8.4	Low----------	0.20	1	---	---
Gravden	7-14	8-17	1.25-1.35	0.06-2.0	0.03-0.08	7.9-8.4	Low----------	0.15			
	14	---	---	---	---	---	----------	----			
14E----------	0-3	15-25	1.25-1.35	0.6-2.0	0.08-0.11	6.6-7.3	Low----------	0.28	1	---	---
Gwin	3-15	23-35	1.20-1.35	0.2-0.6	0.07-0.11	6.6-7.3	Low----------	0.24			
	15	---	---	---	---	---	----------	----			
15F*:											
Gwin----------	0-3	15-25	1.25-1.35	0.6-2.0	0.08-0.11	6.6-7.3	Low----------	0.28	1	---	---
	3-15	23-35	1.20-1.35	0.2-0.6	0.07-0.11	6.6-7.3	Low----------	0.24			
	15	---	---	---	---	---	----------	----			
Rock outcrop.											
16C----------	0-7	18-25	1.25-1.35	0.6-2.0	0.16-0.21	6.1-6.5	Low----------	0.32	2	---	---
Hall Ranch	7-23	18-27	1.30-1.60	0.6-2.0	0.11-0.19	6.6-7.3	Low----------	0.24			
	23	---	---	---	---	---	----------	----			
17E----------	0-7	18-25	1.40-1.50	0.6-2.0	0.14-0.19	6.1-6.5	Low----------	0.28	2	---	---
Hall Ranch	7-23	18-27	1.30-1.60	0.6-2.0	0.11-0.19	6.6-7.3	Low----------	0.24			
	23	---	---	---	---	---	----------	----			
18E----------	0-12	20-35	1.25-1.35	0.2-0.6	0.11-0.21	6.1-7.3	Moderate-----	0.32	4	---	---
Hankins	12-60	45-60	1.15-1.25	0.06-0.2	0.10-0.14	6.1-7.8	High---------	0.20			
19C, 19E, 19F----	0-26	5-10	0.50-0.85	0.6-2.0	0.24-0.38	6.6-7.3	Low----------	0.49	3	---	---
Helter	26-37	18-35	1.30-1.50	0.2-0.6	0.14-0.21	6.6-7.3	Low----------	0.55			
	37-55	18-27	1.30-1.50	0.2-0.6	0.09-0.18	6.6-7.3	Low----------	0.37			
	55	---	---	---	---	---	----------	----			
20B, 20C----------	0-9	2-8	---	6.0-20	0.13-0.15	6.6-8.4	Low----------	0.24	5	2	<.5
Hezel	9-30	2-8	---	6.0-20	0.08-0.12	6.6-9.0	Low----------	0.24			
	30-60	5-12	---	0.2-0.6	0.23-0.25	7.9-9.0	Low----------	0.43			
21B, 21C----------	0-3	5-10	1.30-1.45	0.6-2.0	0.13-0.15	6.6-7.3	Low----------	0.32	2	3	.5-1
Irrigon	3-23	5-10	1.30-1.40	0.6-2.0	0.16-0.18	6.6-7.3	Low----------	0.37			
	23	---	---	---	---	---	----------	----			
22----------	0-15	10-18	1.25-1.35	2.0-6.0	0.11-0.17	6.6-7.8	Low----------	----	---	---	1-2
Kimberly	15-60	10-18	1.30-1.40	2.0-6.0	0.11-0.15	6.6-9.0	Low----------	----			
23D----------	0-11	12-18	---	0.6-2.0	0.15-0.17	6.1-7.3	Low----------	0.28	2	---	2-4
Klicker	11-26	18-35	---	0.2-0.6	0.10-0.13	6.1-6.5	Moderate-----	0.20			
	26	---	---	---	---	---	----------	----			
24E, 24F----------	0-11	12-18	---	0.6-2.0	0.15-0.17	6.1-7.3	Low----------	0.28	2	---	2-4
Klicker	11-26	18-35	---	0.2-0.6	0.10-0.13	6.1-6.5	Moderate-----	0.20			
	26	---	---	---	---	---	----------	----			
25E, 25F----------	0-11	12-18	---	0.6-2.0	0.14-0.16	6.1-7.3	Low----------	0.24	2	---	1-2
