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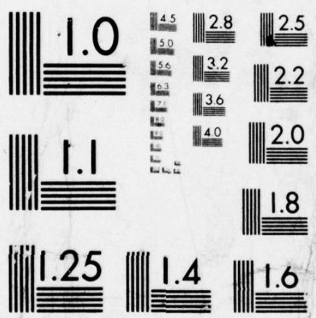


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APPENDIX
VOLUME 1

# LAND & MINERAL RESOURCES





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This appendix is one of a series making up the complete Columbia-North Pacific Region Framework Study on water and related lands. The results of the study are contained in the several documents as shown below:

Main Report

Summary Report

Appendices

I. History of Study

II. The Region

III. Legal & Administrative Background

IV. Land & Mineral Resources

V. Water Resources

VI. Economic Base & Projections

VII. Flood Control

VIII. Land Measures & Watershed Protection

IX. Irrigation

X. Navigation

XI. Municipal & Industrial Water Supply

XII. Water Quality & Pollution Control

XIII. Recreation

XIV. Fish & Wildlife

XV. Electric Power

XVI. Comprehensive Framework Plans

Pacific Northwest River Basins Commission
1 Columbia River
Vancouver, Washington

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# *Land and Mineral Resources*

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APPENDIX IV

(6) Columbia-North Pacific Region
Comprehensive Framework Study

Volume 1
[Subregions 1-5]

of Water and Related Lands. Appendix IV.
Land and Mineral Resources. Volume 1.
Subregions 1-5,

(10) Clyde C / Bowlsby, R. J./Coffman,
C. R./Hubbard, W. A./Post Jack L./ Wood

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APPENDIX IV
Land & Mineral Resources

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This appendix to the Columbia-North Pacific Region Framework Report was prepared at field level under the auspices of the Pacific Northwest River Basins Commission. It is subject to review by the interested Federal agencies at the departmental level, by the Governors of the affected States, and by the Water Resources Council prior to its transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration.

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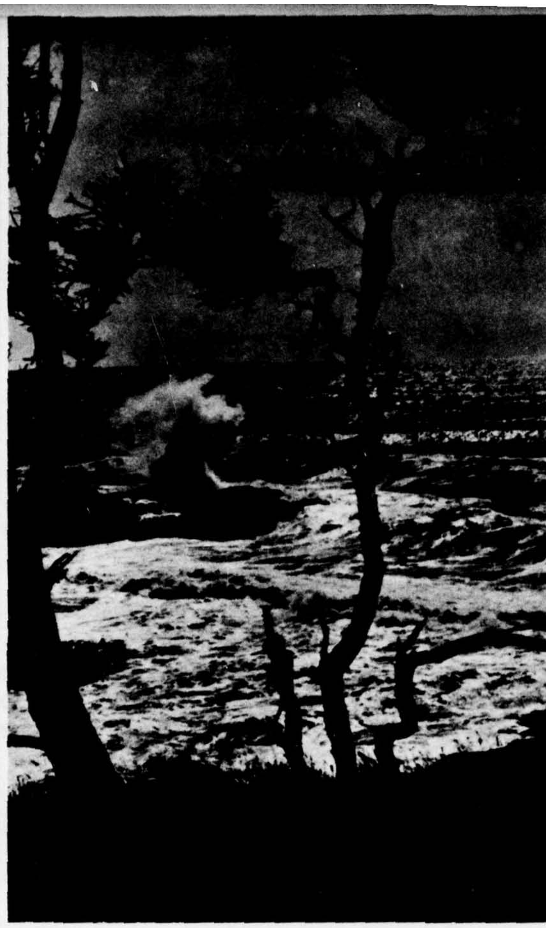

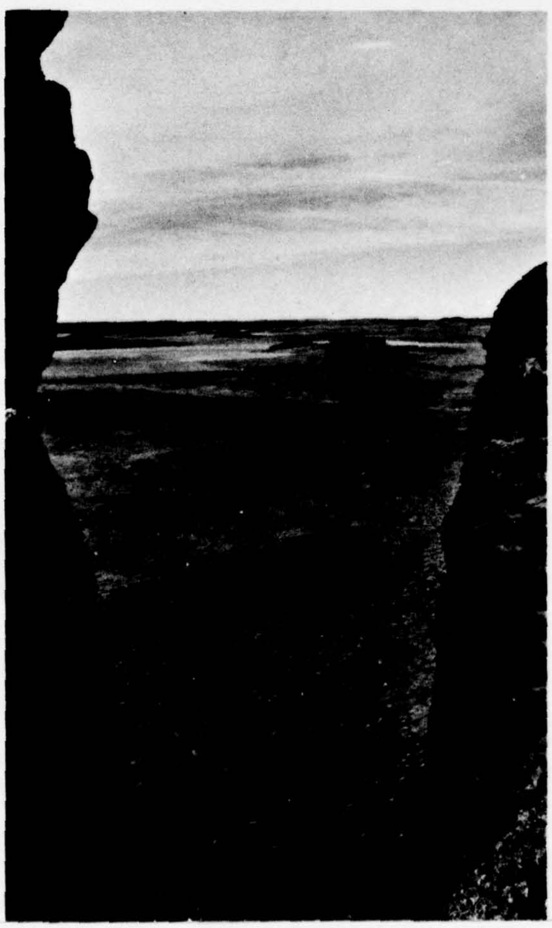


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# I N T R O D U C T I O N

## PURPOSE & SCOPE

The principal function of the Land and Minerals Resources Appendix is to present an inventory of the land and mineral resources of the Columbia-North Pacific Region. These resources are defined, described, and related to the region and subregion's water regime in a manner that is helpful in understanding the use and importance of each resource. (figure 1) Evaluation of the land and minerals presents the productivity potential and the limitations and hazards inherent in the management and use of these resources.

Data are presented mostly in tabular form, in sufficient detail to make possible the establishment of each resource's identity and to differentiate between the various parts of each resource. In addition, the resources are located on maps showing the type and distribution of each. The information is generalized to illustrate the broad pattern of each resource and to point out the general areas needing more research and study. As such, it is intended to be used in the formulation of framework plans.

The land resources include the complete environment, such as the the natural factors of climate, geography, geology, topography, soils, etc., and the cultural factors of manmade improvements, and location with respect to centers of commerce and population. The land resources reflect variable economic conditions, as well as political and social implications, which must be taken into account in their evaluation.

The diversified mineral resources have been the basis for the mineral industry which has had an important role in the economic development, the use of water, and the establishment of water rights in the Columbia-North Pacific Region.

In planning for the use of the land resources there are several factors that have a major influence on the type and scope of a plan to be presented: land ownership, soils, land use, and minerals.

### Land Ownership

Values placed on a resource are often different depending on whether it is in public or private ownership. In order to facilitate a clear and concise understanding of the ownership pattern, land


COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

C-NP REGION

FIGURE 1

ownership data have been developed for Federal, State, county, municipal, and private land. These data are summarized on maps and tables by subregion, state, and region, and are rounded to the nearest 100 acres.

Basic land and water area acreages have been developed using watershed delineation maps from the U.S.D.A. Conservation Needs Inventory. Total land area figures have been tabulated for each subregion and are adjusted to the county acreage as reported in the 1964 Census of Agriculture.

Federal ownership figures were collected from the agencies administering the various types of Federal land within the region, and then were compared with the publication Real Property Owned by the United States (6). Where major discrepancies were found, they were resolved by consultation with the Federal agency involved. Tribal and allotted lands within the Indian Reservations have been included in the Federal acreage subtotals. Although privately owned, they are held in trust and managed by the Federal Government. Other public land ownership figures--state, county, and municipal--were collected from the administering agency involved. Private land was determined by subtracting the public land from the total land area.

## Soils

Soils have been given extensive consideration because of their basic role in agriculture, livestock and game habitat management, forestry, engineering, and water storage. For example, they provide nutrients, moisture, and support for cultivated crops, pasture and game browse, trees, and other ground cover. Soils provide the support and raw material for roads, dams and terraces, and filtering material for sewage filter fields. Soil also plays an important role in water storage and movement after precipitation reaches the ground. In the final analysis, it is water in and on this upper mantle which sustains all terrestrial life.

Soils occur as natural three-dimensional bodies, each having a unique set of properties that result from interaction of climate, vegetation, parent material, topography, and time. In most cases, these factors are interdependent and are not necessarily balanced in their effect; for example, an abrupt change in topography might include important changes in the climate and vegetation and their influence upon soil, or if other factors remain static, the function of time will effect important changes in the soil. In this inventory, the surface mantle that can be penetrated by roots and water to a depth of 60 inches is considered as soil; although, for forest management and other purposes, especially water yield, the entire depth to bedrock is important.

A soil series is the lowest category of the natural system of soil classification based upon such differentiating characteristics as depth, texture, structure, sequence, and arrangement of horizons, etc. Soil associations are combinations of soil series set up as practical segments of the landscape at varying levels of generalization depending upon detail of the basic data. There are vast areas of high mountainous forest soils where basic data are limited and the degree of generalization is much broader. Where possible, individual soil series are used to identify each association in the tables and show the dominant composition and range of contrast within the association. The information summarized in the tables emphasizes the factors that are important to the management of the land.

Soil associations are generalized from, but consistent with, descriptions and definitions of broad areas of soils as defined by Federal agencies, states, counties, or local survey areas. Although the soil association does not identify the soil at any particular spot in the landscape, it carries the identity of the various kinds of soils that serve as a reference from the region down to the field level of detail.

Information used in this inventory is derived in part by generalization of published and unpublished detailed soil survey work of the National Cooperative Soil Survey of the Soil Conservation Service, Forest Service, and Bureau of Indian Affairs, in cooperation with the Agricultural Experiment Stations in each state. Also, contributions were made by the Ultimate Water Needs Cooperative Studies currently being conducted by some of the states.

Many of the individual soils that characterize soil associations are bench-mark soils and have been defined in published reports which give complete physical, chemical, and engineering characterization. More detailed soils information on specific areas may be obtained from the State Offices of the Soil Conservation Service and Regional Offices of the Forest Service, Bureau of Land Management, and Bureau of Indian Affairs. However, some areas have received very little intensive soil investigation. These are primarily in the upland forest areas shown on the generalized cover and land use maps. Insufficient soils work has been done here to warrant detailed interpretive map preparation.

In summary, the soil associations define areas that are:

1. Associated in the landscape.

2. Referred directly to the detailed soil units when more information is needed.

3. Important to all land uses.

## Land Capability

Land Capability classification is based on the standard interpretative groupings used by the Soil Conservation Service. This classification relates soil characteristics, qualities, behavior, and response to agricultural uses. Soil characteristics (such as depth, texture, structure, presence of aggregate, wetness, reaction, and slope), and soil qualities (such as permeability, erosion hazard, overflow hazard, water-holding capacity, inherent fertility, and climatic conditions as they influence use and management of land) are considered in grouping soils into the eight land capability classes. The Class I land has few hazards or limitations that restrict its use for agriculture. Class VIII land, on the other hand, has many limiting soil and land characteristics for crop production. However, areas of Class VIII land may be extremely valuable for recreation, wildlife habitat, water supply, or esthetics.

The capability classifications can be broken into two divisions: (1) Classes I through IV are suitable for cultivation and other use, while (2) Classes V through VIII are generally unsuitable for cultivation but are suitable for range, forest, recreation, wildlife habitat, and water supply. Land capability classes are generally broken into subclasses to indicate the dominating limitation or hazard. The symbols for these subclasses, in order of priority, are: "e" for water or wind erosion, "w" for wetness or frequent inundation from overflow, "s" for soil limitation, and "c" for climatic limitation. This interpretation of the hazards and limitations in the agricultural use of land does not evaluate its productivity nor rate its suitability for forest and range uses.

## Cover and Land Use

The land resource has been divided into four broad categories --cropland, rangeland, forest land (those uses which are dependent upon the soils productive factors), and other land (composed of all land use not dependent upon the soils productive capabilities).

Cropland data have been collected through the National Cooperative Soil Survey, principally by individual U.S.D.A. Conservation Needs Inventory sample areas. The data were transferred to each subregional base map and sent to the field to be generalized and updated as needed for location and acreages of cropland.

Forest land data, including acreages, volumes of timber, and growing stock, have been inventoried by the U.S.D.A. Forest Survey Project of the Pacific Northwest and Intermountain Forest and Range Experiment Stations. The data, collected by county, have been adjusted to fit the subregional boundaries and cover all forest land, commercial and noncommercial, regardless of ownership.

Rangeland generally includes those lands that, because of land capability and physical characteristics, are currently restricted to rangeland cover types, as well as forest stands receiving grazing use. Range is reported under three categories: grasslands, sagebrush, and brushland other than sage. Forest range is used or potentially usable for domestic livestock production and reported under the broad categories of commercial and noncommercial forest land. Statistics are presented in such a manner that acreages for forest land and forest land grazed are not duplicated in total area compilations. All rangeland data have been collected under the following ownership categories: Bureau of Land Management; Forest Service; Bureau of Indian Affairs; other Federal ownership; state and county; and private.

The other land acreage includes two significant categories: those land areas not suitable for productive use, such as dunes, barren land, and rock outcrop; and those lands used for urban and industrial purposes, roads and highways, surface mining, and special use areas. Although these latter areas are relatively small they may occupy some of the region's most productive agricultural land.

### Minerals

The mineral resources and industries were inventoried and are shown on subregional maps. In addition, they are described as to the kinds of minerals, past production, current activity, and future potential. The data for this section were summarized from various publications of State and Federal agencies responsible for the inventory and development of the mineral resources in the Pacific Northwest.

## RELATION TO OTHER PARTS OF THE REPORT

The land and mineral resources data have been collected, described, and evaluated for the purpose of providing basic information to the various appendices. The land and mineral resources are particularly pertinent to other appendices in the following ways:

### Flood Control

The Land and Minerals Appendix locates and discusses: (1) the water storage capacity of soils; (2) kinds of land use that influence water infiltration rates and storage in the soil profile; and (3) the soil areas important to annual sedimentation from runoff waters. The combination of water storage, infiltration, and sedimentation is significant to the accumulation of flood waters on low lying areas.

Surface mining, although occupying a small percentage of the total regional area, affects flood control in several ways. Abandoned pits and spoil banks collect and hold water for more gradual percolation into ground water. Erosion of spoil banks and mine dumps in some places causes deposition in stream channels.

### Land Measures and Watershed Protection

Land facts important to flood control are also pertinent to land measures and watershed protection. The whole spectrum of land ownership, land use, the soil, and how to cope with its limitations and hazards as presented in the Land and Minerals Appendix are all critical to land measures and watershed protection.

The very nature of mining and mineral resource recovery denotes the disturbance of the earth's crust in some manner in order to remove the valuable material for the use of industry and the benefit of mankind. This will have effects on land measures and watershed protection, although it does not follow inevitably that the effects will be adverse.

### Irrigation

Location of the more desirable soil areas is important to irrigation, as are all the basic land facts recorded in the Land and Minerals Appendix. These include soil characteristics, land capability, land ownership, and present land use.

### Water Quality and Pollution Control

The land and mineral resources, as located and described in this appendix, may be utilized to locate areas that contribute sediment and chemicals to the streams, as well as areas managed to protect the inherent water quality.

## HISTORY

### Land

Most of the Columbia-North Pacific Region was originally public land of the Oregon Territory, acquired by the United States in 1846 and hence has been subject to the various Federal land laws. The development of the region was greatly dependent upon these laws and their effect upon the disposal and management of the Federal lands. The transition from emphasis upon disposal to retention and management is, for convenience of discussion, separated into three time intervals--1846 to 1890; 1890 to 1934; and 1934 to present. Actually there was no exact date separating the three periods. However, they do represent significant intervals in the evolution of the Nation's attitude toward the role of the public land in the development of the Pacific Northwest and its natural resources.

## Disposal Period, 1846 to 1890

The major objective of Federal policy during this period was to make lands quickly and cheaply available to settlers for permanent occupation. To this end, laws were enacted to dispose of lands wherever they were in demand. The first act to provide individual ownership was the Donation Land Act of 1850, forerunner of the Homestead Law. Under this law more than 2.6 million acres were claimed by 7,400 settlers in the fertile western Oregon valleys of the Rogue, Umpqua, and Willamette Rivers.

From the Willamette Valley, settlement soon expanded into the Puget Sound area. This settlement resulted in the creation of the Washington Territory in 1853, carved from the vast Oregon Territory. Six years later Oregon attained statehood.

Discovery of gold and an influx of miners were significant in settlement of the interior of the region, initiating a demand for local agricultural production and other services. In response to this population growth, the Idaho Territory was established in 1861.

Much of the Public Domain settled by individuals was patented under the Homestead Law of 1862 with its subsequent modifications. The original 160-acre homestead size was adequate for subsistence and commercial farm development in the more humid parts of the region. However, when settlement expanded into the semiarid lands of eastern Washington and Oregon and to southern Idaho, 160 acres were insufficient unless irrigated and many failures resulted.

To help meet this need, the Desert Land Act of 1877, as amended in 1891, permitted a settler and his wife to claim 320 acres each provided a portion of this land was irrigated within 3 years. This was successful only in those areas where lands could be easily and cheaply irrigated. However, when irrigation was not feasible, 640 acres were often insufficient for a dryland operation.

In the developing livestock industry on the Columbia River Plateau and the Snake River Plains, the small acreage allowed under the homestead laws was inadequate for forage production for year-round use. Increased numbers of cattle and sheep were grazed on the open public range where use was free but no individual grazing rights could be acquired. Without this individual responsibility, natural range forage was used much more rapidly than it could be reproduced, resulting in a marked deterioration of the range.

In western Washington and Oregon, considerable forest land was patented under the Homestead Law. In addition, private acquisition of forest land was desired by the developing lumber industry. An 1873 law allowed the purchase of 160 acres of timber land if 40 acres of it were kept in good condition. Later in 1878, Oregon and Washington lands principally suited for timber production, or as a source of stone, and unfit for cultivation could be purchased by individuals in tracts up to 160 acres.

Railroad land grants accounted for the eventual disposal of nearly 14 million acres or 8 percent of the regional land area. Transcontinental railroad construction toward the end of this period brought a new surge of settlement to the region. A large percentage of these grants were sold to individuals and converted to farm lands and cities.

Washington and Montana attained statehood in 1889, followed by Idaho the next year. Upon attaining statehood each state was given public lands to provide funds for education and other purposes. These grants, amounting to 14 million acres, were another phase of the Federal policy for disposing of the public lands.

By 1890 the region's population had increased to 799,000, compared to 13,000 in 1850.

This period was highlighted by the Federal Government's desire to see the Pacific Northwest settled and the transfer of the public land to private ownership. Although laws were modified to meet settlement demands, no controls were exercised in advance of settlement to assure adequate size of holdings, logical pattern of settlement and ownership, or proper use of resources to best assure sound economic development.

## Protection Period, 1890 to 1934

During this period, there was an increasing public and congressional awareness that the Nation's natural resources were not unlimited and that there was need to conserve and control their use. To this end, a number of Federal withdrawals were made to conserve Indian lands, timber resources, power sites, scenic wonders, and grazing lands, and for other public uses. Meanwhile, settlement was allowed to continue on the open Public Domain as in the previous period.

The forests, which were undergoing obvious degradation, were the first resource to be protected when in 1891 legislation was enacted to reserve public forest lands to assure good management of timber resources and upland watershed areas. The next year saw the establishment of the first forest reserve in the Columbia-North Pacific Region. This was the Bull Run Forest Reserve, which later became Mt. Hood National Forest. Similar reserves were created in other areas of Oregon and in Washington in 1893, and in Idaho and Montana in 1897. These became National Parks and National Forests administered by the newly formed National Park Service and the Forest Service.

Legislation in 1894 allowed up to a million acres to each state which would establish reclamation projects and control settlement of the land. However, very little land was transferred because the states were unprepared for this responsibility. Reclamation projects, undertaken by private companies, were frequently unsuccessful except when irrigation water was relatively inexpensive and easy to develop. This difficulty pointed the need for large-scale studies of irrigation needs and for public construction and financing. To provide these services the Federal Reclamation Act of 1902 was enacted and the Reclamation Service (now the Bureau of Reclamation) established.

Further modification of the Homestead Laws in 1909 allowed a 320-acre claim when lands were suitable for dry farming but not easily developed for irrigation. Many grazing lands where rainfall exceeded 12 inches became dryland wheat producing areas. Subsequent settlement expanded to more arid lands that were unsuitable for dry farming, and made the 320-acre claim an uneconomic farm unit.

In an attempt to assist the livestock industry, legislation in 1916 increased the acreage limitation to 640 acres where public lands were suitable only for grazing livestock. While this increase in acreage was helpful on some rangeland, as much as an estimated 8,000 acres were needed to constitute an economic unit.

In conjunction with the creation of Federal forest reserves and the conservation of forest resources, the Weeks Law of 1911 authorized the Federal Government to purchase cut-over timber lands for National Forests. While these were principally forest lands, they also included some lands that had been unsuccessfully homesteaded. However, this action accounted for only small additions to public land ownership in the Columbia-North Pacific Region.

By 1934, the region's population had increased to approximately 3.2 million people--a 300 percent rise since 1890. The farm economic recession beginning in 1925 forced many settlers to abandon their uneconomical homestead tracts, and considerable cropland reverted to rangeland.

Of the region's total area of 174 million acres, 35 percent was in private ownership by 1934. These lands represented the most productive agricultural land. The remaining public lands available for entry amounted to only 28 million acres, little of which was suitable for farming without irrigation. The Federal Government had withdrawn from entry about 73 million acres (42 percent of the land area); states and counties owned about 12.3 million acres.

During this period, considerable progress was made to protect and conserve many of the region's resources by withdrawal of large tracts of land. On the other hand, little attention had been given to settlement patterns on the open Public Domain and the adverse effects of unwise settlement location on the individual well-being of the settler or on long-term resource values.

## Management Period, 1934 to Present

Under the land disposal laws previously enacted, little attention had been given the problem of suitable land use in advance of settlement. It was left up to individual settlers to decide whether a given tract of land could be farmed and to what type of farming it was best adapted. In many cases they selected lands with poor soils, planted the wrong crops, or settled on tracts that were too small. This generally resulted in the eventual abandonment of the land. Not only was it difficult for the individual settler to make a living, but the basic land resources were threatened with impairment or destruction. Most of the rangeland had been used in excess of its grazing capacity and, consequently, had seriously deteriorated. It had been estimated that "over 12 million acres in Oregon, Washington, and Idaho, three-quarters of the top soil and some subsoil had already been lost, and more than 3 million acres had been destroyed or very severely damaged by wind erosion." (3-6)

The year 1934 marked the end of the open Public Domain and the haphazard settlement of the region's land that typified the early periods. By Executive Order, all remaining open Public Domain was withdrawn and, henceforth, individual settlement would be allowed only if the lands were classified as suitable for the proposed use.

This same year the Taylor Grazing Act authorized the Secretary of the Interior to establish grazing districts and to adjust livestock use to the carrying capacity of the range. Grazing districts were established on the public rangelands and studies made to determine proper carrying capacity. Some progress was made in adjusting livestock numbers to the capacity of the range.

Private land, principally agricultural, began receiving attention during this period. Federal programs were initiated to study soil erosion and associated problems. This led to the creation of the Soil Conservation Service in 1935 to control and prevent soil erosion and conserve the soil and water resources of the Nation. These efforts included range improvement projects on privately owned range lands.

The Bankhead Jones Act of 1937 authorized Federal purchase of privately owned farm lands which were submarginal and incapable of providing livelihood for the owner. Provision was made to relocate the owner and family on more suitable agricultural lands, and the acquired lands were added to various Federal withdrawals for proper management.

World War II placed tremendous pressures upon the region's natural resources; however, improved management and favorable climatic conditions, prevented excessive depletion of these resources.

Irrigation became increasingly more of a factor in the agricultural economy of the region. About 72 percent of the initial irrigation development had been made by individuals, cooperatives, and agencies other than the Federal Government. However, under various reclamation programs, the Federal Government provided aid, primarily supplemental water, so that, by 1952, approximately 60 percent of the irrigated area had received some Federal support.

Distribution of land ownership in 1952 shows that the Federal Government owned about 95.0 million acres, while 70.7 million acres were in private ownership and 8.0 million acres were in state and county ownership (table 1). At this time there was an estimated 18.4 million acres of cropland, 84.4 million of forest land, 63.8 million acres of nonforest rangeland, and 7.1 million acres of other land (rocky, barren, dunes, and urban areas).

Then, as now, concentrations of cropland were located on the Columbia Plateau, Central Washington valleys, the Willamette Valley in Oregon, and on the Snake River Plains in southern Idaho. Cropland use of land had increased substantially in the region. Mechanization of farming made possible larger land holdings and improved timeliness of operations. Efficient uses of rotations, residues, and tillage allowed areas to be cropped that were formerly considered too dry. Irrigation of desert areas allowed further cropland expansion. Development of new strains--particularly of grain, sugar beets, peppermint, and grasses--encouraged diversification and made cropland use more profitable. Agricultural chemistry contributed insecticides, herbicides, hormones of various kinds, other weed killers, and commercial fertilizers that made possible the cropland use of some additional land areas and made improved management

Table 1 - Land Ownership and Use Trends, Columbia-North Pacific Region

| Ownership and Use | 1934 1/ | | 1952 2/ | | 1966 | |
|---|---|---|---|---|---|---|
| | Million acres | Percent | Million acres | Percent | Million acres | Percent |
| Ownership | | | | | | |
| Federal | | | | | | |
| Reserved | 72.8 | 41.9 | 95.0 | 54.7 | 95.6 | 55.0 |
| Public Domain | 27.6 | 15.9 | - | - | - | - |
| Total Federal | 100.4 | 57.8 | 95.0 | 54.7 | 95.6 | 55.0 |
| State | 10.4 | 6.0 | 7.8 | 4.5 | 8.4 | 4.8 |
| County and Municipal | 1.9 | 1.1 | 0.2 | 0.1 | 1.0 | 0.6 |
| Private | 61.0 | 35.1 | 70.7 | 40.7 | 68.7 | 39.6 |
| Total | 173.7 | 100.0 | 173.7 | 100.0 | 173.7 | 100.0 |
| Land Use | | | | | | |
| Cropland | 14.4 | 8.3 | 18.4 | 10.6 | 20.8 | 12.0 |
| Forest Land | 78.2 | 45.0 | 84.4 | 48.6 | 85.8 | 49.4 |
| Range | 77.6 | 44.7 | 63.8 | 36.7 | 58.8 | 33.8 |
| Other | 3.5 | 2.0 | 7.1 | 4.1 | 8.3 | 4.8 |
| Total | 173.7 | 100.0 | 173.7 | 100.0 | 173.7 | 100.0 |

1/ "Migration and the Development of Economic Opportunity in the Pacific Northwest," National Resources Planning Board, Region 9, Portland, Oregon, August 1939, pp. 99, 111 (data proportionally adjusted from total 188 million acres to present C-NP regional area).

2/ "Agricultural Program Reports, Columbia River Basin Area," U.S. Department of Agriculture, preliminary report, 1953 (data proportionally adjusted from total 174.5 million acres to present C-NP regional area).

possible. A combination of these factors aided in the continuation of the trend of converting the cropland to increasingly more intensive uses.

The region's forest resources have been and will continue to be of great importance both to the region and to the Nation. About 15 percent of the Nation's wooded areas and half of its sawtimber are located in this region and for the past 10 years it has been producing almost half of the Nation's softwood lumber. All the uses of the forest land (wood production, livestock use, mineral production, and recreational enjoyment) can be maintained while these forests continue to yield abundant high quality water.

There are now approximately 58.8 million acres of nonforest range in the region, plus some 8.9 million acres of forest land utilized for livestock forage production. More than 4.5 million cattle were reported in 1964, about one-fifth of them dairy cows, concentrated in the area west of the Cascades and the irrigated sections of the interior. Beef cattle are found throughout the region, but the greatest concentrations are in the Middle and Upper Snake and Harney Basin areas. Fattening of livestock in farm feed lots has become important in the marketing process. The heaviest concentration of sheep is in the Snake River areas of Idaho, with 55 percent of the total. The estimated capacity of all usable grazing land in the region is about 9.8 million animal unit months with about 25.5 percent of this capacity within the forest range areas. Broad estimates indicated that 59 percent of the forage production comes from the public rangelands and 41 percent from private range. Many acres of rangeland have better management because hay and grain were produced on adjacent irrigated land for supplemental winter feed.

The protection and management period reflects a further shift in government policy as a result of public opinion towards both the private and public land resources of the Nation and in the Columbia-North Pacific Region. Programs were enacted to stop degradation of the land and to promote its recovery while the random settlement of the Public Domain was halted.

## Summary

To encourage settlement of this and other remote sections of the United States, the policy of making lands quickly and easily available was adopted by the Congress with respect to the Public Domain. The benefits from permanent settlement far outweighed the financial return from sale of these public lands and most legislation was directed to this goal. The early land laws accomplished this objective. In the process many resources were destroyed or seriously depleted through improper management and use not compatible with the productive capacity of the land resources.

It became apparent that all resources were limited and must in some way be protected. This led to the withdrawal of large acreages of Public Domain forest lands and areas for other public purposes. However, settlement was still allowed to continue on the Public Domain with no guidance as to the suitability of lands for the proposed use or the economic feasibility of the efforts.

Finally, all of the Public Domain was withdrawn and settlement allowed only if the land was suitable for the intended use. This eventual restriction in public entry and the retention of the remaining forest and rangeland have led to the ownership pattern we have today, that of private ownership of nearly all the lands presently used for cropland and public ownership of about half the forest and rangeland. Within both ownership sectors there is increasing awareness of the need for sound management and proper use of the land and water resources.

## Minerals

Mining has played an important part in the development of the region's economy. Approximately $10 billion in wealth has been extracted from mines and quarries within the study area, with over $6.5 billion coming from three of the world's important mining districts: Butte, in Montana, one of the country's important sources of copper; the Coeur d'Alenes, in Idaho, the country's leading silver-producing area and one of the leading sources of lead and zinc; and Metaline, in Washington, based on the production of lead, zinc, and some silver. Oregon has been an important source of mercury, nickel, and chrome. Many other metallic and nonmetallic minerals are produced from within the study area.

Except for some coal mined in the Puget Sound area, placer gold was the first mineral to be exploited. In 1850, gold was found in the Klamath River just south of the region, and in 1851 gold was discovered on Jackson Creek and the Illinois River in southwestern Oregon and on Gold Creek in Montana. These discoveries attracted little attention. However, additional discoveries were made, and by 1855 placer gold was being mined along the Upper Columbia and some of its tributaries.

The first big gold rush followed the discovery of gold on Orofino Creek in Idaho in 1860. Other discoveries were made on the Salmon River in the Boise Basin and elsewhere, causing a continuation of the influx of miners, so that by 1863 there were an estimated 25,000 miners in southern Idaho. Some of these placers were very rich, and it is estimated that over $20 million in placer gold was produced from Orofino and neighboring camps in the first 4 years following discovery. The rich gravel was soon exhausted, but mining of the lower grade gravels continued for many years. Discoveries in

Idaho were followed by discoveries in 1861 on the John Day and Powder Rivers in Oregon and in 1862 by an important discovery just east of the region at Bannack, Montana. This discovery brought a rush of miners into Montana and resulted in the finding of rich placers at Helena, Marysville, Virginia City, and elsewhere. The Virginia City-Alder Gulch placers alone are said to have yielded $30 million in the first 3 years following their discovery.

Lode deposits were soon discovered and were being mined by the 1870's. By the 1880's practically all the presently known mining districts had been discovered, and lode mining was well underway. The establishment of base-metal mining did much to hasten the construction of roads, railways, and other means of transportation.

The impact of the miner on the water resources of the area cannot be overemphasized; even the earliest operations utilized water. The placer miners first conducted their operations directly in the gold-bearing streams. Later, bank deposits of placer gold were worked with hydraulic equipment powered by water often brought in by ditch from considerable distances. Numerous diversion dams and reservoirs were constructed, and the first power plants were built by mining companies. Although the heyday of the placer miner is long since gone, the water rights on many streams in the basin originated with him, and the "miner's inch" is still a standard measure of water in many districts. One of the first orders of business in new mining camps was the drafting of local mining laws including water regulations, some of which are still in effect today.

The early miner brought many lasting benefits as well as some problems to the region. The discovery of gold and other resources introduced the hardy pioneer, an essential element of growth. Also important was the outpouring of primary wealth which was readily transferable into durable goods and services needed to build a sound economy. While the early miner, for the most part, ignored the major problem of water quality, the modern mineral industry is working on corrective measures. Another problem, largely in the past, was the disturbance of valley floors by dredge operations.

The mining industry today is characterized in certain sections of the region by large, well established operations which have been producing for many years and still have sufficient reserves to last for many more. Mines are generally producers of metals such as gold, silver, copper, lead, zinc, antimony, and mercury. Equally as important are the industrial mineral operations which are found in almost every community. The production of sand and gravel, crushed rock, limestone, pumice, expandable shale, brick and tile clay, refractory clay, and many others are often a local activity with mine and market in close proximity. Community development depends on the heavy construction minerals such as sand and gravel and stone. These in turn use large quantities of water to wash, size, and concentrate the raw material. Modern practice is toward increasing reuse of process water, but as high-grade deposits are exhausted and lower grade reserves must be used, the quantity of water required will remain fairly high.

Thus, the mineral industry has had and will continue to have an important, far reaching effect on the water utilization and development of the Columbia-North Pacific Region.

# R E G I O N A L   S U M M A R Y

The Columbia-North Pacific Region occupies all the drainage basins of the Columbia and Pacific coastal rivers of Washington and Oregon that occur in the northwest corner of continental United States and the Oregon Closed Basin. This inventory of land and mineral resources was documented by the 12 subregional sections and then summarized into this regional summary. Consideration of Land and Mineral Resources in their relation to various aspects of water in the region was a major objective of this part of the study.

The total surface area of the region is defined as either water or land. Water areas larger than 40 acres in size and streams more than one-eighth mile across are considered as "large water." These are tabulated in the first table of the subregional and regional reports. Water areas smaller than 40 acres and streams less than one-eighth mile wide are included with land and recorded by acreage in all other tables and narrative in the reports. "Total area" of the region or subregion is the sum of "large water areas" and "land areas" as summarized on tables 2, 3, and 4.

## LAND

A plan for the continuing use and management of land must consider the land ownership, the soils, and its present cover and kind of use. The environment, the location, and amount of land also influence the plan for management of this resource.

### Land Ownership

The Federal Government is the largest single landowner in the Columbia-North Pacific Region. Through its various land managing agencies, it owns and manages 55 percent of the total regional land area. Private individuals and corporations own almost 40 percent, the balance being held by state, county, and local governments.

The largest Federal land managing agency in the Columbia-North Pacific Region is the Forest Service, which manages 54.4 million acres in National Forest and National Grassland status. The second largest is the Bureau of Land Management, which manages 29.5 million acres of Public Domain and revested Oregon and California railroad grant lands. Nearly 3.4 million acres are in National Park status, managed by the National Park Service. Another 1.1 million acres are under the jurisdiction of the Bureau

Table 2 - Water Area by State & Subregion, Columbia-North Pacific Region, 1966

| Sub-region | Unit | Idaho | Montana | Nevada | Oregon | Utah | Washington | Wyoming | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Thous. Acres | 163.6 | 254.7 | - | - | - | 33.3 | - | 451.6 |
| | Sq. Miles | 255.6 | 398.0 | - | - | - | 52.0 | - | 705.6 |
| | Thous. Acres | - | - | - | - | - | 288.1 | - | 288.1 |
| | Sq. Miles | - | - | - | - | - | 450.1 | - | 450.1 |
| 3 | Thous. Acres | - | - | - | - | - | 28.5 | - | 28.5 |
| | Sq. Miles | - | - | - | - | - | 44.6 | - | 44.6 |
| 4 | Thous. Acres | 212.9 | - | 0 | - | 0 | - | 53.8 | 266.7 |
| | Sq. Miles | 332.6 | - | 0 | - | 0 | - | 84.0 | 416.6 |
| 5 | Thous. Acres | 118.2 | - | 2.2 | 50.0 | - | - | - | 170.4 |
| | Sq. Miles | 184.6 | - | 3.4 | 78.1 | - | - | - | 266.1 |
| 6 | Thous. Acres | 25.7 | - | - | 3.4 | - | 51.4 | - | 80.5 |
| | Sq. Miles | 40.2 | - | - | 5.3 | - | 80.2 | - | 125.7 |
| 7 | Thous. Acres | - | - | - | 80.8 | - | 44.8 | - | 125.6 |
| | Sq. Miles | - | - | - | 126.3 | - | 70.0 | - | 196.3 |
| 8 | Thous. Acres | - | - | - | 6.2 | - | 67.3 | - | 73.5 |
| | Sq. Miles | - | - | - | 9.6 | - | 105.2 | - | 114.8 |
| 9 | Thous. Acres | - | - | - | 106.4 | - | - | - | 106.4 |
| | Sq. Miles | - | - | - | 166.3 | - | - | - | 166.3 |
| 10 | Thous. Acres | - | - | - | 83.4 | - | 71.0 | - | 154.4 |
| | Sq. Miles | - | - | - | 130.3 | - | 111.0 | - | 241.3 |
| 11 | Thous. Acres | - | - | - | - | - | 100.6 | - | 100.6 |
| | Sq. Miles | - | - | - | - | - | 157.2 | - | 157.2 |
| 12 | Thous. Acres | - | - | - | 63.5 | - | - | - | 63.5 |
| | Sq. Miles | - | - | - | 99.3 | - | - | - | 99.3 |
| Total | Thous. Acres | 520.4 | 254.7 | 2.2 | 393.7 | 0 | 685.0 | 53.8 | 1,909.8 |
| | Sq. Miles | 813.0 | 398.0 | 3.4 | 615.2 | 0 | 1,070.3 | 84.0 | 2.983.9 |

Source: *U.S.D.A. Conservation Needs Inventory adjusted to U.S. Census.*

Table 3 - Land Area by State & Subregion, Columbia-North Pacific Region, 1966

| Sub-region | Unit | Idaho | Montana | Nevada | Oregon | Utah | Washington | Wyoming | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Thous. Acres | 4,665.0 | 15,921.6 | - | - | - | 2,232.8 | - | 22,819.4 |
| | Sq. Miles | 7,289.0 | 24,877.5 | - | - | - | 3,488.8 | - | 35,655.3 |
| 2 | Thous. Acres | - | - | - | - | - | 14,080.8 | - | 14,080.8 |
| | Sq. Miles | - | - | - | - | - | 22,001.3 | - | 22,001.3 |
| 3 | Thous. Acres | - | - | - | - | - | 3,851.4 | - | 3,851.4 |
| | Sq, Miles | - | - | - | - | - | 6,017.7 | - | 6,017.7 |
| 4 | Thous. Acres | 18,232.3 | - | 973.6 | - | 240.9 | - | 3,235.0 | 22,681.8 |
| | Sq. Miles | 28,488.0 | - | 1,521.3 | - | 376.4 | - | 5,054.7 | 35,440.4 |
| 5 | Thous. Acres | 12,193.5 | - | 2,322.9 | 8,881.1 | - | - | - | 23,397.5 |
| | Sq. Miles | 19,052.5 | - | 3,629.6 | 13,876.7 | - | - | - | 36,558.8 |
| 6 | Thous. Acres | 15,694.3 | - | - | 3,168.2 | - | 3,508.7 | - | 22,371.2 |
| | Sq. Miles | 24,522.3 | - | - | 4,950.3 | - | 5,482.4 | - | 34,955.0 |
| 7 | Thous. Acres | - | - | - | 15,366.6 | - | 3,455.6 | - | 18,822.2 |
| | Sq. Miles | - | - | - | 24,010.3 | - | 5,399.3 | - | 29,409.6 |
| 8 | Thous. Acres | - | - | - | 162.6 | - | 3,030.0 | - | 3,192.6 |
| | Sq. Miles | - | - | - | 254.1 | - | 4,734.4 | - | 4,988.5 |
| 9 | Thous. Acres | - | - | - | 7,602.8 | - | - | - | 7,602.8 |
| | Sq. Miles | - | - | - | 11,879.4 | - | - | - | 11,879.4 |
| 10 | Thous. Acres | - | - | - | 10,984.5 | - | 4,069.7 | - | 15,054.2 |
| | Sq. Miles | - | - | - | 17,163.2 | - | 6,358.9 | - | 23,522.1 |
| 11 | Thous. Acres | - | - | - | - | - | 8,446.6 | - | 8,446.6 |
| | Sq. Miles | - | - | - | - | - | 13,197.8 | - | 13,197.8 |
| 12 | Thous. Acres | - | - | - | 11,394.8 | - | - | - | 11,394.8 |
| | Sq. Miles | - | - | - | 17,804.3 | - | - | - | 17,804.3 |
| Total | Thous. Acres | 50,785.1 | 15,921.6 | 3,296.5 | 57,560.6 | 240.9 | 42,675.6 | 3,235.0 | 173,715.3 |
| | Sq. Miles | 79,351.8 | 24,877.5 | 5,150.9 | 89,938.3 | 376.4 | 66,680.6 | 5,054.7 | 271,430.2 |

Source: U.S.D.A. Conservation Needs Inventory adjusted to U.S. Census

Table 4 - Total Area by State & Subregion, Columbia-North Pacific Region, 1966

| Sub-region | Unit | Idaho | Montana | Nevada | Oregon | Utah | Washington | Wyoming | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Thous. Acres | 4,828.6 | 16,176.3 | - | - | - | 2,266.1 | - | 23,271.0 |
| | Sq. Miles | 7,544.6 | 25,275.5 | - | - | - | 3,540.8 | - | 36,360.9 |
| 2 | Thous. Acres | - | - | - | - | - | 14,368.9 | - | 14,368.9 |
| | Sq. Miles | - | - | - | - | - | 22,451.4 | - | 22,451.4 |
| 3 | Thous. Acres | - | - | - | - | - | 3,879.9 | - | 3,879.9 |
| | Sq. Miles | - | - | - | - | - | 6,062.3 | - | 6,062.3 |
| 4 | Thous. Acres | 18,445.2 | - | 973.6 | - | 240.9 | - | 3,288.8 | 22,948.5 |
| | Sq. Miles | 28,820.6 | - | 1,521.3 | - | 376.4 | - | 5,138.7 | 35,857.0 |
| 5 | Thous. Acres | 12,311.7 | - | 2,325.1 | 8,931.1 | - | - | - | 23,567.9 |
| | Sq. Miles | 19,237.1 | - | 3,633.0 | 13,954.8 | - | - | - | 36,824.9 |
| 6 | Thous. Acres | 15,720.0 | - | - | 3,171.6 | - | 3,560.1 | - | 22,451.7 |
| | Sq. Miles | 24,562.5 | - | - | 4,955.6 | - | 5,562.6 | - | 35,080.7 |
| 7 | Thous. Acres | - | - | - | 15,447.4 | - | 3,500.4 | - | 18,947.8 |
| | Sq. Miles | - | - | - | 24,136.6 | - | 5,469.3 | - | 29,605.9 |
| 8 | Thous. Acres | - | - | - | 168.8 | - | 3,097.3 | - | 3,266.1 |
| | Sq. Miles | - | - | - | 263.7 | - | 4,839.6 | - | 5,103.3 |
| 9 | Thous. Acres | - | - | - | 7,709.2 | - | - | - | 7,709.2 |
| | Sq. Miles | - | - | - | 12,045.7 | - | - | - | 12,045.7 |
| 10 | Thous. Acres | - | - | - | 11,067.9 | - | 4,140.7 | - | 15,208.6 |
| | Sq. Miles | - | - | - | 17,293.5 | - | 6,469.9 | - | 23,763.4 |
| 11 | Thous. Acres | - | - | - | - | - | 8,547.2 | - | 8,547.2 |
| | Sq. Miles | - | - | - | - | - | 13,355.0 | - | 13,355.0 |
| 12 | Thous. Acres | - | - | - | 11,458.3 | - | - | - | 11,458.3 |
| | Sq. Miles | - | - | - | 17,903.6 | - | - | - | 17,903.6 |
| Total | Thous. Acres | 51,305.5 | 16,176.3 | 3,298.7 | 57,954.3 | 240.9 | 43,360.6 | 3,288.8 | 175,625.1 |
| | Sq. Miles | 80,164.8 | 25,275.5 | 5,154.3 | 90,553.5 | 376.4 | 67,750.9 | 5,138.7 | 274,414.1 |

Source: U.S.D.A. Conservation Needs Inventory adjusted to U.S. Census

of Reclamation. About 600,000 acres are National Wildlife Refuges and hatcheries managed by the Fish and Wildlife Service. The Department of Defense controls an additional 750,000 acres, both in military reservations and public works projects. The remaining Federal ownership, slightly over one million acres, is under the jurisdiction of various agencies including the Atomic Energy Commission, the Bonneville Power Administration, the Agricultural Research Service, and the Treasury Department.

Nearly 4.8 million acres are Indian tribal and allotted lands, both inside and outside Indian Reservations. These areas are owned by the individual Indians or tribes with trust responsibilities vested in the Bureau of Indian Affairs.

The seven states own nearly 8.5 million acres. The State of Washington owns 3.3 million acres, followed by Idaho with 2.8 million acres, Oregon with 1.7 million acres, Montana with 650,000 acres, Utah with 26,000 acres, and Wyoming with 9,000 acres. The State of Nevada does not own any land in the region. These state lands are distributed between many state agencies, but are principally managed by Natural Resource or Forestry Departments, Parks, Fish and Game, and the highway departments.

Table 5 - Land Ownership Acreage, Columbia-North Pacific Region, 1965

| Administering Agencies | Idaho | Montana | Nevada | Oregon | Utah | Washington | Wyoming | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1000 acres) | | | | |
| Department of Agriculture | | | | | | | | |
| Forest Service | 19,790.2 | 8,736.9 | 675.5 | 13,866.7 | 46.7 | 9,016.0 | 2,274.2 | 54,406.2 |
| Other Agriculture | 32.7 | - | - | 14.6 | - | .4 | - | 47.7 |
| Subtotal | 19,822.9 | 8,736.9 | 675.5 | 13,881.3 | 46.7 | 9,016.4 | 2,274.2 | 54,453.9 |
| Department of the Interior | | | | | | | | |
| Bureau of Land Management | 11,839.4 | 152.3 | 1,871.5 | 15,313.6 | 52.4 | 275.2 | 13.0 | 29,517.4 |
| Bureau of Indian Affairs 1/ | 831.1 | 618.8 | 144.3 | 690.0 | - | 2,507.8 | - | 4,792.0 |
| *National Park Service* 2/ | 84.9 | 655.7 | - | 64.4 | - | 1,903.0 | 686.1 | 3,394.1 |
| Fish & Wildlife Service | 20.2 | 20.4 | - | 433.3 | - | 110.0 | 24.6 | 608.5 |
| Bureau of Reclamation | 581.8 | .4 | - | 160.9 | - | 393.0 | - | 1,136.1 |
| Other Interior | .1 | .1 | - | 2.7 | - | 7.1 | - | 10.0 |
| Subtotal | 13,357.5 | 1,447.7 | 2,015.8 | 16,664.9 | 52.4 | 5,196.1 | 723.7 | 39,458.1 |
| Department of Defense | 94.0 | .1 | - | 148.6 | - | 504.3 | - | 747.0 |
| Other Federal | 575.1 | .3 | - | 3.3 | - | 381.0 | - | 959.7 |
| Federal Subtotal | 33,849.5 | 10,185.0 | 2,691.3 | 30,698.1 | 99.1 | 15,097.8 | 2,997.9 | 95,618.7 |
| State | 2,745.6 | 646.0 | - | 1,710.4 | 25.7 | 3,315.6 | 9.0 | 8,452.3 |
| County | 105.2 | 2.4 | - | 282.9 | - | 96.9 | - | 487.4 |
| Municipal | 40.0 | 7.1 | - | 137.7 | - | 293.3 | - | 478.1 |
| Public Non-Federal Subtotal | 2,890.8 | 655.5 | - | 2,131.0 | 25.7 | 3,705.8 | 9.0 | 9,417.8 |
| Total Public | 36,740.3 | 10,840.5 | 2,691.3 | 32,829.1 | 124.8 | 18,803.6 | 3,006.9 | 105,036.5 |
| Total Private | 14,044.8 | 5,081.1 | 605.2 | 24,731.5 | 116.1 | 23,872.0 | 228.1 | 68,678.8 |
| Grand Total | 50,785.1 | 15,921.6 | 3,296.5 | 57,560.6 | 240.9 | 42,675.6 | 3,235.0 | 173,715.3 |

1/ Private lands held in trust by the Federal Government.
2/ Updated to 1969.
Source: General Services Administration, Real Property Owned by the United States as of June 30, 1965, adjusted by the Land and Minerals Work Group.

Table 5, Land Ownership, Columbia-North Pacific Region, and the subregional land ownership maps depict this information in more detail.

## Soils

The information presented on table 6 relates groups of soil associations to general range in elevation, position in the landscape, dominant soil parent material, major land resource area, use, and problems. The location and comparative extent of each association are illustrated in table 7. Much of the intricate soils detail had to be generalized for this study.

The general association group number 1 in tables 6 and 7 includes soils formed in alluvium on bottomlands, low fans, and terraces. Generally the soils are silty to sandy in texture with frequent and sometimes extensive gravelly and cobbly areas, isolated alkali areas, and a few small patches of peat, muck, or highly organic soils. The depth dominantly ranges from moderately to very deep. Common problems of use are wetness, overflow, and, in isolated areas, a high pH and or presence of coarse fragments. It includes over 8 million acres or 5 percent of the land in the region. It has a low capability for more intensive use even where the climate, slope, and soil depths are suitable.

The general association group number 2 includes soils formed in glacial material on terraces, plains, and mountains. Generally the soils are stony, cobbly, or gravelly, and have silty and sandy textures. The soil depths are generally moderately to very deep,

Table 6 - Characteristics and Qualities of General Association Groups, Columbia-North Pacific Region, 1966

| Association Group and Position[1/] | General Elevation Range in Feet Above Sea Level | Major Land Resource Areas | General Kind of Parent Material | Land Use in Order of Dominance | General Problems Requiring Management |
|---|---|---|---|---|---|
| 1. Bottomlands, low fans terraces, and footslopes | 5 to 500<br>500 to 2,000<br>2,000 to 3,000<br>3,000 to 4,000<br>4,000 to 6,000<br>6,000 to 7,000 | A-2<br>B-7, B-8<br>B-9<br>D-23<br>B-13<br>E-44 | Alluvium | Cropland, Rangeland, Other land uses | Overflow, alkali and salts, climate, wetness, gravelly or clayey soils |
| 2. Terraces, rolling uplands, fans, and foothills | 5 to 500<br>500 to 2,000<br>2,000 to 4,500<br>4,500 to 6,500<br>6,500 to 8,500 | A-2, A-1<br>B-8<br>B-9, E-43<br>A-3, B-3<br>E-43, E-45 | Glacial Till<br>Glacial Outwash | Forest land, Cropland, Rangeland, Other land uses | Aggregate in soil restricted depth to gravel, sandy texture, steep slopes on terrace fronts |
| 3. Terraces, rolling foothills, and basins | 500 to 2,000<br>2,000 to 3,500<br>3,500 to 6,500 | B-6, B-7<br>B-10<br>D-23, E-43 | Stratified<br>Lake-laid sediments | Rangeland, Cropland, Forest land | Restricted permeability, erosive soil material, clayey textures |
| 4. Foothills and uplands | 50 to 1,500 | A-1, A-2 | Residuum-colluvium from sedimentary bedrock | Cropland, Forest land | Moderate to steep slopes, restricted soil depth |
| 5. Hilly uplands and undulating plains on plateaus | 20 to 700<br>700 to 2,000<br>2,000 to 4,000<br>4,000 to 6,000<br>6,000 to 7,500 | A-2<br>B-7, B-8<br>B-9<br>B-13<br>B-12, E43 | Wind-deposited and wind-worked silt and sand | Cropland, Rangeland, Forest land | Moderate and steep slopes, erosive soil material |
| 6. Gentle to moderately sloping plateaus, steep canyon side slopes and mountains | 100 to 2,000<br>2,000 to 3,500<br>3,500 to 4,500<br>4,500 to 7,500<br><br>7,500 to 9,500 | A-1, A-2, B-7<br>B-8, B-9, B-10<br>B-11, D-21, D-23<br>B-12, B-13, D-25, E-43, E-44<br>E-43, E-45 | Loess mixed with residuum-colluvium from basic type rock | Rangeland<br>Cropland<br>Forest land<br>Other land uses | Shallow soil depths aggregate in soil climate, steep slopes |
| 7. Plateaus--steep canyon side slopes and mountains | 100 to 2,500<br>2,500 to 4,000<br>4,000 to 7,000 | A-1, A-2, A-3<br>B-6, B-10<br>B-12, B-13, D-21, E-43 | Volcanic ash, pumice and volcanic tuffs | Forest land, Rangeland, Cropland, and Other Land uses | Lack of soil structure, low water availability, gravelly and sandy texture |
| 8. Steep mountainous uplands | 1,000 to 4,000<br>4,000 to 6,000<br><br>6,000 to 9,000 | A-1, A-2, A-3<br>B-6, B-9, B-10, B-12<br>E-43, E-44, E-45 | Residuum-colluvium from partially consolidated sedimentary bedrock | Forest land, Rangeland, Other land uses | Steep slopes |
| 9. Steep mountainous uplands | 1,000 to 4,000<br>4,000 to 5,500<br><br>5,500 to 10,000 | A-1, A-2, A-3<br>B-6, B-10, B-12, D-25<br>E-43, E-44, E-45 | Residuum-colluvium from acidic rock types | Forest land, Rangeland, Other land uses | Steep slopes, very erodible soils |

1/ For description of each of the nine Association Groups refer to table 7.
Source: Soil Conservation Service Columbia-North Pacific River Basin Staff.

Table 7 - General Association Groups Acreage by States, Columbia-North Pacific Region, 1966

| Group Description | Idaho | Montana | Nevada | Oregon | Utah | Washington | Wyoming | Total | Percen |
|---|---|---|---|---|---|---|---|---|---|
| | | | (1,000 acres) | | | | | | |
| 1. Generally silty and sandy soils formed in alluvial sediments on bottom-lands and terraces. | 675.2 | - | 419.6 | 4,375.6 | 30.0 | 2,740.0 | 449.0 | 8,689.4 | 5 |
| 2. Generally silty and sandy soils with gravel, cobbles and stones formed in glacial materials on terraces, plains, and mountains. | 3,461.8 | 4,475.0 | 125.0 | 3,015.8 | - | 13,341.7 | - | 24,419.3 | 14 |
| 3. Generally silty and sandy soils with somewhat restricted substrata permeability formed in stratified sediments on terraces, basins, and hilly uplands. | 1,060.0 | 1,110.0 | - | 4,250.0 | - | - | - | 6,420.0 | 4 |
| 4. Generally clayey soils formed in materials mixed with residuum-colluvium from sedimentary bedrock on foothills and uplands. | - | - | - | 3,220.0 | - | 1,765.0 | - | 4,985.0 | 3 |
| 5. Generally silty or sandy soils formed in wind-deposited or wind-worked sediments on hilly uplands. | 4,828.2 | - | - | 2,750.6 | - | 6,514.4 | 12.0 | 14,105.2 | 8 |
| 6. Generally silty soils formed in materials mixed with rocky residuum-colluvium from basic rock on plateaus, canyons, and mountains. | 16,754.1 | - | 1,267.9 | 22,683.7 | 25.0 | 4,559.8 | - | 45,290.5 | 26 |
| 7. Generally sandy, gravelly soils formed in materials mixed with volcanic ash or pumice on terraces, foothills, plateaus, and mountains. | 3,231.3 | - | 230.0 | 11,167.6 | - | 9,131.4 | 2,574.0 | 26,334.3 | 15 |
| 8. Generally silty soils formed in materials mixed with gravelly residuum-colluvium from sedimentary bedrock on mountains. | 6,781.8 | 2,730.0 | 1,254.0 | 5,261.0 | 185.9 | 1,111.7 | 200.0 | 17,524.4 | 10 |
| 9. Generally sandy soils formed in materials mixed with rocky residuum-colluvium from acidic rock on terraces, foothills, and mountains. | 13,992.7 | 7,606.6 | - | 836.3 | - | 3,511.6 | - | 25,947.2 | 15 |
| Total | 50,785.1 | 15,921.6 | 3,296.5 | 57,560.6 | 240.9 | 42,675.6 | 3,235.0 | 173,715.3 | 100 |

Source: Soil Conservation Service, Columbia-North Pacific River Basin Staff.

and the dominant slope varies from gentle on plains and terraces to strong and steep on rolling uplands and terrace fronts. Common problems of use are presence of coarse fragments and droughty soil profiles. Although much of the soils formed in glacial materials occur on rolling uplands and are generally used for forest land or rangeland, the soils on valley terraces are irrigated in many places and under very intensive cropland use. An important part of the Wenatchee and Okanogan apple crop is produced on soils formed in glacial materials. The main body of soils formed in glacial materials on plains constitute the Columbia Basin irrigation project in east central Washington and some of the irrigated areas on the Snake River plains in southern Idaho. It includes almost 25 million acres or 14 percent of the region. It has a moderate capability for more intensive use where the slopes are gentle to moderate and the volume of coarse fragments does not exceed 35 percent.

The general association group number 3 consists of soils formed in stratified sediments from old lake-laid materials on terraces, basins, and hilly uplands. Generally the soils have a silty, sandy, or clayey texture, and are mostly free of gravel, cobbles, and stones. The soil depths are generally moderately deep to deep with frequent layers having restricted permeability in the subsoil or upper substrata. This soil area generally borders the bottomland, low fans, and terraces, and does not occur in extensive, contiguous bodies. Most of the soils formed in old Sagemoore lakebed deposits in southeastern Washington are presently irrigated or dry-land cropland. The soils formed in old Bonneville lakebed deposits in southern Idaho and southeastern Oregon are either irrigated crop-land or rangeland with a good potential for development. Irrigated cropland on this area is rather intensively managed under a variety of adapted crops. It includes over 6 million acres or 4 percent of the region. Much of the potato, sugar beet, and alfalfa production comes from this soil area. It has a high capability for more intensive use where slopes are gentle to moderate, the texture is sandy loam to silt loam, permeability of the subsoil is moderate, and irrigation water is available.

The general association group number 4 is restricted to soils formed in materials mixed with residuum-colluvium from sedimentary bedrock on foothills and uplands. The soils are mostly clayey and silty in texture with gravel size fragments of bedrock very numerous in some places. The soil depth varies from moderately shallow to deep and the generally rolling topography has slopes ranging from moderate to strong. Common problems of use are the acid soils and slope of the land. The extent of this general soil area is restricted to the foothills of the Coast Range of mountains in southwestern Washington and western Oregon. It includes almost 5 million acres or 3 percent of the region. Most of the rangeland in western Oregon is concentrated on this area. It has a high capability for more intensive use where slopes are gentle to strong and sufficient soil amendments and fertilizers have been added to insure satisfactory production.

The general association group number 5 consists of soils formed in wind deposited loess or wind worked sand on hilly uplands. The soils are uniformly either silty or sandy, with little or no coarse fragments in the profile or parent material. They are mostly deep and very deep and occur generally on moderate south and west sloping hillsides or strong and steeply sloping north and east exposures. Throughout this area the hilly islands of loess are interspersed with narrow but extensive channels of basalt scabland. The soils along these channels are rocky and shallow over bedrock and have many outcrops of bedrock. A common problem of use on soils formed in loessial deposits is the very high potential erodibility on the moderate to steep slopes. The most extensive bodies occur on the hilly Palouse formation of eastern Washington and northeastern Oregon and on the hilly uplands of southeast Idaho. The close grown field crops produced under dryland management provide a satisfactory income on the rather large size farms typical of the area. In many parts of the area adapted crops are restricted to cereals and forage types by lack of sufficient moisture or by a short growing season. The part of this area suitable for annual cropping is under quite intensive dryland management. It includes over 14 million acres, or 8 percent of the region. Most of this area has silty soil textures and a high capability for more intensive use on gentle to moderate slopes.

The general association group number 6 is composed of soils formed in materials mixed with rocky residuum-colluvium from basic rock on plateaus, canyons, and mountains. The soils are silty in texture and rocky with gravel, cobble, and stone-size fragments and rock outcrops distributed throughout the area. They are generally moderately deep to shallow in depth and occur on broad, gentle to moderate slopes on plateaus; on very steep and precipitous canyon side slopes; and on strong and steep slopes on mountains. The silty overburden is occasionally mixed with clayey residuum resulting in some isolated areas of clay soils. Common problems of use are limited soil depth over bedrock and presence of coarse fragments in the soil profile. It includes over 45 million acres, or 26 percent of the region. It has a low capability for more intensive use even when the soils are moderately deep to deep and the volume of coarse fragments in the soil is less than 35 percent.

The general association group number 7 consists of soils formed in materials mixed with volcanic ash, pumice or volcanic tuffs on terraces, foothills, plateaus, and mountains. The soils are generally sandy to loamy in texture with a considerable admixture of gravel and cobbles. They are mostly moderately to very deep soils with a very high water holding capacity. Slopes on terraces and plateaus generally range from gentle to moderate. On foothills the slopes are dominantly moderate and strong, and on mountains the slopes range from strong to steep. The general area of occurrence relates mainly to the volcanic mountains of the Cascade, Ochoco, and Blue Mountains of west central and eastern Oregon and Washington. The area has mainly a forest land cover and use, although many parts of the area have dual use as forest-range. Also, where the soil, slope, and climatic environment are suitable, important areas are successfully used as irrigated, and in places, dryland cropland. Adapted crops are usually somewhat restricted by a short growing season resulting from the elevation above sea level. Common problems of use relate to sandy, gravelly soil profiles, erosion on moderate and strong slopes and porosity of the parent materials that hold a large quantity of water but do not give it up readily for plant use. Generally the fertility is limited on soils influenced with volcanic ash and pumice. This area includes over 26 million acres, or 15 percent of the region. It has a low capability for more intensive use even where the slopes are gentle, the volume of coarse fragments less than 20 percent, and sufficent soil amendments, fertilizers, and supplemental water supplied to insure satisfactory crop yields.

The general association group number 8 includes soils formed in materials mixed with residuum-colluvium from sedimentary rock. These soils are generally silty to somewhat clayey in texture with generous admixtures of gravel size fragments of bedrock. Soil depths are generally moderate to deep over highly fractured bedrock. The slopes are mostly strong to steep with a smooth, rolling surface configuration. Common problems of use are steep slopes, acid soils, and climatic restrictions imposed by elevation. The soil area is generally forest covered and used commercially for forest products; however, in southeastern Idaho and western Wyoming considerable areas have a dual forest-rangeland use and in places have a grass or browse cover and rangeland use. The principal occurrence of this general soil area is on the Coast Range of mountains in western Oregon and southwestern Washington. However, an extensive area occurs at higher elevations in southeastern Idaho and western Wyoming. It includes over 17 million acres, or 10 percent of the region. It generally has a moderate capability for more intensive use where the climatic environment is suitable and slopes are gentle to strong.

The general association group number 9 consists of soils formed in materials mixed with residuum-colluvium from acidic rock on terraces, foothills, and mountains. The texture is sandy and has a high content of angular quartzitic, coarse sand-size particles. Stones and cobbles occasionally limit use in this area and the soils are generally shallow to deep over highly weathered bedrock. Slopes range from gentle to moderate on terraces, from moderate to strong on foothills, and from strong to very steep and precipitous on mountains. A common problem of use is its very high erosiveness. The sandy texture and strong to steep slope are associated problems.

that contribute to the erodibility. This general soil area is generally forest covered and used for producing forest products, and in some places there is a dual rangeland use. There are a few selected areas with soils and climate suitable for cropland use. A large part of this area is used mainly as watershed, wildlife, and recreational area because most of the highest alpine areas are included. It occurs mostly in the Bitterroot Mountains in north and central Idaho and western Montana in association with bedrock of the Idaho batholith. Segregated areas occur in the Selkirk Mountains of northeastern Washington, and in the Wallowa Mountains in the northeast and the Siskiyou Mountains in the southwest corners of Oregon. It includes almost 26 million acres, or 15 percent of the region. It has a very low capability for more intensive use even where the climate, slope, and soil depths are suitable.

## Interpretations

For additional information and to provide adequate guidance in making decisions for proper land management and use, some soil and land characteristics and qualities are interpreted for their effect upon water and land as they pertain to the current study. These interpretations are evaluated exclusively on the basis of soil characteristics. Soil interpretations, based on a particular present or future use, are evaluated in Appendix VIII.

Major Land Resource Areas Major Land Resource Areas consist of a generally similar pattern of soils, topography, elevation, climate, water resources, land use, and type of farming in broad areas of geographical continuity on the landscape. The object of this grouping is to identify broad areas of land that are uniform in many important relationships significant to agriculture. The grouping is helpful in broad agricultural planning and in coordinating interpretive groupings between states and subregions.

In Major Land Resource Areas B-7, B-8, B-10, and B-11, figure 2, irrigation is generally essential for intensive cropland use. In B-9 and B-13 the range of adapted crops is limited and supplemental irrigation is frequently profitable, but dryland cropping to cereal grains and forage crops has been very successful in the natural environment. The land resource areas identified with the A-B-D and E symbols on figure 2 relate to the land and environmental characteristics that cause differences in cover and differences in agricultural use and management. It follows that the major land use in the A-area is dominantly Douglas-fir forest land and limited cropland, the B-area is rangeland with a high component in cropland. The D-area is almost exclusively rangeland with limited cropland, and the E-area is dominantly the open pine forest land with limited cropland and rangeland.

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# MAJOR LAND RESOU

## MAJOR LAND RESOURCE AREAS

A-1 Northern Pacific Coast Range and Valleys

| | |
|---|---|
| Natural cover: | Hemlock/Douglas fir with cedar/ spruce and alder understory |
| Major present use: | Forest land<br>Cropland on narrow stream valley bottoms and low coastal plains. |
| Elevation: | Generally 0 to 2,500 feet above sea level in Oregon portion. 0 to 4,500 feet in Washington portion. |
| Topography: | Mountainous uplands with moderate to steep slopes dissected by deeply entrenched narrow valleys. |
| Climate: | 80 to 200 inches of precipitation mostly as rain during September through May in Oregon portion. 125 to 200 inches of precipitation mostly as rain during September through May in Washington portion.<br>Average annual temperature: 45° to 50°F<br>Average freeze-free periods: 140 to 220 days decreasing with elevation. |
| Soil parent materials: | Residuum and colluvium from sedimentary and basic igneous bedrock on low mountains and foothills, and local alluvium on fans, terraces, and bottomland. Glacial material at higher elevations in the Washington portion. |

A-2 Willamette and Puget Sound Valleys

| | |
|---|---|
| Natural cover: | Douglas fir/alder, hemlock, cedar, spruce. |
| Major present use: | Forestland<br>Cropland on bottomland, low terraces, fans and footslopes. |
| Elevation: | Generally 200 to 4,500 feet above sea level. |
| Topography: | High mountains with steep and very steep slopes, low mountains and foothills with smooth moderate and strong slopes and bottomlands, terrace and fans with nearly level to gentle slopes. |
| Climate: | 40 to 110 inches of precipitation, mostly as rain at elevations below 2,500 feet above sea level during October through March.<br>Average annual temperatures: 45° to 55°F<br>Average freeze-free period: 130 to 210 days |
| Soil parent materials: | Residuum and colluvium from sedimentary and basic igneous bedrock on low mountains and foothills. Local alluvium on fans, terraces and bottomlands. Some loess on foothills in Oregon. Extensive area of glacial material in Puget Sound area in Washington. |

A-3 Olympic and Cascade Mountains (Western slope)

| | |
|---|---|
| Natural cover: | Hemlock/fir with spruce/cedar and pine subdominant and alder/vine maple understory. |
| Major present use: | Forest land |
| Elevation: | Generally 500 to 4,500 feet above sea level. |
| Topography: | Steep mountainous uplands with very narrow, deeply entrenched valleys. |
| Climate: | 75 to 125 inches falling mostly as snow and rain from October thru April.<br>Average annual temperature: 43° F<br>Average freeze-free period: 90 to 120 days |
| Soil parent materials: | Generally residuum/colluvium from sedimentary or basic igneous bedrock. In places glacial material or pumice and volcanic ash. |

B-6 Cascade Mountains. (Eastern slope)

| | |
|---|---|
| Natural cover: | Pine/fir forest |
| Major present use: | Forest land<br>Dryland cropland and irrigated cropland<br>Some supplemental rangeland |
| Elevation: | 1,000 to 4,500 feet above sea level |
| Topography: | Mountainous uplands with many terraces and fans and extensive plateau dissected by "v" shaped canyons. |
| Climate: | 12 to 30 inches of precipitation falling as snow and rain during November through April.<br>Average annual temperature: 47° F<br>Average freeze-free period: 60 to 140 days |
| Soil parent material: | Volcanic ash and glacial material at the higher elevations and volcanic ash mixed with basic igneous residuum/colluvium farther east. |

B-7 Columbia Basin

| | |
|---|---|
| Natural cover: | Sagebrush/grass |
| Major present use: | Irrigated cropland<br>Rangeland |
| Elevation: | 200 to 1,200 feet above sea level. |
| Topography: | Outwash plain flanked by lacustrian terraces at slightly higher elevations |
| Climate: | 8 to 10 inches precipitation falling as rain November through March.<br>Average annual temperature: 55°F<br>Average freeze-free period: 170 to 210 days |
| Soil parent Material: | Sandy gravelly outwash, loess, loess mixed with residuum/colluvium and some alluvium on fans and bottomlands. |

B-8 Columbia Plateau

| | |
|---|---|
| Natural cover: | Grassland/sagebrush |
| Major present use: | Dryland cropland<br>Some irrigated cropland<br>Rangeland |
| Elevation: | 200 to 1,550 feet above sea level. |
| Topography: | Basaltic plateau with deeply entrenched narrow canyons |
| Climate: | 12 to 16 inches precipitation falling as rain and snow November through April<br>Average annual temperature: 48°F<br>Average freeze-free period: 140-175 days |
| Soil parent material: | Loess and loess mixed with basaltic residuum/colluvium |

B-9 Palouse and Nez Perce Prairies

| | |
|---|---|
| Natural cover: | Grass/browse scattered pine |
| Major present use: | Dryland cropland |
| Elevation: | 1,500 to 3,500 feet above sea level |
| Topography: | Loessal hills on basalt plateau with deep canyons and extensive escarpments. |
| Climate: | 17 to 20 inches of precipitation falling mostly as rain and snow from November through April<br>Average annual temperature: 46°F<br>Average freeze-free period: 120-160 days |
| Soil parent material: | Loess and loess mixed with basaltic residuum/colluvium |

B-10 Upper Snake River Lava Plains and Hills

| | |
|---|---|
| Natural cover: | Grass/sagebrush with forest cover above 4,500 feet above sea level |
| Major present use: | Rangeland<br>Forestland |
| Elevation: | 1,500 to 5,500 feet above sea level |
| Topography: | Basalt plateau with deeply entrenched narrow canyons with extensive escarpments. |
| Climate: | 12 to 18 inches of precipitation falling as snow and rain from November through April<br>Average annual temperature: 45°F<br>Average freeze-free period: 110 to 150 days |
| Soil parent material: | Volcanic ash mixed with residuum/colluvium from sedimentary bedrock. Some alluvium on bottomlands, fans and terraces. |

B-10a Big and Little Wood River Footslopes and Plains

| | |
|---|---|
| Natural cover: | Grass/sagebrush |
| Major present use: | Rangeland<br>Few scattered dryland cropped areas |
| Elevation: | 4,500 to 6,500 feet above sea level |
| Topography: | Mountain foothills including deeply entrenched canyons. |
| Climate: | 14 to 18 inches of precipitation falling mainly as snow and rain November to March.<br>Average annual temperature: 43°F<br>Average freeze-free period: 60 to 100 days |
| Soil parent material: | Residuum/colluvium from basic igneous bedrock mixed with wind deposited volcanic ash and silt. |

B-11 Snake River Plains

| | |
|---|---|
| Natural cover: | Grass/sagebrush |
| Major present use: | Irrigated cropland<br>Rangeland |
| Elevation: | 2,500 to 3,500 feet above sea level |
| Topography: | Nearly level to moderately sloping alluvial fans and terraces formed on basalt plains in lake sediments and loess. |
| Climate: | 7 to 12 inches of precipitation falling as rain and snow from November to March<br>Average annual temperature: 53°F<br>Average freeze-free period: 140 to 170 day |
| Soil parent material: | Residuum from basic igneous bedrock mixed with old lake sediments and loess, and on bottomlands the soils are formed in silty and/or gravelly alluvium. |

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# MAJOR LAND RESOURCE AREAS, THE REGION

Sagebrush/grass
e: Irrigated cropland
Rangeland
200 to 1,200 feet above sea level.
Outwash plain flanked by lacustrian terraces at slightly higher elevations
8 to 10 inches precipitation falling as rain November through March.
Average annual temperature: 55°F
Average freeze-free period: 170 to 210 days

Sandy gravelly outwash, loess, loess mixed with residuum/colluvium and some alluvium on fans and bottomlands.

Grassland/sagebrush
se: Dryland cropland
Some irrigated cropland
Rangeland
200 to 1,550 feet above sea level.
Basaltic plateau with deeply entrenched narrow canyons
12 to 16 inches precipitation falling as rain and snow November through April
Average annual temperature: 48°F
Average freeze-free period: 140-175 days

Loess and loess mixed with basaltic residuum/colluvium

Perce Prairies
Grass/browse scattered pine
se: Dryland cropland
1,500 to 3,500 feet above sea level
Loessal hills on basalt plateau with deep canyons and extensive escarpments.
17 to 20 inches of precipitation falling mostly as rain and snow from November through April
Average annual temperature: 46°F
Average freeze-free period: 120-160 days

Loess and loess mixed with basaltic residuum/colluvium

ver Lava Plains and Hills
Grass/sagebrush with forest cover above 4,500 feet above sea level
use: Rangeland
Forestland
1,500 to 5,500 feet above sea level
Basalt plateau with deeply entrenched narrow canyons with extensive escarpments.
12 to 18 inches of precipitation falling as snow and rain from November through April
Average annual temperature: 45°F
Average freeze-free period: 110 to 150 days

Volcanic ash mixed with residuum/colluvium from sedimentary bedrock. Some alluvium on bottomlands, fans and terraces.

Wood River Footslopes and Plains
Grass/sagebrush
use: Rangeland
Few scattered dryland cropped areas
4,500 to 6,500 feet above sea level
Mountain foothills including deeply entrenched canyons.
14 to 18 inches of precipitation falling mainly as snow and rain November to March.
Average annual temperature: 43°F
Average freeze-free period: 60 to 100 days

Residuum/colluvium from basic igneous bedrock mixed with wind deposited volcanic ash and silt.

lains
Grass/sagebrush
use: Irrigated cropland
Rangeland
2,500 to 3,500 feet above sea level
Nearly level to moderately sloping alluvial fans and terraces formed on basalt plains in lake sediments and loess.
7 to 12 inches of precipitation falling as rain and snow from November to March
Average annual temperature: 53°F
Average freeze-free period: 140 to 170 days

Residuum from basic igneous bedrock mixed with old lake sediments and loess, and on bottomlands the soils are formed in silty and/or gravelly alluvium.

B-11a Central Snake River Plains
Natural cover: Sagebrush/grass
Major present use: Irrigated cropland
Rangeland
Elevation: 3,500 to 4,500 feet above sea level
Topography: Nearly level to moderately sloping loess covered lava plains.
Climate: 8 to 10 inches of precipitation falling as snow and rain from November through March.
Average annual temperature: 47°F
Average freeze-free period: 110 to 140 days
Soil Parent Material: Wind deposited silt and residuum/colluvium from basic igneous bedrock.

B-11b Upper Snake River Plains
Natural cover: Grass/sagebrush
Major present use: Rangeland
Irrigated cropland
Elevation: 4,500 to 5,500 feet above sea level
Topography: Nearly level to moderately sloping lava plains with moderately deep cover of loess.
Climate: 8 to 12 inches of precipitation falling as snow and rain from November through March.
Average annual temperature: 43°F
Average freeze-free period: 100 to 130 days
Soil parent material: Loess mixed with residuum/colluvium from basic igneous bedrock, and in places alluvium on fans and bottom lands.

B-12 Lost River Valley and Mountains
Natural cover: Grass/sagebrush and pine/fir forest
Major Present use: Rangeland
Some Irrigated cropland
Elevation: 4,500 to 6,500 feet above sea level
Topography: Steep and very steep mountain side slopes with gentle to moderately sloping intervening valley floodplains, terraces, and fans.
Climate: 8 to 16 inches of precipitation falling mostly as snow from November through March.
Average annual temperature: 40°F
Average freeze-free period: 60 to 90 days
Soil parent material: Glacial till on uplands and glacial outwash on terraces, fans and bottom lands. Some residuum/colluvium from sedimentary bedrock on higher uplands.

B-13 Eastern Idaho Plateaus
Natural cover: Grass/scattered pine forest
Major present use: Dryland cropland
Limited irrigated cropland
Rangeland
Forest land
Elevation: 4,500 to 6,500 feet above sea level
Topography: Dissected plateaus and lava plains separated by steep isolated mountains. Many intervening fans and bottomland areas.
Climate: 12 to 20 inches of precipitation falling as snow and rain from November through March.
Average annual temperature: 43°F
Average freeze-free period: 50 to 120 days
May frost any month of year
Soil parent material; Residuum/colluvium from sedimentary bedrock mixed with loess overburden. Alluvium on intervening fans and bottom lands.

D-21 Klamath and Shasta Valleys and Basins
Natural cover: Open stand pine with grass understory
Major present use: Rangeland
Elevation: 4,500 to 6,000 feet above sea level
Topography: Steep mountains and rim-rock escarpments. Isolated basins
Climate: 12 to 15 inches precipitation falling mostly as snow and rain from November through April
Average annual temperature: 42°F
Average feeze-free period: 60 to 90 days
Soil Parent Materials: Residuum/colluvium from basic igneous rock mixed with overburden of wind deposited silt. Residuum and alluvium from old lacustrian deposits.

D-23 Malheur High Plateau
Natural cover: Grass/sagebrush
Scattered stand
Major present use: Rangeland
Some forest la
Irrigated cropl
and terraces
Elevation: 3,500 to 5,000
Topography: Undulated basal
extensive old l
promotories wit
Climate: 7 to 12 inches
as rain and sn
March
Average Annual
Average freeze-
Soil parent materials: Residuum/collu
and from acid
Residuum/alluv
deposits.

D-25 Owyhee High Plateau
Natural cover: Grass/sagebrush
Open forest co
Major present use: Rangeland
Irrigated cropl
lands
Elevation: 4,500 to 7,500
Topography: Lava plains and
and intervening
Climate: 8 to 16 inches
falling as sno
through April
Average annual
Average freeze-
days
Soil parent material: Residuum/collu
and basic igne
with overburde

E-43 Northern Rocky Mountains
Natural cover: Pine/fir fores
Fir/tamarack a
Cropland on so
terraces
Elevation: 2,500 to 7,500
Topography: High mountains
Narrow valleys
narrow bottoml
Climate: 20 to 50 inche
mostly as snow
through May
Average annual
Average freeze
Soil parent material: Residuum/collu
and sedimentar
Glacial till
glacial outwas
many bottom la
deposits on so
scattered allu

E-44 Northern Rocky Mountain Valleys
Natural cover: Open Pine gras
Major present use: Cropland some
Rangeland
Forestland
Elevation: 1,500 to 6,500
Topography: Nearly level
moderately sl
fans, and foo
escarpments
Climate: 14 to 33 inch
as rain or sn
Average Annua
Average Freez
Soil parent materials: Glacial till
lands and res
on foothills,
Glacial outwa
races and bot

E-45 Alpine Meadows and Rock Land
Natural cover: Fir/spruce an
areas and sno
Major present use: Recreation
Wildlife
Watershed
Elevation: 8,500 to 10,0
Topography: Precipitous
shaped valley
Climate: 20 to 70 inch
as snow from
Average Annu
Average free
month of the
Soil parent materials: Residuum/col
sedimentary
side slopes
on fans, ter

**D-23 Malheur High Plateau**

Natural cover: Grass/sagebrush
Scattered stands of open pine

Major present use: Rangeland
Some forest land use
Irrigated cropland on some bottomlands and terraces

Elevation: 3,500 to 5,000 feet above sea level

Topography: Undulated basaltic plateau with many extensive old lake basins. Few mountain promotories with rim-rock escarpments

Climate: 7 to 12 inches precipitation falling as rain and snow from November through March
Average Annual temperature: 45°F
Average freeze-free perios: 70 to 110 days

Soil parent materials: Residuum/colluvium from basic igneous and from acid igneous bedrock. Residuum/alluvium from old lacustrian deposits.

**D-25 Owyhee High Plateau**

Natural cover: Grass/sagebrush
Open forest cover above 6,000 feet

Major present use: Rangeland
Irrigated cropland on valley bottom lands

Elevation: 4,500 to 7,500 feet above sea level

Topography: Lava plains and foothills with fans and intervening bottomlands

Climate: 8 to 16 inches of precipitation falling as snow and rain from November through April
Average annual temperature: 45°F
Average freeze-free period: 90 to 120 days

Soil parent material: Residuum/colluvium from acid igneous and basic igneous bedrock mixed in places with overburden of loess

**E-43 Northern Rocky Mountains**

Natural cover: Pine/fir forest land with browse
Fir/tamarack at higher elevation
Cropland on some valley bottomlands and terraces

Elevation: 2,500 to 7,500 feet above sea level

Topography: High mountains with steep side slopes. Narrow valleys with many terraces and narrow bottomlands

Climate: 20 to 50 inches of precipitation falling mostly as snow and rain from November through May
Average annual temperature: 41°F
Average freeze-free period: 30 to 130 days

Soil parent material: Residuum/colluvium from acid igneous and sedimentary bedrock at higher elevations. Glacial till and intermediate uplands and glacial outwash on terraces, fans, and many bottom lands. Residuum from lacustrian deposits on some terraces and basins and scattered alluvial sediments on bottomlands.

**E-44 Northern Rocky Mountain Valleys**

Natural cover: Open Pine grass land with browse.

Major present use: Cropland some irrigated
Rangeland
Forestland

Elevation: 1,500 to 6,500 feet above sea level

Topography: Nearly level bottomlands gently to moderately sloping in valleys, terraces, fans, and footslopes. Many narrow steep escarpments on terrace fronts.

Climate: 14 to 33 inches of precipitation falling as rain or snow from October through May.
Average Annual Temperature: 45°F
Average Freeze-free Period: 80 to 130 days.

Soil parent materials: Glacial till terraces, forestland, bottomlands and residuum from lacustrine deposits on foothills, footslopes and high terraces. Glacial outwash and alluvium on fans, terraces and bottomlands.

**E-45 Alpine Meadows and Rock Land**

Natural cover: Fir/spruce and alpine shrubs some barren areas and snow fields.

Major present use: Recreation
Wildlife
Watershed

Elevation: 8,500 to 10,000 feet above sea level.

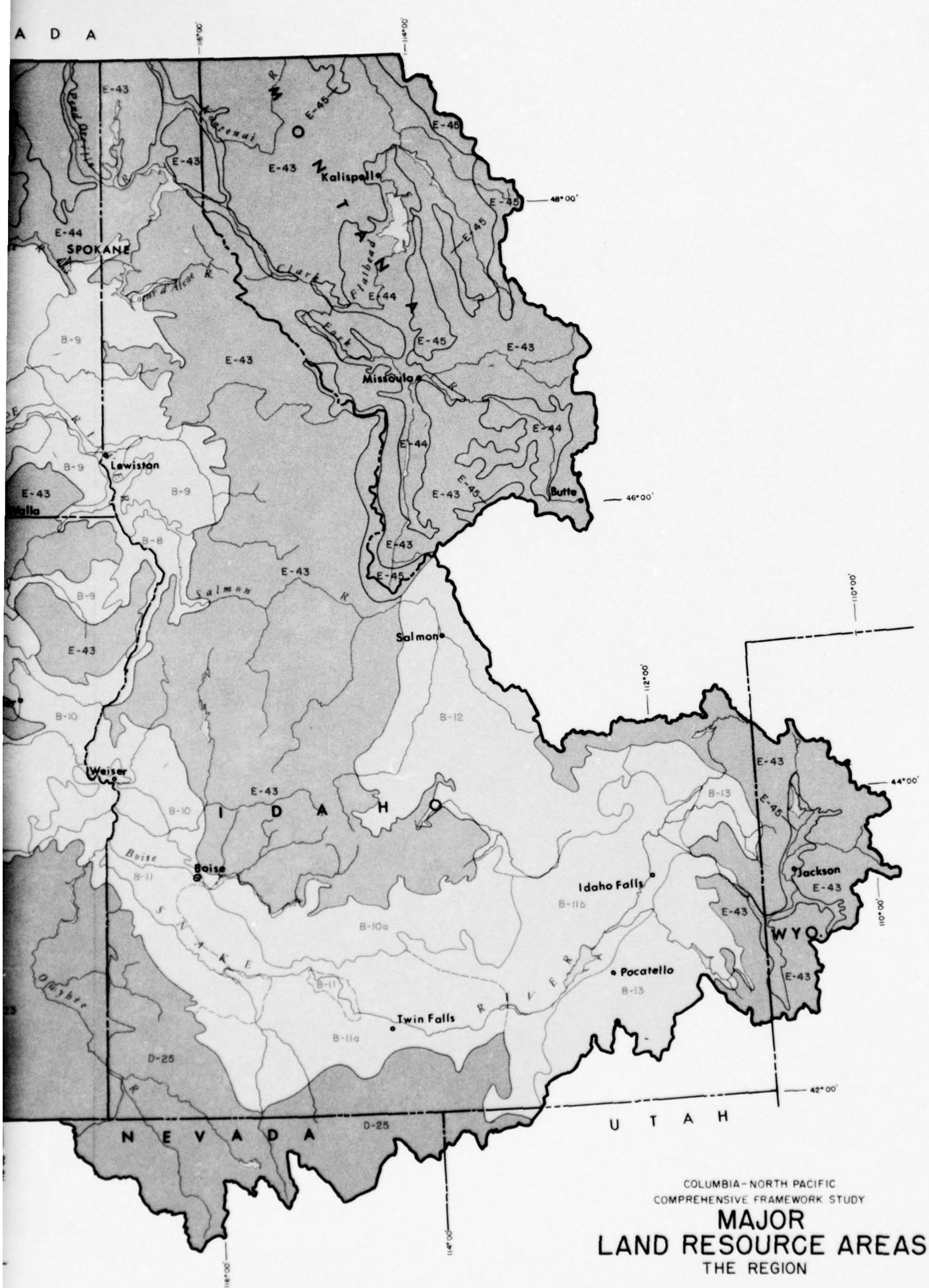
Topography: Precipitous mountains with entrenched "U"-shaped valleys and barren mountain peaks.

Climate: 20 to 70 inches of precipitation, falling as snow from September through June.
Average Annual Temperature: 37°F
Average freeze-free period: Freezes each month of the year.

Soil parent materials: Residuum/colluvium from acid igneous or sedimentary bedrock. Glacial till on side slopes and benches. Glacial outwash on fans, terraces and bottomlands.


CANADA
WASHINGTON
OREGON
CALIF.
NEVADA
PACIFIC OCEAN
Bellingham
Everett
SEATTLE
TACOMA
Olympia
Hoquiam
Aberdeen
Longview-Kelso
Astoria
Vancouver
PORTLAND
Tillamook
Salem
Newport
Eugene
Coos Bay
Roseburg
Grants Pass
Medford
Grand Coulee
Wenatchee
Moses Lake
Yakima
SPOKANE
Lewiston
Walla Walla
Pendleton
The Dalles
La Grande
Baker
Weiser
Boise
Bend
Burns
Malheur Lake
Lake Abert
COLUMBIA
SNAKE R.
Yakima R.
Skagit
Okanogan R.
Quinault R.
Chehalis
Cowlitz R.
WILLAMETTE R.
Deschutes
John Day R.
Umpqua R.
Rogue R.
Owyhee
Salmon
Boise
A-1
A-2
A-3
B-6
B-7
B-8
B-9
B-10
B-11
D-21
D-23
D-25
E-43
E-44
48°00'
46°00'
44°00'
42°00'
124°00'
122°00'
120°00'
118°00'
116°00'
20 0 20 40 60 80 100
Scale in miles
N

2




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# MAJOR LAND RESOURCE AREAS

THE REGION

USDA-SCS-PORTLAND, OREG. 1970

FIGURE 2

Land Capability Classes Explanations of the system of land capability classification, the definition of the classes, and the scope and detail of their use are contained in the Introduction and in the Soils Conservation Service Soils Memorandum 22. A Land Capability Map, figure 3, shows in general those areas having similar hazards and limitations in agricultural use of the land resource. Since the Land Capability Map is generalized, the acreage for each capability class on table 8 shows inclusions of contrasting classes. For example, Capability Classes I through IV that are suitable for cropland use amount to more than 36 million acres or 20 percent of the land. The area shown on figure 3 is somewhat higher. Another item of particular interest on table 8 is the large amount of Classes VI through VIII. Although this land is described as being unsuitable for cropland management, there are over 16 million acres of desert land that would be suitable under irrigation. Over 6 million acres are not suitable for uses other than watershed, recreation, wildlife, or aesthetics, but are still a very valuable land resource. It reflects the highly contrasting land areas of the region.

Water Storage Capacity Water storage capacity in the soil is important to water retention on the upland and in contributing to a stable downstream flow over an extended period of time. Soils can be manipulated to maintain or improve infiltration and reduce surface runoff. Water that flows laterally through the soil or upper substrata has sediment filtered out so clear water feeds the springs and seeps that eventually contribute to surface stream runoff. The soil water storage capacity, in addition to sustaining plant life, tends to retard peak runoff flow. Table 9 shows over 50 million acres (or about 30 percent of the land) have shallow soil profiles over impervious substrata that result in low soil water storage capacity. Regionwide the soil water storage reservoir in the top 5 feet of soil or to bedrock will hold almost 66 million acre-feet of water. This tremendous capacity for water storage in the soil profile and the downstream implications for water use point up the necessity for upland management in any comprehensive plan. Figure 4 shows the occurrence of four classes of water storage capacity. For an estimate of total water storage capacity not limited to the upper 5 feet of soil material, see Appendix VIII, Land Measures and Watershed Protection.

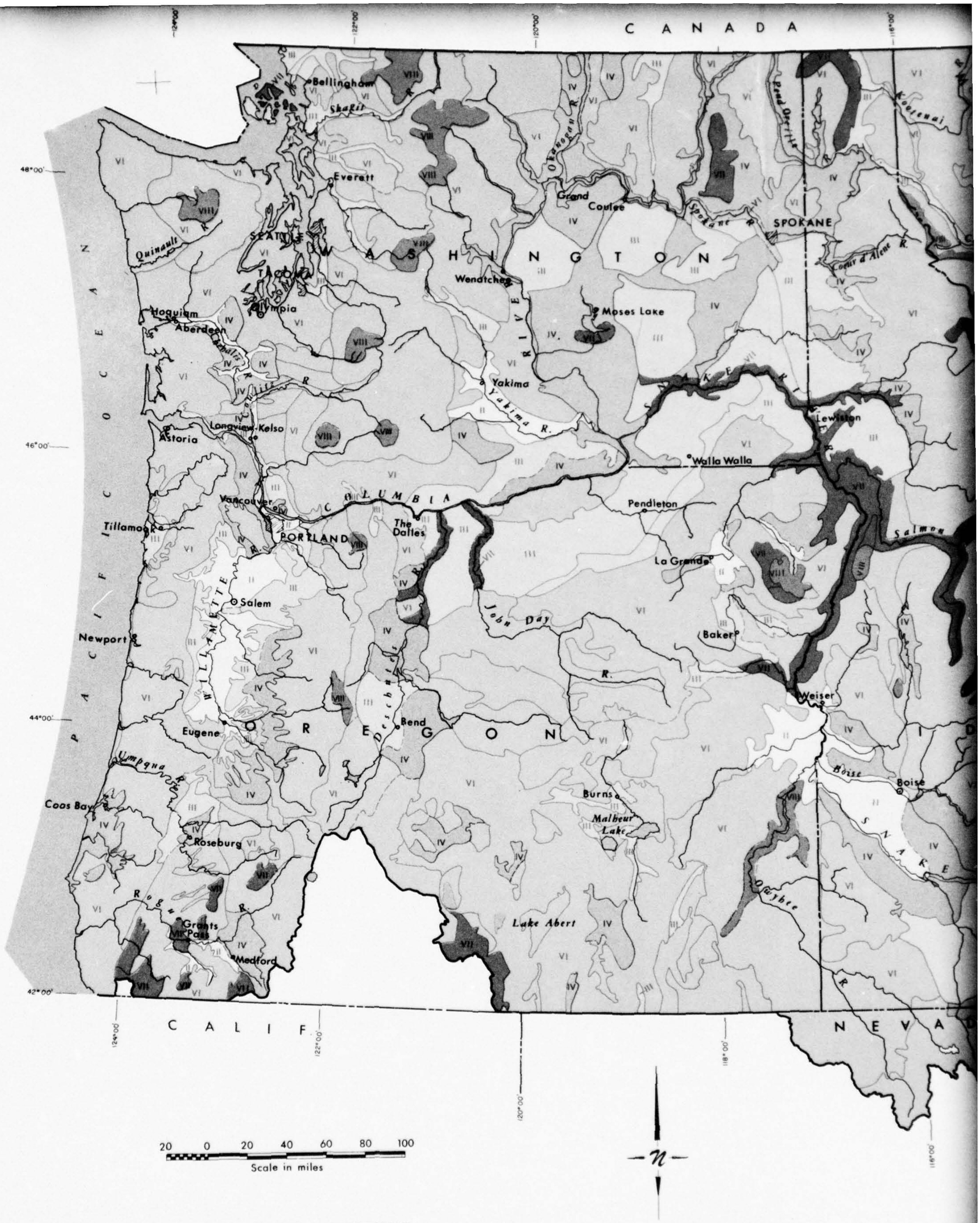
## Cover and Land Use

Land use in the Columbia-North Pacific Region has evolved to its present status more by a process of trial and error than according to a defined plan. The land was used to some extent before the advent of the American pioneer. However, subsequent use of increasing intensity has stratified both the level and kinds of land use based primarily on the environmental characteristics, the soils,

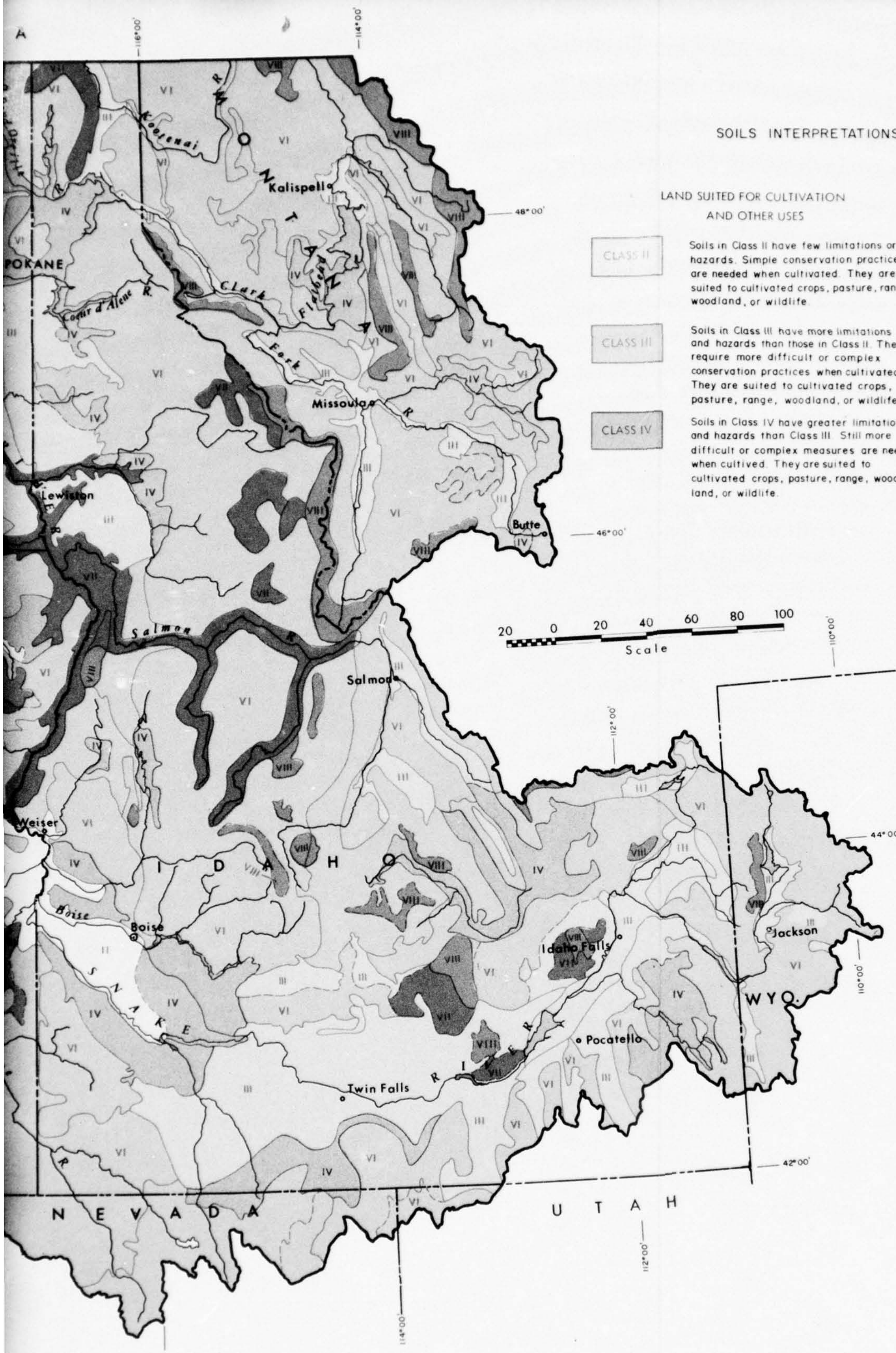
Table 8 - Summary of Land Capability Classes, Columbia-North Pacific Region, 1966

| Land Capability Subclass | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | (1,000 acres) | | | | | | |
| I | 1.0 | 69.1 | 51.8 | - | 43.6 | 3.0 | 20.0 | 11.6 | 171.5 | 1.8 | - | - | 373.4 |
| IIe | 132.8 | 324.5 | 110.5 | 386.4 | 233.3 | 385.8 | 211.1 | 56.9 | 279.9 | 229.6 | - | 26.0 | 2,376.8 |
| IIw | 95.6 | 42.8 | 41.9 | 3.0 | 81.5 | 1.2 | - | 116.6 | 305.4 | 256.3 | 305.0 | 8.5 | 1,257.8 |
| IIs | 88.0 | 132.7 | 102.9 | 39.3 | 151.5 | 37.1 | 128.7 | 43.5 | 320.9 | 94.6 | 10.0 | - | 1,149.2 |
| IIc | 98.7 | - | - | 140.5 | 12.0 | - | 216.0 | - | - | 22.0 | - | 60.0 | 549.2 |
| Total II | 415.1 | 500.0 | 255.3 | 569.2 | 478.3 | 424.1 | 555.8 | 217.0 | 906.2 | 602.5 | 315.0 | 94.5 | 5,333.0 |
| IIIe | 777.3 | 1,915.4 | 266.6 | 1,506.1 | 421.7 | 2,253.5 | 1,680.8 | 200.0 | 530.7 | 443.1 | 148.0 | 130.0 | 10,273.2 |
| IIIw | 67.8 | 72.7 | 41.9 | [illegible] | 91.3 | 111.1 | 12.0 | 104.6 | 256.3 | 232.8 | 315.0 | 300.0 | 1,636.6 |
| IIIs | 228.3 | 330.3 | 22.1 | 523.0 | 333.6 | 132.8 | 214.4 | 130.1 | 64.9 | 167.9 | 58.0 | 80.0 | 2,285.4 |
| IIIc | 62.2 | 199.6 | - | 173.2 | 10.4 | - | 67.0 | - | - | - | - | - | 512.4 |
| Total III | 1,135.6 | 2,518.0 | 330.6 | 2,233.4 | 857.0 | 2,497.4 | 1,974.2 | 434.7 | 851.9 | 843.8 | 521.0 | 510.0 | 14,707.6 |
| IVe | 2,070.7 | 1,175.2 | 320.1 | 399.4 | 338.0 | 687.6 | 2,724.5 | 233.2 | 575.2 | 1,317.6 | 866.0 | 175.0 | 10,882.5 |
| IVw | 136.9 | 35.0 | 29.7 | 50.2 | 9.0 | 76.3 | 45.0 | 189.8 | 245.7 | 469.6 | 72.0 | 85.0 | 1,444.2 |
| IVs | 732.2 | 292.9 | 75.4 | 250.3 | 78.5 | 65.5 | 268.0 | 43.7 | 51.3 | 331.9 | 293.0 | 155.0 | 2,637.7 |
| IVc | 63.2 | - | - | 424.3 | 64.1 | 104.0 | - | - | - | - | - | 130.0 | 785.6 |
| Total IV | 3,003.0 | 1,503.1 | 425.2 | 1,124.2 | 489.6 | 933.4 | 3,037.5 | 466.7 | 872.2 | 2,119.1 | 1,231.0 | 545.0 | 15,750.0 |
| Vw | 144.0 | 10.0 | - | 156.1 | 52.4 | 12.0 | 34.0 | - | 1.8 | - | - | 385.0 | 795.3 |
| Vs | - | - | - | 32.0 | - | - | - | - | - | - | - | - | 32.0 |
| Vc | - | - | - | 12.0 | 48.2 | - | - | - | - | - | - | - | 60.2 |
| Total V | 144.0 | 10.0 | - | 200.1 | 100.6 | 12.0 | 34.0 | - | 1.8 | - | - | 385.0 | 887.5 |
| VIe | 14,850.1 | 7,160.0 | 2,454.1 | 13,125.5 | 17,402.2 | 14,203.6 | 10,851.9 | 1,597.2 | 4,390.8 | 10,005.5 | 4,645.2 | 6,325.3 | 107,011.4 |
| VIw | 49.5 | - | - | - | - | 13.5 | - | 48.6 | - | 122.8 | 32.0 | 170.0 | 436.4 |
| VIs | 456.7 | 1,167.1 | 122.7 | 1,218.3 | 114.0 | 186.8 | 431.5 | 214.7 | 161.0 | 397.9 | 421.0 | 980.0 | 5,871.7 |
| VIc | 11.0 | - | - | 1,004.7 | 520.0 | - | - | - | - | - | - | 20.0 | 1,555.7 |
| Total VI | 15,367.3 | 8,327.1 | 2,576.8 | 15,348.5 | 18,036.2 | 14,403.9 | 11,283.4 | 1,860.5 | 4,551.8 | 10,526.2 | 5,098.2 | 7,495.3 | 114,875.2 1/ |
| VIIe | 1,415.7 | 804.2 | 101.5 | 1,648.1 | 1,702.2 | 2,924.6 | 1,032.6 | 92.1 | 90.4 | 702.9 | 827.4 | 932.1 | 12,273.8 |
| VIIw | 0.6 | - | - | - | - | - | - | - | - | 24.8 | 12.0 | 20.0 | 57.4 |
| VIIs | 150.7 | 92.8 | 63.7 | 56.8 | 356.5 | 391.7 | 680.9 | 34.4 | 28.6 | 67.4 | 27.0 | 1,307.9 | 3,258.4 |
| Total VII | 1,567.0 | 897.0 | 165.2 | 1,704.9 | 2,058.7 | 3,316.3 | 1,713.5 | 126.5 | 119.0 | 795.1 | 866.4 | 2,260.0 | 15,589.6 |
| VIII | 1,186.4 | 256.5 | 46.5 | 1,501.5 | 1,333.5 | 781.1 | 203.8 | 75.6 | 128.4 | 165.7 | 415.0 | 105.0 | 6,199.0 |
| Total Land | 22,819.4 | 14,080.8 | 3,851.4 | 22,681.8 | 23,397.5 | 22,371.2 | 18,822.2 | 3,192.6 | 7,602.8 | 15,054.2 | 8,446.6 | 11,394.8 | 173,715.3 |

1/ An estimated 15 million acres could be classed I through IV when irrigated.
Source: U.S.D.A. Conservation Needs Inventory, adjusted by Land & Minerals Work Group.




U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE




2

SOILS INTERPRETATIONS - LAND CAPABILITY CLASSES

LAND SUITED FOR CULTIVATION AND OTHER USES

CLASS II — Soils in Class II have few limitations or hazards. Simple conservation practices are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland, or wildlife.

CLASS III — Soils in Class III have more limitations and hazards than those in Class II. They require more difficult or complex conservation practices when cultivated. They are suited to cultivated crops, pasture, range, woodland, or wildlife.

CLASS IV — Soils in Class IV have greater limitations and hazards than Class III. Still more difficult or complex measures are needed when cultived. They are suited to cultivated crops, pasture, range, woodland, or wildlife.

LAND LIMITED IN USE--GENERALLY NOT SUITED FOR CULTIVATION

CLASS VI — Soil in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland, or wildlife. Soils respond to management.

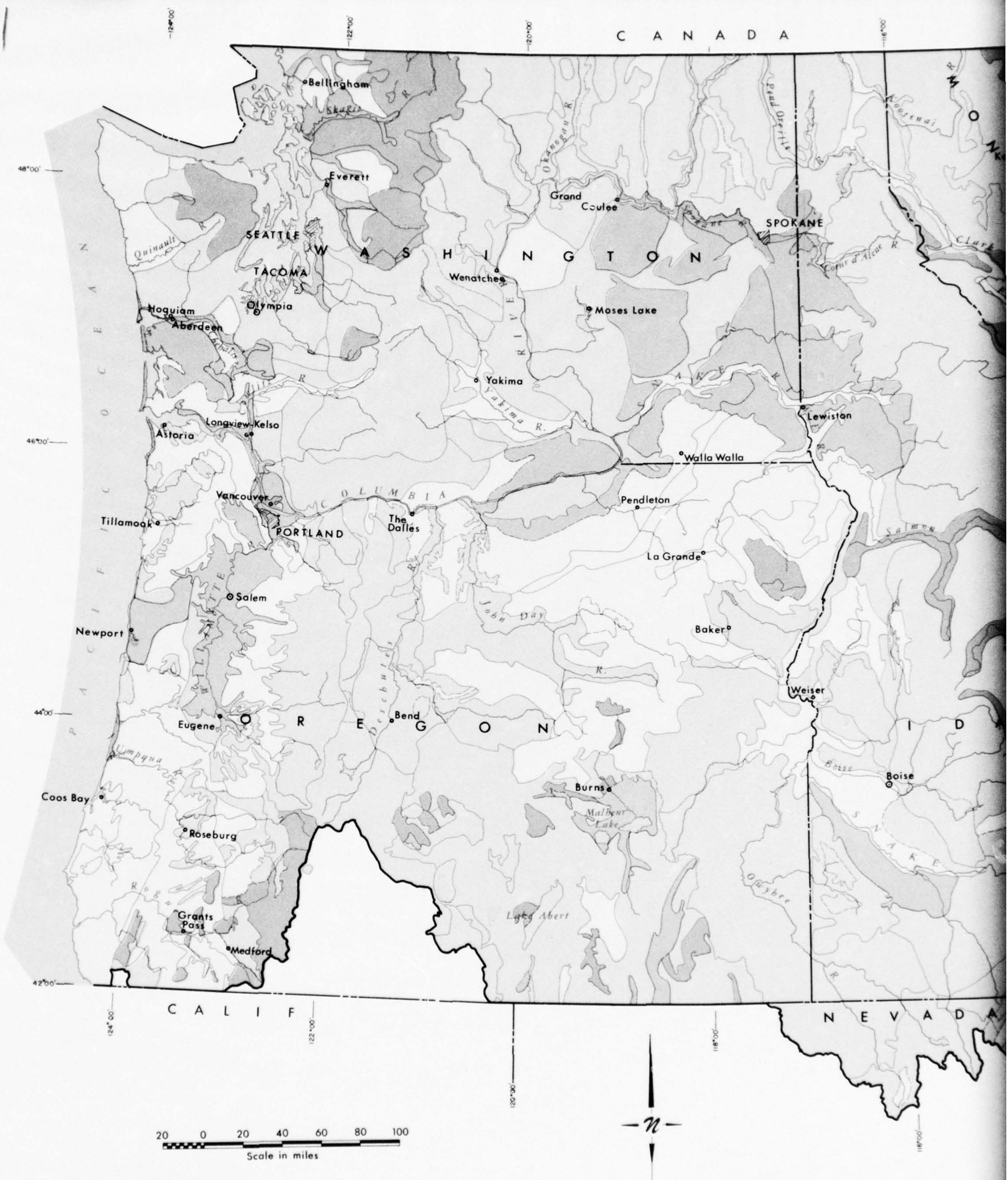
CLASS VII — Soils in Class VII have very sever limitations or hazards that make them generally unsuited for cultivation. They are suited to grazing, woodland, or wildlife. Soils do not respond to management.

CLASS VIII — Soils and land forms in Class VIII have limitations which preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or esthetic purposes.

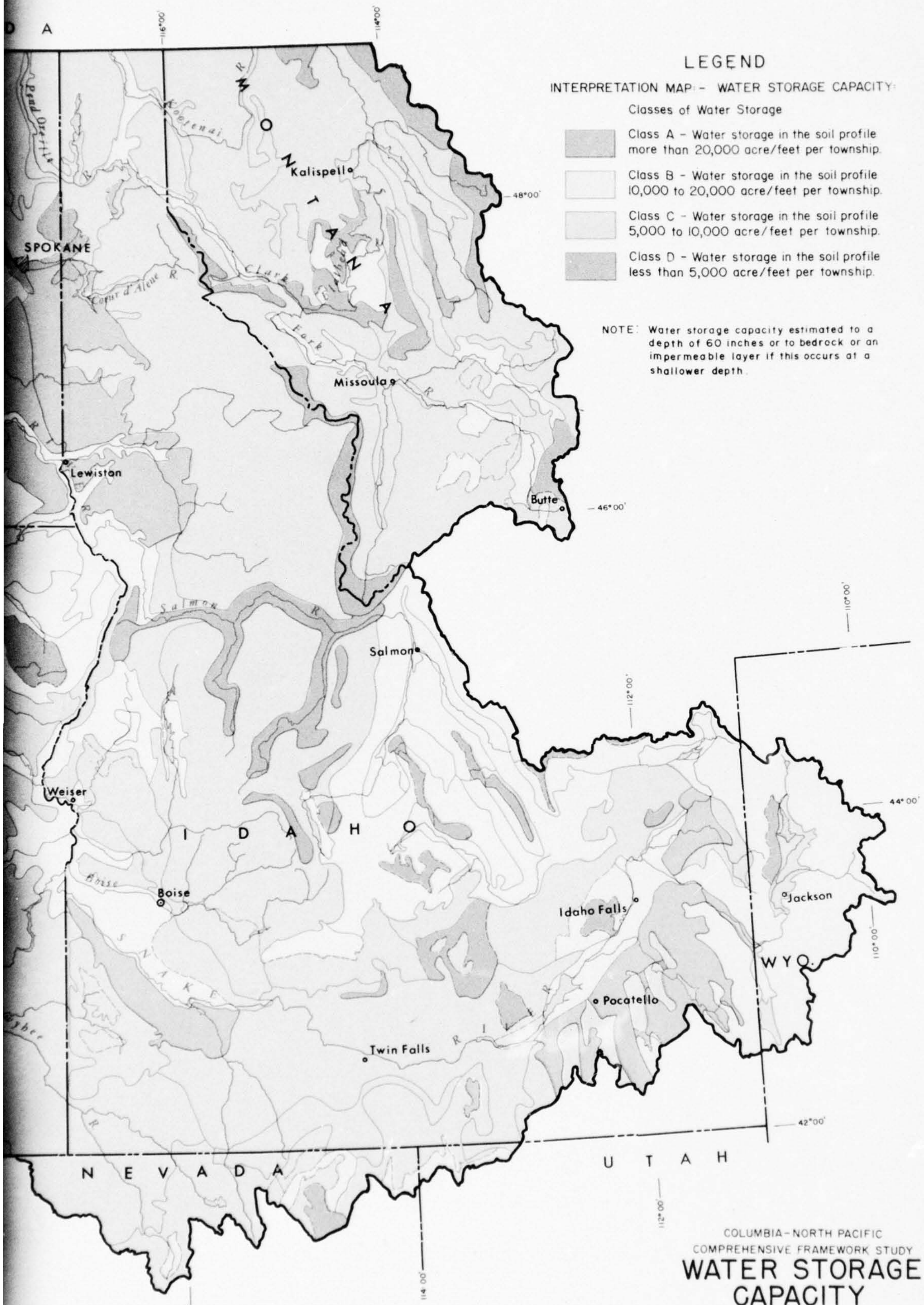
COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# LAND CAPABILITY CLASSES
## THE REGION

FIGURE 3



CANADA
WASHINGTON
OREGON
CALIF
NEVADA
PACIFIC OCEAN
124°00'
122°00'
120°00'
118°00'
116°00'
48°00'
46°00'
44°00'
42°00'
Bellingham
Skagit R
Everett
SEATTLE
TACOMA
Olympia
Quinault R
Hoquiam
Aberdeen
Astoria
Longview-Kelso
Vancouver
COLUMBIA
PORTLAND
Tillamook
Salem
Newport
Eugene
Umpqua R
Coos Bay
Roseburg
Rogue
Grants Pass
Medford
The Dalles
Deschutes
Bend
John Day R.
Wenatchee
Okanogan R
Grand Coulee
Moses Lake
RIVER
Yakima
Yakima R.
Pend Oreille R
SPOKANE
Coeur d'Alene R
Kootenai R
Lewiston
Walla Walla
Pendleton
La Grande
Baker
Salmon
Weiser
Boise
Boise
SNAKE
Owyhee R
Burns
Malheur Lake
Lake Abert
20 0 20 40 60 80 100
Scale in miles




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY
# WATER STORAGE CAPACITY
THE REGION

FIGURE 4

Table 9 - Water Storage Capacity in General Soil Association Groups, Columbia-North Pacific Region, 1966

| Classes of Water Storage Capacity | Subregions | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| Class A--Water storage in the soil profile more than 20,000 acre-feet per township. | 385.0 | 1,970.0 | - | 2,235.0 | 830.0 | 3,636.0 | 1,615.6 | 365.6 | 1,550.0 | 2,500.0 | 740.0 | 1,035.0 | 16,862.2 |
| Class B--Water storage in the soil profile 10,000 to 20,000 acre-feet per township. | 2,180.0 | 885.0 | 670.0 | 10,119.8 | 3,990.0 | 6,780.8 | 7,823.6 | 730.0 | 2,993.0 | 7,277.7 | 845 0 | 905.0 | 45,199.9 |
| Class C--Water storage in the soil profile 5,000 to 10,000 acre-feet per township. | 16,994.4 | 10,980.8 | 3,181.4 | 8,700.0 | 17,797.5 | 10,079.2 | 9,383.0 | 1,957.0 | 2,954.8 | 3,244.7 | 3,538.0 | 8,749.8 | 97,560.6 |
| Class D--Water storage in the soil profile less than 5,000 acre-feet per township. | 3,260.0 | 245.0 | - | 1,627.0 | 780.0 | 1,875.2 | - | 140.0 | 105.0 | 2,029.8 | 3,323.6 | 705.0 | 14,090.6 |
| Total | 22,819.4 | 14,080.8 | 3,851.4 | 22,681.8 | 23,397.5 | 22,371.2 | 18,822.2 | 3,192.6 | 7,602.8 | 15,052.2 | 8,446.6 | 11,394.8 | 173,713.3 |

Source: National Cooperative Soil Survey interpreted by the U.S.D.A. Columbia-North Pacific River Basin Staff.