Klicker	11-26	18-35	---	0.2-0.6	0.10-0.13	6.1-6.5	Moderate-----	0.20			
	26	---	---	---	---	---	----------	----			
26B, 26C----------	0-4	0-5	---	6.0-20	0.09-0.15	7.4-8.4	Low----------	0.17	2	2	---
Koehler	4-28	0-5	---	6.0-20	0.06-0.11	7.9-8.4	Low----------	0.17			
	28	---	---	<0.06	---	---	----------	----			
27E----------	0-14	10-18	1.10-1.35	0.6-2.0	0.10-0.14	6.1-6.5	Low----------	0.28	3	---	---
Labuck	14-31	10-18	1.20-1.35	0.6-2.0	0.06-0.12	5.6-6.5	Low----------	0.24			
	31	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
28E----------	0-2	15-25	1.25-1.35	0.6-2.0	0.08-0.14	6.1-7.3	Low----------	0.17	1	---	---
Lickskillet	2-17	23-33	1.30-1.40	0.6-2.0	0.06-0.14	6.6-7.3	Low----------	0.24			
	17	---	---	---	---	---	----------	----			
29F*:											
Lickskillet-----	0-2	15-25	1.25-1.35	0.6-2.0	0.08-0.14	6.1-7.3	Low----------	0.17	1	---	---
	2-17	23-33	1.30-1.40	0.6-2.0	0.06-0.14	6.6-7.3	Low----------	0.24			
	17	---	---	---	---	---	----------	----			
Rock outcrop.											
30B, 30C, 30D----	0-13	8-12	1.25-1.35	0.6-2.0	0.19-0.21	6.6-7.8	Low----------	0.43	2	---	1-2
Mikkalo	13-35	8-12	1.30-1.40	0.6-2.0	0.18-0.20	7.4-8.4	Low----------	0.49			
	35	---	---	---	---	---	----------	----			
31B, 31C, 32D,											
32E, 33D, 33E---	0-9	18-25	1.25-1.35	0.6-2.0	0.19-0.21	6.6-7.3	Low----------	0.37	2	---	1-2
Morrow	9-14	27-35	1.30-1.40	0.2-0.6	0.19-0.21	6.6-7.8	Moderate-----	0.43			
	14-26	18-30	1.30-1.50	0.6-2.0	0.19-0.21	7.9-8.4	Low----------	0.43			
	26	---	---	---	---	---	----------	----			
34F----------	0-25	10-18	1.25-1.35	0.6-2.0	0.16-0.19	6.1-7.3	Low----------	0.43	3	---	---
Nansene	25-45	10-18	1.30-1.40	0.6-2.0	0.16-0.19	6.1-8.4	Low----------	0.55			
	45	---	---	---	---	---	----------	----			
35----------	0-26	12-17	1.25-1.35	0.6-2.0	0.18-0.22	6.6-7.8	Low----------	0.37	5	5	1-2
Onyx	26-39	12-17	1.25-1.35	0.6-2.0	0.18-0.22	6.6-7.8	Low----------	0.37			
	39-60	12-17	1.25-1.35	0.6-2.0	0.08-0.14	6.6-7.8	Low----------	0.15			
36----------	0-10	10-17	1.25-1.35	0.6-2.0	0.19-0.20	7.4-9.0	Low----------	----	---	5	1-2
Pedigo	10-66	10-17	1.25-1.40	0.6-2.0	0.19-0.20	6.6-9.0	Low----------	----			
37A, 37B---------	0-4	5-12	---	0.6-2.0	0.16-0.23	6.6-8.4	Low----------	0.55	2	3	.5-1
Prosser	4-29	5-12	---	0.6-2.0	0.16-0.22	6.6-8.4	Low----------	0.55			
	29	---	---	---	---	---	----------	----			
38D*:											
Prosser---------	0-4	5-12	---	0.6-2.0	0.16-0.23	6.6-8.4	Low----------	0.55	2	3	.5-1
	4-29	5-12	---	0.6-2.0	0.16-0.22	6.6-8.4	Low----------	0.55			
	29	---	---	---	---	---	----------	----			
Rock outcrop.											