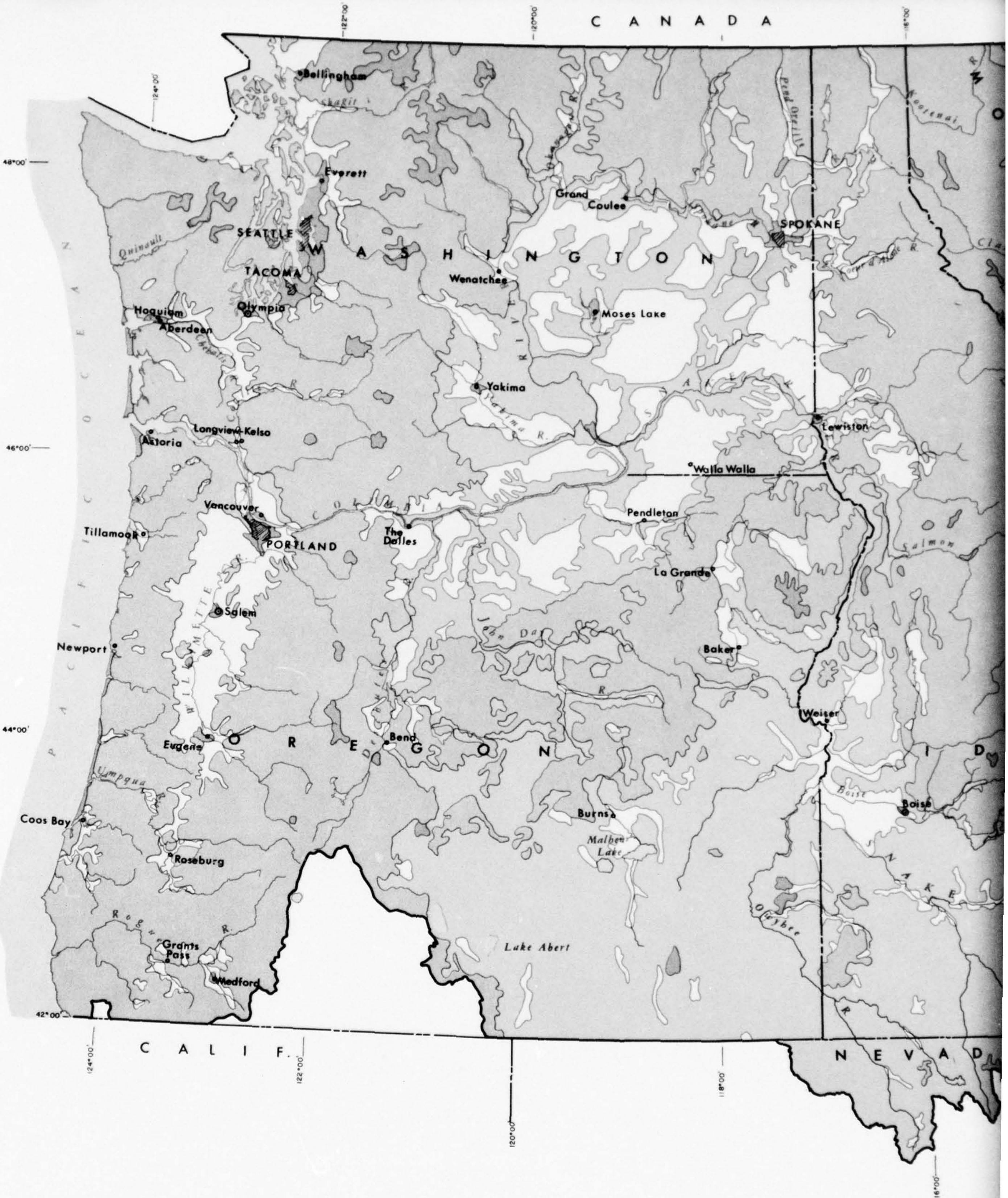
the natural cover, the topography, the position in the landscape, and the demand for products or space. As pointed out in the Introduction, the Land Use for the purpose of this study is divided into the four categories: Cropland, Forest land, Rangeland, and other land. (figure 5) The following discussion under each category treats each kind of use in depth. It must be realized that the kind of use is based upon the product of the land; either cultivated crops, forest, browse, grass, or space that determines its ultimate use. The tables for each category record the amount and extent of each kind of land use. Tables 10 through 19 list the kinds of land use by ownership for the region, the subregions, and for each state.

(Narrative continued on page 37)

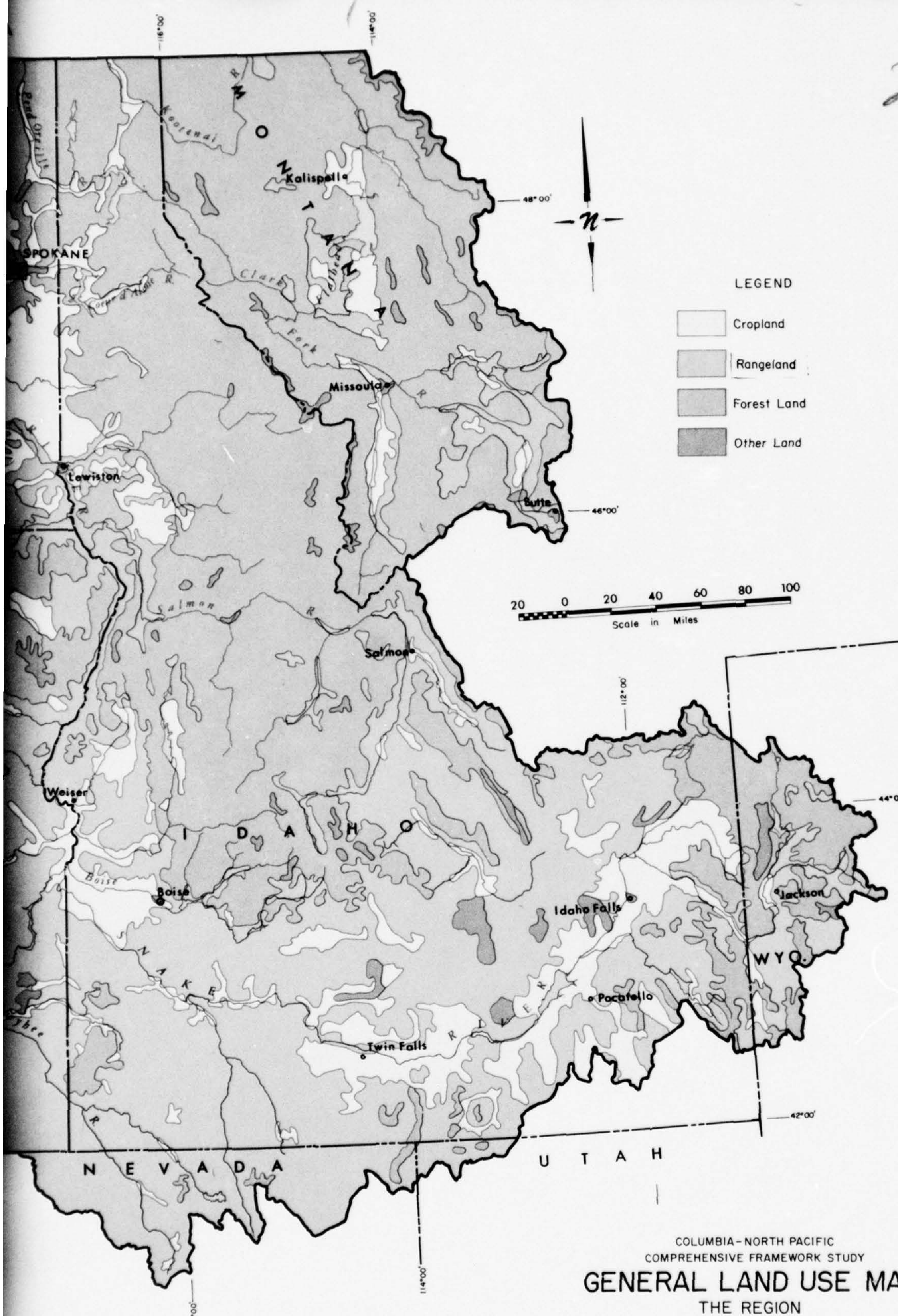
Table 10 - Cover and Land Use by Ownership, Columbia-North Pacific Region, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Department of Agriculture | | | | | |
| Forest Service 2/ | - | 45,727.3 | 6,677.6 | 2,001.3 | 54,406.2 |
| Other Agriculture | .4 | - | 46.8 | .5 | 47.7 |
| | .4 | 45,727.3 | 6,724.4 | 2,001.8 | 54,453.9 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 4,486.6 | 24,275.9 | 754.9 | 29,517.4 |
| Bureau of Indian Affairs 1/ | 364.1 | 2,658.3 | 1,635.7 | 133.9 | 4,792.0 |
| National Park Service 2/ | - | 2,503.9 | 255.7 | 634.5 | 3,394.1 |
| Fish & Wildlife Service | 28.5 | 64.2 | 373.1 | 142.7 | 608.5 |
| Bureau of Reclamation | 14.0 | 17.0 | 1,033.5 | 71.6 | 1,136.1 |
| Other Interior | - | - | - | 10.0 | 10.0 |
| | 406.6 | 9,730.0 | 27,573.9 | 1,747.6 | 39,458.1 |
| Department of Defense | - | 83.4 | 459.6 | 204.0 | 747.0 |
| Other Federal | - | 2.3 | 946.3 | 11.1 | 959.7 |
| Federal Subtotal | 407.0 | 55,543.0 | 35,704.2 | 3,964.5 | 95,618.7 |
| State | 247.4 | 4,341.3 | 3,111.8 | 751.8 | 8,452.3 |
| County | - | 227.0 | - | 260.4 | 487.4 |
| Municipal | - | 222.6 | 3.6 | 251.9 | 478.1 |
| Public Total | 654.4 | 60,333.9 | 38,819.6 | 5,228.6 | 105,036.5 |
| Private Total | 20,149.4 | 25,509.6 | 19,925.0 | 3,094.8 | 68,678.8 |
| Total Land Area | 20,803.8 | 85,843.5 | 58,744.6 | 8,323.4 | 173,715.3 |

1/ Private lands held in trust by the Federal Government.
2/ Updated to 1969.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.



CANADA
WASHINGTON
OREGON
CALIF.
NEVADA
PACIFIC OCEAN
Bellingham
Everett
SEATTLE
TACOMA
Olympia
Hoquiam
Aberdeen
Grand Coulee
SPOKANE
Wenatchee
Moses Lake
Yakima
Lewiston
Walla Walla
Longview-Kelso
Astoria
Vancouver
PORTLAND
The Dalles
Tillamook
Pendleton
La Grande
Salem
Newport
Baker
Weiser
Eugene
Bend
Burns
Boise
Coos Bay
Roseburg
Malheur Lake
Grants Pass
Medford
Lake Abert
Quinault
Skagit
Chehalis
Yakima R.
Columbia
Willamette R.
John Day
Umpqua
Rogue R.
Salmon
Snake
Owyhee
Boise
Kootenai
Pend Oreille
48°00'
46°00'
44°00'
42°00'
124°00'
122°00'
120°00'
118°00'
116°00'




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# GENERAL LAND USE MAP

THE REGION

USDA-SCS-PORTLAND, OREG. 1970

**FIGURE 5**

Table 11 - Cover and Land Use by Subregion, Columbia-North Pacific Region, 1966

| Subregion | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| 1 | 1,552.1 | 18,242.1 | 1,698.1 | 1,327.1 | 22,819.4 |
| 2 | 3,308.8 | 5,652.1 | 4,583.9 | 536.0 | 14,080.8 |
| 3 | 686.3 | 1,508.9 | 1.534.8 | 121.4 | 3,851.4 |
| 4 | 3,781.3 | 4,296.9 | 13,555.8 | 1,047.8 | 22,681.8 |
| 5 | 1,628.9 | 4,190.5 | 16,838.7 | 739.4 | 23,397.5 |
| 6 | 3,077.8 | 13,537.1 | 5,041.8 | 714.5 | 22,371.2 |
| 7 | 3,570.6 | 8,328.3 | 6,358.1 | 565.2 | 18,822.2 |
| 8 | 201.1 | 2,665.0 | 67.9 | 258.6 | 3,192.6 |
| 9 | 1,456.1 | 5,272.0 | 58.8 | 815.9 | 7,602.8 |
| 10 | 584.8 | 13,828.6 | 168.6 | 472.2 | 15,054.2 |
| 11 | 591.0 | 6,429.0 | 105.0 | 1,321.6 | 8,446.6 |
| 12 | 365.0 | 1,893.0 | 8,733.1 | 403.7 | 11,394.8 |
| Total | 20,803.8 | 85,843.5 | 58,744.6 | 8,323.4 | 173,715.3 |

Source: U.S.D.A. Conservation Needs Inventory and Forest Survey adjusted by the Land and Minerals Work Group.

Table 12 - Cover and Land Use by Subregion, Columbia-North Pacific Region, 1966

| State | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Idaho | 5,988.5 | 20,901.0 | 21,998.5 | 1,897.1 | 50,785.1 |
| Montana | 843.4 | 12,708.0 | 1,370.4 | 999.8 | 15,921.6 |
| Nevada | 155.1 | 106.0 | 3,012.4 | 23.0 | 3,296.5 |
| Oregon | 5,347.9 | 27,479.6 | 22,521.9 | 2,211.2 | 57,560.6 |
| Utah | 8.2 | 25.9 | 203.6 | 3.2 | 240.9 |
| Washington | 8,304.6 | 22,970.0 | 8,522.2 | 2,878.8 | 42,675.6 |
| Wyoming | 156.1 | 1,653.0 | 1,115.6 | 310.3 | 3,235.0 |
| Total | 20,803.8 | 85,843.5 | 58,744.6 | 8,323.4 | 173,715.3 |

Source: U.S.D.A. Conservation Needs Inventory and Forest Survey, adjusted by the Land and Minerals Work Group.

Table 13 - Cover and Land Use by Ownership, State of Idaho, Columbia-North Pacific Region, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | (1,000 | acres) | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 15,624.1 | 3,556.5 | 609.6 | 19,790.2 |
| Other Agriculture | - | - | 32.7 | - | 32.7 |
| | - | 15,624.1 | 3,589.2 | 609.6 | 19,822.9 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 784.0 | 10,521.1 | 534.3 | 11,839.4 |
| Bureau of Indian Affairs 1/ | 150.9 | 91.8 | 566.3 | 22.1 | 831.1 |
| National Park Service | - | 30.0 | 14.5 | 40.4 | 84.9 |
| Fish & Wildlife Service | 2.5 | - | 12.6 | 5.1 | 20.2 |
| Bureau of Reclamation | 1.3 | - | 549.4 | 31.1 | 581.8 |
| Other Interior | - | - | - | .1 | .1 |
| | 154.7 | 905.8 | 11,663.9 | 633.1 | 13,357.5 |
| Department of Defense | - | 7.0 | 42.1 | 44.9 | 94.0 |
| Other Federal | - | - | 572.3 | 2.8 | 575.1 |
| Federal Subtotal | 154.7 | 16,536.9 | 15,867.5 | 1,290.4 | 33,849.5 |
| State | 59.5 | 1,006.0 | 1,533.9 | 146.2 | 2,745.6 |
| County | - | 5.0 | - | 100.2 | 105.2 |
| Municipal | - | 4.0 | 1.3 | 34.7 | 40.0 |
| Public Total | 214.2 | 17,551.9 | 17,402.7 | 1,571.5 | 36,740.3 |
| Private Total | 5,774.3 | 3,349.1 | 4,595.8 | 325.6 | 14,044.8 |
| Total Land Area | 5,988.5 | 20,901.0 | 21,998.5 | 1,897.1 | 50,785.1 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 14 - Cover and Land Use by Ownership, State of Montana, Columbia-North Pacific Region, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 8,206.0 | 234.9 | 296.0 | 8,736.9 |
| Other Agriculture | - | - | - | - | - |
| | - | 8,206.0 | 234.9 | 296.0 | 8,736.9 |
| Department of the Interior | | | | | |
| Bureau of Land Management | | 152.3 | - | - | 152.3 |
| Bureau of Indian Affairs 1/ | 31.1 | 460.3 | 103.8 | 23.6 | 618.8 |
| National Park Service | - | 552.2 | 19.0 | 84.5 | 655.7 |
| Fish & Wildlife Service | - | 5.0 | 13.6 | 1.8 | 20.4 |
| Bureau of Reclamation | - | - | .2 | .2 | .4 |
| Other Interior | - | - | - | .1 | .1 |
| | 31.1 | 1,169.8 | 136.6 | 110.2 | 1,447.7 |
| Department of Defense | - | - | - | .1 | .1 |
| Other Federal | - | - | - | .3 | .3 |
| Federal Subtotal | 31.1 | 9,375.8 | 371.5 | 406.6 | 10,185.0 |
| State | 6.2 | 453.4 | 142.7 | 43.7 | 646.0 |
| County | - | 1.0 | - | 1.4 | 2.4 |
| Municipal | - | 1.0 | - | 6.1 | 7.1 |
| Public Total | 37.3 | 9,831.2 | 514.2 | 457.8 | 10,840.5 |
| Private Total | 806.1 | 2,876.8 | 856.2 | 542.0 | 5,081.1 |
| Total Land Area | 843.4 | 12,708.0 | 1,370.4 | 999.8 | 15,921.6 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 15 - Cover and Land Use by Ownership, State of Nevada, Columbia-North Pacific Region, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 70.0 | 605.5 | - | 675.5 |
| Other Agriculture | - | - | - | - | - |
| | - | 70.0 | 605.5 | - | 675.5 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 30.0 | 1,841.5 | - | 1,871.5 |
| Bureau of Indian Affairs 1/ | 11.0 | - | 132.6 | .7 | 144.3 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | - | - | - | - |
| | 11.0 | 30.0 | 1,974.1 | .7 | 2,015.8 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 11.0 | 100.0 | 2,579.6 | .7 | 2,691.3 |
| State | - | - | - | - | - |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 11.0 | 100.0 | 2,579.6 | .7 | 2,691.3 |
| Private Total | 144.1 | 6.0 | 432.8 | 22.3 | 605.2 |
| Total Land Area | 155.1 | 106.0 | 3,012.4 | 23.0 | 3,296.5 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 16 - Cover and Land Use by Ownership, State of Oregon, Columbia-North Pacific Region, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 12,697.9 | 922.4 | 246.4 | 13,866.7 |
| Other Agriculture | - | - | 14.1 | .5 | 14.6 |
| | - | 12,697.9 | 936.5 | 246.9 | 13,881.3 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 3,418.2 | 11,678.1 | 217.3 | 15,313.6 |
| Bureau of Indian Affairs1/ | 50.3 | 460.4 | 173.3 | 6.0 | 690.0 |
| National Park Service | - | 63.0 | - | 1.4 | 64.4 |
| Fish & Wildlife Service | 25.2 | - | 284.1 | 124.0 | 433.3 |
| Bureau of Reclamation | 12.7 | 11.5 | 129.4 | 7.3 | 160.9 |
| Other Interior | - | - | - | 2.7 | 2.7 |
| | 88.2 | 3,953.1 | 12,264.9 | 358.7 | 16,664.9 |
| Department of Defense | - | - | 88.0 | 60.6 | 148.6 |
| Other Federal | - | - | - | 3.3 | 3.3 |
| Federal Subtotal | 88.2 | 16,651.0 | 13,289.4 | 669.5 | 30,698.1 |
| State | 13.9 | 770.1 | 609.5 | 316.9 | 1,710.4 |
| County | - | 168.0 | - | 114.9 | 282.9 |
| Municipal | - | 41.0 | 1.0 | 95.7 | 137.7 |
| Public Total | 102.1 | 17,630.1 | 13,899.9 | 1,197.0 | 32,829.1 |
| Private Total | 5,245.8 | 9,849.5 | 8,622.0 | 1,014.2 | 24,731.5 |
| Total Land Area | 5,347.9 | 27,479.6 | 22,521.9 | 2,211.2 | 57,560.6 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 17 - Cover and Land Use by Ownership, State of Utah, Columbia-North Pacific Region, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 17.0 | 29.7 | - | 46.7 |
| Other Agriculture | - | - | - | - | - |
| | - | 17.0 | 29.7 | - | 46.7 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 8.9 | 42.1 | 1.4 | 52.4 |
| Bureau of Indian Affairs1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | - | - | - | - |
| | - | 8.9 | 42.1 | 1.4 | 52.4 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | - | 25.9 | 71.8 | 1.4 | 99.1 |
| State | 3.5 | - | 22.2 | - | 25.7 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 3.5 | 25.9 | 94.0 | 1.4 | 124.8 |
| Private Total | 4.7 | - | 109.6 | 1.8 | 116.1 |
| Total Land Area | 8.2 | 25.9 | 203.6 | 3.2 | 240.9 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 18 - Cover and Land Use by Ownership, State of Washington, Columbia-North Pacific Region, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 7,975.7 | 373.0 | 667.3 | 9,016.0 |
| Other Agriculture | .4 | - | - | - | .4 |
| | .4 | 7,975.7 | 373.0 | 667.3 | 9,016.4 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 83.3 | 190.0 | 1.9 | 275.2 |
| Bureau of Indian Affairs1/ | 120.8 | 1,645.8 | 659.7 | 81.5 | 2,507.8 |
| National Park Service2/ | - | 1,394.7 | 113.9 | 394.4 | 1,903.0 |
| Fish & Wildlife Service | .8 | 59.2 | 39.2 | 10.8 | 110.0 |
| Bureau of Reclamation | - | 5.5 | 354.5 | 33.0 | 393.0 |
| Other Interior | - | - | - | 7.1 | 7.1 |
| | 121.6 | 3,188.5 | 1,357.3 | 528.7 | 5,196.1 |
| Department of Defense | - | 76.4 | 329.5 | 98.4 | 504.3 |
| Other Federal | - | 2.3 | 374.0 | 4.7 | 381.0 |
| Federal Subtotal | 122.0 | 11,242.9 | 2,433.8 | 1,299.1 | 15,097.8 |
| State | 159.8 | 2,110.3 | 800.5 | 245.0 | 3,315.6 |
| County | - | 53.0 | - | 43.9 | 96.9 |
| Municipal | - | 176.6 | 1.3 | 115.4 | 293.3 |
| Public Total | 281.8 | 13,582.8 | 3,235.6 | 1,703.4 | 18,803.6 |
| Private Total | 8,022.8 | 9,387.2 | 5,286.6 | 1,175.4 | 23,872.0 |
| Total Land Area | 8,304.6 | 22,970.0 | 8,522.2 | 2,878.8 | 42,675.6 |

1/ Private lands held in trust by the Federal Government.
2/ Updated to 1969.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 19 - Cover and Land Use by Ownership, State of Wyoming, Columbia-North Pacific Region, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 1,136.6 | 955.6 | 182.0 | 2,274.2 |
| Other Agriculture | - | - | - | - | - |
| | - | 1,136.6 | 955.6 | 182.0 | 2,274.2 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 9.9 | 3.1 | - | 13.0 |
| Bureau of Indian Affairs1/ | - | - | - | - | - |
| National Park Service | - | 464.0 | 108.3 | 113.8 | 686.1 |
| Fish & Wildlife Service | - | - | 23.6 | 1.0 | 24.6 |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | | | | |
| | - | 473.9 | 135.0 | 114.8 | 723.7 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | - | 1,610.5 | 1,090.6 | 296.8 | 2,997.9 |
| State | 4.5 | 1.5 | 3.0 | - | 9.0 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 4.5 | 1,612.0 | 1,093.6 | 296.8 | 3,006.9 |
| Private Total | 151.6 | 41.0 | 22.0 | 13.5 | 228.1 |
| Total Land Area | 156.1 | 1,653.0 | 1,115.6 | 310.3 | 3,235.0 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

## Cropland

Over 20 million acres, or 12 percent of the land in the region, are used as cropland. Of this total, over 13 million acres are under dryland management and over 7 million acres are presently being irrigated (table 20). Generally cropland is restricted to the general soil areas numbered 1, 2, 3, 5, 6, and 7 in tables 6 and 7.

Table 20 - Cropland Acreage of Representative Categories of Crops by States, Columbia-North Pacific Region, 1966

| Categories of Crops | Idaho | Montana | Nevada | Oregon | Utah | Washington | Wyoming | Total | Percent |
|---|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | | |
| Dryland Cropland | | | | | | | | | |
| Forage Crops | 512.9 | 279.4 | .4 | 829.4 | - | 1,082.3 | 7.8 | 2,712.2 | 13.0 |
| Close Grown Field Crops | 2,180.3 | 144.4 | - | 2,709.8 | 1.4 | 5,663.8 | 14.4 | 10,714.1 | 51.5 |
| Orchards & Vineyards | 17.2 | 1.9 | - | 93.0 | - | 23.1 | - | 135.2 | .7 |
| Specialty Crops | 4.4 | - | - | 23.2 | - | 21.6 | - | 49.2 | .2 |
| Row Crops | - | - | - | - | - | 61.4 | - | 61.4 | .3 |
| Total Dryland Crops | 2,714.8 | 425.7 | .4 | 3,655.4 | 1.4 | 6,852.2 | 22.2 | 13,672.1 | 65.7 |
| Irrigated Cropland 1/ | | | | | | | | | |
| Forage Crops | 1,505.4 | 370.6 | 154.4 | 1,189.0 | 6.2 | 633.5 | 115.8 | 3,974.9 | 19.1 |
| Close Grown Field Crops | 759.7 | 39.5 | .3 | 108.8 | .6 | 216.6 | 17.8 | 1,143.3 | 5.5 |
| Orchards & Vineyards | 8.9 | .8 | - | 46.2 | - | 221.2 | - | 277.1 | 1.3 |
| Specialty Crops | 6.6 | - | - | 77.2 | - | 166.3 | .3 | 250.4 | 1.2 |
| Row Crops | 993.1 | 6.8 | - | 271.3 | - | 214.8 | - | 1,486.0 | 7.2 |
| Total Irrigated Crops | 3,273.7 | 417.7 | 154.7 | 1,692.5 | 6.8 | 1,452.4 | 133.9 | 7,131.7 | 34.3 |
| Total Cropland | 5,988.5 | 843.4 | 155.1 | 5,347.9 | 8.2 | 8,304.6 | 156.1 | 20,803.8 | 100.0 |

1/ Does not include other land that is irrigated. (table 42)
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 20 also lists general categories of crops common to the region. It is interesting to note the sharp build up in forage crops in changing from a dryland to irrigated land management. Of course, this relates to the high value of a soil conditioning hay crop in the rotation of crops on intensively farmed land. Close grown field crops include cereal grains (wheat, barley, oats, and rye) and certain legumes such as field peas and lentils when they are close grown. The close grown field crops include some of the most valuable and extensively produced crops (over 51 percent) grown in the region. Orchards and vineyards are produced under dryland management mostly in western Oregon and Washington and consist generally of cherry, prune, and nut orchards, and of cane fruit (blackberries, blueberries, etc.) and grapes. Irrigated orchards include the renowned apple crop of the Yakima, Wenatchee, and Okanogan Valleys in Washington and the pear orchards of the Rogue Valley in Oregon. Specialty crops consist of innumerable adapted species that are limited in extent but may be highly valuable. Some of these include hops, cranberries, bulbs, and vegetable seed crops. Row crops include the extensive potato, onion, and sugar beet production of south Idaho, eastern Washington, and eastern Oregon. They also include the Willamette Valley bean crop and the vegetable crops of the Puget Sound Valleys. Most of the specialty crops and practically all the row crops are produced under irrigated land management.

Cropland use of land requires a complete and comprehensive sequence of land management and cropping practices to protect the soil body from accelerated wind and water erosion or from accumulation of water, sediments, a high pH, or salts. Additional management must be applied to maintain soil fertility, and soil moisture. Cropland use of land involves a use intensity related to the kinds of crops and level of management. For example, wheat culture in a dryland, grain-fallow system of management is less intensive than annual cropped dryland wheat and this in turn is less intensively managed than irrigated wheat land. By judicious use of cropland the soil, water, and plant resources can be maintained or improved and permanent production from the land resource guaranteed for generations to come. Economic evaluation of the use of land must put cropland use near the top in value for returns when you consider the soil a renewable resource with a potential for permanent use.

## Forest Land

The Columbia-North Pacific Region has a land area of nearly 174 million acres, 7 percent of the total land area of the United States. It contains 85.8 million acres of forest land, 11 percent of the Nation's total; and 70.4 million acres of commercial forest land, 14 percent of the national total. Of the 15.4 million acres of noncommercial forest land, 5.1 million acres are of commercial character but are in areas reserved for use as National Parks; wild, wilderness, and primitive areas; and state, county, and municipal parks. The remaining 10.3 million acres of noncommercial forest land are unsuitable for raising commercial timber crops because of their low productivity due to high altitude, low rainfall, steep terrain, and other factors. A detailed breakdown of these statistics is found on tables 21 through 30.

The forests of the Columbia-North Pacific Region are divided into three broad areas on the basis of differing physiographic and climatic conditions. These areas are the Douglas-fir region which lies west of the Cascade Range, the Ponderosa Pine region of eastern Oregon and eastern Washington, and the Northern Rocky Mountain region of Idaho and western Montana.

The Douglas-fir region of the Columbia-North Pacific Region includes all of western Washington and western Oregon. On the west, it is bounded by the Pacific Ocean and on the east by the rugged Cascade Range. Climatic conditions are very favorable to conifer forest growth, and as a result the region is characterized by its dense stands of tall trees. Douglas-fir is the dominant tree species, except for spruce and hemlock in the more humid areas along the coast and true firs at the higher elevations of the Cascade Range.

(Narrative continued on page 43)

Table 21 - Forest Land Acreage by Generalized Type and Ownership, Columbia-North Pacific Region, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Unproductive-Reserved | Un-productive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Forest Service1/ | 36,131.9 | 3,335.8 | 1,914.2 | 4,345.4 | 45,727.3 |
| Bureau of Land Management | 2,911.9 | - | - | 1,574.7 | 4,486.6 |
| Bureau of Indian Affairs2/ | 2,363.2 | - | - | 295.1 | 2,658.3 |
| National Park Service1/ | 116.7 | 1,630.5 | 722.7 | 34.0 | 2,503.9 |
| Fish & Wildlife Service | 62.0 | .2 | - | 2.0 | 64.2 |
| Bureau of Reclamation | 8.0 | - | - | 9.0 | 17.0 |
| Department of Defense | 73.8 | 9.0 | - | .6 | 83.4 |
| Other Federal | - | 2.3 | - | - | 2.3 |
| Federal Subtotal | 41,667.5 | 4,977.8 | 2,636.9 | 6,260.8 | 55,543.0 |
| State | 4,047.1 | 88.3 | 6.3 | 199.6 | 4,341.3 |
| County | 198.5 | 3.5 | - | 25.0 | 227.0 |
| Municipal | 198.8 | 14.3 | 1.1 | 8.4 | 222.6 |
| Public Total | 46,111.9 | 5,083.9 | 2,644.3 | 6,493.8 | 60,333.9 |
| Private Total | 24,256.1 | - | - | 1,253.5 | 25,509.6 |
| Grand Total | 70,368.0 | 5,083.9 | 2,644.3 | 7,747.3 | 85,843.5 |

1/ Updated to 1969.
2/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Pacific Northwest and Intermountain Experiment Stations.

Table 22 - Forest Land by Subregions, Columbia-North Pacific Region, 1966

| Subregion | Commercial Forest Land | Noncommercial Forest Land: Productive Reserved | Unproductive Reserved | Unproductive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| 1 | 15,759.1 | 916.0 | 768.0 | 799.0 | 18,242.1 |
| 2 | 4,547.1 | 298.0 | 226.0 | 581.0 | 5,652.1 |
| 3 | 1,272.9 | 70.8 | 42.6 | 122.6 | 1,508.9 |
| 4 | 2,515.0 | 677.0 | 50.0 | 1,054.9 | 4,296.9 |
| 5 | 2,819.3 | 112.5 | 69.7 | 1,189.0 | 4,190.5 |
| 6 | 10,256.8 | 1,692.0 | 670.3 | 918.0 | 13,537.1 |
| 7 | 6,515.7 | 99.1 | 76.3 | 1,637.2 | 8,328.3 |
| 8 | 2,473.5 | 65.0 | 40.0 | 86.5 | 2,665.0 |
| 9 | 4,961.3 | 191.7 | 43.5 | 75.5 | 5,272.0 |
| 10 | 12,834.0 | 399.5 | 179.2 | 415.9 | 13,828.6 |
| 11 | 5,004.3 | 558.3 | 478.7 | 387.7 | 6,429.0 |
| 12 | 1,409.0 | 4.0 | - | 480.0 | 1,893.0 |
| Total | 70,368.0 | 5,083.9 | 2,644.3 | 7,747.3 | 85,843.5 |

Source: U.S.D.A. Forest Survey, Pacific and Intermountain Experiment Stations.

Table 23 - Forest Land by States, Columbia-North Pacific Region, 1966

| Subregion | Commercial Forest Land | Noncommercial Forest Land: Productive Reserved | Unproductive Reserved | Unproductive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Idaho | 15,843.0 | 1,739.0 | 613.0 | 2,706.0 | 20,901.0 |
| Montana | 10,453.0 | 889.0 | 768.0 | 598.0 | 12,708.0 |
| Nevada | 20.5 | 11.5 | 5.0 | 69.0 | 106.0 |
| Oregon | 23,974.8 | 452.8 | 304.6 | 2,747.4 | 27,479.6 |
| Utah | 5.0 | - | - | 20.9 | 25.9 |
| Washington | 19,360.7 | 1,352.6 | 905.7 | 1,351.0 | 22,970.0 |
| Wyoming | 711.0 | 639.0 | 48.0 | 255.0 | 1,653.0 |
| Total | 70,368.0 | 5,083.9 | 2,644.3 | 7,747.3 | 85,843.5 |

Source: U.S.D.A. Forest Survey, Pacific and Intermountain Experiment Stations.

Table 24 - Forest Land Acreage by Generalized Type and Ownership, State of Idaho, Columbia-North Pacific Region, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Un-productive | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Forest Service | 11,380.0 | 1,710.0 | 612.0 | 1,922.1 | 15,624.1 |
| Bureau of Land Management | 379.0 | - | - | 405.0 | 784.0 |
| Bureau of Indian Affairs1/ | 46.0 | - | - | 45.8 | 91.8 |
| National Park Service | - | 29.0 | 1.0 | - | 30.0 |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | 7.0 | - | - | - | 7.0 |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 11,812.0 | 1,739.0 | 613.0 | 2,372.9 | 16,536.9 |
| State | 901.0 | - | - | 105.0 | 1,006.0 |
| County | 5.0 | - | - | - | 5.0 |
| Muncipal | 4.0 | - | - | - | 4.0 |
| Public Total | 12,722.0 | 1,739.0 | 613.0 | 2,477.9 | 17,551.9 |
| Private Total | 3,121.0 | - | - | 228.1 | 3,349.1 |
| Grand Total | 15,843.0 | 1,739.0 | 613.0 | 2,706.0 | 20,901.0 |

1/ Private lands held in trust by the Federal Government.
*Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.*

Table 25 - Forest Land Acreage by Generalized Type and Ownership, State of Montana, Columbia-North Pacific Region, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Un-Productive | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Forest Service | 6,680.0 | 490.1 | 614.7 | 421.2 | 8,206.0 |
| Bureau of Land Management | 150.0 | - | - | 2.3 | 152.3 |
| Bureau of Indian Affairs1/ | 379.0 | - | - | 81.3 | 460.3 |
| National Park Service | - | 398.9 | 153.3 | - | 552.2 |
| Fish & Wildlife Service | 3.0 | - | - | 2.0 | 5.0 |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 7,212.0 | 889.0 | 768.0 | 506.8 | 9,375.8 |
| State | 439.0 | - | - | 14.4 | 453.4 |
| County | 1.0 | - | - | - | 1.0 |
| Municipal | 1.0 | - | - | - | 1.0 |
| Public Total | 7,653.0 | 889.0 | 768.0 | 521.2 | 9,831.2 |
| Private Total | 2,800.0 | - | - | 76.8 | 2,876.8 |
| Grand Total | 10,453.0 | 889.0 | 768.0 | 598.0 | 12,708.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 26 - Forest Land Acreage by Generalized Type and Ownership, State of Nevada, Columbia-North Pacific Region, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Un-productive | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Forest Service | 16.5 | 11.5 | 5.0 | 37.0 | 70.0 |
| Bureau of Land Management | - | - | - | 30.0 | 30.0 |
| Bureau of Indian Affairs1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 16.5 | 11.5 | 5.0 | 67.0 | 100.0 |
| State | - | - | - | - | - |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 16.5 | 11.5 | 5.0 | 67.0 | 100.0 |
| Private Total | 4.0 | - | - | 2.0 | 6.0 |
| Grand Total | 20.5 | 11.5 | 5.0 | 69.0 | 106.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 27 - Forest Land Acreage by Generalized Type and Ownership State of Oregon, Columbia-North Pacific Region, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive Reserved | Noncommercial Forest Land: Un-Productive | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Forest Service | 11,416.8 | 381.8 | 285.6 | 613.7 | 12,697.9 |
| Bureau of Land Management | 2,308.2 | - | - | 1,110.0 | 3,418.2 |
| Bureau of Indian Affairs1/ | 325.4 | - | - | 135.0 | 460.4 |
| National Park Service | - | 50.0 | 13.0 | - | 63.0 |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | 2.5 | - | - | 9.0 | 11.5 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 14,052.9 | 431.8 | 298.6 | 1,867.7 | 16,651.0 |
| State | 706.1 | 15.0 | 6.0 | 43.0 | 770.1 |
| County | 143.0 | - | - | 25.0 | 168.0 |
| Municipal | 33.0 | 6.0 | - | 2.0 | 41.0 |
| Public Total | 14,935.0 | 452.8 | 304.6 | 1,937.7 | 17,630.1 |
| Private Total | 9,039.8 | - | - | 809.7 | 9,849.5 |
| Grand Total | 23,974.8 | 452.8 | 304.6 | 2,747.4 | 27,479.6 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Pacific Northwest Forest and Range Experiment Station.

Table 28 - Forest Land Acreage by Generalized Type and Ownership, State of Utah, Columbia-North Pacific Region, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Forest Service | 5.0 | - | - | 12.0 | 17.0 |
| Bureau of Land Management | - | - | - | 8.9 | 8.9 |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 5.0 | - | - | 20.9 | 25.9 |
| State | - | - | - | - | - |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 5.0 | - | - | 20.9 | 25.9 |
| Private Total | - | - | - | - | - |
| Grand Total | 5.0 | - | - | 20.9 | 25.9 |

1/ Private lands held in trust by the Federal Government.
*Source:* U.S.D.A. Forest Survey, Intermountain Forest and Range Experiment Station.

Table 29 - Forest Land Acreage by Generalized Type and Ownership, State of Washington, Columbia-North Pacific Region, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Forest Service | 5,960.0 | 519.4 | 396.9 | 1,099.4 | 7,975.7 |
| Bureau of Land Management | 74.3 | - | - | 9.0 | 83.3 |
| Bureau of Indian Affairs 1/ | 1,612.8 | - | - | 33.0 | 1,645.8 |
| National Park Service | 116.7 | 736.6 | 507.4 | 34.0 | 1,394.7 |
| Fish & Wildlife Service | 59.0 | .2 | - | - | 59.2 |
| Bureau of Reclamation | 5.5 | - | - | - | 5.5 |
| Department of Defense | 66.8 | 9.0 | - | .6 | 76.4 |
| Other Federal | - | 2.3 | - | - | 2.3 |
| Federal Subtotal | 7,895.1 | 1,267.5 | 904.3 | 1,176.0 | 11,242.9 |
| State | 2,000.0 | 73.3 | .3 | 36.7 | 2,110.3 |
| County | 49.5 | 3.5 | - | - | 53.0 |
| Municipal | 160.8 | 8.3 | 1.1 | 6.4 | 176.6 |
| Public Total | 10,105.4 | 1,352.6 | 905.7 | 1,219.1 | 13,582.8 |
| Private Total | 9,2 5.3 | - | - | 131.9 | 9,387.2 |
| Grand Total | 19,360.7 | 1,352.6 | 905.7 | 1,351.0 | 22,970.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Pacific Northwest Forest and Range Experiment Station.

Table 30 - Forest Land Acreage by Generalized Type and Ownership, State of Wyoming, Columbia-North Pacific Region, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Un-Productive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 673.6 | 223.0 | - | 240.0 | 1,136.6 |
| Bureau of Land Management | .4 | - | - | 9.5 | 9.9 |
| Bureau of Indian Affairs[1/] | - | - | - | - | - |
| National Park Service | - | 416.0 | 48.0 | - | 464.0 |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 674.0 | 639.0 | 48.0 | 249.5 | 1,610.5 |
| State | 1.0 | - | - | .5 | 1.5 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 675.0 | 639.0 | 48.0 | 250.0 | 1,612.0 |
| Private Total | 36.0 | - | - | 5.0 | 41.0 |
| Grand Total | 711.0 | 639.0 | 48.0 | 255.0 | 1,653.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Forest and Range Experiment Station.

The Ponderosa Pine region lies just east of the Cascade Range in Washington and Oregon. Here, the climate is much drier than in the Douglas-fir region. There are two timberlines which limit the extent of the forest land area on the east side. As on the west side, there is a timberline associated with the severe climatic conditions at high elevations. The other timberline is associated with arid conditions, and it can be referred to as the "dry" timberline. The Cascade Mountain Range is an effective barrier to the moisture-laden westerly winds from the Pacific Ocean. As a result, extensive areas of eastern Washington and eastern Oregon have low precipitation at lower elevations below which forests cease to grow due to the lack of moisture. The timber zone then lies between these two timberlines and is generally confined to the more mountainous areas where sufficient moisture and suitable climate is available to sustain forest growth.

The eastern Oregon and eastern Washington area is generally referred to as the Ponderosa Pine region because it is characterized by extensive stands of ponderosa pine which occur at low elevations above the "dry" timberline. At higher elevations the pure stands of pine give way to mixed stands of Douglas-fir, western larch, white fir, and lodgepole pine. In colder areas and moist areas in the higher elevations, noble fir, Engelmann spruce, alpine fir, western hemlock, and white pine are found.

The third major area of the Columbia-North Pacific Region lies to the east of the Ponderosa Pine region in Idaho and western Montana. Like the Ponderosa Pine region, this eastern portion of the Columbia-North Pacific Region has extensive semiarid nonforest areas, especially in southern Idaho, and it has extensive forested areas in northern Idaho and western Montana. The forests stretch from the Continental Divide in western Montana west through northern Idaho into eastern Washington.

While both northern Idaho and western Montana are 80 percent forested, southern Idaho is less than 30 percent forested. Both western Montana and northern Idaho have large areas in Douglas-fir, ponderosa pine, lodgepole pine, and fir-spruce type. Northern Idaho in addition has substantial acreage of western white pine type and western Montana a large area of western larch type. Southern Idaho forests consist primarily of Douglas-fir, ponderosa pine, and lodgepole pine types. Both northern Idaho and western Montana have a history of severe forest fires which have left them with extensive areas of nonstocked or poorly stocked forest land thus reducing both current and future yields.

Ownership The National Forests are the largest public forest landowners in the region, with 51 percent (36 million acres) of the commercial forest area of the region. (table 21) East of the Cascades, the National Forests are the dominant ownership, while in the subregions west of the Cascades, National Forests represent a smaller proportion of the total. The proportion of total commercial forest land area in National Forest ownership ranges from 88 percent in Subregion 4 to 24 percent in Subregion 10 in western Washington and western Oregon.

The Bureau of Land Management has commercial forest land in every subregion and it is a major timber owner in western Oregon and especially in Subregion 10 where it has 1.7 million acres of commercial forest land under management. It holds the fourth largest acreage of commercial forest land.

Indian landowners account for 3 percent (2.4 million acres) of the commercial forest land. The Indian timber resources in the larger reservations are important to the economics of several subregions even though they lack major importance in the whole Northwest. For example, the Yakima Indian Reservation accounts for about 28 percent of the commercial forest land in the Yakima Subregion. The Colville and the Spokane Indian Reservations are important to the forest economy of northeastern Washington in the Upper Columbia Subregion where they account for 20 percent of the commercial forest land.

The other public owners include the states, counties, and municipalities, and as a group they account for 4.4 million acres of commercial forest land. The State of Washington is the largest owner in this group with 2 million acres of commercial forest land under management, and it ranks fourth in state ownership of commercial forest land in the United States.

Private owners hold 24 million acres or 34 percent of the commercial forest land in the region. In the Douglas-fir region of western Oregon and western Washington, private ownership accounts for about half of the commercial forest land. Forest industrial owners manage 55 percent of the 13.2 million acres of private commercial forest land. Lumber companies are the most important industrial ownership with 4.6 million acres of commercial forest land, and pulp and paper companies rank second with 2.4 million acres. Farmers own 2.5 million acres of the commercial forest land whereas miscellaneous private ownerships, such as railroad ownership, are large and are actively managed for timber production.

In the Ponderosa Pine region, private owners account for 31 percent of the total commercial forest land (6.2 million acres). Farmers are the largest private owner group in this region, with 54 percent of the private ownership or 3.4 million acres. The lumber industry owns the next largest private commercial forest area (about 2 million acres). The industrial owners in this area own some of the finest stands of ponderosa pine in the Columbia-North Pacific Region.

Private owners in all of Idaho account for 20 percent of the state's commercial forest land (3.2 million acres). Industrial and other private owners manage about 60 percent of the private commercial forest land whereas the farmers own the remainder. Private interests claimed the best timberlands, especially the white pine forests in northern Idaho, during the late 19th century. As a result, 81 percent of the private forest land (2.6 million acres) in Idaho is found in the northern part of the state.

In western Montana, 27 percent of the commercial forest land (2.8 million acres) is privately owned. Miscellaneous private owners, including large mining interests and railroads, hold 46 percent of the private forest lands (1.3 million acres). The lumber industry is the second largest private owner in western Montana with 37 percent of the private commercial forest lands, (1.0 million acres) while farmers are the smallest ownership group (471,000 acres).

Although the 70.4 million acres of commercial forest land in the region represent only 14 percent of the Nation's commercial forest area, it has 42 percent (about 18 million acres) of the Nation's forest land rated as potentially most productive. These are lands which are capable of yielding 120 or more cubic feet per acre per year. These high site lands are mostly found in the Douglas-fir region where the climate is moist and favorable for forest growth. Sixty-one percent of the Douglas-fir region's forest lands are in this productive class. In general, the eastern portion of the Columbia-North Pacific Region has forest lands with lower potential productivity. Almost all of the acres classed as least productive, yielding less than 50 cubic feet per acre per year, are found here.

The Columbia-North Pacific Region contains an estimated net volume of 217 billion cubic feet of timber on commercial forest land in trees 5 inches and larger in diameter at breast height. This is nearly one-third of the Nation's total timber volume. The live, sound trees account for 97 percent of the region's timber volume (210 billion cubic feet). The remaining 3 percent is in nongrowing stock material, including both sound and rotten cull trees and salvable dead trees. Eighty-one percent of live, sound volume (171 billion cubic feet) is in sawtimber-size trees; and 19 percent, or 39 billion cubic feet, is in poletimber-size trees.

Detailed data on timber volumes, growing stock and stand size and condition are found in the Forestry Section of Appendix VI, The Economic Base and Projections. The detail is found in that appendix as it is the base from which the forestry economic projections were made.

Forest Range The forest range includes 24.6 million acres classified as commercial forest land and 4.3 million acres classified as noncommercial forest. This 28.9 million acres represents 34 percent of the total forest land. Table 33 shows the distribution of the forest range by ownership and state. In Oregon, 10.4 million acres of forest range represent 36 percent of all forest range in the region, and Idaho has 8.9 million acres or 31 percent of the total.

Table 31 shows the distribution of the forest range by ownership and subregion. Forest range areas generally occupy the lower fringes of the forest zone adjacent to rangeland and agricultural areas. The predominant forest range is located in the northeastern part of the region north of the Snake River Plains and east of the Columbia Plateau in Subregions 1, 5, and 6. These three subregions account for 47 percent of the forest range. Another 18 percent is located in Subregion 7, primarily in the lower slopes and hills of the Ochoco and Blue Mountains. Subregion 2, located in the Okanogan Highlands and the eastern Cascade forest fringe, accounts for another 10 percent of the regional forest range.

Table 31 - Forest Range Acreage by Subregion and Ownership, Columbia-North Pacific Region, 1966 1/

| | Federal | | | | | Non-Federal | | | |
|---|---|---|---|---|---|---|---|---|---|
| Subregion | BLM | FS | BIA | Other | Total | State & County | Private | Total | Percent |
| | | | | (1,000 acres) | | | | | |
| 1 | 182.4 | 2,577.5 | 584.4 | 55.5 | 3,399.8 | 211.8 | 1,803.0 | 5,414.6 | 18.7 |
| 2 | 60.0 | 651.9 | 825.4 | 1.1 | 1,538.4 | 393.0 | 983.8 | 2,915.2 | 10.1 |
| 3 | 4.1 | 101.7 | 196.9 | - | 302.7 | 96.0 | 264.0 | 662.7 | 2.3 |
| 4 | 246.8 | 1,473.0 | 43.5 | 166.0 | 1,929.3 | 69.0 | 317.5 | 2,315.8 | 8.0 |
| 5 | 329.4 | 2,442.3 | - | - | 2,771.7 | 109.9 | 561.3 | 3,442.9 | 11.9 |
| 6 | 125.1 | 2,565.9 | 20.0 | 7.2 | 2,718.2 | 339.7 | 1,628.0 | 4,685.9 | 16.2 |
| 7 | 779.4 | 1,677.0 | 669.4 | 3.5 | 3,129.3 | 169.0 | 1,803.4 | 5,101.7 | 17.7 |
| 8 | - | 23.2 | - | - | 23.2 | 22.0 | 60.5 | 105.7 | .4 |
| 9 | 50.8 | 51.0 | - | - | 101.8 | 25.6 | 340.3 | 467.7 | 1.6 |
| 10 | 364.8 | 40.9 | - | - | 405.7 | - | 1,558.3 | 1,964.0 | 6.8 |
| 11 | - | 11.8 | - | - | 11.8 | - | 19.3 | 31.1 | .1 |
| 12 | 343.0 | 1,064.2 | - | - | 1,407.2 | 14.5 | 367.0 | 1,788.7 | 6.2 |
| Total | 2,485.8 | 12,680.4 | 2,339.6 | 233.3 | 17,739.1 | 1,450.5 | 9,706.4 | 28,896.0 | 100.0 |
| Percent | 8.6 | 43.9 | 8.1 | .8 | 61.4 | 5.0 | 33.6 | 100.0 | |

1/ Forest and woodland grazed or potentially usable for domestic livestock forage production. Forest range acreage is included within the total forest statistics shown on tables 21-30.
Source: *U.S.D.A. Conservation Needs Inventory* adjusted by Land and Minerals Work Group.

About 32 percent of the forest range is in good range condition, 36 percent in fair condition, and 32 percent in poor condition. The estimated carrying capacity of the forest range is 2.5 million AUMs with publicly owned lands accounting for 58 percent, and privately owned lands 42 percent.

Timber Softwood species types dominate the forests of the Columbia-North Pacific Region, accounting for 92 percent of the commercial forest area. The most common softwood species type is Douglas-fir, which covers 26.8 million acres of commercial forest land, and is found in every subregion.

The ponderosa pine type covers the second largest area of commercial forest land in the Columbia-North Pacific Region. Like Douglas-fir, it occurs in every subregion, but its importance is negligible in those subregions in western Oregon and western Washington.

The fir-spruce forest type is composed of several associated forest species: Engelmann spruce, grand fir, and sub-alpine fir. As a group, these species cover 8.5 million acres of commercial forest land in the region, but they are most significant in the Idaho-western Montana area. These species are grouped because they frequently occur in mixture, and they are utilized similarly for lumber and pulpwood.

Lodgepole pine is found in every subregion. It is the predominant species on 7.5 million acres of commercial forest land, but its utilization has been largely limited to the inland area with some lumber, poles, and piling being produced from it. For the future, it offers a vast untapped resource for uses such as pulp production.

Hardwood forest types cover only 6 percent of the commercial forest land (4.4 million acres) in the Columbia-North Pacific Region. Ninety-two percent of the hardwood area occurs west of the Cascades, where it frequently is found on the better growing sites. In many areas, hardwoods are the first tree species to enter naturally after the forest has been disturbed by fire or logging. Most of the hardwoods in the region occur in southwest Oregon. In the inland portion, the hardwoods are generally associated with moist valley bottoms and are found bordering streams.

Other Uses Although timber production is one of the key uses of the forest land regionwide, the forests are equally important for other purposes; over 85 percent of the region's streamflow originates here. Nearly 3 million people, representing 84 percent of the region's urban population, depend in part on these forested watersheds for their source of domestic water.

*Wood, water, forage, and scenery; products of the forest lands of the region. (Forest Service)*

The forest lands form a significant part of the recreation resource, furnishing vast areas for hunting, fishing, sight-seeing, and other outdoor activities. The public forest lands furnished areas and facilities for nearly 80 million recreation visits in 1965. These included use at developed recreation sites, winter sports areas, plus the general forest environment. The private forest lands furnished areas for another million visits during this period. The forest lands also furnish the habitat for a significant portion of the game, including deer, elk, bear, and many species of smaller game. Some 6 million hunter visits were reported on the forested portion of the region in 1965.