39C, 40C---------	0-6	0-4	1.40-1.60	6.0-20.0	0.06-0.09	6.1-8.4	Low----------	0.17	5	1	<.5-.8
Quincy	6-60	0-4	1.40-1.60	6.0-20.0	0.06-0.09	6.1-8.4	Low----------	0.17			
41B----------	0-30	0-5	1.50-1.70	6.0-20	0.06-0.09	6.6-7.3	Low----------	0.17	2	2	<.8
Quinton	30-37	0-5	1.50-1.70	6.0-20	0.05-0.08	6.6-7.8	Low----------	0.10			
	37	---	---	---	---	---	----------	----			
42D*:											
Quinton---------	0-30	0-5	1.50-1.70	6.0-20	0.06-0.09	6.6-7.3	Low----------	0.17	2	2	<.8
	30-37	0-5	1.50-1.70	6.0-20	0.05-0.08	6.6-7.8	Low----------	0.10			
	37	---	---	---	---	---	----------	----			
Rock outcrop.											
43B, 43C, 43D,											
43E, 43F---------	0-14	18-24	1.25-1.35	0.6-2.0	0.20-0.25	6.6-7.3	Low----------	0.43	5	---	1-2
Rhea	14-60	18-24	1.30-1.50	0.6-2.0	0.20-0.25	6.6-9.0	Moderate-----	0.49			
44B, 44C, 44D---	0-13	8-15	1.25-1.30	0.6-2.0	0.17-0.20	6.6-7.8	Low----------	0.49	5	4	1-2
Ritzville	13-33	8-15	1.30-1.35	0.6-2.0	0.17-0.20	6.6-8.4	Low----------	0.55			
	33-70	8-15	1.35-1.40	0.6-2.0	0.17-0.20	7.9-9.0	Low----------	0.55			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
45A, 45B, 45C, 45D, 46E, 47E---	0-13	8-15	1.25-1.30	0.6-2.0	0.17-0.20	6.6-7.8	Low----------	0.49	5	5	1-2
Ritzville	13-33	8-15	1.30-1.35	0.6-2.0	0.17-0.20	6.6-8.4	Low----------	0.55			
	33-70	8-15	1.35-1.40	0.6-2.0	0.17-0.20	7.9-9.0	Low----------	0.55			
48*. Riverwash											
49F*: Rock outcrop.											
Rubble land.											
50D----------	0-6	20-27	1.25-1.35	0.6-2.0	0.12-0.16	6.1-7.3	Low----------	0.10	1	---	---
Rockly	6-9	20-30	1.30-1.40	0.2-0.6	0.06-0.11	6.1-7.3	Low----------	0.10			
	9	---	---	---	---	---	----------	----			
51B, 51C---------	0-6	2-8	1.20-1.30	6.0-20	0.13-0.17	7.4-8.4	Low----------	0.37	5	2	.5-1
Royal	6-14	5-12	1.40-1.60	2.0-6.0	0.18-0.22	7.4-8.4	----------	0.37			
	14-60	3-12	1.40-1.70	---	0.20-0.24	7.4-9.0	Low----------	0.37			
52B, 52C, 52D----	0-6	5-12	1.40-1.50	2.0-6.0	0.18-0.22	7.4-8.4	Low----------	0.37	5	2	.5-1
Royal	6-17	5-12	1.40-1.60	2.0-6.0	0.18-0.22	7.4-8.4	----------	0.37			
	17-60	3-12	1.40-1.70	---	0.20-0.24	7.4-9.0	Low----------	0.37			
53A----------	0-6	5-12	1.30-1.40	2.0-6.0	0.18-0.22	7.4-8.4	Low----------	0.37	5	3	.5-1
Royal	6-33	5-12	1.40-1.60	2.0-6.0	0.18-0.22	7.4-8.4	----------	0.37			
	33-60	3-12	1.40-1.70	---	0.20-0.24	7.4-9.0	Low----------	0.37			
54B, 54C, 54D, 55B, 55C--------	0-5	2-8	1.30-1.40	2.0-6.0	0.13-0.23	6.6-8.4	Low----------	0.43	5	3	<.5
Sagehill	5-28	2-8	1.30-1.60	2.0-6.0	0.13-0.20	6.6-8.4	Low----------	0.49			
	28-60	2-8	1.30-1.60	0.6-2.0	0.20-0.25	7.9-9.0	Low----------	0.55			
56F----------	0-14	18-35	1.35-1.50	0.6-2.0	0.08-0.11	6.1-7.3	Low----------	0.10	2	---	---
Snell	14-30	35-45	1.15-1.25	0.2-0.6	0.05-0.10	6.1-7.3	High----------	0.10			
	30	---	---	---	---	---	----------	----			
57----------	0-33	18-22	1.25-1.35	0.6-2.0	0.18-0.20	6.6-7.8	Low----------	0.28	5	5	2-3
Snow	33-46	18-27	1.25-1.40	0.6-2.0	0.18-0.20	6.6-7.8	Low----------	0.28			
	46-60	18-27	1.25-1.40	0.6-2.0	0.18-0.20	6.6-7.8	Low----------	0.28			
58A, 58B, 58C, 59B----------	0-5	5-8	1.40-1.55	2.0-6.0	0.14-0.16	7.9-8.4	Low----------	0.37	2	3	.5-1
Taunton	5-32	5-8	1.40-1.55	2.0-6.0	0.14-0.16	7.9-9.0	Low----------	----			
	32	---	---	---	---	---	----------	----			
60C, 60E, 60F----	0-25	5-10	0.75-0.85	0.6-2.0	0.24-0.38	5.6-7.3	Low----------	0.49	5	---	---
Tolo	25-41	18-35	1.20-1.40	0.2-0.6	0.15-0.24	5.6-7.3	Moderate-----	0.55			
	41-60	30-35	1.20-1.40	0.2-0.6	0.10-0.14	5.6-7.3	Moderate-----	0.37		—	
61E----------	0-3	30-35	---	0.06-0.2	0.16-0.18	6.6-7.3	Moderate-----	0.25	2	---	---
Ukiah	3-26	50-60	---	<0.06	0.09-0.14	6.6-7.3	High----------	0.28			
	26	---	---	---	---	---	----------	----			
62D----------	0-16	18-30	1.25-1.35	0.6-2.0	0.15-0.18	6.1-7.3	Low----------	0.28	5	---	---
Utley	16-38	18-30	1.25-1.40	0.6-2.0	0.14-0.17	6.1-7.3	Low----------	0.32			
	38-60	18-30	1.25-1.40	0.6-2.0	0.08-0.10	6.1-7.3	Low----------	0.37			
63B, 63C, 64D, 65D, 65E--------	0-8	15-20	1.25-1.35	0.6-2.0	0.19-0.21	6.6-7.8	Low----------	0.43	2	---	<2
Valby	8-30	18-24	1.30-1.40	0.6-2.0	0.19-0.21	6.6-8.4	Low----------	0.49			
	30	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
66B, 67D, 67E, 68D----------	0-12	10-15	---	0.6-2.0	0.18-0.21	6.1-7.3	Low----------	0.32	2	---	2-3
Waha	12-27	20-32	---	0.2-0.6	0.18-0.21	6.6-7.3	Moderate-----	0.37			
	27-29	25-35	---	0.2-0.6	0.06-0.09	6.6-7.3	Moderate-----	0.24			
	29	---	---	---	---	---	----------	----			
69D*:											
Waha----------	0-12	10-15	---	0.6-2.0	0.18-0.21	6.1-7.3	Low----------	0.32	2	---	2-3
	12-27	20-32	---	0.2-0.6	0.18-0.21	6.6-7.3	Moderate-----	0.37			
	27-29	25-35	---	0.2-0.6	0.06-0.09	6.6-7.3	Moderate-----	0.24			
	29	---	---	---	---	---	----------	----			
Rockly----------	0-2	20-27	1.25-1.35	0.6-2.0	0.12-0.16	6.1-7.3	Low----------	0.10	1	---	---
	2-9	20-30	1.30-1.40	0.2-0.6	0.06-0.11	6.1-7.3	Low----------	0.10			
	9	---	---	---	---	---	----------	----			
70B, 70C, 70D----	0-5	8-15	1.30-1.40	0.6-2.0	0.19-0.21	6.6-7.8	Low----------	0.55	5	4	1-2.
Warden	5-20	8-15	1.30-1.40	0.6-2.0	0.16-0.20	6.6-8.4	Low----------	0.55			
	20-60	8-15	1.35-1.45	0.6-2.0	0.19-0.21	7.9-9.0	Low----------	0.55			
71A, 71B, 71C, 71D, 71E--------	0-5	8-15	1.30-1.40	0.6-2.0	0.19-0.21	6.6-7.8	Low----------	0.55	5	5	1-2.
Warden	5-25	8-15	1.30-1.40	0.6-2.0	0.16-0.20	6.6-8.4	Low----------	0.55			
	25-60	8-15	1.35-1.45	0.6-2.0	0.19-0.21	7.9-9.0	Low----------	0.55			
72C, 72D---------	0-1	8-15	1.30-1.40	0.6-2.0	0.19-0.21	6.6-7.8	Low----------	0.55	5	5	1-2.