## Rangeland

Rangelands in the Columbia-North Pacific Region include 58.7 million acres, which account for 34 percent of the regional land area. Rangeland is heavily concentrated in the southern part of the region east of the Cascades with Subregions 4, 5, and 12, which cover the Snake River Plain and the Oregon Closed Basin, accounting for 66 percent of the total. Another 21 percent is located on the Columbia Plateau in Subregions 2, 3, and 7. The distribution of nonforest rangeland by ownership and subregion is shown on table 32.

Table 32 - Rangeland Acreage by Subregion and Ownership, Columbia-North Pacific Region, 1966

| | Federal | | | | | Non-Federal | | | |
|---|---|---|---|---|---|---|---|---|---|
| Subregion | BLM | FS | BIA | Other | Total | State & County | Private | Total | Percent |
| | | | | (1,000 acres) | | | | | |
| 1 | 26.5 | 261.6 | 133.1 | 35.3 | 456.5 | 149.7 | 1,091.9 | 1,698.1 | 2.9 |
| 2 | 140.0 | 235.4 | 163.9 | 768.0 | 1,307.3 | 392.3 | 2,884.3 | 4,583.9 | 7.8 |
| 3 | 26.8 | 25.0 | 433.8 | 347.3 | 832.9 | 157.6 | 544.3 | 1,534.8 | 2.6 |
| 4 | 5,779.7 | 3,320.3 | 392.2 | 945.8 | 10,438.0 | 884.2 | 2,233.6 | 13,555.8 | 23.1 |
| 5 | 10,287.7 | 1,234.2 | 271.9 | 484.7 | 12,278.5 | 820.2 | 3,740.0 | 16,838.7 | 28.7 |
| 6 | 992.9 | 1,110.4 | 25.0 | 47.2 | 2,175.5 | 287.4 | 2,578.9 | 5,041.8 | 8.6 |
| 7 | 877.9 | 212.1 | 184.2 | 160.0 | 1,434.2 | 130.5 | 4,793.4 | 6,358.1 | 10.8 |
| 8 | - | 18.0 | - | - | 18.0 | 3.0 | 46.9 | 67.9 | .1 |
| 9 | 8.0 | 10.0 | - | 3.0 | 21.0 | 3.0 | 34.8 | 58.8 | .1 |
| 10 | 62.7 | 19.6 | .5 | 12.0 | 94.8 | 12.0 | 61.8 | 168.6 | .3 |
| 11 | - | 36.0 | 1.2 | 16.8 | 54.0 | 1.1 | 49.9 | 105.0 | .2 |
| 12 | 6,073.7 | 195.0 | 29.9 | 294.9 | 6,593.5 | 274.4 | 1,865.2 | 8,733.1 | 14.8 |
| Total | 24,275.9 | 6,677.6 | 1,635.7 | 3,115.0 | 35,704.2 | 3,115.4 | 19,925.0 | 58,744.6 | 100.0 |
| Percent | 41.3 | 11.4 | 2.8 | 5.3 | 60.8 | 5.3 | 33.9 | 100.0 | |

Source: U.S.D.A. Conservation Needs Inventory adjusted by Land and Minerals Work Group.

Table 33 shows the acreage of range by ownership and by state. More than three-fourths of the range is located in Idaho and Oregon with 22.0 million acres and 22.5 million acres respectively. Tables 34 through 41 show the various categories of rangeland by ownership and by state for the region. A similar presentation is made in each of the subregional sections of this appendix.

(Narrative continued on page 53)

Table 33 - Rangeland & Forest Range Acreage by State and Ownership, Columbia-North Pacific Region, 1966

| Category and State | Federal BLM | Federal FS | Federal BIA | Federal Other | Federal Total | Non-Federal State & County | Non-Federal Private | Total | Percent |
|---|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | | |
| **Rangeland** | | | | | | | | | |
| Idaho | 10,521.1 | 3,556.5 | 566.3 | 1,223.6 | 15,867.5 | 1,535.2 | 4,595.8 | 21,998.5 | 37.5 |
| Montana | - | 234.9 | 103.8 | 32.8 | 371.5 | 142.7 | 856.2 | 1,370.4 | 2.3 |
| Nevada | 1,841.5 | 605.5 | 132.6 | - | 2,579.6 | - | 432.8 | 3,012.4 | 5.1 |
| Oregon | 11,678.1 | 922.4 | 173.3 | 515.6 | 13,289.4 | 610.5 | 8,622.0 | 22,521.9 | 38.3 |
| Utah | 42.1 | 29.7 | - | - | 71.8 | 22.2 | 109.6 | 203.6 | .4 |
| Washington | 190.0 | 373.0 | 659.7 | 1,211.1 | 2,433.8 | 801.8 | 5,286.6 | 8,522.2 | 14.5 |
| Wyoming | 3.1 | 955.6 | - | 131.9 | 1,090.6 | 3.0 | 22.0 | 1,115.6 | 1.9 |
| Total | 24,275.9 | 6,677.6 | 1,635.7 | 3,115.0 | 35,704.2 | 3,115.4 | 19,925.0 | 58,744.6 | 100.0 |
| **Forest Range[1/]** | | | | | | | | | |
| Idaho | 571.7 | 5,165.5 | 84.6 | - | 5,821.8 | 565.3 | 2,470.1 | 8,857.2 | 30.6 |
| Montana | 152.3 | 2,424.7 | 460.3 | 55.5 | 3,092.8 | 150.0 | 716.3 | 3,959.1 | 13.7 |
| Nevada | 30.0 | 70.0 | - | - | 100.0 | - | 6.0 | 106.0 | .4 |
| Oregon | 1,634.7 | 3,696.0 | 377.2 | 3.5 | 5,711.4 | 105.6 | 4,572.6 | 10,389.6 | 35.9 |
| Utah | 8.9 | 17.0 | - | - | 25.9 | - | - | 25.9 | .1 |
| Washington | 78.3 | 881.2 | 1,417.5 | 8.3 | 2,385.3 | 628.6 | 1,920.9 | 4,934.8 | 17.1 |
| Wyoming | 9.9 | 426.0 | - | 166.0 | 601.9 | 1.0 | 20.5 | 623.4 | 2.2 |
| Total | 2,485.8 | 12,680.4 | 2,339.6 | 233.3 | 17,739.1 | 1,450.5 | 9,706.4 | 28,896.0 | 100.0 |
| Grand Total | 26,761.7 | 19,358.0 | 3,975.3 | 3,348.3 | 53,443.3 | 4,565.9 | 29,631.4 | 87,640.6 | - |

1/ Forest and woodland grazed or potentially usable for domestic livestock forage production. Forest range acreage is included within the total forest statistics shown on table 24.
Source: U.S.D.A. Conservation Needs Inventory adjusted by Land and Minerals Work Group.

Table 34 - Rangeland and Forest Range Acreage by Range Type and Ownership, Columbia-North Pacific Region, 1966

| Category | Federal BLM | Federal FS | Federal BIA | Federal Other | Federal Total | Non-Federal State & County | Non-Federal Private | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | |
| **Rangeland** | | | | | | | | |
| Grasslands | 2,346.2 | 2,580.7 | 629.2 | 617.9 | 6,174.0 | 1,030.3 | 10,338.3 | 17,542.6 |
| Sagebrush | 21,135.7 | 3,141.7 | 861.3 | 2,402.3 | 27,541.0 | 1,909.6 | 7,992.1 | 37,442.7 |
| Brushland other than sage | 794.0 | 955.2 | 145.2 | 94.8 | 1,989.2 | 175.5 | 1,594.6 | 3,759.3 |
| Total | 24,275.9 | 6,677.6 | 1,635.7 | 3,115.0 | 35,704.2 | 3,115.4 | 19,925.0 | 58,744.6 |
| **Forest Range[1/]** | | | | | | | | |
| Commercial Forest | 971.8 | 11,234.7 | 2,095.5 | 172.3 | 14,474.3 | 1,308.8 | 8,771.2 | 24,554.3 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | 63.4 | 748.5 | 98.4 | 26.9 | 937.2 | 20.5 | 149.4 | 1,107.1 |
| Desert Fringe | 1,450.6 | 697.2 | 145.7 | 34.1 | 2,327.6 | 121.2 | 785.8 | 3,234.6 |
| Total (noncommercial) | 1,514.0 | 1,445.7 | 244.1 | 61.0 | 3,264.8 | 141.7 | 935.2 | 4,341.7 |
| Total (forest range) | 2,485.8 | 12,680.4 | 2,339.6 | 233.3 | 17,739.1 | 1,450.5 | 9,706.4 | 28,896.0 |
| Grand Total | 26,761.7 | 19,358.0 | 3,975.3 | 3,348.3 | 53,443.3 | 4,565.9 | 29,631.4 | 87,640.6 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on tables 21 through 30.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 35 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Idaho Columbia-North Pacific Region, 1966

| Category | Federal BLM | Federal FS | Federal BIA | Federal Other | Federal Total | Non-Federal State & County | Non-Federal Private | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | |
| **Rangeland** | | | | | | | | |
| Grasslands | 1,341.1 | 847.3 | 196.7 | 58.8 | 2,443.9 | 316.3 | 1,307.4 | 4,067.6 |
| Sagebrush | 9,055.8 | 2,391.1 | 336.0 | 1,140.4 | 12,923.3 | 1,155.3 | 3,079.5 | 17,158.1 |
| Brushland other than sage | 124.2 | 318.1 | 33.6 | 24.4 | 500.3 | 63.6 | 208.9 | 772.8 |
| Total | 10,521.1 | 3,556.5 | 566.3 | 1,223.6 | 15,867.5 | 1,535.2 | 4,595.8 | 21,998.5 |
| **Forest Range[1/]** | | | | | | | | |
| Commercial Forest | 214.1 | 4,293.9 | 44.5 | - | 4,552.5 | 505.6 | 2,250.0 | 7,308.1 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | 32.4 | 597.5 | 6.1 | - | 636.0 | 7.0 | 15.0 | 658.0 |
| Desert Fringe | 325.2 | 274.1 | 34.0 | - | 633.3 | 52.7 | 205.1 | 891.1 |
| Total (noncommercial) | 357.6 | 871.6 | 40.1 | - | 1,269.3 | 59.7 | 220.1 | 1,549.1 |
| Total (forest range) | 571.7 | 5,165.[illegible] | 84.6 | - | 5,821.8 | 565.3 | 2,470.1 | 8,857.2 |
| Grand Total | 11,092.8 | 8,[illegible].0 | 650.9 | 1,223.6 | 21,689.3 | 2,100.5 | 7,065.9 | 30,855.7 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on tables 21 through 30.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 36 - Rangeland and Forest Range Acreage by Range Type and Ownership,
State of Montana, Columbia-North Pacific Region, 1966

| Category | Federal: BLM | Federal: FS | Federal: BIA | Federal: Other | Federal: Total | Non-Federal: State & County | Non-Federal: Private | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | |
| **Rangeland** | | | | | | | | |
| Grasslands | - | 193.7 | 80.4 | 12.0 | 286.1 | 111.6 | 674.1 | 1,071.8 |
| Sagebrush | - | 16.0 | 15.6 | 5.8 | 37.4 | 14.4 | 86.5 | 138.3 |
| Brushland other than sage | - | 25.2 | 7.8 | 15.0 | 48.0 | 16.7 | 95.6 | 160.3 |
| Total | - | 234.9 | 103.8 | 32.8 | 371.5 | 142.7 | 856.2 | 1,370.4 |
| **Forest Range[1/]** | | | | | | | | |
| Commercial Forest | 150.0 | 2,362.4 | 379.0 | 3.0 | 2,894.4 | 150.0 | 714.3 | 3,758.7 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 58.9 | 81.3 | 26.9 | 167.1 | - | 2.0 | 169.1 |
| Desert Fringe | 2.3 | 3.4 | - | 25.6 | 31.3 | - | - | 31.3 |
| Total (noncommercial) | 2.3 | 62.3 | 81.3 | 52.5 | 198.4 | - | 2.0 | 200.4 |
| Total (forest range) | 152.3 | 2,424.7 | 460.3 | 55.5 | 3,092.8 | 150.0 | 716.3 | 3,959.1 |
| Grand Total | 152.3 | 2,659.6 | 564.1 | 88.3 | 3,464.3 | 292.7 | 1,572.5 | 5,329.5 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on tables 21 through 30.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 37 - Rangeland and Forest Range Acreage by Range Type and Ownership,
State of Nevada, Columbia-North Pacific Region, 1966

| Category | Federal: BLM | Federal: FS | Federal: BIA | Federal: Other | Federal: Total | Non-Federal: State & County | Non-Federal: Private | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | |
| **Rangeland** | | | | | | | | |
| Grasslands | 61.0 | 91.0 | .6 | - | 152.6 | - | 72.0 | 224.6 |
| Sagebrush | 1,780.5 | 234.0 | 75.6 | - | 2,090.1 | - | 360.8 | 2,450.9 |
| Brushland other than sage | - | 280.5 | 56.4 | - | 336.9 | - | - | 336.9 |
| Total | 1,841.5 | 605.5 | 132.6 | - | 2,579.6 | - | 432.8 | 3,012.4 |
| **Forest Range[1/]** | | | | | | | | |
| Commercial Forest | - | 28.0 | - | - | 28.0 | - | 4.0 | 32.0 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | - | - | - | - | - | - | - |
| Desert Fringe | 30.0 | 42.0 | - | - | 72.0 | - | 2.0 | 74.0 |
| Total (noncommercial) | 30.0 | 42.0 | - | - | 72.0 | - | 2.0 | 74.0 |
| Total (forest range) | 30.0 | 70.0 | - | - | 100.0 | - | 6.0 | 106.0 |
| Grand Total | 1,871.5 | 675.5 | 132.6 | - | 2,679.6 | - | 438.8 | 3,118.4 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on tables 21 through 30.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 38 - Rangeland and Forest Range Acreage by Range Type and Ownership,
State of Oregon, Columbia-North Pacific Region, 1966

| Category | Federal: BLM | Federal: FS | Federal: BIA | Federal: Other | Federal: Total | Non-Federal: State & County | Non-Federal: Private | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | |
| **Rangeland** | | | | | | | | |
| Grasslands | 851.5 | 637.2 | 32.1 | 179.2 | 1,700.0 | 118.4 | 4,638.5 | 6,456.9 |
| Sagebrush | 10,179.8 | 103.9 | 127.0 | 327.2 | 10,737.9 | 452.8 | 3,248.5 | 14,439.2 |
| Brushland other than sage | 646.8 | 181.3 | 14.2 | 9.2 | 851.5 | 39.3 | 735.0 | 1,625.8 |
| Total | 11,678.1 | 922.4 | 173.3 | 515.6 | 13,289.4 | 610.5 | 8,622.0 | 22,521.9 |
| **Forest Range[1/]** | | | | | | | | |
| Commercial Forest | 537.7 | 3,419.6 | 265.5 | - | 4,222.8 | 37.6 | 3,924.8 | 8,185.2 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | 28.0 | 43.8 | - | - | 71.8 | 1.0 | 77.8 | 150.6 |
| Desert Fringe | 1,069.0 | 232.6 | 111.7 | 3.5 | 1,416.8 | 67.0 | 570.0 | 2,053.8 |
| Total (noncommercial) | 1,097.0 | 276.4 | 111.7 | 3.5 | 1,488.6 | 68.0 | 647.8 | 2,204.4 |
| Total (forest range) | 1,634.7 | 3,696.0 | 377.2 | 3.5 | 5,711.4 | 105.6 | 4,572.6 | 10,389.6 |
| Grand Total | 13,312.8 | 4,618.4 | 550.5 | 519.1 | 19,000.8 | 716.1 | 13,194.6 | 32,911.5 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on tables 21 through 30.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 39 - Rangeland and Forest Range Acreage by Range Type and Ownership,
State of Utah, Columbia-North Pacific Region, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Grand Total |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | - | 3.0 | - | - | 3.0 | - | 28.1 | 31.1 |
| Sagebrush | 42.1 | 16.7 | - | - | 58.8 | 22.2 | 69.0 | 150.0 |
| Brushland other than sage | - | 10.0 | - | - | 10.0 | - | 12.5 | 22.5 |
| Total | 42.1 | 29.7 | - | - | 71.8 | 22.2 | 109.6 | 203.6 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | - | 5.0 | - | - | 5.0 | - | - | 5.0 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | - | - | - | - | - | - | - |
| Desert Fringe | 8.9 | 12.0 | - | - | 20.9 | - | - | 20.9 |
| Total (noncommercial) | 8.9 | 12.0 | - | - | 20.9 | - | - | 20.9 |
| Total (forest range) | 8.9 | 17.0 | - | - | 25.9 | - | - | 25.9 |
| Grand Total | 51.0 | 46.7 | - | - | 97.7 | 22.2 | 109.6 | 229.5 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on tables 21 through 30.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 40 - Rangeland and Forest Range Acreage by Range Type and Ownership,
State of Washington, Columbia-North Pacific Region, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Grand Total |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 92.4 | 328.5 | 319.4 | 362.9 | 1,103.2 | 482.0 | 3,603.2 | 5,188.4 |
| Sagebrush | 74.9 | 11.0 | 307.1 | 802.0 | 1,195.0 | 263.9 | 1,140.8 | 2,599.7 |
| Brushland other than sage | 22.7 | 33.5 | 33.2 | 46.2 | 135.6 | 55.9 | 542.6 | 734.1 |
| Total | 190.0 | 373.0 | 659.7 | 1,211.1 | 2,433.8 | 801.8 | 5,286.6 | 8,522.2 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | 69.6 | 830.8 | 1,406.5 | 8.3 | 2,315.2 | 615.1 | 1,860.1 | 4,790.4 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 48.3 | 11.0 | - | 59.3 | 12.5 | 54.6 | 126.4 |
| Desert Fringe | 8.7 | 2.1 | - | - | 10.8 | 1.0 | 6.2 | 18.0 |
| Total (noncommercial) | 8.7 | 50.4 | 11.0 | - | 70.1 | 13.5 | 60.8 | 144.4 |
| Total (forest range) | 78.3 | 881.2 | 1,417.5 | 8.3 | 2,385.3 | 628.6 | 1,920.9 | 4,934.8 |
| Grand Total | 268.3 | 1,254.2 | 2,077.2 | 1,219.4 | 4,819.1 | 1,430.4 | 7,207.5 | 13,457.0 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on tables 21 through 30.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 41 - Rangeland and Forest Range Acreage by Range Type and Ownership,
State of Wyoming, Columbia-North Pacific Region, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Grand Total |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | .2 | 480.0 | - | 5.0 | 485.2 | 2.0 | 15.0 | 502.2 |
| Sagebrush | 2.6 | 369.0 | - | 126.9 | 498.5 | 1.0 | 7.0 | 506.5 |
| Brushland other than sage | .3 | 106.6 | - | - | 106.9 | - | - | 106.9 |
| Total | 3.1 | 955.6 | - | 131.9 | 1,090.6 | 3.0 | 22.0 | 1,115.6 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | .4 | 295.0 | - | 161.0 | 456.4 | .5 | 18.0 | 474.9 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | 3.0 | - | - | - | 3.0 | - | - | 3.0 |
| Desert Fringe | 6.5 | 131.0 | - | 5.0 | 142.5 | .5 | 2.5 | 145.5 |
| Total (noncommercial) | 9.5 | 131.0 | - | 5.0 | 145.5 | .5 | 2.5 | 148.5 |
| Total (forest range) | 9.9 | 426.0 | - | 166.0 | 601.9 | 1.0 | 20.5 | 623.4 |
| Grand Total | 13.0 | 1,381.6 | - | 297.9 | 1,692.5 | 4.0 | 42.5 | 1,739.0 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on tables 21 through 30.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Range cover type may be separated into three broad areas on the basis of influencing aspects of climate, soils, and elevation.

1. The areas at the higher elevations are characterized by large areas of open grassland, perennial weeds, and browse on side slopes and ridge tops, with groups of trees interspersed in the ravines and on the northern exposures. Some of these areas are mountain meadows and meadow type along stream bottoms. The cover for the most part is succulent weeds, both annual and perennial, grasses and grasslike plants, and shrubby browse plants. Some of this type of range is heavily grazed by domestic sheep and cattle during the summer months, and during a more extended season by big game animals such as deer and elk. Over parts of the area, as a result of this heavy grazing use, the native ground cover of perennial grasses, sedges, and more palatable weeds has given way to less palatable plants and those which can withstand trampling. Lupine, wild buckwheat (Eriogonum), and needle grass (Stipa) are a few of many which now dominate some of the rangeland at the higher elevations. Poisonous plants are not a great problem in the higher elevational zones, except larkspur (Delphinium), which is poisonous to cattle.

The reduction of density in plant growth by past heavy grazing use and, to some extent by fire, has impaired the cover and reduced the water absorption powers of the soil and ground litter.

2. The second area is the open range just below the lower fringes of the timbered areas and at intermediate elevations, intermingled or surrounded by the heavier timber type, as in northern Idaho and western Montana, and at the lower elevations in western Oregon and Washington. The grasslands are more extensive than on the above described summer range. The forage is of a drier type and originally consisted largely of perennial grasses and sedges. Meadowland is also quite prevalent along the creeks and rivers. This general type furnishes spring and early summer feed for livestock. The natural grasslands at the lower and intermediate elevations in northern Idaho and eastern Washington were originally the Palouse bunchgrass type. Here too, because of overuse, such cover has reverted to species inferior for forage pruposes, of which cheatgrass, an annual of short seasonal life, is one of the chief invaders. Sagebrush and noxious weeds, of which St. Johnswort or goatweed is a noted example, also have materially increased.

3. The more gently sloping lands ranging from the lower elevations to the intermediate plains country are characterized by grasses, sagebrush, and other dry type vegetation. These include plateaus, river bottoms, flats, and benches, largely with wind deposited or glacial wash soils and some volcanic lava.

As with other types, grazing pressure exerted by both domestic stock and big game animals has led to serious depletion on some areas, followed by a change from perennial grasses and shrubs to unstable annual weeds and the previously mentioned cheatgrass. Noxious weeds, including goatweed, halogeton, and the fast spreading, unpalatable Medusa-head wildrye, are quite prevalent in this type.

It is estimated that about 37 percent of the range is in poor range condition, 44 percent in fair condition, and 19 percent in good condition. Range condition has improved since 1954 when a previous study showed 49 percent in poor condition, 34 percent in fair condition, and 17 percent in good condition. The present estimated carrying capacity range is 7.3 million AUMs with privately owned range accounting for 41 percent of the total capacity and the public range 59 percent.

Grasslands, including perennial grasses and forbs, cover 17.5 million acres and account for 30 percent of the regional range. About 32 percent of the grassland range is in good condition, 36 percent in fair condition, and 32 percent in poor condition.

Sagebrush covers 37.4 million acres and represents 64 percent of the range. It is estimated that 13 percent of the sagebrush range is in good condition, 49 percent in fair condition, and 38 percent in poor condition.

The remaining 6 percent is mountain brush or shrubs other than sagebrush covering 3.8 million acres. Some 16 percent of this type is in good condition, 39 percent in fair condition, and 45 percent in poor condition.

Grassland, sagebrush, and other brush or shrub range types are frequently intermingled to a greater or lesser degree in various areas of the region, and interspersed with forest cover at higher elevations.

Federally owned rangeland covers 35.7 million acres and represents 61 percent of the total. The Bureau of Land Management has jurisdiction over 24.3 million acres, 6.7 million acres are managed by the Forest Service, 1.6 million acres are controlled by the Bureau of Indian Affairs, and other Federal agencies administer 3.1 million acres. Privately owned accounts for 19.9 million acres or 34 percent of the total, and another 3.1 million acres or 5 percent is in state or local government ownership.

The Federally owned forest range covers 17.7 million acres, 9.7 million acres are in private ownership, and state and local governments own 1.5 million acres. This represents 61 percent, 34 percent, and 5 percent, respectively, of the total forest range.

The Federal forest range includes 12.7 million acres managed by the Forest Service, 2.5 million acres administered by the Bureau of Land Management, 2.3 million acres controlled by the Bureau of Indian Affairs, and 233 thousand acres under other Federal agency jurisdiction.

## Other Land

Other uses of land that do not relate to a vegetative product of the soil are of great concern to the present study. One natural and permanent phase of other land use is the bare rock area, defined for this report as barren areas. The high alpine areas of bare rock peaks such as characterize the Rocky Mountains and areas of lava flow mostly related to the Columbia River Basalt are highly important from the standpoints of water production and aesthetic values. Another phase of other land use is the small water areas of less than 40 acres in size and streams less than one-eighth mile wide. The number of small water impoundments will probably increase relatively as the population and extension of irrigated areas. An important part of recreational activities relates directly to the barren areas and small water areas of the other land use. Thus, barren areas (over 5 million acres or almost 3 percent) plus small water (almost .5 million acres or over .2 percent of the land area), together equal almost 6 million acres, or 3 percent of the region, and are significant mainly to water supply or aesthetics.

*Other land in the Columbia-North Pacific Region is composed of such diverse components as urban and barren lands. (Ackroyd photo)*

The balance of the other land use involves the occupancy of land area. Such things as roads, farmsteads, urban, and industrial areas may occupy land of varying quality from barren areas to highly productive soil areas. However, since most people have congregated throughout history on the better soils in low lying areas adjacent to streams, most of the land occupied by these other uses has taken out of production some of the most fertile soil areas available. It is this competition for the good land that has come to be a major concern of present and future land use. Further increases in population with increased industry will require more land for occupancy. With present day transportation facilities, less desirable land can frequently be occupied which leaves the best land for productive use. There are almost 3 million acres, or almost 2 percent of the land, where occupancy is in direct confrontation with production as a use of land. Since this is the part of other land use that will increase most with population, it is most critical that a suitable plan be formulated to guide toward the most beneficial use of the land resource. Table 42 shows the amount of the major categories of other land use.

Table 42 - Other Land, Columbia-North Pacific Region, 1966

| State | Barren | Roads & Railroads | Small Water1/ | Miscellaneous2/ | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Idaho | 1,515.4 | 163.7 | 36.5 | 181.5 | 1,897.1 |
| Montana | 737.9 | 92.4 | 51.8 | 117.7 | 999.8 |
| Nevada | 8.0 | 4.1 | 10.3 | .6 | 23.0 |
| Oregon | 1,052.1 | 225.1 | 202.9 | 731.1 | 2,211.2 |
| Utah | 2.8 | .2 | .1 | .1 | 3.2 |
| Washington | 1,424.6 | 375.3 | 133.3 | 945.6 | 2,878.8 |
| Wyoming | 276.0 | 8.7 | 15.0 | 10.6 | 310.3 |
| Total | 5,016.8 | 869.5 | 449.9 | 1,987.2 | 8,323.4 |
| Percent | 60.3 | 10.4 | 5.4 | 23.9 | 100.0 |

1/ Water areas less than 40 acres in size and streams less than one-eighth mile in width.
2/ Includes urban and industrial areas, farmsteads, airports, and other areas.
Source: Compiled by Soil Conservation Service, Columbia-North Pacific River Basin Staff.

*Barren mountainous land, one of the other land categories found throughout the region. Small lakes such as those in the foreground have been included as other land acreage. (U.S.D.A.)*

## MINERALS

Minerals produced within the Columbia-North Pacific Region constitute an important source of raw materials for industry and contribute significantly to the economy. Mineral resources are herein classified and discussed as metals, nonmetals, and mineral fuels.

### Metals

Two areas in the Columbia-North Pacific Region, the Coeur d'Alene mining area in Shoshone County, Idaho and the Butte mining district in Silver Bow County, Montana, have yielded over $6 billion in metal production values, largely from copper, silver, gold, lead, and zinc. There are, in addition, many other smaller productive or potentially productive localities scattered throughout the region, for example, Pend Oreille and Stevens Counties in northeastern Washington.

## Montana

Montana is credited with slightly over 8 million tons of the 52.2 million tons of copper produced nationwide up through the year 1965. The Butte district produces about 99 percent of the state's copper. In 1965 its mines yielded 115,300 tons of copper, 4,600 tons of lead, 25,600 tons of zinc, 18,400 ounces of gold, and 4,790,400 ounces of silver, with a value of $97,373,000. Recent developments have materially increased the estimated reserves so that, after more than 80 years of continuous operation, reserves are at an alltime high. At the present rate of 115,000 tons of copper produced annually, Butte has sufficient ore reserves to last many years.

Substantial amounts of metals, especially placer gold, are found in other mining districts of Montana, but total tonnages and values are not comparable to the Butte area. Most of these other districts have produced only minor amounts of metals in recent years, in contrast to the bonanza deposits that were highly productive in the late 1800's and early 1900's. Large reserves of manganese ores are found in the Philipsburg District. These have been developed in recent times and manganese production has, in some years, accounted for a large share of the national output. The once productive Heddleston District, north of Butte, has been revived and is expected to become a major producer of copper.

In 1963 the total mineral industry water requirements in the Montana part of the region amounted to 36.2 billion gallons, 19.5 billion gallons as recirculated water and 16.7 billion as new water.

## Idaho

Idaho, in recent years, ranked first in the Nation in the production of silver, second in output of lead, and second or third in the output of zinc. The Coeur d'Alene area, Shoshone County, produces most of the metal. Total 1884 to 1965 metal production from Coeur d'Alene is estimated at 444,300 troy ounces of gold, 703,300,000 troy ounces of silver, 2,385,300 short tons of zinc, 116,000 short tons of copper and 6,833,500 short tons of lead, with a total value of $2.09 billion. Production in 1965 was 2,700 troy ounces of gold, 17,908,000 troy ounces of silver, 3,540 short tons of copper, 63,500 short tons of lead, and 56,400 short tons of zinc, for a total value of $62,054,000. Other mining districts in Banner, Blaine, Butte, Custer, Gem, Lemhi, and Owyhee Counties produce smaller amounts of silver, lead, and zinc.

Potential resources are sufficient to maintain the current annual rate of production of silver, lead, and zinc for many years.

Estimates of silver, lead, and zinc reserves indicate a minimum of 10 years production at the current annual rate. The Coeur d'Alene area contains 90 to 98 percent of the estimated reserves of these metals in Idaho.

In 1962, the mineral industry in Shoshone County had a total water usage of 8.9 billion gallons and consumed 266.9 million gallons.

Idaho has also been a leading producer of tungsten, antimony, mercury, cobalt, columbium-tantalum, and rare earth metals, and is currently producing mercury and antimony.

## Washington

Washington is an important producer of zinc, lead, and silver, principally from Stevens and Pend Oreille counties in the northeastern corner of the state. One of the very few gold mines still operating in the Nation is located near Republic, in Ferry County. Washington has the largest uranium producing area in the region. It is located on the Spokane Indian Reservation in Spokane and Stevens counties.

From 1860 to 1963, Washington produced about 2,844,000 troy ounces of gold, 16,400,000 troy ounces of silver, 121,900 short tons of copper, 227,000 short tons of lead, and 483,700 short tons of zinc; total value of these commodities is $325,104,000.

From 1906 to 1965, the Metaline District, in northern Pend Oreille County, produced 642,000 troy ounces of silver, 307 troy ounces of gold, 473 short tons of copper, 178,000 tons of lead, and 400,800 tons of zinc, valued at $133,086,000. Thus this district dominates the state's production of lead and zinc. The Metaline District has a large potential resource of low grade ores. A minimum of reserves equal to 40 years of production at the current annual rate and possible reserves equal to more than 100 years production at the present rate are estimated. In 1962, the mineral industry in Pend Oreille County used a total of 697 million gallons of water and consumed 20 million gallons.

A total production of 106,000 short tons of copper and 600,000 ounces of gold came from the Holden mine, Railroad Creek District, Chelan County, before closure in 1957. The district was the second largest gold producer in the state and produced more copper than all of the other copper districts in Washington combined. More than 50,000 short tons of copper are indicated in the nearby Miners Ridge (Glacier Peak) area; however, no production has come from this deposit. Plans to bring the Glacier Peak deposit into production are currently the subject of much controversy because it is within a proposed wilderness area.

The Republic-Danville-Curlew District near Republic, Ferry County, has been the largest gold producer in the state, with a total over 1.7 million troy ounces. At the present annual rate of production, reserves appear to be sufficient for several years of operation. In 1962, the mineral industry in Ferry County used a total of 27.8 million gallons of water and had a consumption of 812,000 gallons of water.

Uranium deposits occur in two districts located a few miles north of the city of Spokane. Shortly after discovery in 1954, a mill was built at Ford, Stevens County, that operated from 1957 until 1965. Total uranium production to 1965 was 4 to 7 million pounds of uranium oxide ($U_3O_8$). Most of the ore came from the Midnight mine, which ceased operations in 1965 because its contract with the Federal Government had been completed. A substantial tonnage of ore is available for mining, and recent additional discoveries have been announced south of the mine; resumption of mining and milling in the area is likely. In 1962, the mineral industry of Stevens County had a total water usage of 738 million gallons and a consumption of 3 million gallons.

Pierce County, which contains a copper smelter, a ferro-alloy plant, an aluminum reduction plant and other mineral industry-related manufacturing facilities, was the largest user of water in Washington. In 1962, Pierce County used 3.5 billion gallons of water and consumed 173 million gallons.

## Oregon

Oregon holds the distinction of being the only state in the Nation producing nickel. Mining of nickel ore started in 1954 at Nickel Mountain near Riddle, Douglas County. The recent annual production of from 12,000 to 15,000 tons of contained nickel in ferro-nickel alloy came from about 1 million tons of ore. In 1962, the mineral industry in Douglas County used a total of 101 million gallons of water and consumed 4 million gallons. Reserves of nickel ore are sufficient for about 10 to 15 years output at the present rate of production.

Production of mercury from Oregon between 1882 and 1961 was approximately 103,000 flasks. Most of the mercury has come from the Horse Heaven mine, Jefferson County; Black Butte mine, Lane County; Bonanza mine, Douglas County; and the Bretz and Opalite mines in Malheur County. Production in 1965 was 1,364 flasks, with the Bretz mine and Black Butte mine accounting for nearly all of this output. While Oregon has produced relatively little copper, lead, and zinc, it has yielded a fairly substantial amount of gold and silver. From 1852 to 1963, 5,795,000 troy ounces of gold and 5,440,000 troy ounces of silver were produced, valued at $136 million.

Only a few thousand tons of copper and a few hundred tons of lead and zinc have been produced. In 1965, a small amount of gold and silver came from Grant, Jefferson, Josephine, and Malheur counties.

Water usage by the mineral industry in Oregon was largest in Lane and Multnomah counties because of sand and gravel washing operations, with a total water usage in Lane County of 715 million gallons and a consumption of 48 million gallons. Usage in Multnomah County totaled 635 million gallons and consumption was 34 million gallons.

## Nonmetals

The construction and building material industries consume the largest amounts of nonmetallic minerals produced in the Columbia-North Pacific Region. The nonmetallic construction materials include sand and gravel, stone, and clay. These commodities are of low unit value and must be produced from deposits near the consumer market. Phosphate rock is a major nonmetallic raw material mined in the region. Of lesser importance is the production of vermiculite, fluorite, barite, garnet, olivine, and pumice and volcanic cinders. Magnesite was mined until 1968.

Sand and gravel are ubiquitous materials; however, only deposits near urban markets or convenient to construction projects are generally developed or considered of economic value. Total supply of sand and gravel is virtually inexhaustible. In and near urban centers, problems arise because the necessarily low unit value prohibits transportation of the material for any distance, and near-city operations face increasing competition of other land uses and increasingly restrictive zoning regulations. In 1965, production of sand and gravel and crushed stone totaled about 103 million tons.

Principal stone products are dimension stone and crushed stone. Dimension stone is used for buildings, fireplaces, and other construction; the market is small and irregular and production thus is of minor economic importance. Large quantities of crushed stone are produced from many varieties of rock such as limestone, basalt, ultramafic and granitic rocks, sandstone, quartzite, and other igneous, sedimentary, and metamorphic rocks. Principal uses for crushed stone are for concrete aggregate, road surfacing, and railroad ballast. Roadstone, produced from small roadside quarries, is used intermittently when a local need for the material exists. Where a large and continuous need for aggregate exists, especially near urban centers, numerous stone quarries usually are situated close by. Reserves suitable for crushed stone are large, although, due to competing land uses, quarry sites may be unavailable in some areas.

Limestone has many uses in addition to that of aggregate or roadstone, but these other uses depend upon the chemical composition of the rock. Limestone resources of varying chemical composition are scattered throughout the region. Limestone for metallurgical use and manufacture of lime has been quarried in the Montana portion situated within the region. In Idaho, limestone is quarried for cement, lime, pulp and paper manufacture, sugar refining, metallurgical, and agricultural uses. In Washington, it is quarried for cement manufacture, sugar refining, pulp and paper manufacture, agricultural use, terrazzo, and roofing chips. Similar uses of limestone are made in Oregon. Reserves of limestone are very large and will not be exhausted by the foreseeable future demand.

The Columbia-North Pacific Region contains many clay deposits. The use and value of a clay are determined by its physical characteristics and mineral composition. Common clays are mined in numerous places for manufacture of common brick and tile. Limited areas contain refractory-type clays and high alumina clays. Refractory clay is mined in Latah County near Troy and Bovill in northern Idaho; in Spokane County near Spokane, Washington; and in Pierce County near Seattle, Washington. Deposits of refractory clay occur in Cowlitz and Lewis counties, Washington, and in Marion, Washington, and Lane counties, Oregon, but very little production has come from these areas. Large reserves of high alumina and refractory clays, suitable for the manufacture of high temperature clay products, are available; the potential production principally is based on markets for these specialized products.

Mining of phosphate rock is of major importance to the economy of Montana and Idaho. The rock is used in the manufacture of phosphate fertilizer, elemental phosphorus, and some minor products. Phosphate rock is mined in Montana north of Garrison, Powell County, and near Maxville, Granite County. A plant at Silver Bow produces elemental phosphorus from raw material mined in southern Idaho. Reserves of more than 200 million tons of phosphate rock are estimated to occur in Montana. Bingham, Caribou, and Bannock counties in southeastern Idaho form the center of western phosphate resources and phosphate processing industry. Pocatello and Soda Springs have fertilizer and elemental phosphorus plants nearby. In 1965, Idaho produced over 3 million long tons of phosphate rock. Reserves are estimated at several billion tons, enough for many years of production.

Vermiculite is extracted at a large open pit mine near Libby, Lincoln County, Montana; over 100,000 tons a year of vermiculite are produced. This operation is the principal source of vermiculite in the United States. Resources are large and the outlook for an increase in future production is favorable.

Fluorite has been mined from deposits near Darby, Ravalli County, Montana, since 1952, and reserves are sufficient for several more years at the present rate of production.

Barite was produced near Greenough, Missoula County, Montana, besides several small deposits in Stevens County, Washington. Production is limited by available markets.

Garnet is obtained from placer deposits in Benewah County, Idaho, and from stockpiled material at Lowman, Idaho. Available markets limit production. Resources are adequate for many years of future production at current demand rates.

Magnesite was mined and processed at Chewelah, Stevens County, Washington, for many years. Since World War II, Washington, Nevada, and California have supplied all the United States magnesite production and for several years Washington was the largest producer. The production of magnesite at Chewelah, Washington, ceased in the summer of 1968. Magnesite is made (outside the region) into refractory brick for use in the steel industry.

Olivine production in the region comes from Skagit and Whatcom counties, Washington. The area contains one of the largest olivine deposits known in the Nation. At the present annual production rate of 25,000 tons, the reserves will last for many years.

Pumice and volcanic cinders are present in many areas of southeastern Idaho, and in Washington and Oregon. Reserves are large but production is limited by available markets.

## Mineral Fuels

Western Washington contains most of the coal reserves of the region. About 150 million tons of coal have been produced in the state; production in 1964 was about 69,000 tons. Washington's remaining coal reserves are estimated to be 6,185,000,000 tons. Interest in coal has been revived recently; a coal-fired thermal-electric plant is under construction near Centralia. Most of the coal reserves are in King, Kittitas, Pierce, Lewis, Whatcom, and Cowlitz counties, Washington. Oregon contains some formerly productive coal fields in the Coos Bay area, but there has been very little activity in recent years.

The Columbia-North Pacific Region does not have any producing oil or gas fields. While there has been considerable exploratory drilling and some oil and gas shows have been discovered, no producing fields have been established.

# SUBREGION 1
# CLARK FORK-KOOTENAI-SPOKANE

## ABSTRACT

The Clark Fork-Kootenai-Spokane Subregion is the second largest in the Columbia-North Pacific Region. It occupies the upper reaches of the Columbia River Watershed along the northeast boundary.

The Bitterroot, Cabinet, and Purcell mountains constitute a general north-south mountain barrier for the western third of the subregion. Precipitation varies from over 18 inches at the west margin of the subregion to over 40 inches at the crest of this mountain barrier. The generally west exposure grows forests of fir-larch and white pine, and many parts of the area are used exclusively for forest production. East of the crest the elevation and precipitation fall sharply and the cover changes to a fairly open stand of pine with grass and browse suited to supplemental rangeland use. Some areas on the west border of the Flathead-Bitterroot trough have a natural rangeland cover and precipitation is distributed uniformly throughout the year. Precipitation increases to nearly 100 inches and timber cover develops with increase in elevation going east toward the crest of the Rocky Mountains.

Soils in the high mountainous areas formed in residuum and colluvium from acid igneous and sedimentary bedrock. On the intermediate uplands they formed in gravelly, cobbly, and stony glacial material. On fans, terraces and bottomlands, the soils formed in gravelly glacial outwash, silty and clayey lake-laid sediments, and sandy and silty recent alluvium. The hilly, very deep, wind deposited silty sediments of the Palouse formation extend into the southwest margin of Subregion 1.

Eighty percent of the land is covered with forests. Over 7 percent is rangeland; however, an important part of the forest cover has use both for timber production and grazing. Almost 6 percent consists of barren rockland and miscellaneous alpine and sub-alpine land areas. Cropland use makes up about 7 percent of the land and is generally located at elevations of 2,000 to 5,000 feet with 90 to 140 freeze-free days during an average year. Early maturing crops are best adapted to this area. Generally hay and pasture crops dominate the cropland areas. However, the grain-producing hill land along the west central margin of the subregion is highly productive and intensively farmed.

The total area of Subregion 1 consists of about 98 percent land and 2 percent water. Table 43 shows the land, water, and total acreages by states and counties. Except for this table, areas of land only will be recorded in acreages throughout the discussion.

The two outstanding metal producing areas in the Columbia-North Pacific Region are in Subregion 1. They are the Coeur d'Alene mining area in Shoshone County, Idaho, and the Butte mining area in Silver Bow County, Montana. To the present time, production from these two areas has exceeded $6 billion in value, principally copper, silver, gold, lead, and zinc. A third mining area of importance is the Metaline District in Pend Oreille and Stevens Counties in northeastern Washington. The Butte area produces at least 100,000 tons of copper a year, which is more than 99 percent of the copper produced in Montana. Recent developments have materially increased the estimated reserves so that, currently, reserves are at an alltime high. The Coeur d'Alene area currently ranks

Table 43 - Areas by State and County, Subregion 1, 1967

| State and County | Water Area Sq.Mi. | Water Area Acres | Land Area1/ Sq. Mi. | Land Area1/ Acres | Total Area Sq. Mi. | Total Area Acres |
|---|---|---|---|---|---|---|
| Idaho | | | | | | |
| Benewah | 4.7 | 3,000 | 765.0 | 489,600 | 769.7 | 492,600 |
| Bonner | 171.8 | 110,000 | 1,733.2 | 1,109,200 | 1,905.0 | 1,219,200 |
| Boundary | 9.1 | 5,800 | 1,274.9 | 816,000 | 1,284.0 | 821,800 |
| Clearwater | .0 | 0 | 10.8 | 6,900 | 10.8 | 6,900 |
| Kootenai | 70.0 | 44,800 | 1,249.0 | 799,400 | 1,319.0 | 844,200 |
| Latah | .0 | 0 | 28.4 | 18,200 | 28.4 | 18,200 |
| Shoshone | .0 | 0 | 2,227.7 | 1,425,700 | 2,227.7 | 1,425,700 |
| Total Idaho | 255.6 | 163,600 | 7,289.0 | 4,665,000 | 7,544.6 | 4,828,600 |
| Montana | | | | | | |
| Deer Lodge | 12.4 | 7,900 | 454.3 | 290,800 | 466.7 | 298,700 |
| Flathead | 142.6 | 91,300 | 5,140.0 | 3,289,600 | 5,282.6 | 3,380,900 |
| Granite | 6.7 | 4,300 | 1,733.0 | 1,109,100 | 1,739.7 | 1,113,400 |
| Lake | 172.2 | 110,200 | 1,500.0 | 960,000 | 1,672.2 | 1,070,200 |
| Lewis & Clark | .0 | 0 | 661.4 | 423,300 | 661.4 | 423,300 |
| Lincoln | 13.7 | 8,800 | 3,715.0 | 2,377,600 | 3,728.7 | 2,386,400 |
| Mineral | .0 | 0 | 1,223.0 | 782,700 | 1,223.0 | 782,700 |
| Missoula | 8.9 | 5,700 | 2,613.0 | 1,672,300 | 2,621.9 | 1,678,000 |
| Powell | 2.7 | 1,700 | 2,337.0 | 1,495,700 | 2,339.7 | 1,497,400 |
| Ravalli | 15.0 | 9,600 | 2,384.1 | 1,525,800 | 2,399.1 | 1,535,400 |
| Sanders | 23.8 | 15,200 | 2,799.0 | 1,791,400 | 2,822.8 | 1,806,600 |
| Silver Bow | .0 | 0 | 317.7 | 203.300 | 317.7 | 203,300 |
| Total Montana | 398.0 | 254,700 | 24,877.5 | 15,921,600 | 25,275.5 | 16,176,300 |
| Washington | | | | | | |
| Lincoln | 12.2 | 7,800 | 205.3 | 131,400 | 217.5 | 139,200 |
| Pend Oreille | 25.9 | 16,600 | 1,357.6 | 868,800 | 1,383.5 | 885,400 |
| Spokane | 12.3 | 7,900 | 1,346.7 | 861,900 | 1,359.0 | 869,800 |
| Stevens | 1.6 | 1,000 | 556.6 | 356,200 | 558.2 | 357,200 |
| Whitman | .0 | 0 | 22.6 | 14,500 | 22.6 | 14,500 |
| Total Washington | 52.0 | 33,300 | 3,488.8 | 2,232,800 | 3,540.8 | 2,266,100 |
| Total Subregion | 705.6 | 451,600 | 35,655.3 | 22,819,400 | 36,360.9 | 23,271,000 |

1/ The term "land" is defined to include all water bodies under 40 acres and streams under one-eighth mile in width.
Source: U.S.D.A. Conservation Needs Inventory adjusted to U.S. Census.

first in the Nation in silver production, second in output of lead, and second or third in output of zinc. Reserves are sufficient for many years production at the present rate.

The subregion's manganese production is of strategic importance to the Nation, and phosphate rock production is of economic importance to the subregion. Other mining areas scattered throughout the subregion have been productive (principally gold) but do not compare in output with the Butte and Coeur d'Alene areas.

## LAND

Of major importance to the land resource are the ownership status, the soils, and the present use. The existing combination of these factors greatly influences the present utilization and future potential of the land resource.

### Land Ownership

Subregion 1 contains over 22.8 million acres. Western Montana makes up 70 percent of the subregion, Idaho 20 percent, and Washington 10 percent. The largest land owner is the Federal Government with 13.3 million acres, which is about 58 percent of the total land area. Private holdings amount to slightly over 8.3 million acres or 37 percent of the total area. The balance is in state or local government ownership.

The public lands are distributed between National Forests, with 11.5 million acres; National Parks, with 700,000 acres; public domain, wildlife refuges and defense installations, with 300,000 acres; and state and county lands with over 1 million acres. Over 800,000 acres are in Indian Reservations. Table 44, Land Ownership status, and figure 6, Land Ownership Map, show this information in more detail.

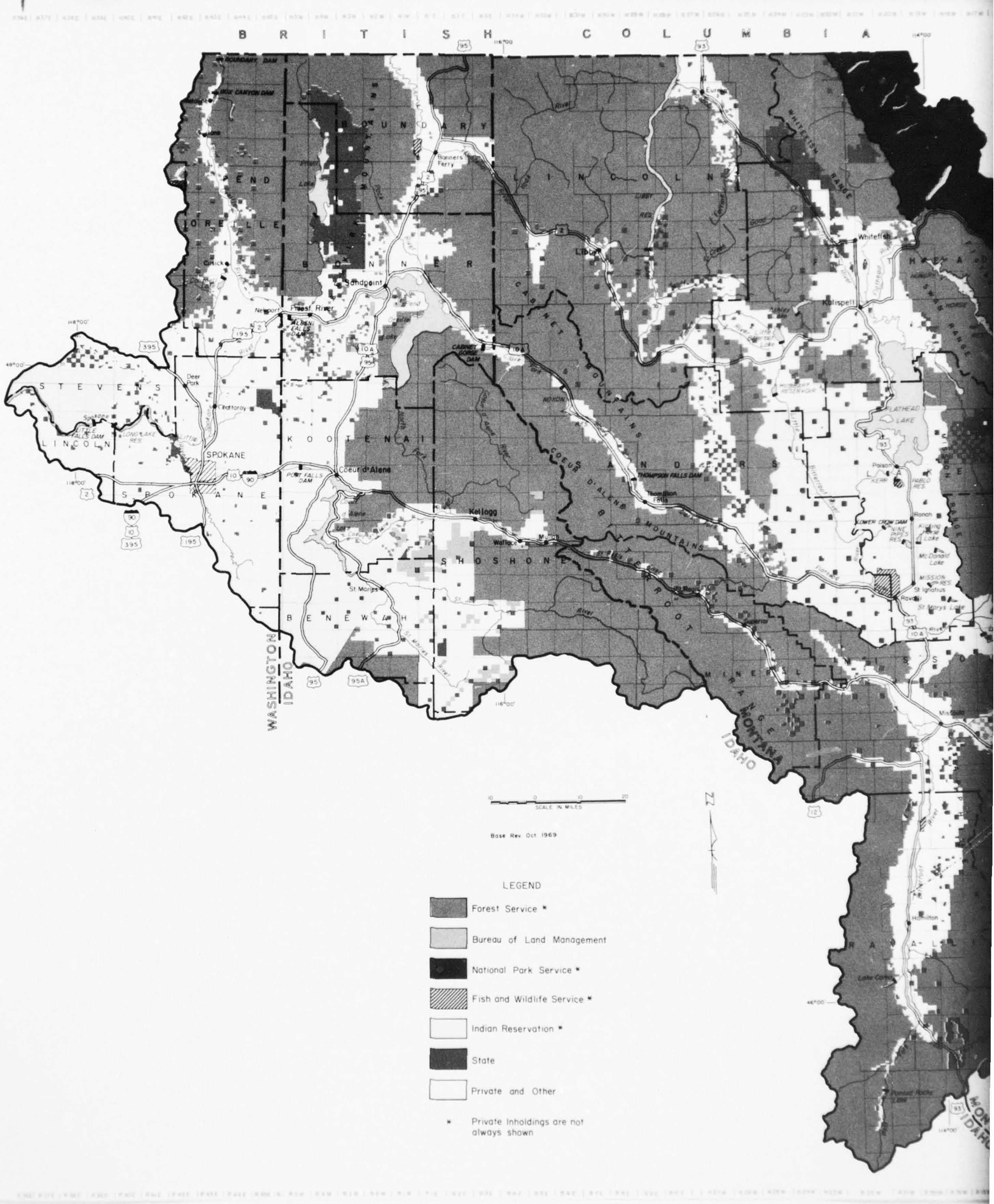
Table 44 - Land Ownership Acreage, Subregion 1, 1965

| Administering Agencies | Montana | Idaho | Washington | Total Subregion 1 |
|---|---|---|---|---|
| | | (1,000 acres) | | |
| Department of Agriculture | | | | |
| Forest Service | 8,736.9 | 2,246.3 | 507.8 | 11,491.0 |
| Other Agriculture | - | - | - | - |
| Subtotal | 8,736.9 | 2,246.3 | 507.8 | 11,491.0 |
| Department of the Interior | | | | |
| Bureau of Land Management | 152.3 | 136.2 | 3.5 | 292.0 |
| Bureau of Indian Affairs1/ | 618.8 | 72.5 | 130.9 | 822.2 |
| National Park Service | 655.7 | - | - | 655.7 |
| Fish & Wildlife Service | 20.4 | 2.3 | - | 22.7 |
| Bureau of Reclamation | .4 | - | - | .4 |
| Other Interior | .1 | .1 | .9 | 1.1 |
| Subtotal | 1,447.7 | 211.1 | 135.3 | 1,794.1 |
| Department of Defense | .1 | 4.5 | 5.8 | 10.4 |
| Other Federal | .3 | 2.7 | .1 | 3.1 |
| Federal Subtotal | 10,185.0 | 2,464.6 | 649.0 | 13,298.6 |
| State | 646.0 | 373.7 | 98.3 | 1,138.9 |
| County | 2.4 | 14.5 | 6.8 | 23.7 |
| Municipal | 7.1 | 7.2 | 12.7 | 27.0 |
| Public Non-Federal Subtotal | 655.5 | 395.4 | 117.8 | 1,189.6 |
| Total Public | 10,840.5 | 2,860.0 | 766.8 | 14,488.2 |
| Total Private | 5,081.1 | 1,805.0 | 1,466.0 | 8,331.2 |
| Grand Total | 15,921.6 | 4,665.0 | 2,232.8 | 22,819.4 |

1/ Private lands held in trust by the Federal Government.
Source: General Services Administration Real Property Owned by the United States as of June 30, 1965, adjusted by the Land and Minerals Work Group.

## Soils

Figure 7, the Soil Associations Map, shows the location and relative extent of each soil association in the subregion. The associations are numbered in a general relationship to the position in the landscape. Thus bottomlands and low terraces have the lowest numbers and alpine areas on mountain tops have the highest numbers. The name of each association relates to the soil series representing general kinds of soil that are most extensive in the landscape. Wherever possible, established soil series are used in the name; however, where the available soil series do not have classification status, the soil series name is not recorded. Generally up to 15 percent of any single soil association in known areas may consist of inclusions of soils other than those identified. Such inclusions may be similar soils or they may be highly contrasting. However, in many high mountainous areas, where detailed knowledge about the area is incomplete, extensive areas are included within delineations and inclusions of other soils may exceed the 15 percent general average.


BRITISH COLUMBIA
WASHINGTON
IDAHO
MONTANA
IDAHO
STEVENS
LINCOLN
SPOKANE
PEND OREILLE
BOUNDARY
BONNER
KOOTENAI
BENEWAH
SHOSHONE
LINCOLN
SANDERS
MINERAL
FLATHEAD
LAKE
MISSOULA
RAVALLI
CABINET MOUNTAINS
COEUR D'ALENE MOUNTAINS
BITTERROOT RANGE
WHITEFISH RANGE
SWAN RANGE
Spokane
Coeur d'Alene
Sandpoint
Bonners Ferry
Priest River
Newport
Deer Park
Kellogg
Wallace
Mullan
St Maries
Libby
Eureka
Whitefish
Kalispell
Polson
Ronan
St Ignatius
Ravalli
Thompson Falls
Superior
Missoula
Hamilton
BOUNDARY DAM
BOX CANYON DAM
ALBENI FALLS DAM
CABINET GORGE DAM
POST FALLS DAM
LITTLE FALLS DAM
LONG LAKE RES
THOMPSON FALLS DAM
KERR
PABLO RES
LOWER CROW DAM
NINE PIPES RES
McDonald Lake
MISSION RES
St Marys Lake
FLATHEAD LAKE
Lake Como
SCALE IN MILES
10 0 10 20
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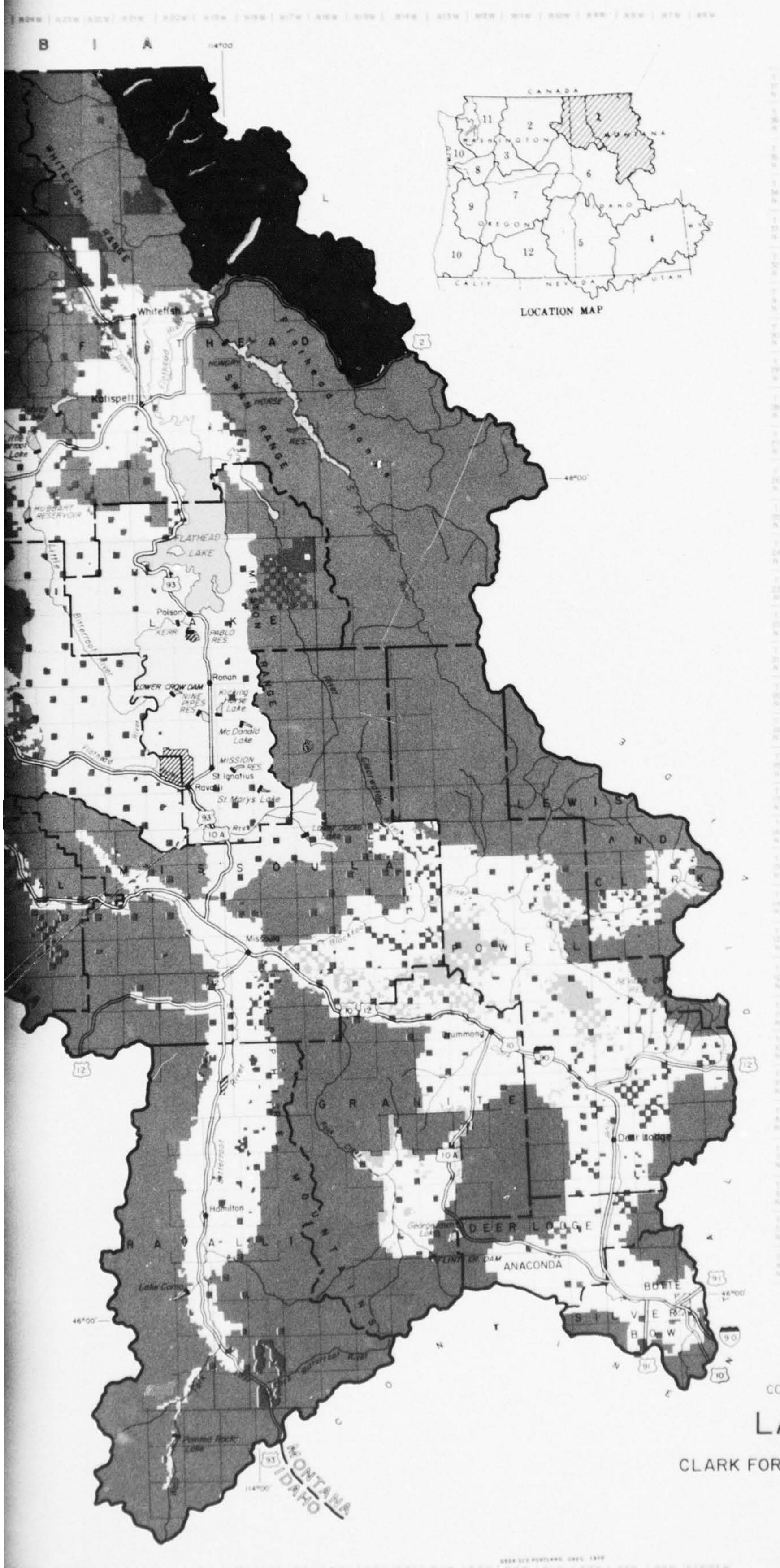
LEGEND
Forest Service *
Bureau of Land Management
National Park Service *
Fish and Wildlife Service *
Indian Reservation *
State
Private and Other
* Private Inholdings are not always shown

2



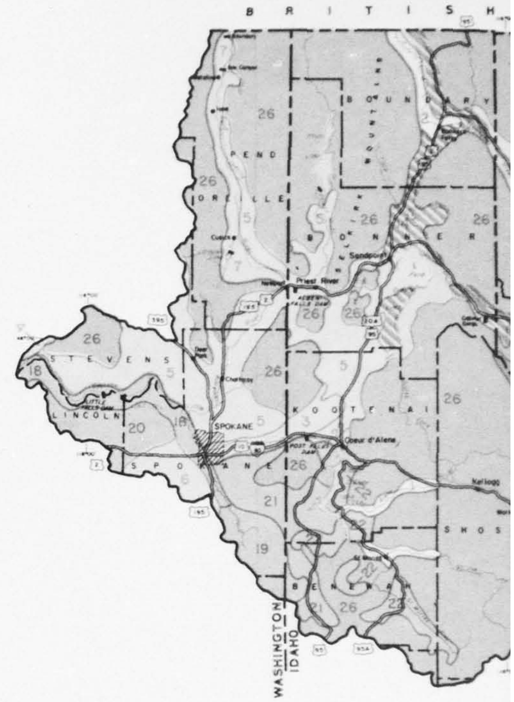

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# LAND OWNERSHIP

CLARK FORK-KOOTENAI-SPOKANE, SUBREGION I

1968

FIGURE 6




LEGEND REVISED 1970

## LEGEND

Soil Associations Map Symbol * — Name of Association

Generally silty and sandy soils formed in alluvial sediments on bottomlands and low terraces.

| | |
|---|---|
| 1 | St. Joe |
| 2 | Haplaquents |

Generally silty and sandy soils with coarse fragments formed in glacial materials on terraces, plains and mountains.

| | |
|---|---|
| 3 | Garrison - Springdale |
| 4 | Springdale - Marble |
| 5 | Bonner - Springdale |
| 6 | Hesseltine - Athena |
| 7 | Addy - Bonner |
| 8 | Chamokane - Hamilton |
| 9 | Yeoman - Blanchard |
| 10 | Dominantly Cryoboralfs |
| 11 | Donald - Philipsburg |
| 12 | Dominantly Cryoboralfs |

Generally silty and clayey soils with somewhat restricted subsoil and substrata permeability formed in stratified sediments on terraces, basins and hilly upland.

| | |
|---|---|
| 13 | Tenibac - Cabinet |
| 14 | Porthill - Bonner |
| 15 | Round Butte - Lonepine |
| 16 | Post - Flathead |
| 17 | Judith - Ekah |

Generally silty or sandy soils formed in wind deposited or wind worked sediments on hilly uplands.

| | |
|---|---|
| 18 | Marble - Springdale |
| 19 | Naff - Thatuna |
| 20 | Athena - Lance |
| 21 | Nez Perce - Larkin |
| 22 | Dominantly Haplcadalfs |

Generally silty soils formed in materials mixed with gravelly residuum-colluvium from sedimentary bedrock on mountains.

| | |
|---|---|
| 23 | Cheadle - Marcetta |
| 24 | Maginnis - Cabba |
| 25 | Dominantly Cryoboralfs |

Generally loamy soils formed in materials mixed with gravelly residuum from sedimentary rock on terraces, foothills and mountains.

| | |
|---|---|
| 26 | Dominantly Cryoboralfs |
| 27 | Dominantly Cryoboralfs |
| 28 | Dominantly Cryoboralfs |
| 29 | Dominantly Cryoboralfs |

* *Symbols are non-conotative and consistent only within each subregion. To compare delineations from one subregion to another refer to the name of the Soil Association.*

*NOTE: The Soil Association name may include a series that does not fit the Soil Associations Group description. The Soil Association name is based on dominant series. The dominant of five series may be only 30 percent of the Soil Association. Thus a clayey textured soil series may be included in a group accurately described as generally silty and sandy in texture.*

AD-A036 547 PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6
COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)
JUN 70 C C BOWLSBY, R J COFFMAN, C R HUBBARD

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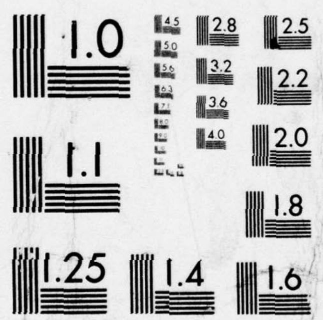


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LEGEND REVISED 1970

## LEGEND

Soil Associations Map Symbol * — Name of Association

Generally silty and sandy soils formed in alluvial sediments on bottomlands and low terraces.

1 St. Joe
2 Haplaquents

Generally silty and sandy soils with coarse fragments formed in glacial materials on terraces, plains and mountains.

3 Garrison - Springdale
4 Springdale - Marble
5 Bonner - Springdale
6 Hesseltine - Athena
7 Addy - Bonner
8 Chamokane - Hamilton
9 Yeoman - Blanchard
10 Dominantly Cryoboralfs
11 Donald - Philipsburg
12 Dominantly Cryoboralfs

Generally silty and clayey soils with somewhat restricted subsoil and substrata permeability formed in stratified sediments on terraces, basins and hilly upland.

13 Tenibac - Cabinet
14 Porthill - Bonner
15 Round Butte - Lonepine
16 Post - Flathead
17 Judith - Ekah

Generally silty or sandy soils
or wind worked sediments on h

18 Marble - Sprin
19 Naff - Thatun
20 Athena - Lanc
21 Nez Perce - L
22 Dominantly H

Generally silty soils formed in
gravelly residuum-colluvium f
on mountains.

23 Cheadle - Mar
24 Maginnis - Ca
25 Dominantly C

Generally loamy soils formed
gravelly residuum from sedime
foothills and mountains.

26 Dominantly C
27 Dominantly C
28 Dominantly C
29 Dominantly C

* *Symbols are non-conotative an*
*subregion. To compare delineatio*
*another refer to the name of the So*

*NOTE: The Soil Association name*
*not fit the Soil Associations Group*
*iation name is based on dominant s*
*series may be only 30 percent of th*
*clayey textured soil series may be*
*described as generally silty and s*

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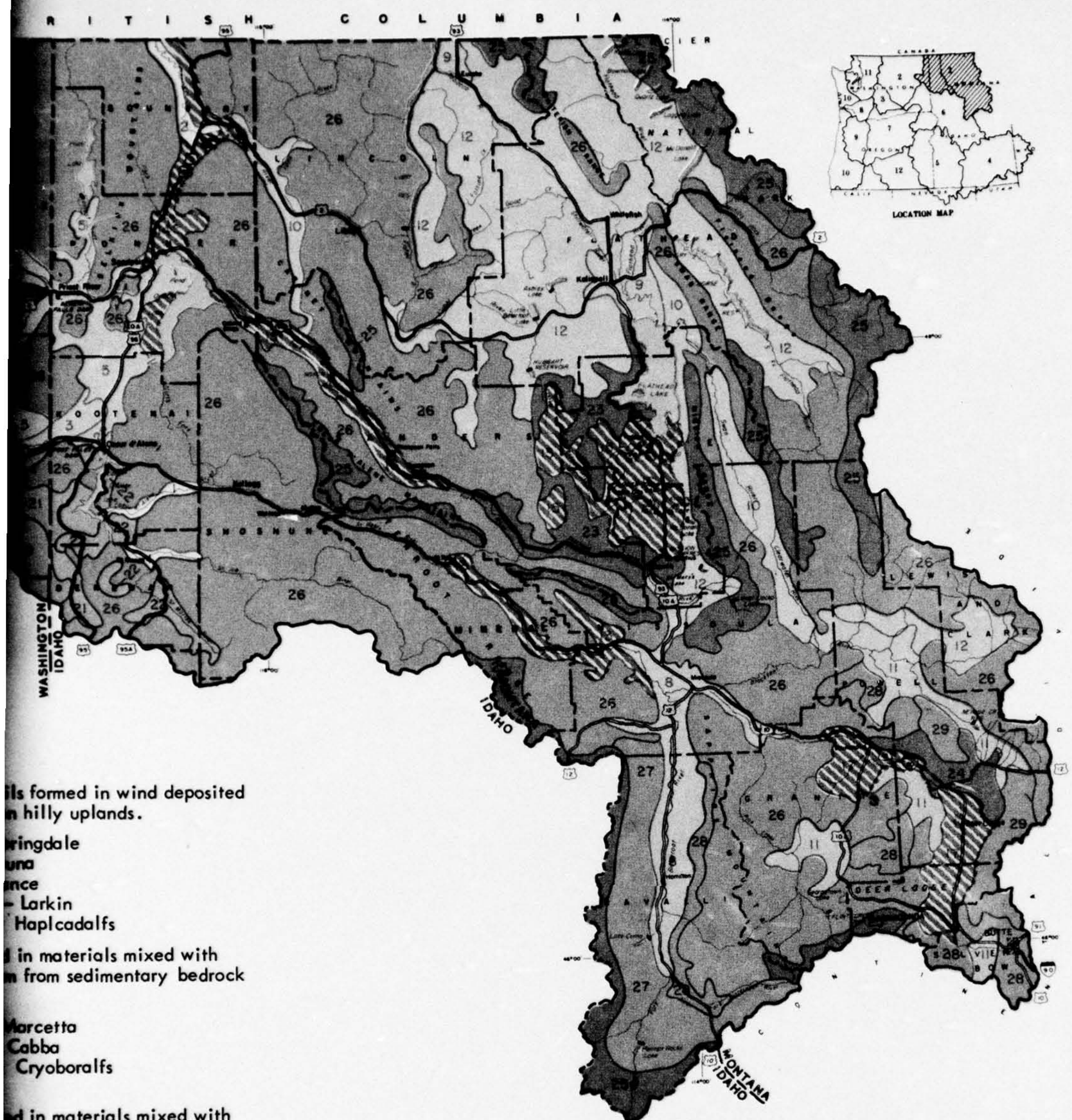


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Cryoboralfs

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Cryoboralfs
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COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# SOIL ASSOCIATIONS

CLARK FORK · KOOTENAI · SPOKANE, SUBREGION I

USDA-SCS-PORTLAND, OREG. 1970

**FIGURE 7**

Table 45 - Characteristics and Qualities of Representative Soils, Subreg

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moderately deep and very deep soils with loamy profiles on nearly level slopes. | 1 | 2,200-2,300 | 25-28 | 120-135 | Rangeland<br>Cropland (pasture and oats) - dryland | Typic Haplaquolls | Coarse-loamy over sandy or sandy-skeletal, mixed, non-calcareous, mesic | St. Joe | 25 | Flood plains | Alluvium | Loam | Sandy loam | Gravel and sand | 80 below 20-40" | 20-40" gravel |
| | | | | | Forest land | Andic Haplaquolls | Fine-silty, mixed, calcareous mesic | Colville | 10 | Flood plains | Alluvium | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | Cumulic Haploxerolls | Coarse-loamy, mixed, mesic | Narcisse | 5 | Terrace | Alluvium | Fine sandy loam | Coarse sandy loam | None | -- | 60"+ |
| | 2 | 1,700-1,800 | 19-22 | 135-140 | Cropland (cereals and alsike clover seed) - dryland | Typic Haplaquents | Fine-loamy, mixed, mesic | | 50 | Flood plains | Alluvium | Silt loam | Silty clay loam | None | -- | 60"+ |
| | | | | | | Calcic Haplaquents | Fine-loamy, mixed, mesic | | 15 | Flood plains | Alluvium | Silt loam | Silty clay loam | None | -- | 60"+ |
| | | | | | | -- | -- | Peat | 10 | Flood plains | Alluvium | Peat | Peat | None | -- | 60"+ |
| Moderately deep to very deep soils with gravelly, loamy, and sandy subsoils on gentle to moderate slopes. | 3 | 1,700-2,300 | 16-22 | 135-170 | Cropland (cereals and grass seed) - dryland (vegetables, hay, pasture and grass seed) - irrigated | Typic Haploxerolls | Loamy-skeletal, mixed, mesic | Garrison | 60 | Terraces | Glacial outwash | Gravelly silt loam | Very gravelly loam | Cobbles, gravel and sand | 35-80 in profile; 80 below 20-40" | 20-40" gravel cobbl |
| | | | | | Other (urban) | Entic Haploxerolls | Sandy-skeletal, mixed, mesic | Springdale | 10 | Terraces | Glacial outwash | Gravelly sandy loam | Gravelly loamy sand | Gravel and sand | 20-35 in profile; 80 below 20-40" | 20-40" gravel sand |
| | | | | | Rangeland | Alfic Xeropsamments | Sandy, mixed, mesic | Marble | 10 | Terraces (gently rolling on edge of outwash plain) | Sand | Loamy fine sand | Fine sand | None | -- | 60"+ |
| | | | | | | Typic Haploxerolls | Coarse-loamy, mixed, mesic | Phoebe | 5 | Fans and footslopes on edge of outwash plain | Glacial outwash | Fine sandy loam | Fine sandy loam | None | -- | 40-60" sand |
| | | | | | | Mollic Vitrandepts | Ashy, mesic | Jacklin | 2 | Swales | Volcanic ash and loess over glacial outwash | Silt loam | Silt loam | None | -- | 60"+ |
| | 4 | 900-1,500 | 14-18 | 120-140 | Rangeland | Entic Haploxerolls | Sandy-skeletal, mixed, mesic | Springdale | 50 | Terraces (nearly level) | Glacial outwash | Gravelly sandy loam | Gravelly loamy sand | Gravel and sand | 20-35 in profile; 80 below 20-30" | 20-30" gravel sand |
| | | | | | | Alfic Xeropsamments | Sandy, mixed, mesic | Marble | 50 | Terraces (moderately sloping) | Sand | Loamy sand | Fine sand | None | -- | 60"+ |

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| Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ure oil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass[6/]: Dryland | Range of: Major Capability Subclass[6/]: Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| y | Gravel and sand | 80 below 20-40" | 20-40" over gravel | Rapid | Very rapid | Poor | Low | IVw | -- | Wetness; moderately deep over gravel | Drainage |
| t | None | -- | 60"+ | Moderate | Moderate | Somewhat poor | High | IVw | -- | Wetness | Drainage |
| rse dy | None | -- | 60"+ | Very rapid | Very rapid | Good | Medium | IIIs | -- | Sandy profile | Residue management |
| ty y | None | -- | 60"+ | Moderately slow | Moderately slow | Poor | High | IIw | -- | Wetness; alkaline soil | Drainage |
| ty y | None | -- | 60"+ | Moderately slow | Moderately slow | Poor | High | IIIw | -- | Wetness | Drainage |
| t | None | -- | 60"+ | Moderate | Moderate | Poor | High | VIIw | -- | Wetness | Drainage |
| y velly | Cobbles, gravel and sand | 35-80 in profile; 80 below 20-40" | 20-40" over gravel and cobbles | Moderate | Very rapid | Good to excessive | Low | IIIs, IVe, IVs, VIs | IIIs, IVe, IVs | Erosion;gravelly profile;moderately deep over cobbles, gravel and sand | Residue management; irrigation management |
| avelly y nd | Gravel and sand | 20-35 in profile; 80 below 20-40" | 20-40" over gravel and sand | Very rapid | Very rapid | Excessive | Low | VIs | -- | Erosion;gravelly profile;moderately deep over gravel and sand | Rangeland and forest land management |
| ne nd | None | -- | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIs | -- | Erosion; sandy profile;droughtiness | Rangeland and forest land management |
| ne ndy | None | -- | 40-60" over sand | Moderately rapid | Very rapid | Good and somewhat excessive | Medium | IIe, IIIe | IIe, IIIe | Erosion; sandy profile;droughtiness | Cross-slope operations; residue mgmt;cropping sequence;irrigation management |
| lt | None | -- | 60"+ | Moderate | Very rapid | Good | High | IIIc | IIIc | Ashy profile | Residue mgmt; irrigation mgmt |
| avelly y nd | Gravel and sand | 20-35 in profile; 80 below 20-30" | 20-30" over gravel and sand | Very rapid | Very rapid | Excessive | Low | VIIs | -- | Erosion;gravelly profile;moderately deep over gravel & sand | Rangeland and forest land management |
| ne nd | None | -- | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIs | -- | Erosion;sandy profile;droughtiness | Rangeland mgmt |

| Soil Groups | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Prof |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 2,000-2,500 | 18-35 | 90-140 | Forest Land | Typic Haplorthods | Coarse-loamy over sandy or sandy-skeletal, mixed frigid | Bonner | 35 | Terraces | Glacial outwash | Loam | Loam | Gravel and sand | 80 below 20-40" | 20-4 gra san |
| | | | | | Cropland (cereals, hay, pasture, and grass seed) - dryland(alfalfa, hay, pasture, and grass seed) irrigated | Entic Haploxerolls | Sandy-skeletal, mixed, mesic | Springdale | 25 | Terraces | Glacial outwash | Gravelly sandy loam | Gravelly sandy loam | Gravel and sand | 20-35 in profile; 80 below 20-40" | 20-4 gra sa |
| | | | | | | Mollic Vitrandepts | Ashy, loamy, mixed, frigid | Hunters | 10 | Terraces | Loess over lake sediments | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | Typic Xerochrepts | Coarse-loamy, mixed, mesic | Clayton | 10 | Alluvial plains | Glacial till and outwash | Fine sandy loam or sandy loam | Fine sandy loam | None | -- | 60"+ |
| | | | | | | Typic Xerochrepts (Dystric) | Coarse-silty, mixed, mesic | Green Bluff | 5 | Uplands (plateaus) | Glacial till and loess | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | Typic Xerorthents | Sandy, mixed, mesic | Hagen | 5 | Uplands (alluvial plains) | Sand | Loamy fine sand | Sand | None | -- | 60"+ |
| | 6 | 2,000-2,500 | 12-18 | 120-140 | Rangeland<br>Forest land | Typic Argixerolls | Coarse-loamy over sandy or sandy-skeletal, mixed, mesic | Hesseltine | 30 | Uplands (plateaus) | Loess over glacial outwash | Gravelly loam | Stony loam | Stones, cobbles & sand | 20-35 in profile | 20-1 bed |
| | | | | | Cropland (cereals, hay) - 10% irrigated | Typic Haploxerolls | Fine-silty, mixed, mesic | Athena | 20 | Uplands (loessal hills) | Loess | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | Calcic Haploxerolls | Coarse-loamy over sandy or sandy-skeletal, mixed, mesic | Cheney | 20 | Terraces | Glacial outwash | Silt loam | Loam or silt loam | Gravel and sand | 80 below 30-40" | 30- gra sa |
| | | | | | | Alfic Xeropsamments | Sandy, mixed, mesic | Marble | 5 | Terraces | Sand | Loamy sand | Fine sand | None | -- | 60" |
| | | | | | | Aeric Mollic Andaquepts | Ashy, calcareous, mesic | Emdent | 2 | Basins | Alluvium and volcanic ash | Silt loam | Silt loam | None | -- | 60" |
| | | | | | | Mollic Andaquepts | Ashy, nonacid, mesic | Cocolalla | 2 | Basins and flood plains | Alluvium and volcanic cash | Silt loam | Silt loam | None | -- | 40- cl ma |

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Table 45 - Continued

| | Soil Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coarse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass 6/ | | | |
| il | Texture Subsoil | Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| | Loam | Gravel and sand | 80 below 20-40" | 20-40: over gravel and sand | Moderate | Very rapid | Good | Low & medium | IVe, IVs, VIe | IVe, IVs | Erosion; moderately deep over gravel and sand | Forest land mgmt; residue mgmt; irrigation mgmt. |
| | Gravelly sandy loam | Gravel and sand | 20-35 in profile; 80 below 20-40" | 20-40" over gravel and sand | Very rapid | Very rapid | Excessive | Low | VIs | -- | Erosion; gravelly profile; moderately deep over gravel&sand | Forest land and rangeland management |
| | Silt loam | None | -- | 60"+ | Moderate | Moderately slow | Good | High | IIc, IIIe | IIc, IIIe | Erosion | Cross-slope operations; residue mgmt; cropping sequence; irrigation management |
| dy | Fine sandy loam | None | -- | 60"+ | Moderately rapid | Very rapid | Good | Medium | IIe, IIIe, IVe | IIe, IIIe, IVe | Erosion | Residue mgmt; irrigation mgmt; forest land management |
| m | Silt loam | None | -- | 60"+ | Moderate | Moderate | Good | High | IIe, IIIe | IIe IIIe | Erosion | Residue management; irrigation management |
| ne | Sand | None | -- | 60"+ | Very rapid | Very rapid | Excessive | Low | VIs | -- | Erosion; sandy profile | Forest land mgmt. |
| | Stony loam | Stones, cobbles & sand | 20-35 in profile | 20-30" over bedrock | Moderate & moderately slow | Impervious | Good | Low | IVe | IVe | Gravelly & stony profile; moderately deep over bedrock | Forest land & rangeland mgmt; residue mgmt; cropping sequence; irrigation management |
| | Silt loam | None | -- | 60"+ | Moderate | Moderate | Good | High | IIe, IIIe, IVe, VIe | IIe, IIIe, IVe | Erosion; free lime below 30" in some areas | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland management |
| | Loam or silt loam | Gravel and sand | 80 below 30-40" | 30-40" over gravel & sand | Moderate | Very rapid | Good | Low & medium | IVe | IVe | Erosion; droughtiness | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland management |
| | Fine sand | None | -- | 50"+ | Very rapid | Very rapid | Excessive | Low | VIIs | -- | Erosion; sandy profile; droughtiness | Rangeland & forest land management |
| | Silt loam | None | -- | 60"+ | Moderate | Impervious | Poor | High | VIw | -- | High seasonal water table; strongly alkaline | Drainage; soil amendments |
| | Silt loam | None | -- | 40-60" over clayey material | Moderate | Slow & impervious | Poor | Medium & high | Vw | -- | High seasonal water table | Drainage |

| Soil Association | | | | | | Classification | | | | | | Soil Characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil Groups | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Pe |
| Shallow to very deep, frigid soils with stony, cobbly, gravelly loamy profiles on gentle and moderate slopes. | 7 | 2,000-2,500 | 28-35 | 90-100 | Cropland (hay, pasture, and cereals)-20% irrigated | Typic Haploxeralfs | Fine, mixed, mesic | Addy | 30 | Basin | Lake sediments | Silt loam | Clay loam | None | -- | 10-15" over compact silt and clay | Mod sl |
| | | | | | Forest land | -- | -- | Rough mountainous land 5/ | 25 | Canyon side slopes & terrace escarpments | Glacial outwash & till | -- | -- | None | -- | Variable | Ve |
| | | | | | | Typic Haploxeralfs | Fine-loamy, mixed, frigid | | 20 | Terraces & Footslopes | Glacial till | Loam | Loam | None | -- | 60"+ | Mod |
| | | | | | | Typic Haplaquolls | Fine-loamy, mixed, frigid | | 15 | Flood plains | Alluvium | Silt Loam | Silty clay loam | None | -- | 20-30" over compact silty clay | Mo sl |
| | | | | | | Typic Haplorthod | Coarse-loamy over sandy or sandy-skeletal, mixed, frigid | Bonner | 9 | Terrace breaks | Glacial outwash | Loam | Gravelly loam | Gravel & sand | 20-35 below 10" in profile; 80 below 20-40" | 20-40" over gravel | Mo |
| | | | | | | -- | -- | Riverwash 5/ | 1 | Flood plains | Alluvium | Gravelly material | Gravel & sand | Gravel & sand | 60 in profile | Variable | Ve |
| | 8 | 3,000-4,000 | 12-18 | 90-120 | Cropland (cereals)-dryland (hay, pasture, cereals, sugar beets, & some tree & can fruits) irrigated | Typic Argiustolls | Fine-loamy, mixed, frigid | | 25 | Fans & terraces | Lake sediments | Loam | Clay loam | None | -- | 60"+ | Mo s |
| | | | | | | Aridic Haploborolls | Sandy-skeletal, mixed | Riverside | 15 | Terraces | Glacial outwash | Gravelly sandy loam | Gravelly loamy sand | Cobbles, gravel & sand | 20-35 in profile; 80 below 10-20" | 10-20" over gravel & sand | Va |
| | | | | | Rangeland | | | | | | | | | | | | |
| | | | | | Forest land | Aquic Fluventic Hapludolls | Coarse-sandy, mixed, mesic | Chamokane | 10 | Flood plains | Glacial outwash | Sandy loam to loamy sand | Sandy loam | Gravel & sand | 80 below 15 to 40" | 15-40" over gravel & sand | Ra |
| | | | | | | Typic Haploborolls | Coarse-loamy, mixed | Victor | 5 | Fans | Glacial outwash | Loam to sandy loam | Loam to sandy loam | Gravel & sand | 80 below 20-40" | 20-40" over gravel & sand | Mo to |
| | | | | | | Pachic Haploborolls | Loamy-skeletal, mixed | Lolo | 5 | Fans | Glacial outwash | Loam or gravelly loam | Loam or gravelly loam | Gravel & sand | 20-35 in profile in places; 80 below 20-40" | 20-40" over gravel & sand | N |

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Table 45 - Continued



| | Soil Characteristics | | | | Soil Qualities and Interpretations | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ...re ...il | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass 6/ Dryland | Range of: Major Capability Subclass 6/ Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| | None | -- | 10-15" over compact silt and clay | Moderately slow | Very slow | Poor | Low | IVw | IVw | Wetness; shallow over compact silt and clay | Drainage |
| | None | -- | Variable | Very rapid | Variable | Good to excessive | Low | VIIs | -- | Stony material | |
| | None | -- | 60"+ | Moderate | Moderate | Moderately good | High | IIIe, IIIc, VIe | IIIe IIIc | Erosion | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; forest land mgmt. |
| | None | -- | 20-30" over compact silty clay | Moderately slow | Very slow | Poor | Low | IVw | IVw | Wetness; Moderately deep over compact silty clay | Drainage |
| | Gravel & sand | 20-35 below 10" in profile; 80 below 20-40" | 20-40" over gravel | Moderate | Very rapid | Good | Low | IVe VIe VIIe | IVe | Erosion; moderately deep over gravel & sand; gravelly subsoil | Forest land management |
| | Gravel & sand | 60 in profile | Variable | Very rapid | Variable | Poor | Low | VIIw | -- | Flood; gravelly material | -- |
| | None | -- | 60"+ | Moderately slow | Moderately slow | Good | Medium | IIc IIIe IVe VIe | IIe IIc IIIe VIe | Erosion; strongly calcareous below 12-20" | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| ...lly | Cobbles, gravel & sand | 20-35 in profile; 80 below 10-20" | 10-20" over gravel & sand | Very rapid | Very rapid | Excessive | Low | VIe VIs | IIIs IVe IVs VIe | Erosion; shallow over gravel and sand; gravelly profile; droughtiness | Residue mgmt; irrigation mgmt; rangeland mgmt. |
| | Gravel & sand | 80 below 15 to 40" | 15-40" over gravel & sand | Rapid | Very rapid | Good | Low | IVs VIs VIw | IIIs IVe VIw | Sandy profile; shallow over gravel & sand in places; flooding; seasonal high water table | Drainage |
| ...to | Gravel & sand | 80 below 20-40" | 20-40" over gravel & sand | Moderate to rapid | Very rapid | Good | Low and medium | IIIe IIIs IVe | IIs IIIe IVe | Erosion; moderately deep over gravel & sand; seasonal flowing water table | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| ...or ...lly | Gravel & sand | 20-35 in profile in places; 80 below 20-40" | 20-40" over gravel & sand | Moderate | Very rapid | Good | Low and medium | IIIe IIIs IVe | IIs IIIe IVe | Erosion; moderately deep over gravel and sand | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland management |

| Soil Groups | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Pr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Soil Association | Classification | | | | | Soil Characteristics | | | | | |
| | 9 | 2,950-3,200 | 14-18 | 85-125 | Cropland (cereals & alfalfa)-dryland (cereals, potatoes, pasture, hay & some fruits & vegetables) irrigated<br>Rangeland | Typic Cryoborolls | Fine-loamy, mixed | Yeoman | 30 | Uplands (nearly level to rolling morainic) | Glacial till | Gravelly loam or loam | Gravelly loam or loam | Cobbles, gravel & sand | 20-35 in profile in places; 80 below 40-60" | 40 co gr |
| | | | | | | Typic Ustipsamments | Mixed, frigid | Blanchard | 15 | Terraces (dunelike) | Glacial outwash | Loamy fine sand or fine sand | Loamy fine sand or fine sand | Sand | -- | -- |
| | | | | | | Typic Haploborolls | Coarse-silty, mixed | Creston | 10 | Terraces | Lake Sediments | Silt loam | Silt loam | None | -- | 60 |
| | | | | | | Typic Haploborolls | Coarse-loamy, mixed | Kalispell | 10 | Fans and terraces | Glacial outwash | Loam or gravelly loam | Loam or gravelly loam | Gravel & sand | 20-35 in profile in places; 80 below 40-60" | 40 gr sa |
| | | | | | | Fluventic Haploborolls | Coarse-loamy over sandy or sandy-skeletal, mixed | Kiwanis | 5 | Flood plains & terraces | Alluvium over glacial outwash | Loam or fine sandy loam | Fine sandy loam | Gravel & sand | 80 below 20-40" | 20 gr sa |
| | 10 | 3,000-5,000 | 20-35 | 70-115 | Forest land<br>Cropland (hay, pasture, cereals & some tree & cane fruits)-dryland | Cryoboralfs plus Cryothods | Loamy-skeletal, mixed & ashy over loamy mixed | -- | 100 | Uplands & terraces (hills) nearly level to gently sloping | Glacial till & outwash | -- | -- | -- | -- | 10 co an |
| Very deep cold soils with loamy profiles on gentle to steep slopes | 11 | 5,000-6,000 | 16-24 | 50-90 | Rangeland<br>Cropland (hay and pasture)-some irrigated | Mollic Cryoboralfs | Fine, mixed | Donald | 25 | Fans and terraces | Glacial till | Loam | Clay or gravelly clay | Gravel & sand | 20-35 below 10" in places | 60 |
| | | | | | | Argic Cryoborolls | Fine-loamy, mixed | Philipsburg | 15 | Fans and terraces | Glacial till | Clay loam | Gravelly clay loam | Gravel & sand | 20-35" below 10" | 60 |
| | | | | | | Cryic Paleborolls | Fine-loamy, mixed | Pintlar | 10 | Fans and terraces | Glacial till | Loam | Gravelly loam | Gravel & sand | 20-35 below 10" | 60 |
| | | | | | | Typic Cryoborolls | Sandy-skeletal, mixed | Bearmouth | 5 | Fans | Glacial outwash | Gravelly loam | Gravelly loamy sand | Gravel & sand & cobbles | 20-35 in profile; 80 below 10-20" | 10 co gr sa |

Table 45 - Continued

| Soil Characteristics | | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ...re Soil | Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass 6/ Dryland | Range of: Major Capability Subclass 6/ Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| ...y | Gravelly loam or loam | Cobbles, gravel & sand | 20-35 in profile in places; 80 below 40-60" | 40-60" over cobbles & gravel | Moderate | Very rapid | Good | Low to high | IIc,IIIe IIIs,IVe VIe,VIs | IVc IIIe IVe | Erosion; gravelly profile in places | Cross-slope operations;residue mgmt; cropping sequence; irrigation mgmt. |
| ...fine ...r ...nd | Loamy fine sand or fine sand | Sand | -- | -- | Very rapid | Very rapid | Good | Low | IVs,VIe | IIIs IIIe IVe | Erosion;moderately deep over gravel& sand;sandy profile; droughtiness | Cross-slope operations;residue mgmt; cropping sequence; irrigation mgmt. |
| ...oam | Silt loam | None | -- | 60"+ | Moderate | Moderate | Good | High | IIc,IIIe IVe | IIe,IIc IIIe IVe | Erosion | Cross-slope operations;residue mgmt; cropping sequence; irrigation mgmt. |
| ...r ...ly | Loam or gravelly loam | Gravel & sand | 20-35 in profile in places; 80 below 40-60" | 40-60" over gravel & sand | Moderate | Very rapid | Good | Low to high | IIc,IIIe IVe | IIc, IIIe, IVe | Erosion; gravelly profile in places | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt. |
| ...r ...andy | Fine sandy loam | Gravel & sand | 80 below 20-40" | 20-40" over gravel & sand | Moderately rapid | Very rapid | Moderately good | Low | IIIe IIIs IVe | IIs IIIe | Erosion;mod. deep over gravel&sand; seasonal flowing water table; droughtiness | Cross-slope operations;residue mgmt; cropping sequence; irrigation mgmt. |
| | -- | -- | -- | 10-40" over cobbles,sand and gravel | Moderate | | Good | High | VIe VIs | -- | Erosion; stony subsoil | Continued forest land mgmt;cross-slope operations; residue mgmt; cropping sequence |
| | Clay or gravelly clay | Gravel & sand | 20-35 below 10" in places | 60"+ | Slow | Slow | Good | Medium & High | IVe VIe | IVe | Erosion;clay subsoil;acid surface soil | Rangeland mgmt; cross-slope opers; residue mgmt;Cropping sequence;subsurface tillage; irrigation mgmt. |
| ...loam | Gravelly clay loam | Gravel & sand | 20-35" below 10" | 60"+ | Moderately slow | Moderately slow | Good | Medium | IVe VIe | IVe | Erosion; calcareous subsoil | Rangeland mgmt; cross-slope opers; residue mgmt;cropping sequence; irrigation mgmt. |
| | Gravelly loam | Gravel & sand | 20-35 below 10" | 60"+ | Moderate | Moderate | Good | Medium | IVe VIe | IVe | Erosion | Rangeland mgmt; cross-slope opers; residue mgmt;cropping sequence; irrigation mgmt. |
| ...lly | Gravelly loamy sand | Gravel & sand & cobbles | 20-35 in profile; 80 below 10-20" | 10-20" over cobbles, gravel & sand | Very rapid | Very rapid | Good | Low | VIs | IVs | Shallow over cobbles,gravel & sand;gravelly profile; droughtiness | Rangeland mgmt; residue mgmt; irrigation mgmt. |

Table 45 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage of Assn.[3/] | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Permeab Subs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moderately deep very cold soils with stony, loamy profiles soils on moderate to very steep slopes. | 12 | 3,000-8,000 | 20-60 | 30-95 | Forest land[4/]<br>Rangeland<br>Cropland (limited) | Cryoboralfs and Cryothods | Fine-loamy to loamy skeletal, mixed | -- | 100 | Valleys & uplands (moderately steep or hilly) | Glacial till, acid ignitious & sedimentary rock | -- | -- | -- | -- | 40-60" over bedrock | Moderat |
| Moderately deep to very deep soils with loamy and clayey subsoils on gentle to moderate slopes. | 13 | 2,000-2,900 | 20-35 | 70-120 | Forest land | Abruptic Andic Paleboralfs | Fine, mixed | Tenibac | 25 | Terraces | Lake sediments | Silt loam | Clay loam | None | -- | 60"+ | Moderat slow |
| | | | | | Cropland (hay, pasture, cereals & seed potatoes) 10% irrigated | Typic Haplorthods | Coarse-loamy over clayey, mixed, frigid | Cabinet | 15 | Terraces | Lake sediments | Silt loam | Silty clay | None | -- | 20-40" over clayey material | Slow |
| | | | | | | Typic Haplorthods | Sandy, mixed, frigid | Selle | 15 | Terraces (dunelike) | Eolian material | Fine sandy loam | Loamy fine sand | None | -- | 60"+ | Very r |
| | | | | | | Typic Vitrandepts | Ashy, loamy, mixed, frigid | Waits | 15 | Uplands (hills-moderately & steeply sloping) | Glacial hill | Stony silt loam | Stony silt loam | Gravel, cobbles & stones | 20-35 in profile; 80 below 40-60" | 40-60" over gravel | Moderat |
| | 14 | 1,700-2,500 | 19-32 | 100-140 | Forest land<br>Cropland (hay, pasture and cereals)-5% irrigated | Hapludic Eutroboralfs | Fine, montmorillonitic | Porthill | 30 | Terraces | Lake sediments | Silt loam | Silty clay | None | -- | 10-20" over clayey material | Slow |
| | | | | | | Typic Haplorthods | Coarse-loamy over sandy or sandy-skeletal, mixed, frigid | Bonner | 25 | Terraces | Glacial outwash | Loam | Loam | Gravel & sand | 80 below 20-40" | 20-40" over gravel and sand | Modera |
| | | | | | | Alfic Fragiorthods | Fine-silty, mixed, frigid | Mission | 20 | Terraces | Lake sediments | Silt loam | Silty clay loam | None | -- | 60"+ | Modera slow |
| | | | | | | Alfic Xeropsamments | Mixed, frigid | Elmira | 15 | Sand dune-land on terraces | Sand | Loamy sand | Sand | None | -- | 60"+ | Very r |

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ble 45 - Continued

| il Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| exture ubsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Range of: Major Capability Subclass Irrigated 6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| -- | -- | -- | 40-60" over bedrock | Moderate | -- | Good | Medium | VIe VIIs | -- | Erosion with severe cover disturbance | Continuing forest land mgmt; cross slope operations |
| Clay loam | None | -- | 60"+ | Moderately slow | Slow | Good | High | IIc IIIe IVe IVc VIe | IIc IIIe IVe IVc | Erosion;perched water table in spring;soil slippage | Forest land mgmt; residue mgmt;cropping sequence;subsurface tillage; irrigation mgmt. |
| Silty clay | None | -- | 20-40" over clayey material | Slow | Slow | Moderately good | Medium | IVe IVs VIe | IVe IVs VIe | Erosion;perched water table in spring; soil slippage;mod. deep over clayey material | Forest land mgmt; residue mgmt;cropping sequence; irrigated mgmt. |
| Loamy fine sand | None | -- | 60"+ | Very rapid | Slow in underlying lake sediments | Excessive | Low | IIe IIIe IVe VIe | IIs IIIe IVe | Erosion; sandy profile | Forest land mgmt; residue mgmt;cropping sequence; irrigation mgmt. |
| Stony silt loam | Gravel, cobbles & stones | 20-35 in profile; 80 below 40-60" | 40-60" over gravel | Moderate | Very rapid | Good | Low and medium | IIIs,IIIe IVe, VIe, VIIs | IIc IIIe IVe | Erosion; stony profile | Forest land mgmt; cross-slope opers; residue mgmt;cropping sequence; irrigation mgmt. |
| Silty clay | None | -- | 10-20" over clayey material | Slow | Very slow | Good | Low | IIIs IVe | IIIc IVe | Erosion;shallow over clayey material | Cross-slope opers; residue mgmt;cropping sequence;irrigation mgmt;forest land mgmt. |
| Loam | Gravel & sand | 80 below 20-40" | 20-40" over gravel and sand | Moderate | Very rapid | Good | Low and medium | IVe IVs VIe | IVe IVs | Erosion;moderately deep over gravel & sand | Forest land mgmt; residue mgmt. |
| Silty clay loam | None | -- | 60"+ | Moderately slow | Moderately slow | Good | High | IIIs IVe | IIIc IVe | Erosion | Cross-slope opers; residue mgmt;cropping sequence;irrigation mgmt; forest land mgmt. |
| Sand | None | -- | 60"+ | Very rapid | Very rapid | Good | Low | VIs | -- | Erosion; sandy profile | Forest land mgmt. |

| Soil Groups | Map Sym. | Elevation feet (Soil Association) | Precip. Inches | Freeze free Season | Major land use | Great Group or Subgroup (Classification) | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Parent Material (Soil Characteristics) | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 2,600-3,000 | 9-14 | 90-110 | Cropland(hay, cereals, and pasture) - mostly irrigated | Borollic Natrargids | Very fine, mixed | Round Butte | 30 | Lake basins | Lake sediments | Silt loam | Clay | None | -- | 20-40" over laminated material |
| | | | | | Rangeland | Ustollic Haplargids | Fine-silty, mixed, mesic | Lonepine | 25 | Terraces | Lake sediments | Silt loam | Silty clay loam | None | -- | 60"+ |
| | | | | | | Typic Haploborolls | Fine-loamy, mixed | Prospect | 15 | Fans (short slopes) | Glacial till | Loam | Loam | None | -- | 60"+ |
| | | | | | | Boralfic Argiborolls | Fine, mixed | McDonald | 5 | Fans (short slopes) | Glacial till | Silt loam | Gravelly silty clay loam | Gravel & sand | 20-35 below 10" | 60"+ |
| | | | | | | Typic Ustorthents | Fine-silty, mixed calcareous, frigid | Lambert | 5 | Eroded lake basins | Lake sediments | silt loam | Stratified silt & fine sand | None | -- | 60"+ |
| | 16 | 2,800-3,000 | 12-16 | 110-130 | Cropland (cereals, hay and pasture)-dryland (cereals, hay, pasture, potatoes&some tree fruits & vegetables) irrigated | Typic Natriborolls | Very fine, mixed | Post | 35 | Lake basins | Lake sediments | Silt loam | Clay | None | -- | 60"+ |
| | | | | | | Pachic Haploborolls | Coarse-loamy, mixed | Flathead | 15 | Footslopes and terraces | Glacial till | Loam or fine sandy loam | Loam or fine sandy loam | None | -- | 60"+ |
| | | | | | Rangeland | Boralfic Argiborolls | Fine, mixed | McDonald | 10 | Footslopes and fans (gently sloping) | Glacial till | Silt loam | Gravelly silty clay loam | Gravel & sand | 20-35 below 10" | 60"+ |
| | | | | | | Typic Eutroberalfs | Fine, mixed | Crow | 5 | Lake basins | Lake sediments | Silt loam | Silty clay | None | -- | 60"+ |
| | | | | | | Mollic Vitrandepts | Ashy over sandy or sandy-skeletal, mixed, frigid | Mires | 5 | Fans & terraces | Glacial outwash | Loam or gravelly loam | Loam or gravelly loam | Gravel & sand | 20-35 in profile in places; 80 below 10-20" | 10-20" over gravel |

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| Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ture soil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Range of: Major Capability Subclass Irrigated[6] | Major Soil Problems | Suitable Land Treatment and Structures |
| y | None | -- | 20-40" over laminated material | Slow | Very slow | Good | Low and medium | IVe<br>IVs<br>VIe | IVe<br>IVs<br>VIe | Erosion; clay & alkaline subsoil; soil slippage | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; soil amends; irrig. mgmt; rangeland mgmt. |
| lty y | None | -- | 60"+ | Moderately slow | Moderately | Good | High | IIIe<br>IIIc<br>IVe | IIc<br>IIIe<br>IVe<br>VIe | Erosion; soil slippage | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| | None | -- | 60"+ | Moderate | Moderate | Good | High | IIc<br>IIIe<br>IVe<br>VIe | IIc<br>IIIe<br>IVe<br>VIe | Erosion; strongly calcareous subsoil | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| avelly lty ay | Gravel & sand | 20-35 below 10" | 60"+ | Moderately slow | Moderately slow | Good | Medium | IIc<br>IIIe<br>IVe | IIc<br>IIIe<br>IVe | Erosion; gravelly profile below 10" | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| rati- ed lt & e d | None | -- | 60"+ | Moderately slow | Moderately slow | Good | Medium | IVe<br>VIe<br>VIIe | IIIe<br>IVe<br>VIe | Erosion; soil slippage; calcareous | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| y | None | -- | 60"+ | Very slow | Very slow | Good | Medium | IIIe<br>IIIs<br>IVe<br>VIe | IVe<br>IVs<br>VIe | Erosion; clay subsoil; soil slippage on steep slopes | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; irrigation mgmt; rangeland mgmt. |
| or ne ndy | None | -- | 60"+ | Moderate or moderately rapid | Moderate or moderately rapid | Good | Medium and high | IIe<br>IIc<br>IIIe<br>IVe | IIs<br>IIc<br>IIIe<br>IVe | Erosion | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| avelly lty ay | Gravel & sand | 20-35 below 10" | 60"+ | Moderately slow | Moderately slow | Good | Medium | IIc<br>IIIe<br>IVe | IIc<br>IIIe<br>IVe | Erosion; gravelly profile below 10" | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| lty lay | None | -- | 60"+ | Slow | Slow | Good | Medium and high | IIs<br>IIIe<br>IVe | IIs<br>IIIe<br>IVe | Erosion; clayey subsoil; soil slippage on steep slopes | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; irrigation mgmt; rangeland mgmt. |
| or avelly | Gravel & sand | 20-35 in profile in places; 80 below 10-20" | 10-20" over gravel | Moderate | Very rapid | Somewhat excessive | Low | IVe<br>IVs<br>VIe | IIIe<br>IIIs<br>IVe | Erosion; shallow over gravel & sand; gravelly profile in places; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Per |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Very deep frigid soils with loamy and clayey subsoils on gentle to moderate slopes. | 17 | 4,000-5,000 | 12-15 | 85-100 | Cropland (hay, pasture, cereals)-irrigated (cereals)-dryland | Typic Calciborolls | Fine-carbonatic | Judith | 30 | Terraces | Alluvium | Loam | Loam or gravelly loam | Gravel and sand | 20-35 below 10" in places | 60"+ | Mod |
| | | | | | Rangeland | Typic Argiborolls | Fine, montmorillonitic | Ekah | 20 | Uplands (hills) (gently sloping to rolling) | Old alluvium | Clay loam | Clay loam | None | -- | 60"+ | Mod slo |
| | | | | | | Abruptic Argiborolls | Fine, montmorillonitic | Coben | 10 | Uplands (hills) (gently sloping to rolling) | Old alluvium | Clay loam | Clay | None | -- | 60"+ | Slo |
| | | | | | | Typic Argiborolls | Fine-loamy, mixed | Martinsdale | 10 | Terraces | Alluvium | Loam | Clay loam | None | -- | 60"+ | Mod slo |
| | | | | | | Cumulic Haploborolls | Fine-loamy, mixed | Straw | 10 | Flood plains | Alluvium | Loam | Loam | Gravel and sand | 80 below 40-60" | 40-60" over gravel | Mod |
| Moderately deep to very deep soils with sandy or gravelly profiles on moderate to steep slopes. | 18 | 900-2,500 | 12-16 | 120-150 | Rangeland | Alfic Xeropsamments | Sandy, mixed, mesic | Marble | 35 | Terraces | Sand | Loamy sand | Fine sand | None | -- | 60"+ | Ver |
| | | | | | Forest land | Entic Haploxerolls | Sandy-skeletal, mixed, mesic | Springdale | 30 | Terraces | Glacial outwash | Gravelly sandy loam | Gravelly loamy sand | Gravel & sand | 20-35 in profile; 80 below 20-30" | 20-30" over gravel and sand | Ver |
| | | | | | | Typic Haploxerolls | Loamy-skeletal, mixed, mesic | Speigle | 20 | Uplands (colluvial slopes) | Loess & basic igneous colluvium | Very stony silt loam | Very stony silt loam | Stones, cobbles, & gravel | 35-80 in profile | 60"+ | Mod |
| Moderately deep and very deep soils with silty profiles on moderate to steep slopes. | 19 | 2,200-2,900 | 18-22 | 120-150 | Cropland (cereals, peas, grass seed & lentils) - dryland | Typic Argixerolls | Fine-silty, mixed, mesic | Naff | 55 | Uplands (rolling hills) | Loess | Silt loam | Silty clay loam | None | -- | 60"+ | Mod slo |
| | | | | | Rangeland; Forest land | Boralfic Argixerolls | Fine-silty, mixed, mesic | Thatuna | 20 | Uplands (steep hills-north slopes) | Loess | Silt loam | Silty clay loam | None | -- | 30-40" over compact silty clay | Slo |
| | | | | | | Typic Haploxerolls | Fine-silty, mixed, mesic | Palouse | 10 | Uplands (rolling) | Loess | Silt loam | Silt loam | None | -- | 60"+ | Mod |
| | | | | | | Cumulic Haploxerolls (Haplaquolls) | Fine-silty, mixed, mesic | Caldwell | 5 | Flood plains | Alluvium | Silt loam | Silty clay loam | None | -- | 60"+ | Mod slo |
| | | | | | | Typic Argialbolls | Fine, montmorillonitic, mesic | Latah | 5 | Flood plains | Alluvium | Silt loam | Silty clay or clay | None | -- | 20-30" over compact clay | Slo |
| | | | | | | Mollic Haploxeralfs | Fine, montmorillonitic, mesic | Garfield | 3 | Uplands (ridgetops) | Loess | Silty clay loam or silty clay | Silty clay loam or silty clay | None | -- | 60"+ | Mod slo |

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| ...teristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coarse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass 6/ | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| Gravel and sand | 20-35 below 10" in places | 60"+ | Moderate | Moderate | Good | Medium and high | IIc IIIe VIe VIe | IIc IIIe IVe | Erosion; calcareous subsoil | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderately slow | Moderately slow | Good | High | IIe IIIe IVe | IIIe IVe | Erosion; calcareous subsoil | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Slow | Slow | Good | High | IIe IIIe IVe | IIIe IVe | Erosion; clayey and calcareous subsoil | Cross-slope opers; residue mgmt; cropping seq; subsurface tillage; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderately slow | Moderately slow | Good | High | IIc IIIe IVe | IIc IIIe IVe | Erosion; calcareous subsoil | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| Gravel and sand | 80 below 40-60" | 40-60" over gravel | Moderate | Very rapid | Moderately good | Medium and high | IIc | IIc IIIe | Erosion; deep over gravel; calcareous subsoil | Residue mgmt; irrigation mgmt. |
| None | -- | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIs | -- | Erosion; sandy profile; droughtiness | Rangeland management |
| Gravel & sand | 20-35 in profile; 80 below 20-30" | 20-30" over gravel and sand | Very rapid | Very rapid | Excessive | Low | VIs | -- | Erosion; mod. deep over gravel & sand; gravelly profile | Rangeland & forest land management |
| Stones, cobbles, & gravel | 35-80 in profile | 60"+ | Moderate | Moderate | Good | Low | VIIs | -- | Erosion; stony profile; steep slopes | Forest land mgmt. |
| None | -- | 60"+ | Moderately slow | Moderate & moderately slow | Good | High | IIe IIIe IVe | -- | Erosion | Cross-slope opers; residue mgmt; cropping sequence |
| None | -- | 30-40" over compact silty clay | Slow | Slow | Moderately good | Medium | IIe IIIe IVe | -- | Erosion; mod. deep over clayey material | Cross-slope opers; residue mgmt; cropping sequence |
| None | -- | 60"+ | Moderate | Moderate & moderately slow | Good | High | IIe IIIe IVe | -- | Erosion | Cross-slope opers; residue mgmt; cropping sequence |
| None | -- | 60"+ | Moderately slow | Moderately slow or impervious | Somewhat poor | High | IIw | -- | High seasonal water table | Drainage |
| None | -- | 20-30" over compact clay | Slow | Slow | Somewhat poor | Medium | IIIw | -- | Wetness; moderately deep over clayey material | Drainage |
| None | -- | 60"+ | Moderately slow or slow | Moderately slow or slow | Good | Medium & high | IVe VIe | -- | Erosion; clayey profile | Permanent cover |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage of Assn. 3/ | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | 1,800-2,200 | 15-18 | 110-120 | Cropland (cereals & peas)-dryland (alfalfa, cereals and pasture) - irrigated | Typic Haploxerolls | Fine-silty, mixed, mesic | Athena | 60 | Uplands | Loess | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | Typic Xerorthents | Fine-silty, mixed, calcareous, mesic | Lance | 10 | Uplands (ridgetops and south slopes) | Loess & lacustrine material | Silt loam | Silt loam (laminated) | None | -- | 60"+ |
| | | | | | Rangeland | Calcic Argixerolls | Fine-silty, mixed mesic | Reardan | 10 | Footslopes (gently sloping) | Loess | Silt loam | Silty clay loam | None | -- | 20-30" over clayey material |
| | | | | | | Typic Haploxerolls (Pachic) | Fine-silty, mixed, mesic | Tucannon | 5 | Uplands (south slopes) | Loess & basic igneous rock | Silt loam | Silt loam | None | -- | 30-40" over bedrock |
| | | | | | | Cumulic Haploxerolls | Coarse-silty, mixed, mesic | Mondovi | 2 | Flood plains | Alluvium | Silt loam | Silt loam | None | -- | 60"+ |
| | 21 | 2,200-3,000 | 20-26 | 100-140 | Cropland (cereals, peas, hay, pasture, & grass seed) dryland (alfalfa, hay, & pasture)-irrigated | Abruptic Palexerolls (Paleudolls) | Fine, montmorillonitic, mesic | Nez Perce | 40 | Uplands-hills (nearly level & gently sloping | Loess | Silt loam | Clay or silty clay | None | -- | 20-35" over clayey material |
| | | | | | | Ultic Argixerolls | Fine-loamy, mixed, mesic | Larkin | 15 | Uplands-hills (gently & moderately sloping) | Loess | Silt loam | Silty clay loam | None | -- | 60"+ |
| | | | | | Forest land<br>Rangeland | Typic Xerochrepts | Coarse-loamy, mixed mesic | Bernhill | 15 | Uplands-hills (steep & hilly) | Glacial hill | Loam or silt loam | Gravelly loam | Sand & gravel | 20-35 below 10" in profile; 80 below 20-40" | 20-40" over gravel |
| | | | | | | Typic Argixerolls | Fine-loamy, mixed, mesic | Tekoa | 15 | Uplands-hills (steep and hilly) | Acid igneous rock | Gravelly loam | Gravelly clay loam | Gravel & sand | 20-35 in profile | 20-40" over bedrock |
| | | | | | | Lithic Argiudolls (Argixerolls) | Loamy-skeletal, mixed, mesic | Lacy | 5 | Uplands-hills (gently to steeply sloping) | Loess & basic igneous rock | Stony loam | Extremely stony clay loam | Stones, cobbles & gravel | 35-80 in profile | 10-20" over bedrock |
| | | | | | | Typic Argialbolls | Fine, montmorillonitic, mesic | Latah | 4 | Flood plains | Alluvium | Silt loam | Silty clay | None | -- | 20-30" over compact clay |
| | 22 | 2,200-3,500 | 25-35 | 80-110 | Forest land<br>Cropland (hay, pasture, and cereals) - dryland | Hapludalfs and Cryandepts | Fine-silty, mixed, frigid & ashy over loamy, frigid | -- | 100 | Uplands-hills (gently & moderately sloping) | Loess | -- | -- | -- | -- | 20-60"+ over clayey material |