Warden	1-21	8-15	1.30-1.40	0.6-2.0	0.16-0.20	6.6-8.4	Low----------	0.55			
	21-60	8-15	1.35-1.45	0.6-2.0	0.19-0.21	7.9-9.0	Low----------	0.55			
73E----------	0-9	18-27	1.15-1.25	0.6-2.0	0.09-0.17	6.6-7.3	Low----------	0.28	1	---	---
Waterbury	9-17	50-60	1.15-1.25	<0.06	0.04-0.10	6.6-7.3	High----------	0.17			
	17	---	---	---	---	---	----------	----			
74F*:											
Waterbury--------	0-9	18-27	1.15-1.25	0.6-2.0	0.09-0.17	6.6-7.3	Low----------	0.28	1	---	---
	9-17	50-60	1.15-1.25	<0.06	0.04-0.10	6.6-7.3	High----------	0.17			
	17	---	---	---	---	---	----------	----			
Rock outcrop.											
75B, 75C, 75D----	0-12	10-15	---	0.6-2.0	0.19-0.21	7.4-7.8	Low----------	0.49	2	5	1-1.
Willis	12-35	10-15	---	0.6-2.0	0.19-0.21	7.9-9.0	Low----------	0.55			
	35	---	---	<0.06	---	---	----------	----			
76B----------	0-18	0-5	1.50-1.70	6.0-20	0.05-0.07	6.1-8.4	Low----------	0.10	5	1	<.5
Winchester	18-60	0-5	1.50-1.70	6.0-20	0.05-0.07	6.6-8.4	Low----------	0.10			
77F*:											
Wrentham--------	0-4	15-25	---	0.6-2.0	0.15-0.21	6.1-7.3	Low----------	0.37	2	---	---
	4-32	18-35	---	0.2-0.6	0.09-0.14	6.6-7.3	Low----------	0.20			
	32	---	---	---	---	---	----------	----			
Rock outcrop.											
78*. Xeric Torriorthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

[See text for descriptions of symbols and such terms as "rare" and "brief." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
1*: Aquepts. Aquolls.											
2D---- Bakeoven	D	None----	---	---	5-12	Hard	---	---	Moderate	Moderate	Low.
3D*: Bakeoven----	D	None----	---	---	5-12	Hard	---	---	Moderate	Moderate	Low.
Morrow----	C	None----	---	---	20-40	Hard	---	---	High----	High----	Low.
4D*: Bakeoven----	D	None----	---	---	5-12	Hard	---	---	Moderate	Moderate	Low.
Valby----	C	None----	---	---	20-40	Hard	---	---	High----	Moderate	Low.
5E---- Boardtree	C	None----	---	---	>60	---	---	---	Low----	High----	Low.
6C---- Bocker	D	None----	---	---	4-10	Hard	---	---	Moderate	Low----	Low.
7C*: Bocker----	D	None----	---	---	4-10	Hard	---	---	Moderate	Low----	Low.
Wrightman----	C	None----	---	---	20-40	Hard	---	---	Moderate	Moderate	Low.
8B, 8C---- Burbank	A	None----	---	---	>60	---	---	---	Low----	High----	Low.
9*. Dune land											
10B, 10C---- Ellum	C	None----	---	---	>60	---	20-40	Rippable	Moderate	High----	Low.
11---- Endersby	B	Rare----	---	---	>60	---	---	---	Moderate	Moderate	Low.
12---- Esquatzel	B	Rare----	Brief----	Mar-Apr	>60	---	---	---	Moderate	High----	Low.
13D, 13E---- Gravden	D	None----	---	---	>60	---	10-20	Rippable	Moderate	Moderate	Low.
14E---- Gwin	D	None----	---	---	10-20	Hard	---	---	Moderate	Moderate	Low.
15F*: Gwin----	D	None----	---	---	10-20	Hard	---	---	Moderate	Moderate	Low.
Rock outcrop.											
16C, 17E---- Hall Ranch	C	None----	---	---	20-40	Rippable	---	---	Moderate	Moderate	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
18E--Hankins	C	None	---	---	>60	---	---	---	Moderate	High	Low.
19C, 19E, 19F--Helter	B	None	---	---	40-60	Hard	---	---	High	Moderate	Moderate.
20B, 20C--Hezel	B	None	---	---	>60	---	---	---	Low	Moderate	Low.
21B, 21C--Irrigon	C	None	---	---	20-40	Ripable	---	---	Moderate	Moderate	Low.
22--Kimberly	B	Rare	Brief	Dec-Mar	>60	---	---	---	Low	Moderate	Low.
23D, 24E, 24F, 25E, 25F--Klicker	C	None	---	---	20-40	Hard	---	---	Moderate	Moderate	Low.
26B, 26C--Koehler	C	None	---	---	>60	---	20-40	Ripable	Low	Moderate	Low.
27E--Labuck	B	None	---	---	20-40	Ripable	---	---	Moderate	Low	Moderate.
28E--Lickskillet	D	None	---	---	12-20	Hard	---	---	Moderate	Moderate	Low.
29F*: Lickskillet	D	None	---	---	12-20	Hard	---	---	Moderate	Moderate	Low.
Rock outcrop.											
30B, 30C, 30D--Mikkalo	C	None	---	---	20-40	Hard	---	---	Moderate	Low	Low.
31B, 31C, 32D, 32E, 33D, 33E--Morrow	C	None	---	---	20-40	Hard	---	---	High	High	Low.
34F--Nansene	B	None	---	---	40-60	Hard	---	---	High	Moderate	Low.
35--Onyx	B	Rare	Brief	Jan-Apr	>60	---	---	---	High	Moderate	Low.
36--Pedigo	C	Rare	Long	Nov-May	>60	---	---	---	High	High	Low.
37A, 37B--Prosser	C	None	---	---	20-40	Hard	---	---	Moderate	High	Low.
38D*: Prosser	C	None	---	---	20-40	Hard	---	---	Moderate	High	Low.
Rock outcrop.											
39C, 40C--Quincy	A	None	---	---	>60	---	---	---	Low	Low	Low.
41B--Quinton	C	None	---	---	20-40	Hard	---	---	Low	Low	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
42D*: Quinton	C	None	---	---	20-40	Hard	---	---	Low	Low	Low.
Rock outcrop.											
43B, 43C, 43D, 43E, 43F---- Rhea	B	None	---	---	>60	---	---	---	High	Moderate	Low.
44B, 44C, 44D, 45A, 45B, 45C, 45D, 46E, 47E---- Ritzville	B	None	---	---	>60	---	---	---	High	High	Low.
48*. Riverwash											
49F*: Rock outcrop.											
Rubble land.											
50D---------- Rockly	D	None	---	---	5-12	Hard	---	---	Moderate	Low	Low.
51B, 51C, 52B, 52C, 52D, 53A---- Royal	B	None	---	---	>60	---	---	---	Moderate	High	Low.
54B, 54C, 54D, 55B, 55C---------- Sagehill	B	None	---	---	>60	---	---	---	Moderate	High	Low.
56F---------- Snell	C	None	---	---	20-40	Hard	---	---	Moderate	High	Low.
57---------- Snow	B	Rare	---	---	>60	---	---	---	High	Moderate	Low.
58A, 58B, 58C, 59B---------- Taunton	C	None	---	---	>60	---	20-40	Hard	Moderate	High	Low.
60C, 60E, 60F----- Tolo	B	None	---	---	>60	---	---	---	High	Moderate	Moderate.
61E---------- Ukiah	C	None	---	---	20-40	Ripable	---	---	Low	High	Low.
62D---------- Utley	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
63B, 63C, 64D, 65D, 65E---------- Valby	C	None	---	---	20-40	Hard	---	---	High	Moderate	Low.
66B, 67D, 67E, 68D---------- Waha	C	None	---	---	20-40	Hard	---	---	Moderate	Moderate	Low.
69D*: Waha----------	C	None	---	---	20-40	Hard	---	---	Moderate	Moderate	Low.
Rockly----------	D	None	---	---	5-12	Hard	---	---	Moderate	Low	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
70B, 70C, 70D, 71A, 71B, 71C, 71D, 71E, 72C, 72D---------- Warden	B	None--------	---	---	>60	---	---	---	Moderate	High-----	Low.
73E---------- Waterbury	D	None--------	---	---	12-20	Hard	---	---	Moderate	High-----	Low.
74F*: Waterbury-------- Rock outcrop.	D	None--------	---	---	12-20	Hard	---	---	Moderate	High-----	Low.
75B, 75C, 75D----- Willis	C	None--------	---	---	>60	---	20-40	Rippable	Moderate	High-----	Low.