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| ...teristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coarse Fragments | | | | | | | Range of: Major Capability Subclass 6/ | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IIe, IIIe, IVe, VIe | IIe IIIe | Erosion; free lime below 30" in some areas | Cross-slope opers; residue mgmt; cropping sequence |
| None | -- | 60"+ | Moderately slow | Moderately slow | Good | Low and Medium | IVe | -- | Erosion; calcareous laminated profile | Permanent cover |
| None | -- | 20-30" over clayey material | Moderately slow | Slow | Good | Medium and high | IIe IIIe | IIe IIIe | Erosion; moderately deep over clayey material | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage |
| None | -- | 30-40" over bedrock | Moderate | Impervious | Good | Low and medium | IIIe | IIIe | Erosion; moderately deep over bedrock | Cross-slope opers; residue mgmt; cropping sequence |
| None | -- | 60"+ | Moderate | Moderate or impervious | Moderately good | High | IIc | IIc | Frost hazard | Residue management |
| None | -- | 20-35" over clayey material | Slow | Slow | Moderately good | Medium and high | IIw IIIe IVe | IIw IIIe IVe | Erosion; moderately deep over clayey material | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IIIe IVe VIe | IIIe IVe VIe | Erosion | Cross-slope opers; residue mgmt; cropping sequence; forest land mgmt. |
| Sand & gravel | 20-35 below 10" in profile; 80 below 20-40" | 20-40" over gravel | Moderate | Very rapid | Good | Low and medium | IIe IIIe IVe VIe | IIe IIIe IVe | Erosion; moderately deep over gravel; gravelly below 10" in profile | Cross-slope opers; residue mgmt; cropping sequence; forest land mgmt. |
| Gravel & sand | 20-35 in profile | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | IVe VIe | -- | Erosion; moderately deep over bedrock; gravelly profile | Cross-slope opers; residue mgmt; cropping sequence; forest land mgmt. |
| Stones, cobbles & gravel | 35-80 in profile | 10-20" over bedrock | Moderately slow | Impervious | Good | Low | VIs VIIs | -- | Shallow over bedrock; stony profile | Rangeland mgmt. |
| None | -- | 20-30" over compact clay | Slow | Slow | Somewhat poor | Medium | IIIw | -- | Wetness; moderately deep over clayey material | Drainage |
| -- | -- | 20-60"+ over clayey material | Moderate | -- | Good and moderately good | Medium | VIs | -- | Erosion; moderately deep over clayey material | Continued forest land mgmt; cross-slope opers; residue mgmt; subsurface tillage; cropping sequence. |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Perm S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shallow to deep soils with stony, gravelly loamy profiles on moderate to steep slopes. | 23 | 2,500-4,000 | 10-18 | 70-110 | Rangeland<br>Forest land<br>Cropland(hay, pasture, cereals and some vegetables & tree fruits)-irrigated(cereals)-dryland | Lithic Cryoborolls | Loamy-skeletal, mixed | Cheadle | 35 | Uplands (steep and hilly) | Sedimentary rock | Stony loam | Stony loam | Stones, cobbles & gravel | 20-35 in profile | 10-20" over bedrock | Mod |
| | | | | | | Pachic Cryoborolls | Loamy-skeletal, mixed | Marcetta | 10 | Uplands (steep and hilly) | Sedimentary rock | Gravelly loam | Very gravelly or stony loam | Stones, cobbles & gravel | 20-35 in profile | 40-60" over bedrock | Mod |
| | | | | | | Ustallic Haplargids | Fine-silty, mixed, mesic | Lonepine | 10 | Terraces (gently sloping) | Lake sediments | Silt loam or very fine sandy loam | Silty clay loam | None | -- | 60"+ | Mod slo |
| | | | | | | Typic Cryochrepts | Loamy-skeletal, mixed | Garlet | 5 | Uplands (steep and hilly) | Sedimentary rock | Very stony sandy loam | Very stony sandy loam | Stones, cobbles & gravel | 35-80 in profile | 40-60" over bedrock | Rapi |
| | | | | | | Torriorthentic Haploborolls | Sandy-skeletal, mixed | Dominic | 5 | Fans, terraces & flood plains | Glacial outwash | Very cobbly sandy loam | Very cobbly or gravelly loamy sand | Cobbles, gravel & sand | 35-80 in profile;80 below 10-20" | 10-20" over gravel & sand | Very |
| Shallow cold soils with rocky, loamy profiles on strong to extremely steep slopes. | 24 | 4,000-5,500 | 13-16 | 70-95 | Rangeland | Lithic Haploborolls | Clayey-skeletal, montmorillonitic | Maginnis | 25 | Uplands (steeply rolling) | Sedimentary rock | Clay loam | Very gravelly clay loam | Gravel | 35-80 below 10" | 10-20" over bedrock | Mod slo |
| | | | | | | Typic Ustorthents | Loamy, mixed, calcareous, frigid, shallow | Cabba | 23 | Uplands (steeply rolling) | Sedimentary rock | Loam | Loam | None | -- | 10-20" over soft silty shale | Mod |
| | | | | | | Lithic Haploborolls | Loamy-skeletal, mixed | Spring Creek | 15 | Uplands (steeply rolling) | Sedimentary rock | Loam | Very gravelly & stony loam | Stones, cobbles, & gravel | 35-80 below 10" | 10-20" over bedrock | Mod |
| | | | | | | Typic Haploborolls | Fine-loamy, mixed | Quigley | 12 | Fans, footslopes, & swales | Alluvium & sedimentary rock | Loam | Loam | None | -- | 60"+ | Mod |
| | 25 | 6,000-10,000 | 30-80 | 0-50 | Other Forest land 4/<br>Rangeland | Ceyochrepts and Rockland | -- | -- | 100 | Uplands (steep mountains) | Sedimentary & igneous rock & volcanic ash | -- | -- | -- | -- | 10-60" over bedrock | Mod imp |
| Moderately deep and deep soils stony, loamy profiles high in quartz on strong to extremely steep slopes. | 26 | 1,700-10,000 | 15-60 | 0-120 | Forest land 4/ | Cryondepts and Cryochrepts, Cryothods | Ashy over loamy & coarse to loamy-skeletal, mixed, frigid | -- | 100 | Uplands-mtns (mountain slopes) and terraces | Acidic igneous rock, glacial till volcanic ash & sedimentary rock | -- | -- | -- | -- | 40-60" over bedrock or gravel | Mod |

| ...istics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ...rse Fragments | | | | | | | Range of: Major Capability Subclass | | | |
| ...d | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated 6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| ...ones, ...bbles gravel | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIe, VIIe VIIs | -- | Erosion;shallow over bedrock; stony profile | Rangeland and forest land mgmt. |
| ...ones, ...bbles gravel | 20-35 in profile | 40-60" over bedrock | Moderate | Impervious | Good | Low | VIe VIIs | -- | Erosion;stony profile | Rangeland & forest land management |
| ...ne | -- | 60"+ | *Moderately slow* | *Moderately slow* | *Good* | *High* | *IIIe IIIc* | *IIc IIIe IVe* | *Erosion;soil slippage* | *Cross-slope opers;* residue mgmt;cropping sequence;irrigation mgmt;rangeland management |
| ...tones, ...obbles gravel | 35-80 in profile | 40-60" over bedrock | Rapid | Impervious | Excessive | Low | VIIe VIIs | -- | Erosion;stony profile | Forest land management |
| ...obbles, ...ravel & ...and | 35-80 in profile;80 below 10-20" | 10-20" over gravel & sand | Very rapid | Very rapid | Good | Low | VIs | IIIe IIIs IVe | Erosion;shallow over gravel and sand;cobbly profile;droughtiness | Rangeland & forest land mgmt;residue mgmt;irrigation mgmt. |
| ...avel | 35-80 below 10" | 10-20" over bedrock | Moderately slow | Impervious | Good | Low | VIe VIIe | -- | Erosion;shallow over bedrock; gravelly profile | Rangeland management |
| ...one | -- | 10-20" over soft silty shale | Moderate | Impervious | Good | Low | VIIe VIIs | -- | Erosion;shallow over bedrock | Rangeland management |
| ...ones, ...bbles, gravel | 35-80 below 10" | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIe VIIe | -- | Erosion;shallow over bedrock;gravelly profile; calcareous subsoil | Rangeland management |
| ...one | -- | 60"+ | Moderate | Moderate | Good | High | IIIe IVe VIe | -- | Erosion; calcareous below 15" | Rangeland mgmt;residue management |
| -- | -- | 10-60" over bedrock | Moderate to impervious | -- | Good to poor | Medium | VIIIe VIIIs | -- | Cold climate; high elevations; steep slopes | -- |
| ... | -- | 40-60" over bedrock or gravel | Moderate | -- | Good | Medium | VIe VIIe | -- | Erosion; stony profile | Continued forest land management |

| Soil Association | | | | | | Classification | | | | Position | Soil Characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil Groups | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | on Landscape | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth |
| Shallow to moderately deep very cold soils with gravelly, loamy profiles on strong to extremely steep slopes. | 27 | 5,000-10,000 | 20-50 | 30-90 | Forest land 4/ | Cryandepts and Cryochrepts, Cryothods | Coarse-loamy, mixed | -- | 100 | Uplands-mtns (steeply sloping) | Acidic igneous rock | -- | -- | -- | -- | 20-60" over bedrock |
| | 28 | 5,000-6,500 | 14-20 | 50-90 | Rangeland<br>Forest land 4/<br>Cropland (hay and pasture)-dryland & irrigated | Cryoboralfs, and Cryothods | Fine loamy to sandy-skeletal, mixed | -- | 100 | Uplands (hilly) | Acidic igneous rock | -- | -- | -- | -- | 10-60" over bedrock |
| | 29 | 5,500-8,000 | 18-30 | 50-80 | Forest land 4/<br>Rangeland<br>Cropland (limited to some hay) | Cryoboralfs and Cryothods | Fine-loamy to loamy-skeletal, mixed | -- | 100 | Uplands | Acidic igneous rock | -- | -- | -- | -- | 10-60" over bedrock |

1/ Based on data summarized during 1966.
2/ Only soil series names that have a status as reserved, tentative, or established are listed.
3/ Differences of total percentage in each soil association from 100 percent are inclusions of other soils and land types.
4/ For the upland forest soils, the above characteristics and qualities have been extended from a limited amount of survey data. Additional data and land use interpretations for forest soils are available in the Forest Land section of Appendix VIII, Land Measures and Watershed Protection. These areas include National Forest and adjacent non-Federal forest lands.
5/ Miscellaneous land types.
6/ Presently irrigated cropland.

SOURCE: National Cooperative Soil Survey.

le 45 - Continued

2

| xture bsoil | Coarse Fragments Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Irrigated[6/] | Major Soil Problems | Suitable Land Treatment and Structures |
|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | -- | -- | 20-60" over bedrock | Moderate to rapid | -- | Good | Medium | VIe VIIe | | Erosion; moderately deep over bedrock | Continued forest land management |
| -- | -- | -- | 10-60" over bedrock | Rapid | -- | Good | Medium | VIe VIIe VIIs | | Erosion; shall over bedrock; gravelly profile | Continued rangeland & forest land management |
| -- | -- | -- | 10-60" over bedrock | Rapid | -- | Good | Medium | VIe VIIe VIIs | -- | Erosion; gravelly profile | Continued forest & rangeland mgmt. |

Table 45 contains information about each soil association shown on figure 7. The symbol listed in the second column on the table is the same symbol shown on the Soil Association Map.

The table is organized to show land characteristics, and the characterististics, qualities, and some interpretations of soil series representing the dominant and the contrasting kinds of soil in each association. The first six columns show some general land characteristics for each soil association. The next 11 columns show characteristics (permanent soil facts) of individual key soil series that represent dominant and contrasting soils. The following four show qualities inferred from the characteristics of these soils, and the last four columns show interpretations concerning agricultural use based upon the foregoing soil characteristics and qualities. All of the representative soil series listed have status in classifications. A blank space in the soil series column indicates that the soil series name has no classification status.

The "soil groups" column shows soil associations that contain soils having broad similarities in some important characteristics, frequently identified with a position on the landscape.

The "percentage of association" column shows the extent of each soil in an association. Differences of the total soil percentage in each association from 100 percent are inclusions of other soils and land types. For example, association 11 lists a total of only 55 percent. Knowledge of this area is limited, so 45 percent of the area consists of inclusions of soils that have not been defined.

Terms listed for permeability of water through the subsoil and permeability of substratum are:

Very rapid: Over 10 inches per hour.
Rapid: 5 to 10 inches per hour.
Moderately rapid: 2.50 to 5 inches per hour.
Moderate: 0.8 to 2.5 inches per hour.
Moderately slow: 0.2 to 0.8 inches per hour.
Slow: 0.05 to 0.2 inches per hour.
Very slow: Less than 0.05 inches per hour.

Terms listed for total available water-holding capacity are:

Low: Less than 6 inches in profile.
Medium: 6 to 10 inches.
High: More than 10 inches in profile.

The irrigated capability subclasses are an interpretation of limitations and hazards of using only presently irrigated lands. Many areas not presently irrigated may be potentially irrigable, but are not included in this classification.

A dash in any column indicates that the information is non-existent or not pertinent.

Table 46 shows the estimated acreage and proportionate extent of the soil association by states.

Many of the soils in this subregion are rocky having developed mostly in glacial materials. The inextensive bottomlands show only three soil associations having soils with restricted drainage, as compared with many associations having excessively drained and rapidly permeable subsoils and substrata.

Table 46 - Soil Associations Acreage by States, Subregion 1, 1966

| Soil Association | | | | | | |
|---|---|---|---|---|---|---|
| Map Symbol | Name | Montana | Idaho | Washington | Total | Percent |
| | | | (1,000 acres) | | | |
| 1 | St. Joe | - | 75.0 | - | 75.0 | 1.3 |
| 2 | Haplaquents | - | 90.0 | - | 90.0 | 0.4 |
| 3 | Garrison-Springdale | - | 45.0 | 45.0 | 90.0 | 0.4 |
| 4 | Springdale-Marble | - | - | 10.0 | 10.0 | Tr. |
| 5 | Bonner-Springdale | - | 440.0 | 560.0 | 1,000.0 | 4.4 |
| 6 | Hesseltine-Athena | - | - | 80.0 | 80.0 | 0.4 |
| 7 | Addy-Bonner | - | - | 160.0 | 160.0 | 0.7 |
| 8 | Chamokane-Hamilton | 500.0 | - | - | 500.0 | 2.2 |
| 9 | Yeoman-Blanchard | 200.0 | - | - | 200.0 | 0.9 |
| 10 | Dominantly Cryoboralfs | 500.0 | 15.0 | - | 515.0 | 2.3 |
| 11 | Donald-Phlipsburg | 425.0 | - | - | 425.0 | 1.9 |
| 12 | Dominantly Cryoboralfs | 2,850.0 | - | - | 2,850.0 | 12.5 |
| 13 | Tenibac-Cabinet | 350.0 | 20.0 | - | 370.0 | 1.6 |
| 14 | Porthill-Bonner | - | 210.0 | - | 210.0 | 0.9 |
| 15 | Round Butte-Lonepine | 240.0 | - | - | 240.0 | 1.1 |
| 16 | Post-Flathead | 190.0 | - | - | 190.0 | 0.8 |
| 17 | Judith-Ekah | 330.0 | - | - | 330.0 | 1.4 |
| 18 | Marble-Springdale | - | - | 150.0 | 150.0 | 0.7 |
| 19 | Naff-Thatuna | - | 20.0 | 115.0 | 135.0 | 0.6 |
| 20 | Athena-Lance | - | - | 160.0 | 160.0 | 0.7 |
| 21 | Nez Perce-Larkin | - | 115.0 | 90.0 | 205.0 | 0.9 |
| 22 | Dominantly Hapludalfs | - | 210.0 | - | 210.0 | 0.9 |
| 23 | Cheadle-Marcetta | 450.0 | - | - | 450.0 | 2.0 |
| 24 | Maginnis-Cabba | 140.0 | - | - | 140.0 | 0.6 |
| 25 | Dominantly Cryoboralfs | 2,140.0 | 60.0 | - | 2,200.0 | 9.[illegible] |
| 26 | Dominantly Cryoboralfs | 5,846.6 | 3,365.0 | 862.8 | 10,074.4 | 44.[illegible] |
| 27 | Dominantly Cryoboralfs | 1,100.0 | - | - | 1,100.0 | 4.8 |
| 28 | Dominantly Cryoboralfs | 440.0 | - | - | 440.0 | 1.9 |
| 29 | Dominantly Cryoboralfs | 220.0 | - | - | 220.0 | 1.0 |
| | Total Land Area | 15,921.6 | 4,665.0 | 2,232.8 | 22,819.4 | 100.0 |

Source: National Cooperative Soil Survey.

## Interpretation and Evaluation

Table 47 relates the land capability classes to the Land Capability Map, figure 3. The Land Capability Map is highly generalized and a specific capability class on table 47 may not be shown. To determine the land capability of any particular area, refer to the soil association symbols listed in the second column of the table and then locate the area of that symbol on the Soil Association Map, figure 7. Table 47 also shows the acreage and extent of the dominant land capability class for practical segments of the landscape.

Table 47 - Summary and Distribution of Land Capability Classes, Subregion 1, 1966

| Land Capability Classes | Distribution by Soil Associations 1/ Soil Association Map Symbols 2/ | 1,000 Acres | Percent | Inventoried 1,000 Acres 3/ |
|---|---|---|---|---|
| Class I - Soils in Class I have no limitations or hazards. They are adopted to all uses with a minimum of conservation treatment other than standard conditioning ones. 4/ | - | - | - | 1.0 |
| Class II - Soils in Class II have few limitations or hazards. Simple conservation practices are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 2 | 90.0 | 0.4 | 415.1 |
| Class III - Soils in Class III have more limitations and hazards than those in Class II. They require more difficult or complex conservation practices when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 8-9-13-14 17-19-20-21 | 2,110.0 | 9.2 | 1,135.6 |
| Class IV - Soils in Class IV have greater limitations and hazards than Class III. Still more difficult or complex measures are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 1-3-5-6-7 11-15-16 | 2,260.0 | 9.9 | 3,003.0 |
| Class V - Soils in Class V have more limitations than Class IV. They are generally unsuited for cultivation, but are well suited for grazing and forestry use. They require good management practices. 4/ | - | - | - | 144.0 |
| Class VI - Soils in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland or wildlife. | 10-12-22 23-26-27 | 15,199.4 | 66.6 | 15,367.3 |
| Class VII - Soils in Class VII have very severe limitations and hazards that make them generally unsuited for cultivation. They are suited to grazing, noncommercial, woodland or wildlife. | 4-18-24 28-29 | 960.0 | 4.2 | 1,567.0 |
| Class VIII - Soils and land forms in Class VIII have limitations and hazards that prevent their use for cultivated crops, pasture, range or woodland. They may be used for recreation, wildlife or water supply. | 25 | 2,200.0 | 9.7 | 1,186.4 |
| Total Land | - | 22,819.4 | 100.0 | 22,819.4 |

1/ Class I and 10 percent of other capability classes may be included in areas of Class II. Up to 25 percent of other capability classes may be included in Classes III and IV. Class V and up to 40 percent of other capability classes may be included in Classes VI, VII, and VIII. In areas of rainfall less than 12 inches, large areas of Class VI can be potential Classes I through IV where irrigation water is available.
2/ Refer to the Subregional Soil Association Map, figure 7.
3/ Taken from table 8.
4/ Capability Classes I and V are distributed in small segregated areas over segments of the landscape. Many small areas could not be delineated on the map. This added detail, although still generalized, is commensurate with the subregional level of generalization.
Source: National Cooperative Soil Survey and U.S.D.A. Conservation Needs Inventory adjusted.

Classified on table 48 is the dominant water storage capacity for each soil association in Subregion 1. Each class on the table relates to a similar class on the regional map on Water Storage Capacity, figure 4. To locate those areas having contrasting water storage capacity in the upper 5 feet of soil, refer to figure 4, to figure 7 (the subregional Soil Association Map), and to the following table. The class letter symbol in the first column and the Soil Association Map numerical symbol listed in the second column may be used to locate those areas having contrasting water storage capacity. Complete utilization of this storage can contribute a more stable and sustained streamflow.

Table 48 - Water Storage Capacity of Soils Generalized to the Soil Associations, Subregion 1, 1966

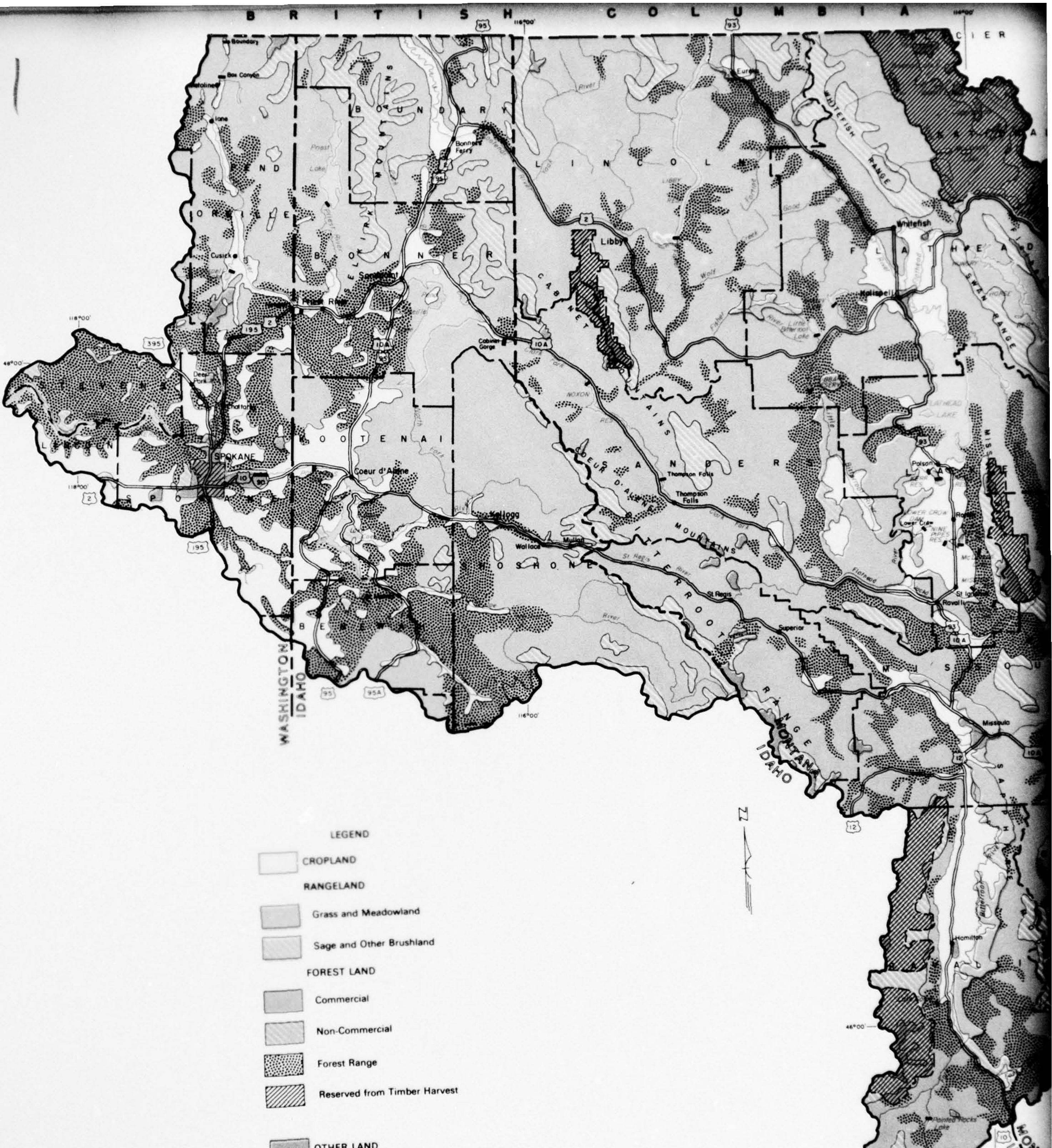
| Classes of Water Storage Capacity1/ | Soil Association Symbols | 1,000 Acres | Percent |
|---|---|---|---|
| Class A - Water storage in the soil profile more than 20,000 acre-feet per township. | 2-19-20 | 385.0 | 1.7 |
| Class B - Water storage in the soil profile 10,000 to 20,000 acre-feet per township. | 11-13-14 15-16-17 21-22 | 2,180.0 | 9.5 |
| Class C - Water storage in the soil profile 5,000 to 10,000 acre-feet per township. | 1-5-6-7-8 9-10-12-26 27-28 | 16,994.4 | 74.5 |
| Class D - Water storage in the soil profile less than 5,000 acre-feet per township. | 3-4-18-23 24-25-29 | 3,260.0 | 14.3 |
| Total | | 22,819.4 | 100.0 |

1/ Measurement of the water storage capacity is limited to the upper 5 feet of soil or to bedrock.
Source: National Cooperative Soil Survey.

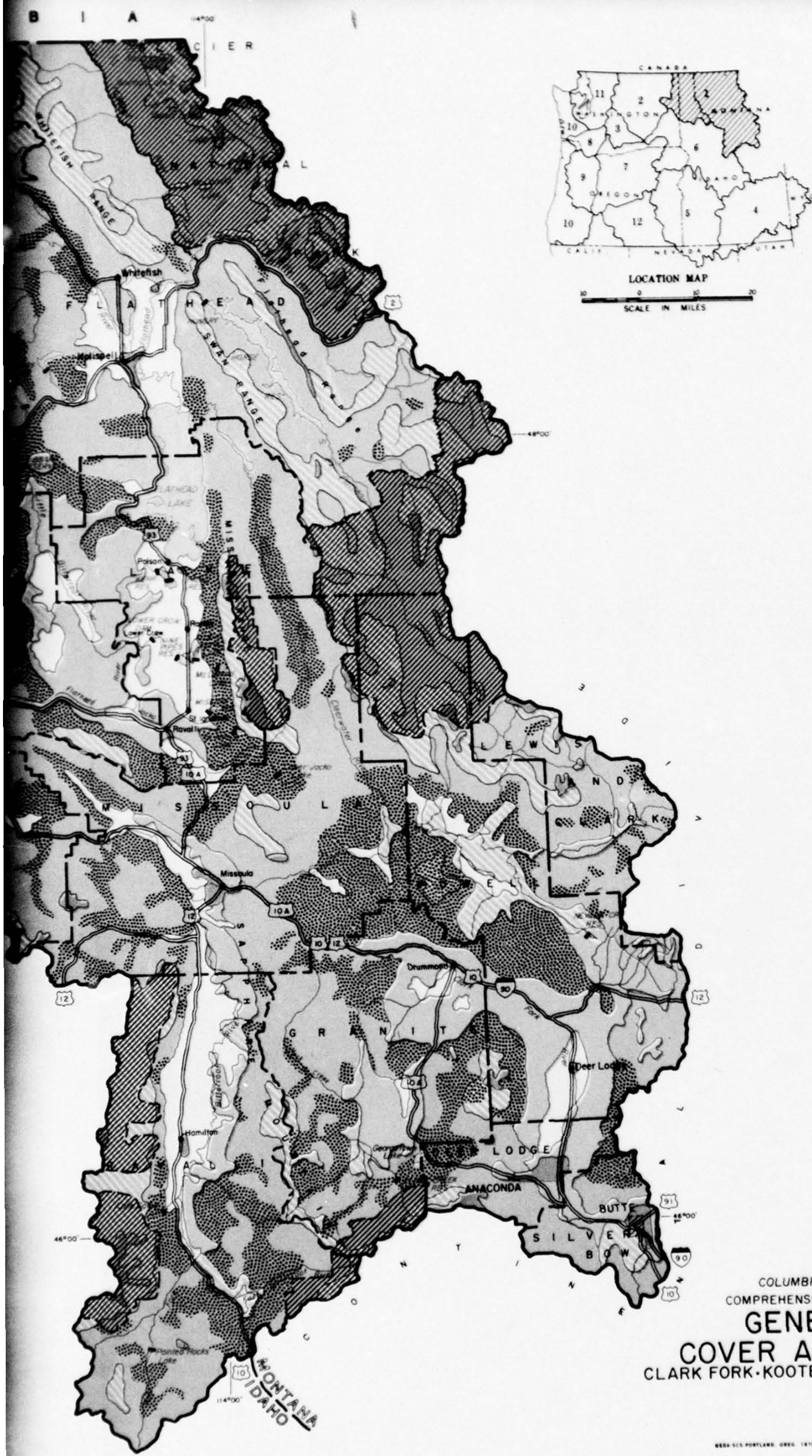
## Cover and Land Use

The four major cover and land uses, as defined in the glossary and explained in the introduction have been summarized by acreage and ownership on tables 49 through 52. These broad categories have been determined both on the basis of cover and use. Cropland is more specifically a use category. Forest land has more than 10 percent forest cover. Rangeland areas have broad range cover characteristics. Other land includes land specifically based on use such as urban, as well as that based specifically on cover characteristics such as rock and sand dune areas. The four major categories have been generalized for presentation on figure 8. Since this information has been generalized, isolated areas of different cover and uses may occur within the broad patterns.

(Narrative continued on page 75)



BRITISH COLUMBIA
116°00'
114°00'
BOUNDARY
LINCOLN
FLATHEAD
WHITEFISH RANGE
Eureka
Bonners Ferry
Libby
Whitefish
Kalispell
Cusick
Ione
Box Canyon
Sandpoint
Priest River
CABINET
PEND OREILLE
BONNER
STEVENS
SPOKANE
KOOTENAI
Coeur d'Alene
Deer Park
Cabinet Gorge
SANDERS
Thompson Falls
Polson
FLATHEAD LAKE
Kellogg
Wallace
Mullan
SHOSHONE
COEUR D'ALENE MOUNTAINS
BITTERROOT RANGE
St Regis
Superior
BENEWAH
Missoula
Hamilton
Painted Rocks Lake
118°00'
48°00'
46°00'
WASHINGTON
IDAHO
MONTANA
IDAHO
N
LEGEND
CROPLAND
RANGELAND
Grass and Meadowland
Sage and Other Brushland
FOREST LAND
Commercial
Non-Commercial
Forest Range
Reserved from Timber Harvest
OTHER LAND




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# GENERALIZED COVER AND LAND USE

CLARK FORK·KOOTENAI·SPOKANE, SUBREGION I

1968

FIGURE 8

Table 49 - Cover and Land Use by Ownership, Subregion 1, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 10,794.7 | 261.6 | 434.7 | 11,491.0 |
| Other Agriculture | - | - | - | - | - |
| | - | 10,794.7 | 261.6 | 434.7 | 11,491.0 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 254.3 | 26.5 | 11.2 | 292.0 |
| Bureau of Indian Affairs 1/ | 68.6 | 586.9 | 133.1 | 33.6 | 822.2 |
| National Park Service | - | 552.2 | 19.0 | 84.5 | 655.7 |
| Fish & Wildlife Service | 1.6 | 5.0 | 14.1 | 2.0 | 22.7 |
| Bureau of Reclamation | - | - | .2 | .2 | .4 |
| Other Interior | - | - | - | 1.1 | 1.1 |
| | 70.2 | 1,398.4 | 192.9 | 132.6 | 1,794.1 |
| Department of Defense | - | - | 2.0 | 8.4 | 10.4 |
| Other Federal | - | - | - | 3.1 | 3.1 |
| Federal Subtotal | 70.2 | 12,193.1 | 456.5 | 578.8 | 13,298.6 |
| State | 9.5 | 914.7 | 149.7 | 65.0 | 1,138.9 |
| County | - | 5.0 | - | 18.7 | 23.7 |
| Municipal | - | 5.0 | - | 22.0 | 27.0 |
| Public Total | 79.7 | 13,117.8 | 606.2 | 684.5 | 14,488.2 |
| Private Total | 1,472.4 | 5,124.3 | 1,091.9 | 642.6 | 8,331.2 |
| Total Land Area | 1,552.1 | 18,242.1 | 1,698.1 | 1,327.1 | 22,819.4 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 50 - Cover and Land Use by Ownership, State of Idaho, Subregion 1, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 2,086.6 | 21.0 | 138.7 | 2,246.3 |
| Other Agriculture | - | - | - | - | - |
| | - | 2,086.6 | 21.0 | 138.7 | 2,246.3 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 99.0 | 26.0 | 11.2 | 136.2 |
| Bureau of Indian Affairs 1/ | 35.3 | 23.4 | 9.8 | 4.0 | 72.5 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | 1.6 | - | .5 | .2 | 2.3 |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | - | - | .1 | .1 |
| | 36.9 | 122.4 | 36.3 | 15.5 | 211.1 |
| Department of Defense | - | - | - | 4.5 | 4.5 |
| Other Federal | - | - | - | 2.7 | 2.7 |
| Federal Subtotal | 36.9 | 2,209.0 | 57.3 | 161.4 | 2,464.6 |
| State | .4 | 371.0 | - | 2.3 | 373.7 |
| County | - | - | - | 14.5 | 14.5 |
| Municipal | - | 4.0 | - | 3.2 | 7.2 |
| Public Total | 37.3 | 2,584.0 | 57.3 | 181.4 | 2,860.0 |
| Private Total | 255.0 | 1,515.0 | 19.0 | 16.0 | 1,805.0 |
| Total Land Area | 292.3 | 4,099.0 | 76.3 | 197.4 | 4,665.0 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 51 - Cover and Land Use by Ownership, State of Montana, Subregion 1, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 8,206.0 | 234.9 | 296.0 | 8,736.9 |
| Other Agriculture | - | - | - | - | - |
| | - | 8,206.0 | 234.9 | 296.0 | 8,736.9 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 152.3 | - | - | 152.3 |
| Bureau of Indian Affairs 1/ | 31.1 | 460.3 | 103.8 | 23.6 | 618.8 |
| National Park Service | - | 552.2 | 19.0 | 84.5 | 655.7 |
| Fish & Wildlife Service | - | 5.0 | 13.6 | 1.8 | 20.4 |
| Bureau of Reclamation | - | - | .2 | .2 | .4 |
| Other Interior | - | - | - | .1 | .1 |
| | 31.1 | 1,169.8 | 136.6 | 110.2 | 1,447.7 |
| Department of Defense | - | - | - | .1 | .1 |
| Other Federal | - | - | - | .3 | .3 |
| Federal Subtotal | 31.1 | 9,375.8 | 371.5 | 406.6 | 10,185.0 |
| State | 6.2 | 453.4 | 142.7 | 43.7 | 646.0 |
| County | - | 1.0 | - | 1.4 | 2.4 |
| Municipal | - | 1.0 | - | 6.1 | 7.1 |
| Public Total | 37.3 | 9,831.2 | 514.2 | 457.8 | 10,840.5 |
| Private Total | 806.1 | 2,876.8 | 856.2 | 542.0 | 5,081.1 |
| Total Land Area | 843.4 | 12,708.0 | 1,370.4 | 999.8 | 15,921.6 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

Table 52 - Cover and Land Use by Ownership, State of Washington, Subregion 1, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 502.1 | 5.7 | - | 507.8 |
| Other Agriculture | - | - | - | - | - |
| | - | 502.1 | 5.7 | - | 507.8 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 3.0 | .5 | - | 3.5 |
| Bureau of Indian Affairs 1/ | 2.2 | 103.2 | 19.5 | 6.0 | 130.9 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | - | - | .9 | .9 |
| | 2.2 | 106.2 | 20.0 | 6.9 | 135.3 |
| Department of Defense | - | - | 2.0 | 3.8 | 5.8 |
| Other Federal | - | - | - | .1 | .1 |
| Federal Subtotal | 2.2 | 608.3 | 27.7 | 10.8 | 649.0 |
| State | 2.9 | 90.3 | 7.0 | 19.0 | 119.2 |
| County | - | 4.0 | - | 2.8 | 6.8 |
| Municipal | - | - | - | 12.7 | 12.7 |
| Public Total | 5.1 | 702.6 | 34.7 | 45.3 | 787.7 |
| Private Total | 411.3 | 732.5 | 216.7 | 84.6 | 1,445.1 |
| Total Land Area | 416.4 | 1,435.1 | 251.4 | 129.9 | 2,232.8 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, Forest Survey, and other sources.

## Cropland

Cropland in Subregion 1 may be broken into three relatively extensive areas:

1. The Palouse Hills that produce mostly grain with some hay and pasture crops. Erosion on slopes above 7 percent and restricted permeability are major soil problems.

2. Bottomlands and terraces along major drainage ways produce mostly hay and pasture crops with some grain and adapted specialty crops. Soil problems relate mostly to gravelly or clayey soil profiles and in spots wetness is a serious problem.

3. The higher terraces and old lake basins adjacent to Flathead Lake and along the Upper Clark Fork River have cropland areas that produce irrigated hay and pasture, potatoes, and orchards in select areas, and dryland hay, pasture, and grain crops throughout the cropland area. Soil problems relate to the moderate and strong slopes in many areas, the sandy-gravelly soils formed in glacial material, and the restricted permeability and clayey textures typical of many soils formed in old lake-laid sediments.

Other cropland areas occur in isolated places where the soil, slope, climate, and water supply present a combination of the land resource factors compatible with more intensive use. Table 53 lists the acreage by states for each of the major categories of crops grown in the subregion.

Table 53 - Cropland, Acreage of Representative Categories of Crops by States, Subregion 1, 1966

| Categories of Crops | Montana | Idaho | Washington | Total | Percent |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Dryland Cropland 1/ | | | | | |
| Forage Crops | 279.4 | 103.7 | 122.2 | 505.3 | 32.6 |
| Close grown field crops | 144.4 | 147.9 | 264.9 | 557.2 | 35.9 |
| Orchards and vineyards | 1.9 | 17.2 | 5.2 | 24.3 | 1.6 |
| Total dryland crops | 425.7 | 268.8 | 392.3 | 1,086.8 | 70.1 |
| Irrigated Cropland 1/ | | | | | |
| Forage crops | 370.6 | 23.1 | 19.0 | 412.7 | 26.6 |
| Close grown field crops | 39.5 | .4 | 4.0 | 43.9 | 2.8 |
| Row crops | 6.8 | - | - | 6.8 | .4 |
| Orchards and vineyards | .8 | - | 1.1 | 1.9 | .1 |
| Total irrigated crops | 417.7 | 23.5 | 24.1 | 465.3 | 29.9 |
| Total cropland | 843.4 | 292.3 | 416.4 | 1,552.1 | 100.0 |

1/ Does not include other land that is irrigated. (Table 62)
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

## Forest Land

Forests cover 18,242,100 acres, or 80 percent of the total land area of Subregion 1. Within the boundaries of this subregion, 80 percent of Montana, 88 percent of Idaho, and 64 percent of Washington are forested. These forests cover all but the high alpine and barren zones and the lower slopes and bottoms of larger valleys scattered throughout the area. Tables 54 through 57 show the forest land acreage by generalized type and ownership.

Seventy-two percent or over 13 million acres of the forest land are publicly owned. Of this public land, 82 percent is National Forest, 11 percent is administered by agencies of the Department of the Interior, and 7 percent is State owned. The remaining 5 million acres, or 28 percent of the forest land, are in private ownership.

Timber More than 15.5 million of the forest acres are classed as commercial forest land. Over 98 percent of the commercial stands are of the softwood variety. Douglas-fir and lodgepole pine predominate with western larch and ponderosa pine next in quantity inventoried. Other species include the true firs and spruce, white pine, and western hemlock. The remaining 2.5 million acres are noncommercial forest (three-fourths million acres of this being nonproductive) with an additional 1.5 million acres on lands reserved from cutting.

Sixty percent of the commercial forest land is in the sawtimber class. Some 26 percent is classed as pole timber and 10 percent saplings and seedlings; 4 percent is nonstocked. There are about 900,000 acres of commercial forest land withdrawn from cutting in classified and other designated areas. The balance supports over 115 billion board feet of commercial timber which is available to the forest products industry, furnishing 47 percent of the total manufacturing employment in the subregion.

Forest Range Included in the forest range are 5.2 million acres classified as commercial forest land and 231,000 acres classified as noncommercial forest. This 5.4 million acres represents 30 percent of the total forest land in the subregion.

About 48 percent of the forest range is under jurisdiction of the Forest Service, and 33 percent is in private ownership. Another 11 percent is managed by the Bureau of Indian Affairs. The remaining 8 percent is under other Federal agency control or is owned by state and county government.

An estimated 51 percent is in good condition, 24 percent in fair condition, and 25 percent in poor condition. The estimated carrying capacity of the forest range is 346,000 AUMs,with private range accounting for 37 percent and public range 63 percent.

Table 54 - Forest Land Acreage by Generalized Type and Ownership, Subregion 1, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Un-productive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 9,104.1 | 490.1 | 614.7 | 585.8 | 10,794.7 |
| Bureau of Land Management | 252.0 | - | - | 2.3 | 254.3 |
| Bureau of Indian Affairs 1/ | 494.2 | - | - | 92.7 | 586.9 |
| National Park Service | - | 398.9 | 153.3 | - | 552.2 |
| Fish & Wildlife Service | 3.0 | - | - | 2.0 | 5.0 |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 9,853.3 | 889.0 | 768.0 | 682.8 | 12,193.1 |
| State | 851.3 | 27.0 | - | 36.4 | 914.7 |
| County | 5.0 | - | - | - | 5.0 |
| Municipal | 5.0 | - | - | - | 5.0 |
| Public Total | 10,714.6 | 916.0 | 768.0 | 719.0 | 13,117.8 |
| Private Total | 5,044.5 | - | - | 79.8 | 5,124.3 |
| Grand Total | 15,759.1 | 916.0 | 768.0 | 799.0 | 18,242.1 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Pacific Northwest and Intermountain Experiment Stations.

Table 55 - Forest Land Acreage by Generalized Type and Ownership, State of Idaho, Subregion 1, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Un-Productive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 1,952.0 | - | - | 134.6 | 2,086.6 |
| Bureau of Land Management | 99.0 | - | - | - | 99.0 |
| Bureau of Indian Affairs 1/ | 16.0 | - | - | 7.4 | 23.4 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 2,067.0 | - | - | 142.0 | 2,209.0 |
| State | 349.0 | - | - | 22.0 | 371.0 |
| County | - | - | - | - | - |
| Municipal | 4.0 | - | - | - | 4.0 |
| Public Total | 2,420.0 | - | - | 164.0 | 2,584.0 |
| Private Total | 1,515.0 | - | - | - | 1,515.0 |
| Grand Total | 3,935.0 | - | - | 164.0 | 4,099.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 56 - Forest Land Acreage by Generalized Type and Ownership, State of Montana, Subregion 1, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Un-productive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Forest Service | 6,680.0 | 490.1 | 614.7 | 421.2 | 8,206.0 |
| Bureau of Land Management | 150.0 | - | - | 2.3 | 152.3 |
| Bureau of Indian Affairs1/ | 379.0 | - | - | 81.3 | 460.3 |
| National Park Service | - | 398.9 | 153.3 | - | 552.2 |
| Fish & Wildlife Service | 3.0 | - | - | 2.0 | 5.0 |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 7,212.0 | 889.0 | 768.0 | 506.8 | 9,375.8 |
| State | 439.0 | - | - | 14.4 | 453.4 |
| County | 1.0 | - | - | - | 1.0 |
| Municipal | 1.0 | - | - | - | 1.0 |
| Public Total | 7,653.0 | 889.0 | 768.0 | 521.2 | 9,831.2 |
| Private Total | 2,800.0 | - | - | 76.8 | 2,876.8 |
| Grand Total | 10,453.0 | 889.0 | 768.0 | 598.0 | 12,708.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 57 - Forest Land Acreage by Generalized Type and Ownership, State of Washington, Subregion 1, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive-Reserved | Noncommercial Forest Land: Unproductive-Reserved | Noncommercial Forest Land: Un-productive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Forest Service | 472.1 | - | - | 30.0 | 502.1 |
| Bureau of Land Management | 3.0 | - | - | - | 3.0 |
| Bureau of Indian Affairs1/ | 99.2 | - | - | 4.0 | 103.2 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 574.3 | - | - | 34.0 | 608.3 |
| State | 63.3 | 27.0 | - | - | 90.3 |
| County | 4.0 | - | - | - | 4.0 |
| Municipal | - | - | - | - | - |
| Public Total | 641.6 | 27.0 | - | 34.0 | 702.6 |
| Private Total | 729.5 | - | - | 3.0 | 732.5 |
| Grand Total | 1,371.1 | 27.0 | - | 37.0 | 1,435.1 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Pacific Northwest Experiment Station.

Much of the forest range that is in good condition is in an isolated location where access is discouraged because of dense timber, steep or rocky slopes, or streams. Much of the poor condition range is at lower elevations where sheep, cattle, and horses graze during the spring, summer, and fall, and deer and elk concentrate during the winter. The grasses and forbs are depleted and much bare soil is exposed and eroding.

Approximately 95 percent of the forest range has been identified as commercial forest land. So much of the ponderosa pine and noncommercial forest types grow naturally in open stands that considerable forage is produced. Forage is also produced in these and other forest types for a number of years following severe forest fires, insect epidemic, or heavy logging. There is considerable grazing on temporary brush and herbaceous types established as a result of large forest fires in past years. As forest reproduction becomes more dense much of this range becomes unusable. The forested range is accessible to big game, and most of it is used by them during all or part of the year. While all range types are used to some extent by big game, the forest range carries by far the largest portion of this use.

Other Uses In addition to the timber resource, forest land provides 94 percent of the subregion's runoff. The value of the quantity and quality of this water is reflected in the estimated 160,000 people, or 44 percent of the urban population, dependent on surface water flows for domestic use.

There were over 7.1 million recreation visits to these forest lands in 1964. Hunting, fishing, and other outdoor activities center in and around these wooded lands. In addition to the general outdoor environment, developed campgrounds and winter sports areas are available to the visitor.

## Rangeland

Rangeland in Subregion 1 comprises about 1.7 million acres of typical open, grazing land, which accounts for about 7 percent of the subregional land area. Subregion 1 has 3 percent of all rangeland in the region. Tables 58 through 61 show the various categories of rangeland by ownership.

Rangeland is situated primarily among the foothills of the major Montana agricultural valleys, the Bitterroot, Flathead, and Little Bitterroot, and in higher mountain valleys. Small stringers of open grazing land extend up many of the smaller valleys, and numerous relatively small mountain parks and meadows are scattered throughout the forested higher mountain areas.

Table 58 - Rangeland and Forest Range Acreage by Range Type and Ownership, Subregion 1, 1966

| Category | Federal | | | | | Non-Federal | | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | |
| | | | | (1,000 acres) | | | | |
| **Rangeland** | | | | | | | | |
| Grasslands | .5 | 214.4 | 98.7 | 14.5 | 328.1 | 114.6 | 771.6 | 1,214.3 |
| Sagebrush | - | 16.0 | 26.6 | 5.8 | 48.4 | 14.4 | 86.5 | 149.3 |
| Brushland other than sage | 26.0 | 31.2 | 7.8 | 15.0 | 80.0 | 20.7 | 233.8 | 334.5 |
| Total | 26.5 | 261.6 | 133.1 | 35.3 | 456.5 | 149.7 | 1,091.9 | 1,698.1 |
| **Forest Range**1/ | | | | | | | | |
| Commercial Forest | 180.1 | 2,510.6 | 493.0 | 3.0 | 3,186.7 | 209.0 | 1,787.7 | 5,183.4 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 63.5 | 91.4 | 26.9 | 181.8 | 2.8 | 15.3 | 199.9 |
| Desert Fringe | 2.3 | 3.4 | - | 25.6 | 31.3 | - | - | 31.3 |
| Total (noncommercial) | 2.3 | 66.9 | 91.4 | 52.5 | 213.1 | 2.8 | 15.3 | 231.2 |
| Total (forest range) | 182.4 | 2,577.5 | 584.4 | 55.5 | 3,399.8 | 211.8 | 1,803.0 | 5,414.6 |
| *Grand Total* | 208.9 | 2,839.1 | 717.5 | 90.8 | 3,856.3 | 361.5 | 2,894.9 | 7,112.7 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on table 54.
**Source:** U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 59 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Idaho, Subregion 1, 1966

| Category | Federal | | | | | Non-Federal | | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | |
| | | | | (1,000 acres) | | | | |
| **Rangeland** | | | | | | | | |
| Grasslands | - | 15.0 | 9.8 | .5 | 25.3 | - | 10.7 | 36.0 |
| Sagebrush | - | - | - | - | - | - | - | - |
| Brushland *other than sage* | 26.0 | 6.0 | - | - | 32.0 | - | 8.3 | 40.3 |
| Total | 26.0 | 21.0 | 9.8 | .5 | 57.3 | - | 19.0 | 76.3 |
| **Forest Range**1/ | | | | | | | | |
| Commercial Forest | 27.1 | 96.7 | 15.0 | - | 138.8 | 54.0 | 820.0 | 1,012.8 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 3.5 | 6.1 | - | 9.6 | 2.8 | - | 12.4 |
| Desert Fringe | - | - | - | - | - | - | - | - |
| Total (noncommercial) | - | 3.5 | 6.1 | - | 9.6 | 2.8 | - | 12.4 |
| Total (forest range) | 27.1 | 100.2 | 21.1 | - | 148.4 | 56.8 | 820.0 | 1,025.2 |
| Grand Total | 53.1 | 121.2 | 30.9 | .5 | 205.7 | 56.8 | 839.0 | 1,101.5 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on table 54.
**Source:** U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 60 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Montana, Subregion 1, 1966

| Category | Federal | | | | | Non-Federal | | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | - | 193.7 | 80.4 | 12.0 | 286.1 | 111.6 | 674.1 | 1,071.8 |
| Sagebrush | - | 16.0 | 15.6 | 5.8 | 37.4 | 14.4 | 86.5 | 138.3 |
| Brushland other than sage | - | 25.2 | 7.8 | 15.0 | 48.0 | 16.7 | 95.6 | 160.3 |
| Total | - | 234.9 | 103.8 | 32.8 | 371.5 | 142.7 | 856.2 | 1,370.4 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | 150.0 | 2,362.4 | 379.0 | 3.0 | 2,894.4 | 150.0 | 714.3 | 3,758.7 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 58.9 | 81.3 | 26.9 | 167.1 | - | 2.0 | 169.1 |
| Desert Fringe | 2.3 | 3.4 | - | 25.6 | 31.3 | - | - | 31.3 |
| Total (noncommercial) | 2.3 | 62.3 | 81.3 | 52.5 | 198.4 | - | 2.0 | 200.4 |
| Total (forest range) | 152.3 | 2,424.7 | 460.3 | 55.5 | 3,092.8 | 150.0 | 716.3 | 3,959.1 |
| Grand Total | 152.3 | 2,659.6 | 564.1 | 88.3 | 3,464.3 | 292.7 | 1,572.5 | 5,329.5 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on table 54.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 61 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Washington, Subregion 1, 1966

| Category | Federal | | | | | Non-Federal | | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | .5 | 5.7 | 8.5 | 2.0 | 16.7 | 3.0 | 86.8 | 106.5 |
| Sagebrush | - | - | 11.0 | - | 11.0 | - | - | 11.0 |
| Brushland other than sage | - | - | - | - | - | 4.0 | 129.9 | 133.9 |
| Total | .5 | 5.7 | 19.5 | 2.0 | 27.7 | 7.0 | 216.7 | 251.4 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | 3.0 | 51.5 | 99.0 | - | 153.5 | 5.0 | 253.4 | 411.9 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 1.1 | 4.0 | - | 5.1 | - | 13.3 | 18.4 |
| Desert Fringe | - | - | - | - | - | - | - | - |
| Total (noncommercial) | - | 1.1 | 4.0 | - | 5.1 | - | 13.3 | 18.4 |
| Total (forest range) | 3.0 | 52.6 | 103.0 | - | 158.6 | 5.0 | 266.7 | 430.3 |
| Grand Total | 3.5 | 58.3 | 122.5 | 2.0 | 186.3 | 12.0 | 483.4 | 681.7 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is also included within the total forest statistics shown on table 54.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

About 35 percent of the range is in poor range condition due to overgrazing and misuse, 39 percent is in fair condition, and only 26 percent is in good condition. The estimated carrying capacity is 266,000 AUMs with private range accounting for 77 percent and public range 23 percent.

Privately owned range covers 1.1 million acres and represents 65 percent of the total range in this subregion. Another 27 percent is under Federal Government jurisdiction, principally managed by the Forest Service and the Bureau of Indian Affairs. The remaining 8 percent is in state and county ownership.

Grasslands containing perennial grasses and forb types account for 72 percent of the range. About 32 percent is in good condition, another 37 percent is in fair condition, and the remaining 31 percent is in poor condition. The perennial grass type predominates in the major valleys and is scattered elsewhere throughout the area in mountain parks and openings on south and west exposures. Under natural conditions, bunchgrasses, such as bluebunch wheatgrass and the fescues, are the most important grasses. Perennial forbs such as balsamroot, lupine, and yarrow are also common. On many parts of the range many less desirable species have invaded or increased at the expense of the native species. Generally the poor condition range is found on the more accessible areas at lower elevations and on the steep or rocky south and west-facing slopes. Best conditions prevail in areas difficult to use because of inaccessibility or lack of stock water.

Sagebrush covers 9 percent of the rangeland. This type is in the poorest condition, with only about 1 percent in good range condition, 41 percent in fair condition, and 58 percent in poor condition. This type generally lies at lower elevations where it is readily accessible to grazing throughout the year, and overgrazing is common. Precipitation is inadequate and competition between grass and sagebrush is intense. In many areas, the perennial grass which used to be relatively abundant has been replaced by sagebrush, cheatgrass, and other low value plants.

Brushland other than sage accounts for the remaining 20 percent of the range. This includes all untimbered lands where mountain shrubs represent predominant vegetation. They generally occupy the transitional area on lower mountain slopes and foothills and scattered pockets throughout the timbered areas. It is estimated that 37 percent of this range is in poor condition, 48 percent in fair condition, and 15 percent in good condition.

## Other Land

The other land use in Subregion 1 consists of 1,327,100 acres or about 6 percent of the land area. This includes barren land and rockland in alpine areas that make up about 68 percent of the total. About 27 percent of the total is urban, industrial areas, farmsteads, airports, roads, and other miscellaneous use areas. Almost 5 percent consists of water areas less than 40 acres in size and streams less than one-eighth mile wide. Table 62 shows the acreage and extent of other land in the subregion.

Table 62 - Other Land, Subregion 1, 1966

| Kinds of Land Use | Montana | Idaho | Washington | Total | Percent |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Barren | 737.9 | 154.1 | 19.2 | 911.2 | 68.6 |
| Roads and railroads | 92.4 | 24.5 | 26.3 | 143.2 | 10.8 |
| Small water[1/] | 51.8 | 4.1 | 4.7 | 60.6 | 4.6 |
| Miscellaneous[2/] | 117.7 | 14.7 | 79.7 | 212.1 | 16.0 |
| Total other land | 999.8 | 197.4 | 129.9 | 1,327.1 | 100.0 |

1/ Water areas less than 40 acres in size and streams less than one-eighth mile in width.
2/ Includes urban and industrial areas, farmsteads, airports, and other areas.
Source: Compiled by the Soil Conservation Service Columbia-North Pacific River Basin Staff.

## MINERAL RESOURCES

The geologic formations underlying Subregion 1 vary widely in age and character and usually determine the location of mineral resources. Metallic mineral resources are concentrated principally in the Coeur d'Alene River Basin, Idaho, and in the Upper Clark Fork Basin, Montana. In Idaho, the Coeur d'Alene, St. Joe, and St. Maries River basins are underlain mostly by Precambrian Belt rocks, a group of very old, predominently metasedimentary rocks of great thickness and areal extent. Where structural conditions are favorable, these rocks contain large deposits of metallic minerals as in the Coeur d'Alene mining area. Adjoining the Belt rocks to the north, in the Kootenai River drainage in Idaho, a granitic pluton of late Mesozoic and early Tertiary age, probably related to the Idaho batholith, underlies most of Bonner and Boundary Counties. These granitic rocks extend westward into Washington underlying part of the Pend Oreille River Basin in Pend Oreille County. Limestones and shales of Cambrian age flank the granite pluton in northern Pend Oreille County and contain large deposits of metalliferous ores. South of the granite area are basalt flows related to the Columbia River basalt of middle Tertiary age partly covered by glacial and fluvial sand and gravel in the Spokane River Basin.

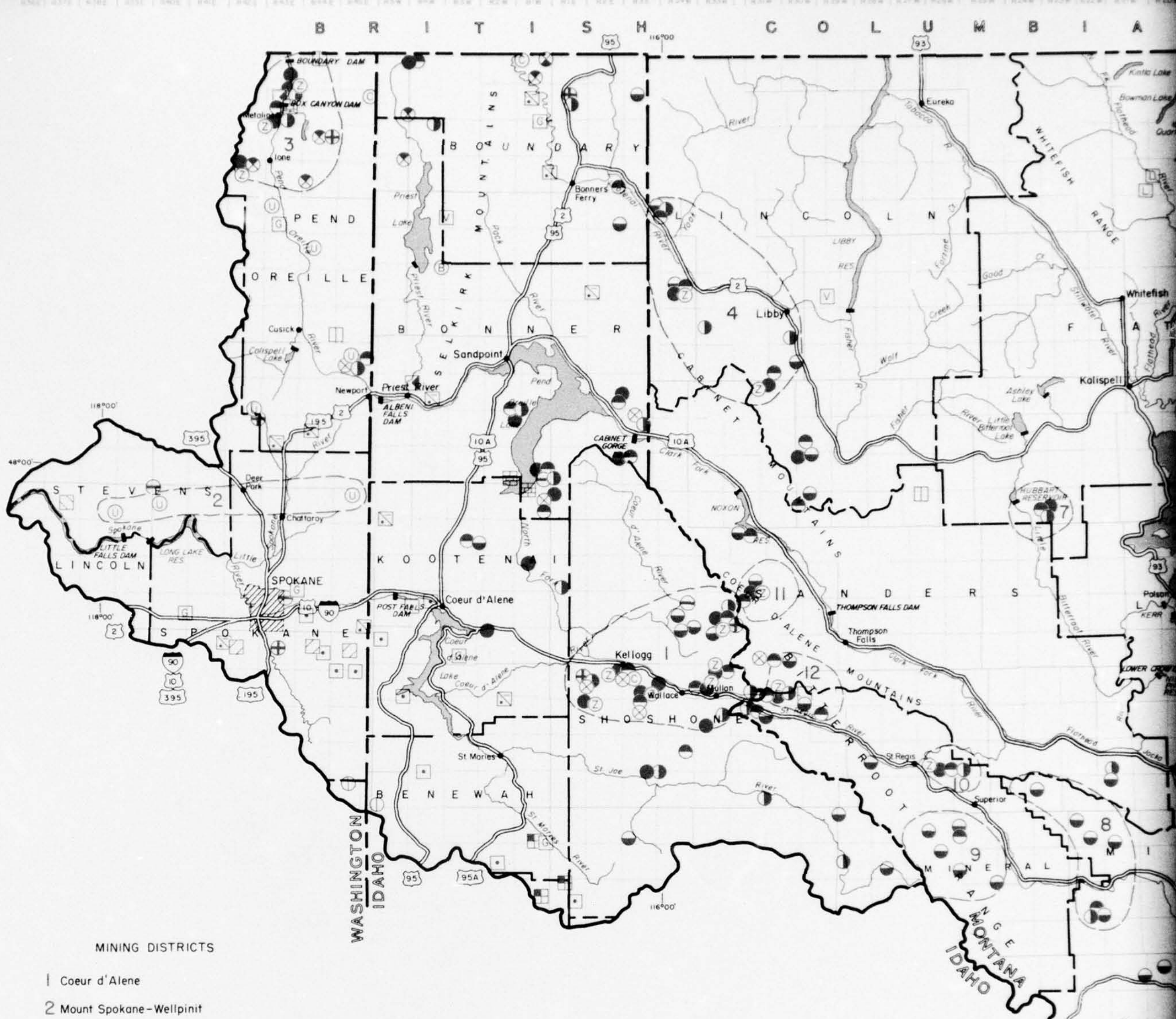
In Montana, the Upper Clark Fork drainage is underlain partly by the Boulder batholith, a granitic intrusion of late Cretaceous and early Tertiary age. It is present in the vicinity of Butte, Warm Springs, Anaconda, and Philipsburg. Metallic mineral deposits are associated with the Boulder batholith, as in the Butte and Philipsburg districts. Precambrian Belt series are the predominantly underlying formations in the rest of the Montana part of the subregion. These include the Missoula and Ravalli groups.

## Metals

As in all of the Columbia-North Pacific Region, the first prospectors and miners were seeking gold, principally from placer deposits. Many placer deposits were discovered and early mining developed in the vicinity of these placers. Somewhat later lode deposits were found and developed for their prospective gold content and, later, (as the greater value of the silver, lead, zinc, and copper in the ores was appreciated) for their silver and base metal content.

The subregion contains two of the world's most productive mining areas, the Coeur d'Alene area in Idaho and the Butte area in Montana. Another major mining area is the Metaline District, Pend Oreille County, Washington. Great varieties of metals and nonmetals are widely distributed in the subregion. However, the largest amount of production has come from areas of greatest concentration of deposits shown as mining districts in figure 9 and described in table 63.

The world-renowned Coeur d'Alene mining area includes several early mining districts that presently are more or less grouped together under the name of Coeur d'Alene District (figure 9). This district is in the drainage basin of the South and North Fork of the Coeur d'Alene River, tributaries to the Spokane River. Gold was first mined in the district in the 1860's, mostly from placers on Prichard Creek, a tributary to the North Fork. The valuable lodes containing silver, lead, and zinc on the South Fork were not discovered or developed until after 1885. During 80 or more years of continuous output, the district has produced more than $2 billion in metals, one of a few mining districts in the world of such magnitude. This enormous output comprised over 444,300 ounces of gold, 703,300 ounces of silver, 116,000 tons of copper, 6,833,500 tons of lead, and 2,385,300 tons of zinc. Value of recovered metals is about 84 percent of the total metal production of Idaho. This district is the largest silver producer in the Nation and ranks second or third in production of lead and zinc. In addition to the major metals produced, several metals occurring in small amounts as a minor constituent of the ores have been recovered as byproducts in the smelters. The district has produced



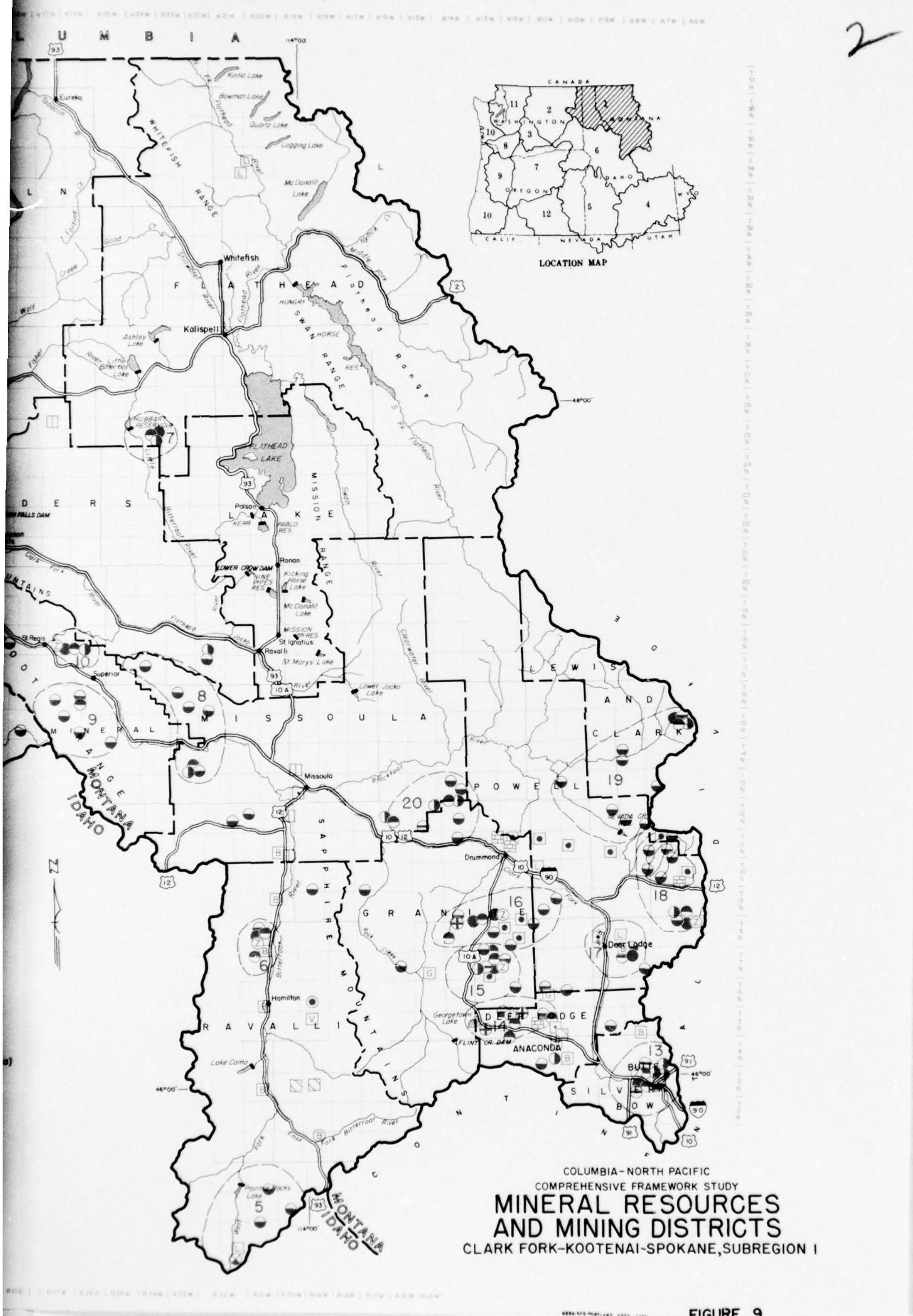

MINING DISTRICTS

1 Coeur d'Alene
2 Mount Spokane-Wellpinit
3 Metaline
4 Libby-Troy-Sylvanite
5 Hughes Cr.-Slate Cr. (Alta)
6 Curlew
7 Hog Heaven
8 Nine Mile
9 Cedar Cr.-Trout Cr.
10 Keystone (Iron Mountain-Nancy Lee)
11 White Pine-Trout Cr.
12 Packer Cr. (Last Chance)
13 Butte
14 Georgetown-Red Lion-Blue Eyed Nellie
15 Philipsburg
16 Dunkelberg-Garnet-Henderson-Boulder
17 Oro Fino
18 Emery-Elliston-Rimini
19 Ophir-Finn-Lincoln
20 Garnet-Elk Cr.-Coloma

LEGEND

| METAL | NON-METALLIC |
|---|---|
| Antimony | Barite |
| Beryllium | Bentonite |
| Cobalt | Clay-pottery, refractory (other than alumina) |
| Columbium, Tantalum | Feldspar |
| Copper | Fluorspar-Fluorite |
| Gold | Garnet |
| Iron | Gem stones |
| Lead | Kyanite |
| Manganese | Lignite |
| Molybdenum | Limestone |
| Silver | Monazite sand |
| Thorium | Oil shale |
| Titanium | Peat |
| Tungsten | Phosphate |
| Uranium | Silica (quartz) |
| Zinc | Vermiculite |

2




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# MINERAL RESOURCES AND MINING DISTRICTS

CLARK FORK-KOOTENAI-SPOKANE, SUBREGION I

FIGURE 9

Table 63 - Mining Districts, Subregion 1

| Index No. Fig. | District | County | Drainage | Size of Districts - Production Plus Potential Reserves 1/ Gold | Silver | Copper | Lead | Zinc | References |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Coeur d'Alene | Idaho Shoshone | South and North Fork Coeur d'Alene River Lode deposits Some placer gold on North Fork | 1 1/ | 1 1/ | 2 1/ | 1 1/ | 1 1/ | Ransome, F.L. & Calkins, 1908 U.S.Geol. Survey Prof. Paper 62, 203 pp. Hobbs, S.W., and others, 1965, U.S. Geol.Survey Prof. Paper 478, 139 pp. |
| 2 | Mount Spokane-Wellpinit | Washington Spokane and Stevens | Spokane River, Mount Spokane, Uranium deposits | Uranium production 4,700,000 pounds | | | | | Weissenborn, A.E. 1966. 89th Congress 2nd Session, Committee Print. Mineral and Water Resources of Wash. pp. 157-166. |
| 3 | Metaline | Pend Oreille | Lode deposits along Pend Oreille River near Metaline Falls | - | 3 | 3 | 2 | 2 | Park, C. F., Jr., and Cannon, 1943. U.S. Geol. Survey Prof. Paper 202, 81 pp. Dings, J.G. & Whitebread, D.H., 1965. U.S. Geol. Survey, Prof. Paper 489, 109 pp. |
| 4 | Libby-Troy-Sylvanite | Montana Lincoln | | 2 | 3 | 3 | 3 | 3 | Gibson, Russell, 1948, U.S. Geol. Survey Bull. 956 |
| 5 | Hughes Creek-Slate Creek (Alta) | Ravalli | Mostly placer with few lodes on Hughes and Slate Creek tributary to the Bitterroot River | 2 | - | - | - | - | Lyden, C. J., 1948. Mont. Bur. Mines & Geol. Mem. 26, 152 pp. |
| 6 | Curlew | Ravalli | Lode deposits on Big Creek tributary to Bitterroot River | - | 3 | - | 3 | 3 | Sahinen, V.M., 1957. Mont. Bur. Mines & Geol. Info. Circ. 11, 9 pp. |
| 7 | Hog Heaven | Flathead | Lode deposits near Mary Ronan Lake, tributary to Flathead River | - | 2 | - | 3 | - | Shenon, and Taylor, 1936, Mont.Bur.Mines & Geol. Mem. 17, 26 pp. |
| 8 | Nine Mile | Missoula | Gold placer deposits on Nine Mile Creek, tributary to the Clark Fork River | 1 | - | - | - | - | Lyden, C. J., 1948. Mont. Bur. Mines & Geol. Mem. 26, 152 pp. |
| 9 | Cedar Creek-Trout Creek | Mineral | Placer gold deposits on Cedar and Trout Creeks, tributary to the Clark Fork. | 1 | - | - | - | - | Lyden, C. J., 1948 Mont. Bur. Mines & Geol. Mem. 26, 152 pp. |
| 10 | Keystone (Iron Mountain-Nancy Lee) | Mineral | Lodes near Keystone Peak in big bend of the Clark Fork River. | - | 3 | 3 | 3 | 3 | Campbell, A.B., 1960. U.S. Geol. Survey Bull. 1082-1 |

Table 63 - continued

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 11 | White Pine-Trout Creek | Mineral | Lodes near Beaver and Trout Creeks, tributary to Clark Fork | 3 | 3 | - | 2 | 3 | Campbell, A.B., 1960. U.S.Geol. Survey Bull. 1082-1 |
| 12 | Packer Creek (Last Chance) | Mineral | Lodes near headwater of St. Regis River, tributary to Clark Fork | - | 3 | - | 3 | 3 | Wallace, R.E., and Hosterman, 1956. U.S. Geol. Survey Bull., 1027 M. pp. 525-612 |
| 13 | Butte | Silver Bow | Lodes and some placer in Silver Bow Creek drainage, tributary to upper Clark Fork | 1+ | 1 | 1 | 2 | 1 | Hart, L.H., 1935. The Butte District, Mont. Internat. Geol.Congress, 16th, Wash., D.C. 1933, v. 1, pp. 287, 305 |
| 14 | Georgetown-Red Lion-Blue-Eyed Nellie | Deer Lodge | Lode deposits in the Warm Springs Creek drainage | 1 | 3 | - | - | - | Emmons, W.H., and Calkins, 1913. U.S.Geol. Survey Prof. Paper 78 |
| 15 | Philipsburg | Granite | Lode and small placer in Flint Creek drainage | 1 | 1 | - | 3 | 2 | Emmons, W.H., and Calkins, 1913. U.S. Geol. Survey Prof. Paper 78 |
| 16 | Dunkelberg-Garnet-Henderson-Boulder | Granite | Lodes in the Willow Creek drainage. Gold placers on Willow and Gold Creeks | 3 | 3 | - | 3 | 3 | Emmons, W.H., and Calkins, 1913. U.S. Geol. Survey Prof. Paper 78 |
| 17 | Oro Fino | Deer Lodge | Lodes in the Peterson Creek drainage south of Deer Lodge | - | 3 | - | - | - | Pardee, J.T., and Schrader, 1933. U.S.Geol. Survey Bull. 842, 318 pp. |
| 18 | Emery-Elliston-Rimini | Powell Lewis & Clark | North of Deer Lodge in the Little Blackfoot River drainage. | 2 | 3 | - | 3 | 3 | Pardee, J.R., and Schrader, 1933. U.S. Geol. Survey Bull. 842, 318 pp. |
| 19 | Ophir-Finn-Lincoln | Powell Lewis & Clark | Lodes and gold placers in Blackfoot River drainage | 1 | - | - | - | - | Pardee, J.T., and Schrader, 1933. U.S. Geol. Survey Bull. 842, 318 pp. |
| 20 | Garnet-Elk Creek Coloma | Missoula | Gold placer and lode on Elk Creek | 1 | - | - | - | - | Pardee, J.T., 1918. U.S. Geol. Survey Bull. 660-F, pp. 159-239. |

1/ Size

| Index | Gold (Troy Ounces) | Silver (Troy Ounces) | Copper (Net Tons) | Lead (Net Tons) | Zinc (Net Tons) |
|---|---|---|---|---|---|
| 1 | 100,000 - 1,000,000 | More than 50,000,000 | More than 1,000,000 | More than 1,000,000 | More than 1,000,000 |
| 2 | 10,000 - 100,000 | 5,000,000 - 50,000,000 | 50,000 - 1,000,000 | 50,000 - 1,000,000 | 50,000 - 1,000,000 |
| 3 | 1,000 - 10,000 | 100,000 - 5,000,000 | 1,000 - 50,000 | 1,000 - 50,000 | 1,000 - 50,000 |

more than 10,000 tons of antimony, also a small amount of arsenic, cadmium, germanium, selenium, and bismuth. Small amounts of uranium and tungsten are also present in the ores.

In the Lower Spokane River drainage near Spokane, Washington, there is a deposit of tin and tungsten at Silver Hill about 5 miles south of the city. A few thousand units of tungsten have come from this deposit. Iron ore occurs near Tekoa and several thousand tons have been produced for use in cement manufacture at Spokane. North of Spokane, near Wellpinit and Mount Spokane, are uranium deposits (figure 9). Between 1954 and 1966, 4,700,000 pounds of $U_3O_8$ were produced from 1,200,000 tons of ore. The mill at Ford has been closed and there is no present production from the district; however, there is currently much exploration activity in this area.

In the Lower Clark Fork Basin in Idaho, the Lakeview-Pend Oreille-Clark Fork Districts bordering Pend Oreille Lake and near the mouth of the Clark Fork River have each produced 100,000 or more ounces of silver, 1,000 or more tons of lead together with a small amount of antimony as byproduct (figure 6).

The Metaline District, along the Pend Oreille River (Clark Fork downstream from Pend Oreille Lake), has produced about 619,000 ounces of silver, 175,000 tons of lead, and 390,000 tons of zinc. A very large reserve of low grade ore remains to be mined in this district.

In the Lower Kootenai River Basin in Idaho, the Moyie-Yaak-Porthill District contains deposits of cobalt-nickel, molybdenum, copper, gold, silver-lead, and thorium. About 1,000 pounds of molybdenum, 80 tons of copper, and a few test shipments of thorite ore have been produced. The Hall Mountain thorite deposits have significant future potential.

Upper Kootenai River Basin in Montana contains a few gold deposits that have been productive. In the Libby-Troy-Sylvanite Districts, 30,000 ounces or more of gold have come from placer and lode deposits. Reserves plus production from lode deposits also include 100,000 or more ounces of silver, 1,000 or more tons of lead, and 1,000 or more tons of zinc. Cabinet District on the headwaters of Libby Creek and Fisher River has produced silver, lead, and gold in minor amounts from placer and lode deposits.

The Clark Fork drainage from Missoula downstream to the Idaho border with its tributaries, the Flathead, St. Regis, and Bitterroot Rivers, contains several mining districts, some of which have made significant contributions to Montana's mineral output. Hughes Creek placers on Hughes Creek and the Slate Creek District near Alta on the headwaters of the South Fork of the Bitterroot River have produced 10,000 ounces or more of gold mostly from placers with a few lodes containing silver and copper. An iron deposit with substantial potential tonnage occurs on Woods Creek. Curlew District near Big Creek, a tributary to the Bitterroot, has produced 100,000 or more ounces of silver, 1,000 or more tons of lead and zinc, and a minor amount of gold and copper.

In the Flathead River drainage, the Hog Heaven District near Lake Mary Ronan has produced 5 million or more ounces of silver and more than 1,000 tons of lead from lode deposits.

On Ninemile Creek, tributary to the Clark Fork, placer deposits have produced 100,000 ounces or more of gold. Cedar Creek District on Cedar and Trout Creeks, southwest of Superior, has produced 120,000 ounces of gold, mostly from placers with a small amount of silver and lead from lode deposits. Keystone District, near Keystone Peak in the big bend of the Clark Fork, has produced more than 100,000 ounces of silver, 1,000 tons of lead and zinc respectively, and 100 or more tons of copper. Mining is currently active in the district. The White Pine-Trout Creek Districts on Beaver and Trout Creeks have produced 100,000 ounces or more of silver, 1,000 tons of zinc, and 50,000 or more tons of lead with a minor amount of gold.

Near the headwaters of the St. Regis River, the Packer Creek (Last Chance) District, has produced more than 100,000 ounces of silver, 1,000 tons of lead, and 1,000 tons of zinc.

The upper Clark Fork River Basin with its tributaries, Blackfoot and Little Blackfoot Rivers, Flint Creek, Warm Springs Creek, and Silver Bow Creek, contains the largest metallic mineral resources in Montana and one of the largest in the Nation and the world. Gold was first produced from placer deposits about 1852 and lode mining started at Philipsburg in 1864; gold lodes were developed in the Butte area in 1866. Since then, this part of the subregion has produced 82 percent of the silver (about 850 million ounces), 99 percent of the copper (about 7.9 million tons), 49 percent of the lead (460 thousand tons), and 87 percent of the zinc (2.4 million tons) mined in Montana.

Butte District (comprising several earlier named mining districts) is in the Silver Bow Creek drainage, a tributary to the headwaters of the Clark Fork. The district has produced metals valued at about $4 billion. These metals include about 2,400,000 ounces of gold, 643 million ounces of silver, 8 million tons of copper, 411,000 tons of lead, and 2,400,000 tons of zinc. Cadmium, tellurium, and other minor metal byproducts have come from the smelting of Butte ores. Manganese production was first started in the Butte District during World War I; however, largest production was from 1941 to 1959, when the Anaconda Company operated a manganese concentrator to treat the Butte manganese carbonate ores. Reserves of manganese ore are estimated at more than 5 million tons.

Georgetown-Red Lion-Blue-Eyed Nellie Districts in the Warm Springs Creek drainage produced about 460,000 ounces of gold from lode and placer deposits, 100,000 or more ounces of silver, and a small amount of copper from lode deposits.

Philipsburg District has been a major metal producer in the past and mining is still active. This district is in the Flint Creek drainage. Production has been about 260,000 ounces of gold, 50 million ounces or more of silver, 50,000 tons of zinc, and 1,000 tons of lead. The district is also the most important producer of manganese in the United States; since the start of World War I, total production has been about 1,600,000 tons of manganese ore and reserves are estimated to be about 710,000 tons. It is the most important domestic source of battery grade manganese ore.

Tungsten has been mined at several locations in the Flint Creek District; approximately 500 tons of contained tungsten have been produced.

The Willow Creek drainage, south of Drummond, contains the Dunkleburg-Garnet-Henderson-Boulder District that has produced 100,000 ounces or more of silver with a minor amount of gold, zinc, and lead. Gold has come from placers on Willow Creek and Gold Creek.

South of Deer Lodge, the Oro Fino District on Peterson Creek has produced 100,000 or more ounces of silver from lodes and a minor amount of gold from placers. North of Deer Lodge, the Emery-Elliston-Rimini District produced 100,000 or more ounces of silver, and more than 1,000 tons of lead, with some copper and gold. Gold has also come from placer deposits on Little Blackfoot River and its tributaries, such as Snowshoe Creek and Spotted Dog Creek. The Ophir-Finn-Lincoln District near the head of the Blackfoot and its tributaries has produced about 611,000 ounces of gold, virtually all from placer deposits.

On Bear Creek and Elk Creek, north of the Clark Fork near Garnet, the Garnet-Elk Creek-Coloma District has produced about 490,000 ounces of gold, mostly from placers, and more than 100,000 ounces of silver and 100 tons of lead from lode deposits.

## Nonmetals

Nonmetallic mineral production is of major importance to the economy. Mining of nonmetals is of relatively recent importance compared to mining of metals. Phosphate rock production probably contributes the greatest value to subregion economy, followed in order by sand and gravel, stone, vermiculite, and clay. Other nonmetallic, industrial minerals produced in the region are fluorspar, barite, and bentonite.

Phosphate rock deposits are mined north of Garrison in the Garnet Range from Drummond eastward to the subregion boundary. Recently, mining operations have begun on phosphate rock deposits in the Maxville District in the Flint Creek drainage. Of the approximately 10 million tons of phosphate rock produced in Montana about 60 percent has come from the subregion.

Sand and gravel deposits occur in nearly all the stream and river basins. Deposits are so widespread that only those close to a market for aggregates and building material or accessible for use as road material are being mined. The largest commercial production is in the Spokane River Valley near the city of Spokane. Commercial sand-gravel plants are in operation in the Clark Fork-Bitterroot Valley near Missoula, and in the Flathead River Valley near Kalispell.

Limestone is an important mineral product and contributes significantly to the economy of the subregion. Large limestone and dolomitic limestone deposits are found in many localities and a few are quarried for cement rock, aggregate, lime production, sugar refining, agriculture, road material, and other minor uses.

Limestone is quarried at Metaline Falls, Pend Oreille County, Washington, for cement manufacture. Production figures are not published but about 1,300,000 tons of limestone were used for cement manufacture in Washington in 1965, with 6 cement plants operating. Limestone is quarried at Brown's quarry in Deer Lodge County near Anaconda for metallurgical use. Several limestone quarries near Drummond have produced stone for sugar refining.

Other stone products include silica rock, dimension stone, and basalt rock. Silica rock is quarried near Metaline Falls for cement manufacture, at Luke quarry near Anaconda in Deer Lodge County for cement, refractories, and metallurgical use. High purity silica for electrochemical industry was mined in eastern Washington near Denison and near Mount Spokane. Currently there is no production. Granite quarries producing dimension stone are located in Spokane County, Washington, and in Flathead and Missoula Counties, Montana. Basalt is produced locally for road material in Washington and Idaho.

Clay products are important in Spokane County. The clay deposits near Mica produce high alumina clays for refractory products and common clays for brick and other clay products. Other clay deposits are widespread throughout the subregion.

Barite deposits occur near Greenough, Missoula County, and Florence and Darby, Ravalli County, Montana, and in Stevens County, Washington. Barite is used in oil well drilling.

Fluorspar deposits on Crystal Mountain, Ravalli County, Montana, near Darby, are producing fluorspar which is used in the steel industry.

Vermiculite is produced from a deposit near Libby, Lincoln County, Montana. This is the principal source of vermiculite in the United States.

The St. Maries River and its tributary, Emerald Creek in Benewah County, Idaho, contain large deposits of garnet and garnet sands. Garnet sand placers have been mined since 1940, and garnet lode deposits have been exploited by rock and gem collectors. The garnet sand is cleaned and sized for abrasive and sand blasting material. Output is not disclosed, but the principal garnet production in the Columbia-North Pacific Region comes from this deposit.

## Mineral Fuels

No mineral fuels of economic importance have been found in the subregion; however, some low-grade lignite beds are found in the Clark Fork and Flathead River drainages and a small amount of coal was produced many years ago for local consumption, but there has been no recent production. Peat beds are found in the Spokane River drainage, and some peat production has come from beds in Spokane and Stevens County, Washington. Widespread peat deposits are present in the Kootenai River drainage in Boundary County, Idaho. These deposits have not been exploited except for local use. No oil or gas fields occur in the subregion.

## Present Mineral Industry and Outlook for the Future

In the Columbia-North Pacific Region, Subregion 1 has by far the most important mineral industry and it is of major importance in the national output of copper, silver, lead, and zinc. The total value of mineral production has exceeded $5 billion and reserves are estimated to equal total past production.

### Metals

Gold Present gold production in the subregion is chiefly recovered as a byproduct from ores of copper, lead, and zinc. Gold mining in this subregion and throughout the United States is at an alltime low ebb. Total production in 1965 was about 23,000 ounces of gold, of which more than 18,000 ounces were recovered from copper ores mined in the Butte District. The low gold output is due in part to the imbalance between the price of gold at $35 an ounce and costs of production. With a change in the unfavorable economic climate for gold, output would increase substantially as there are resources of several million ounces of gold in the subregion.

Silver The Coeur d'Alene District, Idaho, has, for a number of years, been the Nation's leading silver producer. Sunshine mine has been the largest silver mine in the district, followed by the Galena mine. This district produced 17,918,000 ounces of silver valued at $23,167,000 in 1965.

Butte District, Montana, is also a major silver producer as a byproduct from the copper and lead-zinc ores. In 1965, output was 4,790,000 ounces valued at $6,194,000. Silver is also recovered as a byproduct from ores in the Philipsburg District. Granite County produced 123,700 ounces and Deer Lodge County, 48,400 ounces of silver in 1965.

A small silver output comes from the Metaline District, Washington, where the Pend Oreille mine produces silver as a by-product of lead-zinc ore. In 1965 silver production was 23,700 ounces.

The increase in silver prices in recent years and the favorable outlook for a still higher market price in the near future have stimulated the search for new ore bodies with high silver content in the Coeur d'Alene area and elsewhere in the subregion. The greatest future potential continues to be the mines of the Coeur d'Alene region; much deep exploration is being done in the district and further discoveries are expected. Favorable potential exists in the Philipsburg and other districts. Production of silver is expected to increase at least during the next 5-year period.

Lead and Zinc As with silver, the Coeur d'Alene District, Idaho, is one of the more important lead and zinc producers in the Nation. In recent years, it has ranked second in output of lead and second or third in output of zinc. For 1965, lead production was 63,500 tons valued at $18,800,000, and zinc was 56,400 tons valued at $16,500,000. The Bunker Hill mine is the largest producer, and the Lucky Friday mine is next.

Butte District, Montana, produced 4,600 tons of lead valued at $1,400,000 and 25,600 tons of zinc valued at $7,500,000 in 1965. It ranks second in the subregion in output of these two metals. A small production comes from mines in Granite and Deer Lodge counties.

The Metaline District, Washington, (Pend Oreille mine) produced 4,400 tons of lead and 13,200 tons of zinc for the year 1965.

Lead and zinc production will continue to contribute a very important share to the economy for at least the next 50 years. Yearly production will vary somewhat depending on the market price for lead and zinc, but average production should equal or exceed that shown for the year 1965.

Copper Principal copper production comes from the Butte District. Production for 1965 in Silver Bow County was 115,300 tons of copper valued at $81,618,000. Granite County produced 39 tons of copper, and Deer Lodge County, 4 tons, in 1965. The Coeur d'Alene region produced 3,500 tons of copper valued at $2,500,000 in 1965 as a byproduct of the silver ores. The Anaconda Company plans for continued expansion of capacity in the Butte District and estimated reserves of copper ore exceed 9 million tons of contained copper.

Manganese This subregion is the major manganese-producing area in the United States.

Philipsburg and Butte Districts have been the principal producers. The Anaconda Company built a manganese concentrator at Anaconda in 1941 and operated continuously on ore mined at Butte until 1949. The company presently makes ferromanganese in its furnaces at Great Falls. No manganese ore has been mined since 1959 because of unfavorable economic conditions, but large reserves of ore remain in the district. The Taylor-Knapp Company mined 12,200 tons of manganese ore in the Philipsburg District in 1965. Most of the manganese concentrate produced was shipped as battery and chemical grade manganese.

Large reserves of manganese ore remain and, in emergency situations when other world supplies are unavailable, this region will again become of great strategic importance as a producer of essential manganese.

Antimony Antimony is produced in the Coeur d'Alene District as a byproduct of silver ores. The Sunshine Mining Company shipped 822 tons of antimony metal in 1965 from its reduction plant.

Aluminum The aluminum industry is centered at Spokane, Washington, and Columbia Falls, Montana. Kaiser Aluminum and Chemical Corporation's plants at Spokane comprise a reduction works and a rolling mill. Raw material (alumina) is imported from outside the state. The Anaconda Aluminum Reduction plant is located at Columbia Falls, Montana. It produces aluminum ingots from alumina imported from outside the state. Both the Spokane and Columbia Falls plants have recently increased capacity and expanded production. Capacity of the Kaiser plant in Spokane is in the range of 200,000 tons of metal per year, and the capacity of the Anaconda Company's plant at Columbia Falls is about 100,000 tons per year.

Iron Iron ore is produced for use in cement manufacture at McCleary Butte in Benewah County, Idaho. Other iron deposits in Idaho and Montana have potential but no economic market.

Uranium Milling of uranium ores by the Dawn Mining Company at Ford, Washington, was suspended in 1966. More than 500,000 tons of ore remain to be mined at the Midnight mine should an economic market be available for the product. This is the major uranium producer in the Columbia-North Pacific Region. Discovery of important amounts of additional ore south of the Midnight mine has been reported recently.

Smelter Byproducts Smelter and refinery byproducts that are recovered or are recoverable from the smelters and refineries in the subregion are arsenic, bismuth, cadmium, gallium, germanium, indium, selenium, and tellurium. The Anaconda Company's smelter at Anaconda recovers arsenic and cadmium. Bunker Hill smelter at Kellogg recovers cadmium. Sulphur is also recovered from smelter gas and sulfuric acid is produced.

Nonmetals

Phosphate Rock Phosphate rock for use in fertilizer and animal feed products is produced in Granite and Powell counties, Montana. Cominco American, Inc. is the major producer with mines and a concentrating plant located north of Garrison in Powell County and mines east of Maxville in Granite County. Total daily capacity of all producing mines is about 3,000 tons of raw phosphate rock. Victor Chemical Company operates a plant producing elemental phosphorous at Silver Bow from phosphate rock mined in southern Idaho.

Potential for increased future production of phosphate rock is very favorable as demands for fertilizer and other phosphate products will increase in the future. Resources of phosphate rock are probably in the range of 200 million tons or more.

Sand and Gravel Sand and gravel production probably ranks second to phosphate rock in tonnage and in value of the nonmetallic minerals produced. Spokane County, Washington, near the city of

Spokane, is the largest sand and gravel producer with output of 1,300,000 tons in 1965 valued at about $1 million. Also in 1965, sand and gravel was first in order of value of mineral production in Bonner, Boundary, and Kootenai counties, Idaho, and Flathead, Lake, Mineral, and Missoula counties, Montana.

Sand and gravel is a low value product and must be produced near the consumer; the price ranges from $.80 to $1.25 per short ton. Adequate supplies are available for future demand in the subregion except in local areas where other land uses conflict with sand-gravel operations. As in the past, future production will be contingent on the demand by the construction industry.

Stone Limestone is quarried principally in Pend Oreille County, Washington, and near Anaconda, Deer Lodge County, Montana. Lehigh Portland Cement Company mines about 150,000 to 200,000 tons of limestone a year from their quarry at the cement plant at Metaline Falls for cement manufacture. Plant capacity is 1 million barrels of cement annually. Dolomite is also quarried about 10 miles north of Cusick. Pend Oreille and Stevens counties have the largest resources of limestone and dolomite in Washington. Elliston Lime Company formerly mined limestone at their Elliston quarry to produce quicklime and hydrated lime at the calcining plant nearby. The Anaconda Company mined limestone at their Brown's quarry near Anaconda for use in the Anaconda smelter. Small tonnages of limestone are quarried near Drummond for use in sugar refining.

Silica rock is quarried by the Lehigh Portland Cement Company from deposits near Metaline Falls and used for cement manufacture. Silica rock is also quarried in Deer Lodge County for flux in phosphate and copper reduction. Small tonnages of granite are quarried for monument and dimension stone in Spokane County, Washington, and Missoula County, Montana.

A substantial amount of crushed stone (basalt, quartzite, limestone, and granite) is quarried and crushed mostly for state and county agencies and utilized for road surfacing material. Some is used for concrete aggregate.

Future potential for production of stone is contingent on the local market for its products. Resources are adequate for all foreseeable future needs.

Clay Principal clay production comes from Spokane County, Washington. International Pipe and Ceramics Corporation operates a clay products plant at Mica near Spokane. Plant capacity is 16 million brick and 12,000 tons of hollow ware per year. The company also makes fire clay products and refractories. Clay is mined from pits near the plant at Mica.

The clay deposits in Spokane County and adjoining counties in Idaho contain very large reserves of clay minerals. The potential for future increased production is largely dependent on the size of the available market for the clay products.

Vermiculite The Zonolite Division of W. R. Grace and Company operates a large open pit vermiculite mine near Libby, Lincoln County, Montana. The mine and adjoining concentrator produce over 100,000 tons of expandable vermiculite a year. This is the principal source of this material in the United States. Resources of ore-grade material are extensive and potential for increased future production is very favorable.

Fluorspar Fluorspar production has come from the Crystal Mountain deposits near Darby, Montana. Roberts Mining Company mines fluorspar by open pit and treats the ore in a processing plant at Darby. Production figures are not disclosed, but reserves are known to be sufficient for several more years of production at present rates. The mine has been producing since 1952.

Garnet Garnet sands in placer deposits are mined on Emerald Creek, a tributary to St. Maries River, near Fernwood, Benewah County, Idaho. The mining operation together with a concentrator-sizing plant is owned and operated by the Idaho Garnet Abrasive Company, a subsidiary of Sunshine Mining Company. Production is mainly limited by market demand within the economic shipping radius of the operation. The products are used principally for airblast abrasive and garnet abrasive paper. Resources are adequate for many years at present production rates.

Barite Barite was produced near Greenough, Missoula County, Montana, by the Baroid Division, National Lead Company. It is sold as a weighting agent in oil well drilling. Production is limited by available markets and not by the mineral resources. The plant is currently closed.

Gem Stones Gem stones or gem materials provide recreation for a large number of amateur collectors and "rockhounds." There is no commercial mining operation based on production of gem stones. Garnets from the Emerald Creek area, Benewah County, Idaho, and sapphires from Granite County, Montana, are the most common gem materials. These materials will continue to provide an interesting hobby to tourists and collectors.

# SUBREGION 2


LOCATION MAP

S U B R E G I O N 2
U P P E R C O L U M B I A

## ABSTRACT


The Upper Columbia Subregion in north central Washington, although seventh among the subregions in size, is one of the richest in mineral and agricultural resources. The agricultural resources include the major part of the famous irrigated apple producing area, almost half of the winter wheat producing area, and all of the million acre plus Columbia Basin Project in the Columbia-North Pacific Region. The land resource segregates itself naturally into two physiographic areas:

1. The Okanogan Highlands are deeply entrenched high plateaus and mountains north and west of the Columbia River. The bedrock is mainly acid igneous granitic type rock that is glaciated over most of its area. The narrow valleys have mostly gravelly sandy soils on terraces and bottomlands and support the major part of the irrigated apple crop of eastern Washington. The foothills are mainly grass and sagebrush covered and devoted to rangeland use. The higher plateaus and mountains are mostly forested and used for grazing and the production of forest products. There are a few upland cropland areas in the foothills where grain, hay, and pasture are produced. Climate throughout the Okanogan Highlands is highly variable. Rainfall ranges from 10 inches in the valleys to 40 inches in the mountains. The frost-free period ranges from 75 to 175 days.

2. The Columbia Basin is east and south of the big bend of the Columbia River on a generally south sloping plateau with basalt bedrock. The northwest part was glaciated and presently the soils are formed in a mixture of glacial materials and wind deposited silt. Grain, hay, and pasture are the main crops with many rather extensive and intermingled grass and sagebrush range areas. South and east and along the east side of the subregion are the smoothly undulating hills of wind deposited silts where wheat is the major crop and other grain, hay, and pasture crops are supplementary. There are many intermingled areas of soil shallow to basalt bedrock, covered with grass and sagebrush and used for rangeland. This hilly area is an extension of the Palouse formation. The vast outwash plain on the south side is the site of the Columbia Basin Project. Soils formed in a mixture of glacial outwash material, wind deposited silt, silty lake-laid deposits and in wind-worked sand. Generally the soils are shallow to moderately deep and adapted to a wide range of agricultural crops. Presently grain and hay crops occupy the most land area, with row crops (potatoes and sugar beets) and specialty crops

providing the high value support. The climate throughout the Columbia Basin is characterized by low rainfall and a long growing season. Precipitation ranges from 7 to 14 inches and the frost-free period from 140 to 200 days.

Mineral resources in the Upper Columbia Subregion are located predominantly in the northern and western parts of the subregion in Stevens, Ferry, Okanogan, and Chelan counties.

Stevens County has produced a notable amount of silver, lead, and zinc; mostly from the northern part of the county in the Orient, Bossburg, Northport, and Colville districts. The Chewalah District is noted for magnesite production, having been the largest producer in the Nation for several years. Magnesite production stopped completely in September 1968, due to imports from Asia. The county also produces silica, limestone, marble, and other rock products.

Ferry County contains the only active gold mine in the Columbia-North Pacific Region. The county has been an important gold and silver producer for many years.

Chelan County has a record of the largest production of copper in Washington and was also a major gold producer, due primarily to the outstanding production of the Holden mine in the northern part of the county. A gold mine at Wenatchee was notable as one of the few gold mines operating in recent years. Both mines have recently closed.

Table 64 - Areas by State and County, Subregion 2, 1967

| State and County | Water | | Land Area 1/ | | Total Area | |
|---|---|---|---|---|---|---|
| | Sq. Mi. | Acres | Sq. Mi. | Acres | Sq. Mi. | Acres |
| Washington | | | | | | |
| Adams | 00.8 | 500 | 1,391.9 | 890,800 | 1,392.7 | 891,300 |
| Benton | 18.7 | 12,000 | 254.9 | 163,100 | 273.6 | 175,100 |
| Chelan | 73.0 | 46,700 | 2,923.0 | 1,870,700 | 2,996.0 | 1,917,400 |
| Douglas | 30.3 | 19,400 | 1,831.7 | 1,172,300 | 1,862.0 | 1,191,700 |
| Ferry | 57.0 | 36,400 | 2,202.0 | 1,409,400 | 2,259.0 | 1,445,800 |
| Franklin | 09.5 | 6,100 | 945.1 | 604,800 | 954.6 | 610,900 |
| Grant | 138.5 | 88,600 | 2,668.5 | 1,707,900 | 2,807.0 | 1,796,500 |
| Kittitas | .0 | 0 | 406.6 | 260,200 | 406.6 | 260,200 |
| Lincoln | 16.8 | 10,800 | 1,992.1 | 1,274,900 | 2,008.9 | 1,285,700 |
| Okanogan | 35.5 | 22,700 | 5,296.5 | 3,389,800 | 5,332.0 | 3,412,500 |
| Pend Oreille | 00.1 | 100 | 44.4 | 28,400 | 44.5 | 28,500 |
| Spokane | 01.7 | 1,100 | 45.8 | 29,300 | 47.5 | 30,400 |
| Stevens | 68.2 | 43,700 | 1,924.6 | 1,231,700 | 1,992.8 | 1,275,400 |
| Yakima | .0 | 0 | 74.2 | 47,500 | 74.2 | 47,500 |
| Total Subregion | 450.1 | 288,100 | 22,001.3 | 14,080,800 | 22,451.4 | 14,368,900 |

1/ The term "land" is defined to include all water bodies under 40 acres and streams under one-eighth mile in width.
Source: U.S.D.A. Conservation Needs Inventory adjusted to U.S. Census.

The total area of Subregion 2 consists of about 98 percent land and 2 percent water. Table 64 shows the land, water, and total watershed acreages of Subregion 2 by state and county. Except for this table, land areas only will be used throughout the following discussion.

## LAND

Factors of major importance to the land resource are: the ownership status, the soils, and the present use. The combination of these factors greatly influences the present and future utilization of the land resource.

### Land Ownership

The upper Columbia Subregion contains a little over 14 million acres. The largest single landowner is the Federal Government with 5.8 million acres or 41 percent of the total land area. Mixed private ownerships amount to nearly 7.4 million acres or 52 percent of the total area. State, county, and municipal ownerships make up the balance.

The public lands are distributed between National Forests with 3.5 million acres; National Parks, Public Domain, wildlife refuges, reclamation projects, and defense installations, 1 million acres; and state, county, and municipal lands, nearly 1 million acres. Another 1 million acres are Indian Reservations.

Table 65, Land Ownership status, and figure 10, Land Ownership Map, show this information in more detail.

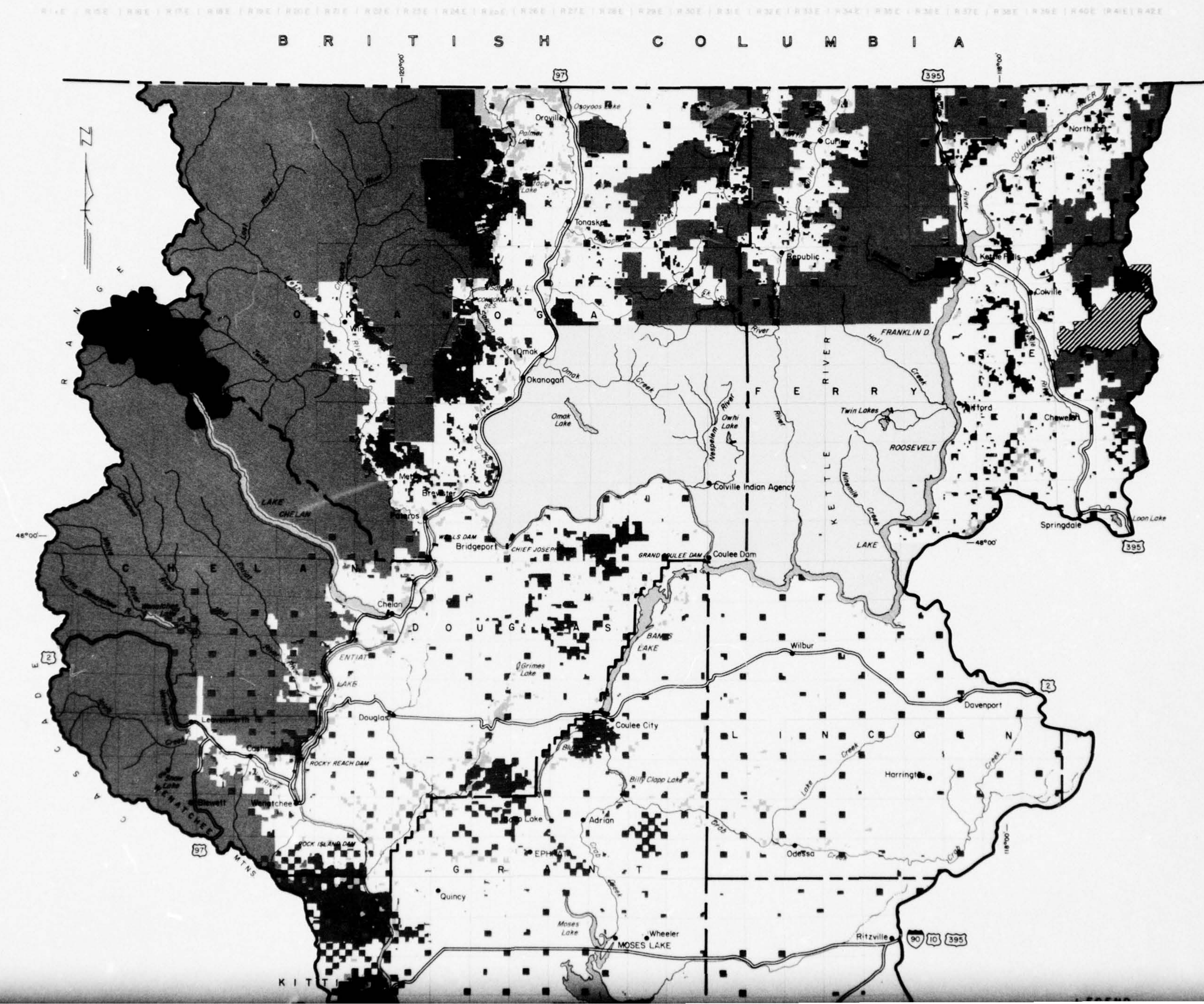
### Soils

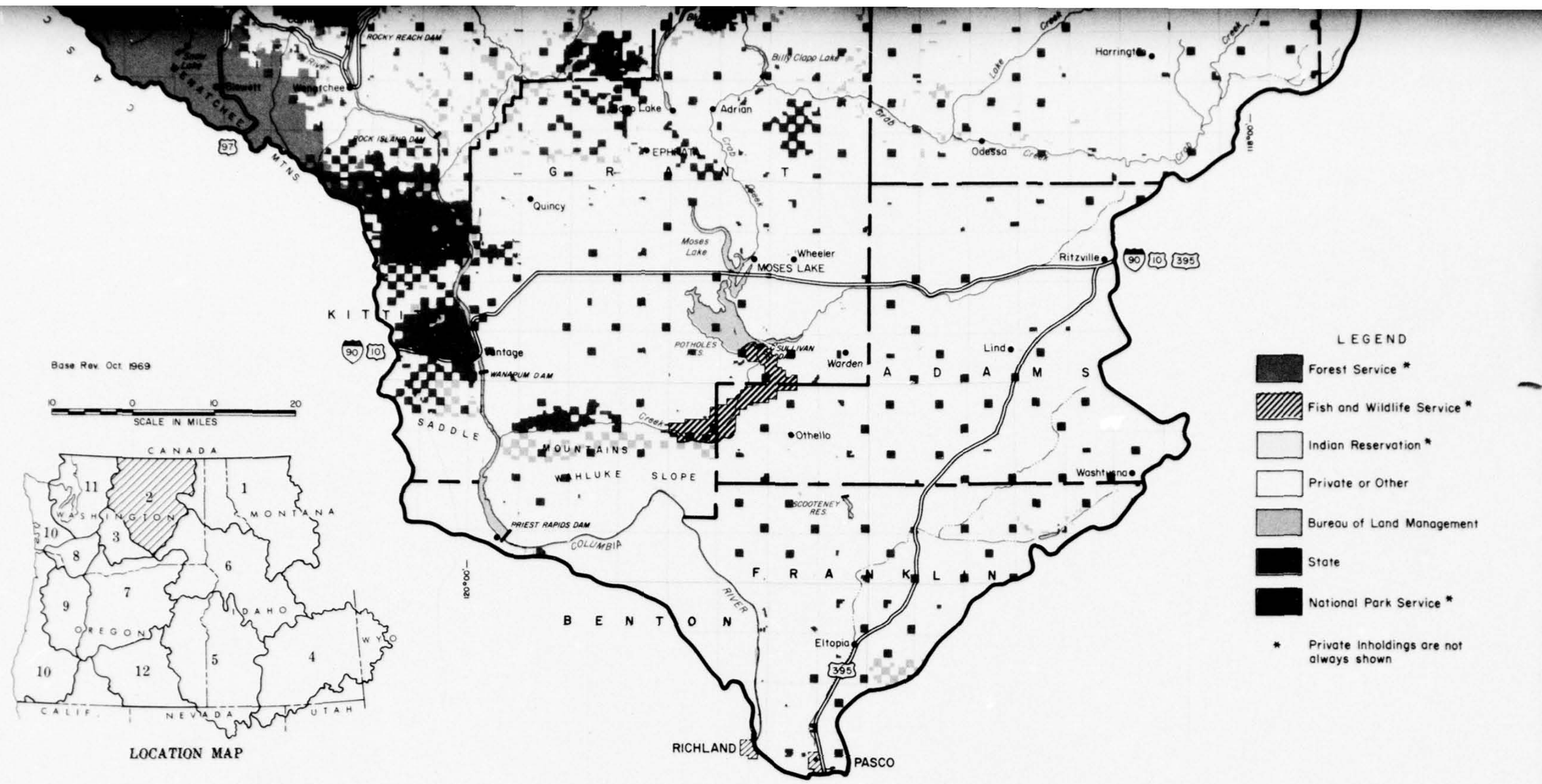
Figure 11, the Soil Associations Map, shows the location and relative extent of each soil association in the subregion. The associations are numbered in a general relationship to the position in the landscape. Thus, bottomlands and low terraces have the lowest numbers and alpine areas have the highest numbers. The name of each association relates to the soil series representing general kinds of soil that are most extensive in the landscape. Wherever possible, established soil series are used in the name; however, where the available soil series do not have classification status, the soil series name is not recorded. Generally, up to 15 percent of any single soil association in known areas may consist of inclusions of soils other than those identified. Such inclusions may be similar soils or they may be highly contrasting. However, in many high mountainous areas, where detailed knowledge about the area is

Table 65 - Land Ownership Acreage, Subregion 2, 1965

| Administering Agencies | Washington (1,000 acres) |
|---|---|
| Department of Agriculture | |
| Forest Service | 3,495.3 |
| Other Agriculture | - |
| Subtotal | 3,495.3 |
| Department of the Interior | |
| Bureau of Land Management | 200.6 |
| Bureau of Indian Affairs 1/ | 1,053.2 |
| National Park Service 2/ | 233.5 |
| Fish & Wildlife Service | 83.2 |
| Bureau of Reclamation | 361.1 |
| Other Interior | .5 |
| Subtotal | 1,932.1 |
| Department of Defense | 98.3 |
| Other Federal | 230.7 |
| Federal Subtotal | 5,756.4 |
| State | 931.3 |
| County | 18.8 |
| Municipal | 15.3 |
| Public Non-Federal Subtotal | 965.4 |
| Total Public | 6,721.8 |
| Total Private | 7,359.0 |
| Total Land Area | 14,080.8 |

1/ Private lands held in trust by the Federal Government.
2/ Data updated to 1969.
Source: General Services Administration Real Property Owned by the United States as of June 30, 1965, adjusted by the Land and Minerals Work Group.


BRITISH COLUMBIA
OKANOGAN
FERRY
STEVENS
CHELAN
DOUGLAS
LINCOLN
GRANT
CASCADE RANGE
WENATCHEE MTNS
LAKE CHELAN
FRANKLIN D. ROOSEVELT LAKE
KETTLE RIVER
BANKS LAKE
ENTIAT LAKE
GRAND COULEE DAM
CHIEF JOSEPH
WELLS DAM
ROCKY REACH DAM
ROCK ISLAND DAM
Oroville
Osoyoos Lake
Palmer Lake
Tonasket
Omak
Okanogan
Omak Lake
Brewster
Pateros
Bridgeport
Chelan
Douglas
Leavenworth
Cashmere
Wenatchee
Curlew
Republic
Colville Indian Agency
Coulee Dam
Kettle Falls
Colville
Northport
Chewelah
Springdale
Loon Lake
Wilbur
Davenport
Harrington
Odessa
Coulee City
Billy Clapp Lake
Adrian
Soap Lake
Ephrata
Quincy
Moses Lake
Wheeler
MOSES LAKE
Ritzville
Twin Lakes
Grimes Lake
Owhi Lake
120°00'
118°00'
48°00'
97
395
2
90
10




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# LAND OWNERSHIP

UPPER COLUMBIA, SUBREGION 2

1968

USDA-SCS PORTLAND, OREG. 1970

FIGURE 10

2

LEGEND REVISED 1970

## LEGEND

Soil Associations Map Symbol * — Name of Association

Generally silty and sandy soils formed in alluvial sediments on bottomlands and low terraces.

1 Colville - Mires

Generally silty and sandy soils with coarse fragments formed in glacial materials on terraces, plains, and mountains.

2 Springdale - Marble
3 Pogue - Brief
4 Warden - Ephrata
5 Bonner - Springdale
6 Benge - Anders
7 Conconnully - Kartar
8 Nevine - Molson
9 Touhey - Timentwa

Generally silty or sandy soils formed in wind deposited or wind worked sediments on hilly uplands.