76B---------- Winchester	A	None--------	---	---	>60	---	---	---	Low------	Moderate	Low.
77F*: Wrentham--------- Rock outcrop.	C	None--------	---	---	20-40	Hard	---	---	Moderate	Moderate	Low.
78*. Xeric Torriorthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Bakeoven	Loamy-skeletal, mixed, mesic Lithic Haploxerolls
Boardtree	Medial over clayey, mixed, frigid Typic Vitrandepts
Bocker	Loamy-skeletal, mixed, frigid Lithic Haploxerolls
Burbank	Sandy-skeletal, mixed, mesic Xeric Torriorthents
Ellum	Loamy-skeletal, mixed, mesic Haploxerollic Durorthids
Endersby	Coarse-loamy, mixed, mesic Cumulic Haploxerolls
Esquatzel	Coarse-silty, mixed, mesic Torrifluventic Haploxerolls
Gravden	Loamy-skeletal, mixed, mesic, shallow Haploxerollic Durorthids
Gwin	Loamy-skeletal, mixed, mesic Lithic Argixerolls
Hall Ranch	Fine-loamy, mixed, frigid Ultic Haploxerolls
Hankins	Fine, montmorillonitic, frigid Ultic Palexerolls
Helter	Medial over loamy, mixed Entic Cryandepts
Hezel	Sandy over loamy, mixed, nonacid, mesic Xeric Torriorthents
Irrigon	Coarse-loamy, mixed, mesic Xerollic Camborthids
Kimberly	Coarse-loamy, mixed, mesic Torrifluventic Haploxerolls
Klicker	Loamy-skeletal, mixed, frigid Ultic Argixerolls
Koehler	Sandy, mixed, mesic Xerollic Durorthids
Labuck	Coarse-loamy, mixed, frigid Typic Xerochrepts
Lickskillet	Loamy-skeletal, mixed, mesic Lithic Haploxerolls
Mikkalo	Coarse-silty, mixed, mesic Calciorthidic Haploxerolls
Morrow	Fine-silty, mixed, mesic Calcic Argixerolls
Nansene	Coarse-silty, mixed, mesic Pachic Haploxerolls
Onyx	Coarse-silty, mixed, mesic Cumulic Haploxerolls
Pedigo	Coarse-silty, mixed, mesic Cumulic Haploxerolls
Prosser	Coarse-loamy, mixed, mesic Xerollic Camborthids
Quincy	Mixed, mesic Xeric Torripsamments
Quinton	Mixed, mesic Xeric Torripsamments
Rhea	Fine-silty, mixed, mesic Calcic Haploxerolls
Ritzville	Coarse-silty, mixed, mesic Calciorthidic Haploxerolls
Rockly	Loamy-skeletal, mixed, mesic Lithic Haploxerolls
Royal	Coarse-loamy, mixed, mesic Xerollic Camborthids
Sagehill	Coarse-loamy, mixed, mesic Xerollic Camborthids
Snell	Clayey-skeletal, montmorillonitic, frigid Pachic Argixerolls
Snow	Fine-silty, mixed, mesic Cumulic Haploxerolls
Taunton	Coarse-loamy, mixed, mesic Xerollic Durorthids
Tolo	Medial over loamy, mixed, frigid Typic Vitrandepts
Ukiah	Fine, montmorillonitic, mesic Vertic Argixerolls
Utley	Fine-loamy, mixed, frigid Pachic Haploxerolls
Valby	Fine-silty, mixed, mesic Calcic Haploxerolls
Waha	Fine-loamy, mixed, mesic Pachic Argixerolls
Warden	Coarse-silty, mixed, mesic Xerollic Camborthids
Waterbury	Clayey-skeletal, montmorillonitic, mesic Lithic Argixerolls
Willis	Coarse-silty, mixed, mesic Orthidic Durixerolls
Winchester	Mixed, mesic Xeric Torripsamments
Wrentham	Loamy-skeletal, mixed, mesic Pachic Haploxerolls
Wrightman	Fine-loamy, mixed, frigid Pachic Haploxerolls

☆ U.S GOVERNMENT PRINTING OFFICE 1983 O - 298-862 QL3

Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The USDA Target Center can convert USDA information and documents into alternative formats, including Braille, large print, video description, diskette, and audiotape. For more information, visit the TARGET Center's Web site (http://www.targetcenter.dm.usda.gov/) or call (202) 720-2600 (Voice/TTY).

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).