10 Winchester - Quincy
11 Marble - Speigle
12 Shano - Starbuck
13 Warden - Quincy
14 Ritzville - Renslow
15 Athena - Reardan
16 Bagdad - Anders

Generally silty soils formed in materials mixed with rocky residuum-colluvium from basic rock types on plateaus, canyons and mountains.

17 Clerf - Kuhl
18 Waterville - Kuhl
19 Kuhl - Starbuck

Generally sandy soils formed in materials mixed with volcanic ash or pumice on terraces, foothills, plateaus and mountains.

20 Dominantly Cryandepts

Generally silty soils formed in materials mixed with gravelly residuum-colluvium from sedimentary bedrock on mountains.

21 Rockland

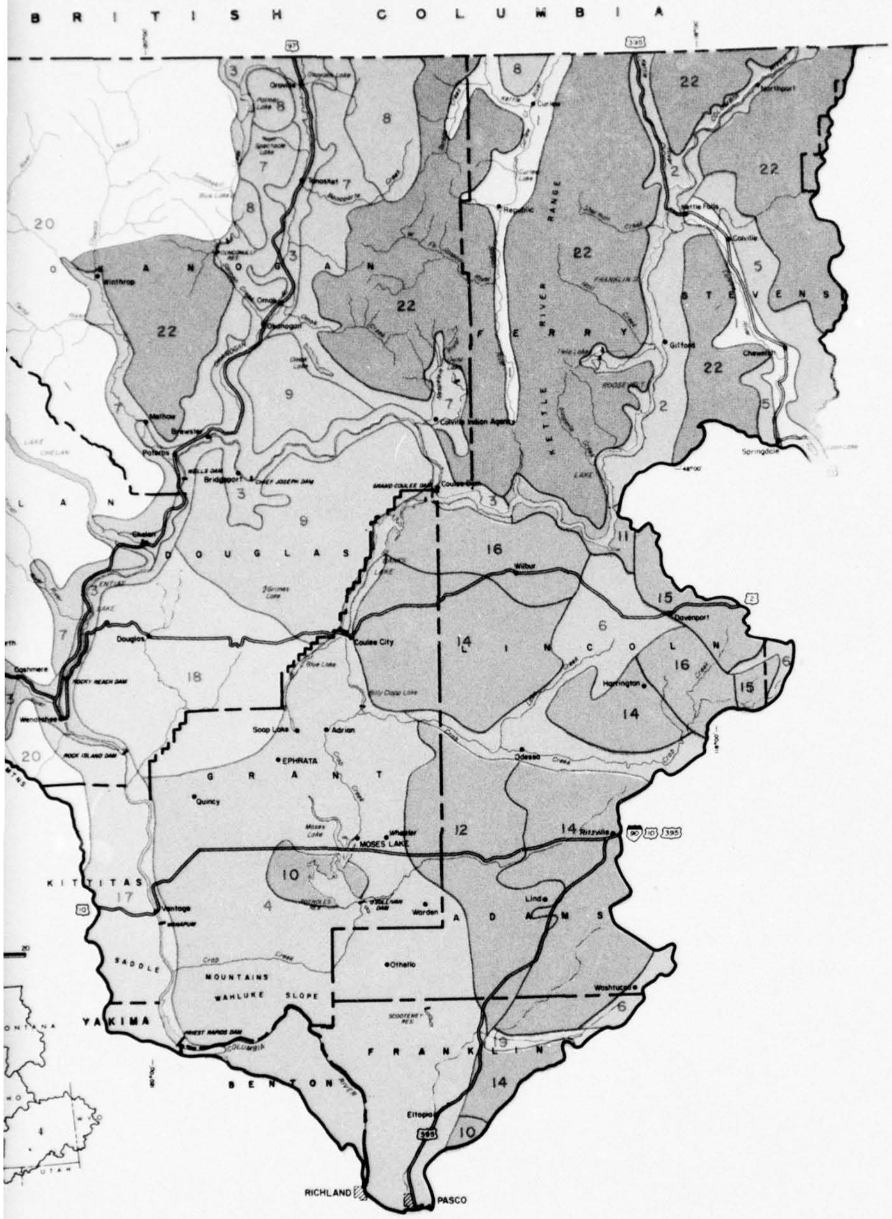
Generally sandy soils formed in materials mixed with rocky residuum-colluvium from acidic rock types on terraces, foothills and mountains.

22 Dominantly Cryandepts

* *Symbols are non-conotative and consistent only within each subregion. To compare delineations from one subregion to another refer to the name of the Soil Association.*

*NOTE: The Soil Association name may include a series that does not fit the Soil Associations Group description. The Soil Association name is based on dominant series. The dominant of five series may be only 30 percent of the Soil Association. Thus a clayey textured soil series may be included in a group accurately described as generally silty and sandy in texture.*

2




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# SOIL ASSOCIATIONS

UPPER COLUMBIA, SUBREGION 2

USDA-SCS-PORTLAND, OREG. 1970

**FIGURE 11**

Table 66 - Characteristics and Qualities of Soils, Subregion 2[1/]

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ashy soils with loamy subsoils on nearly level slopes | 1 | 1,500-2,000 | 16-24 | 110-130 | Rangeland<br>Forest land | Andic Haplaquolls | Fine-silty, mixed, calcareous, mesic | Colville | 30 | Floodplains | Alluvium | Silt loam | Silty clay loam | None | - | 20-40" over water table |
| | | | | | Cropland (cereals, alfalfa, clover, pasture, peas and potatoes) -75% irrigated | Mollic Vitrandepts | Ashy over sandy or sandy-skeletal, mixed, frigid | Mires | 20 | Terraces | Outwash | Gravelly silt loam | Gravelly silt loam | Gravel | 20-35 in profile | 20-40" over gravel and sand |
| | | | | | | Typic Haploxerolls | Coarse-loamy, mixed frigid | Republic | 20 | Fans and footslopes | Glacial till & outwash | Fine sandy loam | Fine sandy loam | Gravel and sand | 60 below 40-60" | 40-60" over gravelly till |
| | | | | | | Mollis Vitrandepts | Ashy, mesic | San Poil | 3 | Floodplains | Alluvium and ash | Very fine sandy loam | Fine sandy loam | None | - | 60"+ |
| | | | | | | Typic Haploxeralfs | Fine, mixed, mesic | Addy | 1 | Terraces | Lake sediments | Silt loam | Clay or silty clay | None | - | 20-40" over clayey material |
| | | | | | | Typic Haploxerolls | Coarse-loamy over sandy-skeletal, mixed, mesic | Chewelah | 1 | Terraces and fans | Alluvium | Silt loam | Loam | None | - | 20-40" over gravel & sand |
| Moderately deep and shallow soils with loamy, sandy and gravelly subsoils on gentle to moderate slopes. | 2 | 1,000-1,500 | 14-18 | 120-140 | Rangeland<br>Cropland (cereals, alfalfa, hay, and pasture) - some irrigated | Entic Haploxerolls | Sandy-skeletal, mixed, mesic | Springdale | 25 | Terraces | Glacial outwash | Gravelly sandy loam | Gravelly sand | Gravel and sand | 20-35 in profile; 60 below 20-40" | 20-40" over gravel and sand |
| | | | | | | Alfic Xeropsamments | Sandy, mixed, mesic | Marble | 15 | Terraces | Sand | Loamy fine sand | Loamy sand | None | - | 60"+ |
| | | | | | Forest land | Mollic Vitrandepts | Ashy over loamy, mixed, mesic | Stevens | 15 | Uplands | Carbonaceous shale and glacial till | Silt loam | Silt loam | None | - | 60"+ |
| | | | | | | Typic Xerochrepts | Fine-silty, mixed mesic | Cedonia | 15 | Terraces | Lake sediments | Silt loam | Silt loam | None | - | 60"+ |
| | | | | | | Mollic Vitrandepts | Ashy, loamy, frigid | Hunters | 8 | Uplands | Loess over lake sediments | Silt loam | Silt loam | None | - | 60"+ |
| | | | | | | Typic Haploxeralfs | Fine, mixed, mesic | Addy | 4 | Terraces | Lake sediments | Silt loam | Clay or silty clay | None | - | 15-18" over clayey material |

nd Qualities of Soils, Subregion 2[1/]

| aracteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| e l | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass: Dryland | Range of: Major Capability Subclass: Irrigated6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| | None | - | 20-40" over water table | Moderately slow | Slow | Poor | High | IIIw | IIIw | High water table | Drainage; irrigation management |
| ly | Gravel | 20-35 in profile | 20-40" over gravel and sand | Moderate | Very rapid | Good | Low | IIIs, IIIe, IVe, IVs, VIe | IIIs, IIIe | Moderately deep over gravelly sand; gravelly profile | Residue mgmt; cropping sequence; irrig. mgmt; range land mgmt. |
| | Gravel and sand | 60 below 40-60" | 40-60" over gravelly till | Moderately rapid | Very rapid | Good | Medium | IIIw | - | Erosion, sandy profile | Residue mgmt; cropping sequence; rangeland mgmt |
| | None | - | 60"+ | Moderately rapid | Moderately rapid | Somewhat poor | Medium | - | IIIw, IIIe, VIe | Wetness | Drainage |
| r | None | - | 20-40" over clayey material | Slow | Slow | Good | Low and Medium | IIIe, IVe, VIe | - | Erosion; clayey subsoil | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; irrig. mgmt. |
| | None | - | 20-40" over gravel & sand | Moderate | Very rapid | Somewhat poor | Low and Medium | IIIw | IIs | Wetness | Drainage; irrigation management |
| ly | Gravel and sand | 20-35 in profile; 60 below 20-40" | 20-40" over gravel and sand | Very rapid | Very rapid | Excessive | Low | IVe, VIs, VIIs | - | Erosion gravelly profile; moderately deep over gravel & sand | Rangeland and forest land management |
| | None | - | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIs | - | Sandy profile | Rangeland and forest land management |
| | None | - | 60"+ | Moderate | Moderate | Good | High | IIe, IIIe, IVe, VIs, VIIs | - | Erosion | Cross-slope opers; residue mgmt; cropping sequence; forest land and rangeland mgmt. |
| | None | - | 60"+ | Moderate | Moderately slow | Good | High | IIe, IIIe, IVe, VIe | IIe, IIIe | Erosion | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; forest land mgmt. |
| | None | - | 60"+ | Moderate | Moderately slow | Good | High | IIe, IIIe, IVe | IIe, IIIe | Erosion | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland mgmt. |
| r | None | - | 15-18" over clayey material | Slow | Slow | Good | Low | IIIe, IVe, VIe | IIIe | Erosion; clay subsoil | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; irrig. mgmt. |

Table 66 - Continued

| Soil Groups | Soil Association: Map Sym. | Soil Association: Elevation Feet | Soil Association: Precip. Inches | Soil Association: Freeze free Season Days | Soil Association: Major land use | Classification: Great Group or Subgroup | Classification: Family | Classification: Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Soil Characteristics: Texture Surface Soil | Soil Characteristics: Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Perme... Su... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | 800-1,000 | 8-12 | 160-180 | Rangeland<br>Cropland (cereals, fruit orchards, hay and pasture)-90% irrigated | Aridic Haploxerolls | Coarse-loamy or sandy-skeletal, mixed, mesic | Pogue | 30 | Terraces | Alluvium | Fine sandy loam | Fine sandy loam | None | - | 60"+ | Moder rapid |
| | | | | | | Typic Haploxerolls | Loamy-skeletal, mixed, mesic | Brief | 30 | Fans and terraces | Alluvium | Sandy loam | Sandy Loam | None | - | 60"+ | Rapid |
| | | | | | | Aridic Haploxerolls | Coarse-loamy, mixed, mesic | Cashmont | 10 | Terraces | Glacial outwash | Fine sandy loam | Gravelly sandy loam | Gravel and sand | 20-35 in profile; 60 below 20-40" | 20-40" over gravel and sand | Rapid |
| | | | | | | Aridic Haploxerolls (Pachic) | Coarse-loamy, mixed, mesic | Cashmere | 10 | Fans and terraces | Old alluvium | Loam | Gravelly loam | Gravel | 20-35 in profile | 60"+ | Moder |
| | | | | | | Calciorthidic Haploxerolls | Coarse-loamy, mixed, mesic | Okanogan | 5 | Flood-plains | Alluvium | Silt loam | Silt loam | None | - | 60"+ | Moder |
| | | | | | | Typic Xeropsamments | Mixed, mesic | Ewall | 2 | Terraces | Sand | Loamy fine sand | Sand | None | - | 60"+ | Very |
| | 4 | 500-1,200 | 6-8 | 140-180 | Rangeland<br>Cropland (alfalfa, potatoes, sugar beets, vegetables, grass seed, and fruit orchards)-irrigated (cereals)-dryland | Xerollic Camborthids | Coarse-silty, mixed, mesic | Warden | 30 | Terraces | Loess & sediments | Silt loam | Very fine sandy loam | None | - | 60"+ | Moder rapid |
| | | | | | | Xerollic Camborthids | Coarse-loamy over sandy or sandy-skeletal, mixed, mesic | Ephrata | 20 | Terraces | Alluvium over outwash | Loam or sandy loam | Gravelly loam | Sand and Gravel | 20-35 below 10" in profile; 80 below 20-40" | 20-40" over sand & gravel | Moder |
| | | | | | | Xerollic Camborthids | Coarse-silty, mixed, mesic | Sagemoor | 15 | Terraces | Loess over lacustrine material | Silt loam | Silt loam | None | - | 60"+ | Moder |
| | | | | | | Xerollic Camborthids | Coarse-loamy, mixed, mesic | Royal | 15 | Uplands | Mixed loess & sediments | Fine sandy loam | Fine sandy loam | None | - | 60"+ | Moder rapid |
| | | | | | | Typic Torripsamments | Mixed, mesic | Quincy | 3 | Duned terraces | Sand | Loamy fine sand | Loamy fine sand | None | - | 60"+ | Very |
| | | | | | | Xerollic Camborthids | Coarse-loamy, mixed, mesic | Prosser | 3 | Uplands (plateaus) | Loess over basic igneous rock | Silt loam | Silt loam | None | - | 20-40" over bedrock | Moder |

nued

| tics | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | e Fragments | | Soil Qualities and Interpretations | | | | | | | | |
| | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Range of: Major Capability Subclass Irrigated6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| | - | 60"+ | Moderately rapid | Moderately rapid | Good | Medium | IIs, IIIe, IVe, VIe | IIs, IIIe, IVe, VIe | Erosion; droughtiness; sandy profile | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland management |
| | - | 60"+ | Rapid | Rapid | Good | Medium | IVe, VIs, VIIs | IIs, IIIe, IVe, VIe | Erosion;droughtiness; sandy profile | Rangeland mgmt; cross-slope opers; residue mgmt; cropping sequence; irrigation management |
| 1 | 20-35 in profile; 60 below 20-40" | 20-40" over gravel and sand | Rapid | Very rapid | Good | Low | IIs, IIIe, IVe | IIs, IIIe, IVe | Erosion;droughtiness;gravelly profile;mod.deep over gravel and sand. | Cross-slope opers; residue mgmt; cropping sequence; irri. mgmt; rangeland management |
| 1 | 20-35 in profile | 60"+ | Moderate | Moderate | Good | Medium | IIs, IIIe, VIe | IIs, IIIe, VIe | Erosion;droughtiness; gravelly profile | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland management |
| | - | 60"+ | Moderate | Moderate | Good | High | IIe, IIIe | IIe IIIe | Erosion | Residue management; cropping sequence; irrig. mgmt. |
| | - | 60"+ | Very rapid | Very rapid | Excessive | Low | IVe, IVs, VIe | IVe, IVs, VIe | Erosion;droughtiness; sandy profile | Residue mgmt; irrig. mgmt; rangeland management |
| | - | 60"+ | Moderately rapid | Rapid | Good | Medium | IVe | IIe, IIIe, IVe | Erosion; sandy profile; droughtiness | Residue mgmt; cropping sequence; irrig. mgmt; rangeland management |
| el | 20-35 below 10" in profile; 80 below 20-40" | 20-40" over sand & gravel | Moderate | Very rapid | Good | Low | VIe | IIs, IIIe, IVe | Erosion;gravelly profile;mod.deep over sand and gravel;droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland mgmt |
| | - | 60"+ | Moderate | Very slow | Good | Medium & high | IVe | IIs, IIIe, IVe | Erosion;strongly alkaline lacustrine material below 30" | Cross-slope opers; residue mgmt; cropping sequence; irrigation management |
| | - | 60"+ | Moderately rapid | Moderately rapid | Good | Medium | VIe, VIIe | IIs, IIIe, IVe | Erosion,sandy profile; droughtiness | Cross-slope opers;residue mgmt;cropping sequence; irrig. mgmt; rangeland mgmt. |
| | - | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIe | IVs | Erosion;sandy profile; droughtiness | Residue mgmt; irrig. mgmt. rangeland mgmt. |
| | - | 20-40" over bedrock | Moderate | Impervious | Good | Low & Medium | VIe | IIs, IIIe, IVe | Erosion;moderately deep over bedrock; droughtiness | Cross-slope opers;residue mgmt;cropping sequence; irrigation management |

Table 66 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 2,500-3,500 | 16-24 | 90-110 | Forest land | Typic Haplorthods | Coarse-loamy over sandy or sandy-skeletal, mixed, frigid | Bonner | 30 | Terraces | Glacial outwash | Silt loam | Silt loam | Gravel & sand | 60 below 20-40" | 20-40" over gravel & sand | M |
| | | | | | Cropland (cereals, hay and pasture) dryland and irrigated | Entic Haploxerolls | Sandy-skeletal, mixed, mesic | Springdale | 30 | Terraces | Glacial outwash | Gravelly coarse sandy loam | Gravelly loamy coarse sand | Gravel & sand | 20-35in profile;60 below 20-40" | 20-40" over gravel & sand | V |
| | | | | | Rangeland | Typic Haplorthods | Coarse-loamy, mixed, mesic | Eloika | 10 | Uplands (plains) | Glacial till | Silt loam | Gravelly loam | Gravel | 20-35 below 10" in profile; 60 below 40-60" | 40-60" over gravel | M |
| | | | | | | Mollic Vitrandepts | Ashy, loamy, mixed, frigid | Donavan | 10 | Terraces and foot-slopes | Glacial till | Loam | Gravelly sandy loam | Gravel & sand | 20-35 below 10" | 60"+ | R |
| | | | | | | Typic Xerorthents | Sandy, mixed, mesic | Hagen | 5 | Uplands (outwash plains) | Sand | Sandy loam | Sand | None | - | 60"+ | V |
| | | | | | | Typic Xerochrepts | Coarse-loamy, mixed, mesic | Clayton | 5 | Outwash plains | Glacial till and outwash | Fine sandy loam or sandy loam | Fine sandy loam | None | - | 60"+ | M r |
| | 6 | 1,500-2,500 | 12-18 | 110-150 | Rangeland | Calcic Haploxerolls | Coarse-loamy over sandy or sandy-skeletal mixed, mesic | Benge | 20 | Terraces | Glacial outwash | Silt loam | Gravelly loam | Gravel & sand | 20-35 in profile;60 below 20-40" | 20-40" over gravel & sand | M |
| | | | | | Cropland (cereals, hay and pasture)-irrigated and dryland | Typic Haploxerolls | Coarse-loamy, mixed, mesic | Anders | 15 | Uplands (depression) | Loess over basic igneous rock | Silt loam | Silt loam | None | - | 20-40" over bedrock | M |
| | | | | | | Calcic Haploxerolls | Coarse-loamy over sandy or sandy-skeletal, mixed, mesic | Cheney | 15 | Fans and terraces | Glacial outwash | Silt loam | Silt loam | Gravel & sand | 60 below 20-40" | 20-40" over sand & gravel | M |
| | | | | | | Calcic Haploxerolls | Coarse-loamy over sandy or sandy-skeletal, mixed, mesic | Stratford | 12 | Terraces | Glacial outwash | Stony silt loam | Gravelly silt loam | Gravel cobbles & stones | 20-35 in profile;60 below 20-40" | 20-40" over sand & gravel | M |
| | | | | | | Typic Argixerolls | Coarse-loamy over sandy or sandy-skeletal, mixed, mesic | Hesseltine | 10 | Uplands (plateau) | Loess over glacial outwash | Stony silt loam | Clay loam | Stones | 20-35 in surface soil | 20-40" over bedrock | M s |
| | | | | | | Aeric Mollic Andaquepts | Ashy, calcareous, mesic | Emdent | Less than 1 | Basins | Alluvium and volcanic ash | Silt loam | Silt loam | None | - | 40-60" over gleyed material | M |

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| arse Fragments | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| nd | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Irrigated6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| avel sand | 60 below 20-40" | 20-40" over gravel & sand | Moderate | Very rapid | Good | Low & Medium | IVe, VIe, VIIe | IVe | Erosion; moderately deep over gravel & sand | Forest land mgmt;residue mgmt;cropping sequence; irrig. mgmt. |
| avel sand | 20-35in profile;60 below 20-40" | 20-40" over gravel & sand | Very rapid | Very rapid | Excessive | Low | IVs, VIs, VIIs | IVs, VIs | Gravelly profile;moderately deep over gravel and sand | Forest land and rangeland mgmt;residue mgmt; cropping sequence;irrig. mgmt. |
| avel | 20-35 below 10" in profile; 60 below 40-60" | 40-60" over gravel | Moderate | Very rapid | Good | Low & Medium | IIIe, VIs, VIIs | IIIe | Erosion;gravelly profile | Forest land mgmt; residue mgmt; cropping sequence; irrig. mgmt. |
| avel sand | 20-35 below 10" | 60"+ | Rapid | Rapid | Good | Low & Medium | IIIe, IVe, VIe | IIIe, IVe | Erosion;gravelly profile | Forest land mgmt; cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt. |
| ne | - | 60"+ | Very rapid | Very rapid | Excessive | Low | IV, VIs | IIIs, IVs | Erosion;sandy profile | Forest land mgmt;cross-slope opers; residue mgmt; irrig. mgmt. |
| ne | - | 60"+ | Moderately rapid | Very rapid | Good | Medium | IIe, IIIe, IVe | IIe, IIIe, IVe | Erosion | Cross-slope opers;residue mgmt; cropping sequence; irrig. systems; forest land mgmt. |
| avel sand | 20-35 in profile;60 below 20-40" | 20-40" over gravel & sand | Moderate | Very rapid | Good | Low | IIIe, IIIc, VIe VIIs | IIIe | Erosion;gravelly profile; droughtiness | Rangeland mgmt;residue mgmt; cropping sequence; irrigation management |
| ne | - | 20-40" over bedrock | Moderate | Impervious | Good | Low & Medium | IIIe, IIIs, IVe VIIs | IIIe, IIIs, IVe | Erosion;moderately deep over bedrock droughtiness | Rangeland mgmt;cross-slope opers; residue mgmt; cropping sequence; irrigation management |
| avel sand | 60 below 20-40" | 20-40" over sand & gravel | Moderate | Very rapid | Good | Low & Medium | IIe, IIIe, VIe, VIs, VIIs | IIe, IIIe | Erosion; droughtiness | Rangeland mgmt; cross-slope opers; residue mgmt; cropping sequence; irrigation management |
| avel ob-les & ones | 20-35 in profile;60 below 20-40" | 20-40" over sand & gravel | Moderate | Very rapid | Good | Low | VIIs | - | Stony & gravelly profile;mod. deep over sand and gravel | Rangeland management |
| ones | 20-35 in surface soil | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | VIs, VIIs | - | Stony profile; moderately deep over bedrock | Rangeland management |
| ne | - | 40-60" over gleyed material | Moderate | Impervious | Somewhat poor | Medium & High | IIIs, VIw | IIIs | Strongly alkaline; high seasonal water table | Soil amendments; drainage; irrigation mgmt. |

Table 66 - Continued

| Soil Groups | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Permeabi[lity] Subso[il] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 900-1,500 | 11-14 | 130-160 | Rangeland; Cropland (cereals)-dryland (fruit orchards, hay and pasture)-irrigated | Typic Haploxerolls | Coarse-loamy, mixed, mesic | Conconully | 25 | Uplands (plateaus & side slopes) | Glacial till | Fine sandy loam | Sandy loam | None | - | 20-40" over sandy till | Rapid |
| | | | | | | Andic Dystric Eutrochrepts | Coarse-loamy, mixed, frigid | Kartar | 15 | Footslopes and coves | Glacial till | Sandy loam | Sandy loam | None | - | 60"+ | Rapid |
| | | | | | | Mollic Vitrandepts | Cindery, mesic | Chelan | 15 | Terraces and footslopes | Glacial till and pumice | Sandy loam | Sandy loam | None | - | 60"+ | Rapid |
| | | | | | | Typic Haploxerolls | Coarse-loamy, mixed, frigid | Newby | 10 | Uplands (gentle to steep slopes) | Shaley glacial till | Loam or silt loam | Gravelly loam | Gravel & sand | 20-35 below 10" | 60"+ | Moderate |
| | | | | | | Typic Xerochrepts | Coarse-loamy, mixed, frigid | Leader | 10 | Fans | Alluvium | Fine sandy loam | Sandy loam | None | - | 60"+ | Rapid |
| Deep, rocky, soils with loamy subsoil on gentle to strong slopes | 8 | 3,000-4,000 | 14-20 | 90-110 | Rangeland; Cropland (cereals, alfalfa, grass)-dryland; Forest land | Typic Vitrandepts | Ashy, loamy-skeletal, mixed, frigid | Nevine | 20 | Uplands | Ash over glacial till | Silt loam | Silt loam | None | - | 60"+ | Moderate |
| | | | | | | Mollic Vitrandepts | Ashy over loamy, mixed, frigid | Molson | 15 | Uplands | Shale and glacial till | Silt loam | Silt loam | None | - | 40-60"+ over bedrock | Moderate |
| | | | | | | Mollic Vitrandepts | Ashy over loamy, mixed, frigid | Koepke | 12 | Uplands | Ash over glacial till | Silt loam | Silt loam | None | - | 60"+ | Moderate |
| | | | | | | Calcic Entic Haploxerolls | Coarse-loamy, mixed, frigid | Havillah | 10 | Terraces and footslopes | Glacial till and outwash | Fine sandy loam | Fine sandy loam | Gravel | 0-20 below 10" in places | 60"+ | Moderate rapid |
| | | | | | | Typic Haploxerolls | Coarse-loamy, mixed, frigid | Republic | 10 | Uplands | Glacial till | Silt loam | Loam or gravelly loam | Gravel | 20-35 below 10" in places | 20-40" over calcareous till | Moderate |
| | | | | | | Entic Haploxerolls | Sandy, mixed, frigid | Chesaw | 5 | Terraces | Glacial outwash | Gravelly silt loam | Very gravelly loamy sand | Gravel & sand | 20-80 in profile; 80 below 20-40" | 20-40" over gravel and sand | Very rap[id] |

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| ...eristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ...rse Fragments | | | | | | | Range of: Major Capability Subclass | | | |
| ...ind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated[b/] | Major Soil Problems | Suitable Land Treatment and Structures |
| ...one | - | 20-40" over sandy till | Rapid | Rapid | Good | Low & medium | IIIe, IVe, VIs, VIIe, VIIs | - | Erosion; sandy profile; mod. deep over sandy till | Rangeland management |
| ...one | - | 60"+ | Rapid | Very rapid | Good | Low & medium | IVe, IVs, VIs, VIIe, VIIs | - | Erosion; sandy profile | Rangeland management |
| ...one | - | 60"+ | Rapid | Rapid | Good to excessive | Medium | IIs, IIIe, IVe, VIe | IIs, IIIe, IVe, VIe | Erosion; droughtiness; pumicy profile | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland mgmt. |
| ...ravel & sand | 20-35 below 10" | 60"+ | Moderate | Moderate | Good | Medium | IIIe, IVe, VIe, VIIe | IIIe, IVe, VIe, VIIe | Erosion; droughtiness; gravelly profile | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland mgmt |
| ...one | - | 60"+ | Rapid | Rapid | Good | Medium | IIIe, IVe, VIe | IIIe, IVe, VIe | Erosion; droughtiness; sandy profile | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt.; rangeland mgmt |
| ...one | - | 60"+ | Moderate | Moderate | Good | High | VIe, VIIe | - | Erosion | Forest land management |
| ...one | - | 40-60"+ over bedrock | Moderate | Impervious | Good | Medium & High | IIe, IIIe, IVe, VIe | - | Erosion | Cross-slope opers; residue mgmt; cropping sequence; rangeland mgmt. |
| ...None | - | 60"+ | Moderate | Moderate | Good | High | IIe, IIIe, IVe, VIe | - | Erosion | Cross-slope opers; residue mgmt; cropping sequence; rangeland mgmt. |
| Gravel | 0-20 below 10" in places | 60"+ | Moderately rapid | Moderately rapid | Good | Medium | IIe, IIIe, IVe, VIe | - | Erosion | Cross-slope opers; residue mgmt; cropping sequence; rangeland mgmt. |
| Gravel | 20-35 below 10" in places | 20-40" over calcareous till | Moderate | Moderate | Good | Low & Medium | IIe, IIIe, IVe, VIe | - | Erosion | Cross-slope opers; residue mgmt; cropping sequence; rangeland mgmt. |
| Gravel & sand | 20-80 in profile; 80 below 20-40" | 20-40" over gravel and sand | *Very rapid* | *Very rapid* | *Excessive* | *Low* | VIs, VIIe | - | Erosion | Rangeland management |

Table 66 - Continued

| Soil Groups | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series2/ | Percentage3/ of Assn. | Position on Landscape | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Per |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 2,600-3,000 | 11-15 | 110-130 | Rangeland | Calciorthidic Haploxerolls | Coarse-loamy, mixed, mesic | Touhey | 40 | Uplands (plateaus) | Glacial till | Sandy loam or loam | Gravelly sandy loam | Gravel and cobbles | 20-35 below 10" in profile;60 below 20-40" | 20-40" over cobbly till | Rap |
| | | | | | Cropland (cereals)-dryland | | | | | | | | | | | | |
| | | | | | | Calcic Haploxerolls | Coarse-loamy, mixed, mesic | Timentwa | 25 | Uplands (plateaus) | Glacial till | Loam | Loam or gravelly loam | Gravel and cobbles | 20-35 below 10" in profile in places; 60 below 20-40" | 20-40" over cobbly till | Mod |
| | | | | | | - | - | Rockland 5/ | 15 | Uplands | Basic igneous rock | - | - | - | - | Less than 10" over bedrock | |
| Very deep soils with sandy profiles on gentle to moderate slopes | 10 | 900-1,100 | 7-8 | 120-140 | Rangeland | Typic Torripsamments | Mixed, mesic | Winchester | 45 | Uplands (plains) | Sand | Fine sand | Sand | None | - | 60"+ | Ver |
| | | | | | | Typic Torripsamments | Mixed, mesic | Quincy | 40 | Duned terraces | Sand | Loamy fine sand | Fine sand | None | - | 60"+ | Ver |
| | 11 | 1,500-2,000 | 12-16 | 110-140 | Rangeland | Alfic Xeropsamments | Sandy, mixed, mesic | Marble | 35 | Terraces | Sand | Loamy fine sand | Fine sand | None | - | 60"+ | Ver |
| | | | | | Cropland (limited hay and pasture)-irrigated | | | | | | | | | | | | |
| | | | | | Forest land | Typic Haploxerolls | Loamy-skeletal, mixed, mesic | Speigle | 30 | Uplands (steep colluvial slopes) | Loess and basic igneous rock | Stony loam | Cobbly loam | Gravel cobbles & stones | 20-35 in profile | 60"+ | Mod |
| | | | | | | Entic Haploxerolls | Sandy-skeletal, mixed, mesic | Springdale | 20 | Terraces | Glacial outwash | Fine sandy loam or sandy loam | Gravelly loamy sand | Gravel & sand | 20-35 in profile;60 below 20-40" | 20-40" over gravel and sand | Rap |
| Moderately deep to very deep soils with silty profiles on gentle to steep slopes. | 12 | 900-1,400 | 7-10 | 140-180 | Cropland (cereals)-dryland (cereals, hay, and pasture)-irrigated | Xerollic Camborthids | Coarse-silty, mixed, mesic | Shano | 70 | Uplands (plateaus & rolling hills) | Loess | Silt loam | Silt loam | None | - | 60"+ | Mod |
| | | | | | Rangeland | Lithic Xerollic Camborthids | Loamy, mixed mesic | Starbuck | 10 | Uplands (south exposures along drainage ways) | Loess & basic igneous rock | Silt loam | Very gravelly silt loam | Gravel | 35-80 below 10" | 10-20" over bedrock | Mod |
| | | | | | | Calciorthidic Haploxerolls | Coarse-loamy over sandy or sandy-skeletal, mixed, mesic | Magallon | 10 | Terraces | Alluvium over glacial outwash | Loam | Sandy loam | Gravel & sand | 60 below 20-40" | 20-40" over sand and gravel | Mod |

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| rse Fragments | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| nd | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Irrigated 6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| vel d bbles | 20-35 below 10" in profile;60 below 20-40" | 20-40" over cobbly till | Rapid | Rapid | Good | Low | IIIe, IVe,IVs, VIe,VIs, VIIs | - | Erosion;gravelly profile;mod. deep over cobbly till | Cross-slope opers;residue mgmt; cropping sequence; rangeland mgmt. |
| avel d bbles | 20-35 below 10" in profile in places; 60 below 20-40" | 20-40" over cobbly till | Moderate | Rapid | Good | Low & Medium | IIIe, IVe,VIe, VIIs | - | Erosion;gravelly profile in places; mod. deep over cobbly till | Cross-slope opers;residue mgmt; cropping sequence; rangeland mgmt. |
| - | - | Less than 10" over bedrock | - | Impervious | Good | Low | VIIs | - | Shallow over bedrock | - |
| one | - | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIe | - | Erosion; sandy profile; droughtiness | Rangeland management; residue management |
| one | - | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIe | - | Erosion; sandy profile; droughtiness | Rangeland management; residue management |
| one | - | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIs | - | Erosion; sandy profile; droughtiness | Rangeland and forest land management |
| ravel obbles stones | 20-35 in profile | 60"+ | Moderate | Moderate | Good to Excessive | Medium | VIIs | - | Erosion; steep slopes; stony and cobbly profile | Forest land management |
| ravel sand | 20-35 in profile;60 below 20-40" | 20-40" over gravel and sand | Rapid | Very rapid | Good to excessive | Low | IVe,IVs, VIs, VIIs | - | Erosion;gravelly profile;mod. deep over gravel & sand | Rangeland and forest land management |
| one | - | 60"+ | Moderate | Moderate | Good | High | IVe,VIe, VIIe | IVe | Erosion;strongly alkaline below 30"; droughtiness | Cross-slope opers;residue mgmt; cropping sequence;irrig. mgmt; rangeland management |
| Gravel | 35-80 below 10" | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | - | Shallow over bedrock;gravelly profile | Rangeland management |
| Gravel & sand | 60 below 20-40" | 20-40" over sand and gravel | Moderate | Very rapid | Good | Low | IVe, VIe | IVe, VIs | Erosion;mod. deep over gravel and sand droughtiness | Cross-slope opers;residue mgmt; cropping sequence; irrig. mgmt; rangeland management |

Table 66 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Perm S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 13 | 600-700 | 7-9 | 160-180 | Cropland (sugar beets, hay, pasture, mint, and corn)- irrigated | Xerollic Camborthids | Coarse-silty, mixed, mesic | Warden | 40 | Terraces | Reworked sediments and loess | Silt loam | Silt loam | None | - | 60"+ | Mode |
| | | | | | Rangeland | Typic Torripsamments | Mixed, mesic | Quincy | 30 | Duned terraces | Sand | Loamy fine sand | Loamy sand | None | - | 60"+ | Very |
| | | | | | | Cumulic Haploxerolls | Coarse-silty, mixed, mesic | Pasco | 10 | Floodplains | Alluvium | Fine sandy loam | Very fine sandy loam | None | - | 60"+ | Mode rapi |
| | 14 | 1,200-2,000 | 9-12 | 120-160 | Cropland (cereals)- dryland (limited hay and pasture)- irrigated | Calciorthidic Haploxerolls | Coarse-silty, mixed, mesic | Ritzville | 40 | Uplands (nearly level to rolling) | Loess | Silt loam | Silt loam | None | - | 60"+ | Mode |
| | | | | | Rangeland | Aridic Haploxerolls | Coarse-silty, mixed, mesic | Renslow | 15 | Upland (nearly level to undulating) | Loess | Silt loam | Silt loam | None | - | 40-60" over bedrock | Mode |
| | | | | | | Calciorthidic Haploxerolls | Coarse-silty, mixed, mesic | Ritzcal | 10 | Uplands (plateau edges & upper side slopes) | Loess (calcareous) | Silt loam | Silt loam | None | - | 60"+ | Mode |
| | | | | | | Calciorthidic Haploxerolls | Coarse-loamy, mixed, mesic | Farrell | 10 | Terraces | Loess & glacial material | Silt loam | Sandy loam | None | - | 40-60" over sand | Rapi |
| | | | | | | Calcic Lithic Haploxerolls | Loamy, mixed, mesic | Kuhl | 10 | Uplands (slopes along drainage ways) | Loess & basic igneous rock | Gravelly silt loam | Very gravelly silt loam | Gravel | 20-80 in profile | 10-20" over bedrock | Mode |
| | | | | | | Orthidic Durixerolls | Coarse-silty, mixed, mesic | Willis | 5 | Uplands | Loess | Silt loam | Silt loam | None | - | 20-40" over lime hardpan | Mode |
| Moderately deep to very deep soils with silty profiles and cold winters on gentle to very steep slopes. | 15 | 2,100-2,700 | 15-18 | 110-130 | Cropland (cereals, hay, and pasture)- 70% dryland and 10% irrigated | Typic Haploxerolls | Fine-silty, mixed, mesic | Athena | 65 | Uplands | Loess | Silt loam | Silt loam | None | - | 40-60"+ over bedrock | Mode |
| | | | | | Rangeland<br>Forest land | Calcic Argixerolls | Fine-silty, mixed, mesic | Reardan | 20 | Uplands (commonly on foot-slopes) | Loess | Silt loam | Silty clay | None | - | 20-30" over clayey material | Slow |
| | | | | | | Typic Xerorthents | Fine-silty, mixed, calcareous, mesic | Lance | 10 | Uplands (ridgetops & side slopes) | Loess & Lacustrine material | Silt loam | Silt loam (laminated) | None | - | 40-60" over lime hardpan | Mode slow |

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| ed ics | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fragments | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass | | | |
| Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated b/ | Major Soil Problems | Suitable Land Treatment and Structures |
| - | 60"+ | Moderate | Moderate | Good | High | VIe | I, IIe, IIIe, IVe, VIe | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt. |
| - | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIe | IVs | Erosion; droughtiness; sandy profile | Residue mgmt; irrigation mgmt; rangeland mgmt. |
| - | 60"+ | Moderately rapid | Rapid | Moderately good | Medium | - | IIIw | Wetness | Drainage; irrigation management |
| - | 60"+ | Moderate | Moderate | Good | High | IIIe, IVe, VIe | I | Erosion; free lime below 30", droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland management |
| - | 40-60" over bedrock | Moderate | Impervious | Good | Medium & high | IIIe | - | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence |
| - | 60"+ | Moderate | Moderate | Good | Medium | IVe, VIe | - | Erosion; strongly calcareous below 10" | Permanent cover |
| - | 40-60" over sand | Rapid | Very rapid | Good | Medium | IIIe, IVe, VIe | IIe, IIIe, IVe | Erosion; sandy profile; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland management |
| 20-80 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs, VIIs | - | Shallow over bedrock; gravelly profile | Rangeland management |
| - | 20-40" over lime hardpan | Moderate | Impervious in hardpan | Good | Low & Medium | IIIs, IVe, VIe | IIIs, IIIe, IVs, IVe | Erosion; mod. deep over hardpan; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland mgmt. |
| - | 40-60"+ over bedrock | Moderate | Impervious | Good | Medium & High | IIe, IIIe, IVe, VIe | - | Erosion; free lime below 30" in some areas | Terrace-diversions; cross-slope opers; residue mgmt; cropping sequence |
| - | 20-30" over clayey material | Slow | Slow | Good | Medium & High | IIe, IIIe, IVe | - | Erosion; 20-30" over clayey material | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage |
| - | 40-60" over lime hardpan | Moderately slow | Moderately slow | Good | Low & Medium | IVe, VIe | - | Erosion; calcareous laminated profile | Permanent cover |

Table 66 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Perm[…] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 16 | 2,500-3,000 | 11-15 | 100-120 | Cropland (cereals, hay, and pasture)-mostly dryland with limited irrigation | Calcic Argixerolls | Fine-silty, mixed, mesic | Bagdad | 50 | Uplands | Loess | Silt loam | Silt loam | None | - | 40-60" over bedrock | Mode[…] |
| | | | | | Rangeland | Typic Haploxerolls | Coarse-loamy, mixed, mesic | Anders | 12 | Uplands (plateaus and swales) | Loess over basic igneous rock | Silt loam | Silt loam | None | - | 20-40" over bedrock | Mode[…] |
| | | | | | | Calcic Haploxerolls | Coarse-loamy, over sandy, or sandy-skeletal, mixed, mesic | Benge | 10 | Terraces | Glacial outwash | Silt loam | Gravelly loam | Gravel & sand | 20-35 below 10" in profile; 60 below 20-40" | 20-40" over gravel & sand | Mode[…] |
| | | | | | | Calcic Lithic Haploxerolls | Loamy, mixed, mesic | Kuhl | 3 | Uplands (ridgetops & south Slopes) | Loess & basic igneous rock | Gravelly silt loam | Very gravelly loam | Gravel | 20-80 in profile | 10-20" over bedrock | Mode[…] |
| Moderately deep and shallow soils with loamy, rocky profiles on gentle to very steep slopes. | 17 | 1,000-3,000 | 9-11 | 110-160 | Rangeland | Typic Argixerolls | Clayey-skeletal, mixed, mesic | Clerf | 50 | Uplands (steep north slopes & canyon side slopes) | Loess & basic igneous rock | Cobbly silt loam | Cobbly clay loam | Cobbles and gravel | - | 20-40" over bedrock | Mode[…] slow |
| | | | | | | Calcic Lithic Haploxerolls | Loamy, mixed, mesic | Kuhl | 25 | Uplands (ridgetops & south slopes) | Loess & basic igneous rock | Stony silt loam | Gravelly loam | Stones, cobbles and gravel | 20-35 in profile | 10-20" over bedrock | Mode[…] |
| | | | | | | Aridic Haploxerolls | Coarse-silty, mixed, mesic | Renslow | 10 | Uplands | Loess | Silt loam | Silt loam | None | - | 40-60" over bedrock | Mode[…] |
| | 18 | 1,500-3,500 | 10-15 | 110-140 | Cropland (cereals)-dryland | Xerollic Haplargids | Fine-silty, mixed mesic | Waterville | 30 | Uplands (plateaus) | Loess | Silt loam | Silt loam | None | - | 20-40" over compact silts | Mode[…] |
| | | | | | Rangeland | Calcic Lithic Haploxerolls | Loamy, mixed, mesic | Kuhl | 25 | Uplands (side slopes) | Loess & basic igneous rock | Stony silt loam | Stony silt loam | Cobbles and stones | 20-35 in profile | 10-20" over bedrock | Mode[…] |
| | | | | | | Calciorthidic Haploxerolls | Coarse-silty, mixed, mesic | Ritzville | 20 | Uplands (plateaus) | Loess | Silt loam | Silt loam | None | - | 60"+ | Mode[…] |
| | | | | | | Aridic Haploxerolls | Coarse-silty, mixed, mesic | Renslow | 10 | Uplands (plateaus) | Loess | Silt loam | Silt loam | None | - | 40-60" over compact silts or bedrock | Mode[…] |
| | | | | | | Calciorthidic Haploxerolls | Coarse-loamy, mixed, mesic | Alstown | 5 | Terraces & footslopes | Alluvium | Silt loam | Silt loam | None | - | 60"+ | Mode[…] |

tinued

| istics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| rse Fragments | | | | | | | Range of: Major Capability Subclass | | | |
| d | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| | - | 40-60" over bedrock | Moderate | Impervious | Good | Medium & High | IIIe, IVe, VIe | - | Erosion;calcareous and strongly alkaline below 28" | Cross-slope opers; residue mgmt; cropping sequence |
| e | - | 20-40" over bedrock | Moderate | Impervious | Good | Low & Medium | VIs, VIIs | IIIs, IIIe, IVs, IVe | Erosion; mod. deep over bedrock;droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland mgmt. |
| vel and | 20-35 below 10" in profile; 60 below 20-40" | 20-40" over gravel & sand | Moderate | Very rapid | Good | Low | VIe, VIs, VIIs | IIIs, IIIe, IVs, IVe | Erosion;mod. deep over gravel and sand; gravelly profile; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland mgmt. |
| vel | 20-80 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs, VIIs | - | Shallow over bedrock; gravelly profile | Rangeland management |
| bles vel | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | VIe | - | Erosion; steep slopes; cobbly and gravelly profile | Rangeland management |
| nes, bles vel | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | - | Shallow over bedrock; stony and gravelly profile | Rangeland management |
| e | - | 40-60" over bedrock | Moderate | Impervious | Good | Medium & High | IIIe | - | Erosion; droughtiness | Rangeland management |
| e | - | 20-40" over compact silts | Moderate | Very slow | Good | Low & Medium | IIIe, IVe, VIe | - | Erosion; mod. deep over compact silts; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; rangeland mgmt. |
| bles nes | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | - | Shallow over bedrock; stony profile | Rangeland management |
| e | - | 60"+ | Moderate | Moderate | Good | High | IIIe, IVe,VIe | - | Erosion; free lime below 30"; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; rangeland mgmt. |
| e | - | 40-60" over compact silts or bedrock | Moderate | Very slow or impervious | Good | Medium & HIgh | IIIe, IVe,VIe | - | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; rangeland mgmt. |
| e | - | 60"+ | Moderate | Moderate | Good | High | IIIe, VIe | - | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; rangeland mgmt. |

Table 66 - Continued

| Soil Groups | Soil Association: Map Sym. | Soil Association: Elevation Feet | Soil Association: Precip. Inches | Soil Association: Freeze Season Days | Soil Association: Major Land use | Classification: Great Group or Subgroup | Classification: Family | Classification: Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Soil Characteristics: Texture Surface Soil | Soil Characteristics: Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Pe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 19 | 900-1,000 | 8-10 | 160-180 | Rangeland | Calcic Lithic Haploxerolls | Loamy, mixed, mesic | Kuhl | 35 | Uplands (side slopes) | Loess & basic igneous rock | Gravelly silt loam | Gravelly loam | Gravel | 20-35 in profile | 10-20" over bedrock | Mo |
| | | | | | Cropland (cereals)-dryland (hay and pasture)-irrigated | Lithic Xerollic Camborthids | Loamy, mixed, mesic | Starbuck | 25 | Uplands (south exposures) | Loess & basic igneous rock | Silt loam | Very gravelly silt loam | Gravel | 35-80 below 10" | 10-20" over bedrock | Mo |
| | | | | | | Calciorthidic Haploxerolls | Coarse-loamy, over sandy or sandy-skeletal, mixed, mesic | Magallon | 20 | Terraces | Alluvium over glacial outwash | Loam | Sandy loam | Sand | 80 below 20-40" | 20-40" over coarse sand | Ra |
| Moderately deep and very deep soils with ashy loamy profiles on moderate to very steep slopes. | 20 | 3,000-10,000 | 20-120 | 0-100 | Forest land 4/ Rangeland | Cryandepts plus Cryumbrepts, Cryorthods and Haplumbrepts | Ashy over fine to coarse-loamy mixed | | 100 | Uplands (foot-slopes, and plateaus) | Sandstone, ash, loess, pumice and glacial till | - | - | - | - | 40-60" and bedrock | Mo ra |
| Miscellaneous rocky soils on strong to extremely steep slopes. | 21 | 6,000-12,000 | 150-200 | None | Other Forest land 4/ | Rockland | - | | 100 | Uplands (steep mountains) | Sedimentary and igneous rock | - | - | None | - | Less than 10" over bedrock | Mo im |
| Moderately deep and deep soils with rocky profiles high in quartz on moderate to very steep slopes. | 22 | 1,000-7,000 | 16-40 | 0-130 | Principally Forest and Rangeland 4/ | Cryandepts plus C.,orthrods, Eutrandepts, Xerochrepts, and Haploxerolls | Ashy, loamy-skeletal, mixed, frigid and coarse-silty, mixed (coarse-loamy) | | 100 | Uplands (mountain slopes) | Acidic igneous rock and glacial till | - | - | - | - | 20-60" over bedrock, sand or gravel | Mo ra |

1/ Based on data summarized during 1966.
2/ Only soil series names that have a status as reserved, tentative, or established are listed.
3/ Differences of total percentage in each soil association from 100 percent are inclusions of other soils and land types.
4/ For the upland forest soils, the above characteristics and qualities have been extended from a limited amount of survey data. Additional data and land use interpretations for forest soils are available in the Forest Land section of Appendix VIII, Land Measures and Watershed Protection. These areas include National Forest and adjacent non-Federal forest lands.
5/ Miscellaneous land types.
6/ Presently irrigated cropland.

Source: National Cooperative Soil Survey.

nued

| tics | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Soil Qualities and Interpretations | | | | | | | |
| se Fragments | | | | | | | Range of: Major Capability Subclass | | | |
| | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| el | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | - | Shallow over bedrock; gravelly profile | Rangeland management |
| el | 35-80 below 10" | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | - | Shallow over bedrock; very gravelly profile | Rangeland management |
| | 80 below 20-40" | 20-40" over coarse sand | Rapid | Very rapid | Good | Low | IIIe, IIIc, IVe | IVe, IVs | Erosion; mod. deep over coarse sand; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrig. mgmt; rangeland mgmt. |
| | - | 40-60" and bedrock | Moderately rapid | - | Good | Low to Medium | VIe | - | Erosion with improper land use | Continued forest land management |
| | - | Less than 10" over bedrock | Moderate to impervious | - | Good | Low | VIIIs | - | Shallow over bedrock; steep slopes | |
| | - | 20-60" over bedrock, sand or gravel | Moderate to rapid | - | Good | Medium | VIe | - | Erosion; with heavy cover disturbance | Continued forest land management |

incomplete, extensive areas are included within delineations and inclusions of other soils may exceed the 15 percent general average.

Table 66 contains information about each soil association shown on figure 11. The symbol listed in the second column on the table is the same symbol shown on the Soil Association Map.

The table is organized to show land characteristics and the characteristics, qualities, and some interpretations of soil series representing the dominant and the contrasting kinds of soil in each association. The first six columns show some general land characteristics for each soil association. The next 11 columns show characteristics (permanent soil facts) of individual key soil series that represent dominant and contrasting soils. The following four show qualities inferred from the characteristics of these soils and the last four columns show interpretations concerning agricultural use based upon the foregoing soil characteristics and qualities. All of the representative soil series listed have status in classifications. A blank space in the soil series column indicates that the soil series name has no classification status.

The "soil groups" column shows soil associations that contain soils having broad similarities in some important characteristics frequently identified with a position on the landscape.

The "percentage of association" column shows the extent of each soil in an association. Differences of the total soil percentage in each association from 100 percent are inclusions of other soil and land types. For example, association 16 lists a total of 75. Knowledge of this area is limited, so 25 percent of the area consists of inclusions of soils that have not been defined.

Terms listed for permeability of water through the subsoil and permeability of substratum are:

Very rapid: Over 10 inches per hour.
Rapid: 5 to 10 inches per hour.
Moderately rapid: 2.50 to 5 inches per hour.
Moderate: 0.8 to 2.5 inches per hour.
Moderately slow: 0.2 to 0.8 inches per hour.
Slow: 0.05 to 0.2 inches per hour.
Very slow: Less than 0.05 inches per hour.

Terms listed for total available water-holding capacity are:

Low: Less than 6 inches in profile.
Medium: 6 to 10 inches.
High: More than 10 inches in profile.

The irrigated capability subclasses are an interpretation of limitations and hazards of using only presently irrigated lands. Many areas not presently irrigated may be potentially irrigable, but are not included in this classification.

A dash in any column indicates that the information is nonexistent or not pertinent.

The soils defined on table 66 reflect the influence of the soil parent materials in many important ways. An example is the prevalence of coarse fragments and the droughtiness of soils formed in glacial materials or in loess mixed with basalt bedrock. Also, note the silty texture, depth, and absence of coarse fragments in the soils formed in deep beds of wind deposited materials on hilly uplands. Generally the table shows most of the soils are well to somewhat excessively drained and are underlain at various depths by basalt bedrock. The well drained loamy and gravelly soils on gentle to moderate slopes typical of the Columbia Basin respond particularly well to intensive cropland use under irrigation.

Table 67 shows the estimated acreage and proportionate extent of the soil associations.

Table 67 - Soil Associations Acreage, Subregion 2, 1966

| Soil Association | | | |
|---|---|---|---|
| Map Symbol | Name | Washington (1,000 acres) | Percent |
| 1 | Colville-Mires | 285.0 | 2.0 |
| 2 | Springdale-Marble | 390.0 | 2.8 |
| 3 | Pogue-Brief | 600.0 | 4.3 |
| 4 | Warden-Ephrata | 1,900.0 | 13.5 |
| 5 | Bonner-Springdale | 190.0 | 1.3 |
| 6 | Benge-Anders | 390.0 | 2.8 |
| 7 | Conconully-Kartar | 690.0 | 4.9 |
| 8 | Nevine-Molson | 250.0 | 1.8 |
| 9 | Touhey-Timentwa | 650.0 | 4.6 |
| 10 | Winchester-Quincy | 90.0 | 0.6 |
| 11 | Marble-Speigle | 70.0 | 0.5 |
| 12 | Shano-Starbuck | 390.0 | 2.8 |
| 13 | Warden-Quincy | 12.0 | 0.1 |
| 14 | Ritzville-Renslow | 1,100.0 | 7.8 |
| 15 | Athena-Reardan | 150.0 | 1.1 |
| 16 | Bagdad-Anders | 330.0 | 2.3 |
| 17 | Clerf-Kuhl | 360.0 | 2.5 |
| 18 | Waterville-Kuhl | 600.0 | 4.3 |
| 19 | Kuhl-Starbuck | 25.0 | 0.2 |
| 20 | Dominantly Cryandepts | 2,900.0 | 20.6 |
| 21 | Rockland | 60.0 | 0.4 |
| 22 | Dominantly Cryandepts | 2,648.8 | 18.8 |
| Total Land Area | | 14,080.8 | 100.0 |

Source: National Cooperative Soil Survey.

## Interpretations and Evaluation

Table 68 relates the land capability classes to the Land Capability Map, figure 3. It must be realized that the Land Capability Map is highly generalized and a specific capability class on table 68 may not be shown. To determine the land capability of any particular area, refer to the soil association symbols listed in the second column of the table and then locate the area of that symbol on the Soil Association Map, figure 11. Table 68 also shows the acreage and extent of the dominant land capability class for practical segments of the landscape.

Table 68 - Summary and Distribution of Land Capability Classes, Subregion 2, 1966

| Land Capability Classes | Distribution by Soil Associations 1/ | | | Inventoried 1,000 Acres 3/ |
|---|---|---|---|---|
| | Soil Association Map Symbols 2/ | 1,000 Acres | Percent | |
| Class I - Soils in Class I have no limitations or hazards. They are adopted to all uses with a minimum of conservation treatment other than standard conditioning ones. 4/ | - | - | - | 69.1 |
| *Class II - Soils in Class II have few limitations or* hazards. Simple conservation practices are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | - | - | - | 500.0 |
| Class III - Soils in Class III have more limitations and hazards than those in Class II. They require more difficult or complex conservation practices when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 1-12-14-15 16-18 | 2,855.0 | 20.3 | 2,518.0 |
| Class IV - Soils in Class IV have greater limitations and hazards than Class III. Still more difficult or complex measures are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 2-3-4-5-6 8-9-13 | 4,382.0 | 31.1 | 1,503.1 |
| Class V - Soils in Class V have more limitations than Class IV. They are generally unsuited for cultivation, but are well suited for grazing and forestry use. They require *good management practices.* 4/ | - | - | - | 10.0 |
| Class VI - Soils in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland or wildlife. | 7-17-20-22 | 6,598.8 | 46.9 | 8,327.1 |
| Class VII - Soils in Class VII have very severe limitations and hazards that make them generally unsuited for cultivation. They are suited to grazing, noncommercial, woodland or wildlife. | 10-11-19 | 185.0 | 1.3 | 897.0 |
| Class VIII - Soils and land forms in Class VIII have limitations and hazards that prevent their use for cultivated crops, pasture, range or woodland. They may be used for recreation, wildlife or water supply. | 21 | 60.0 | 0.4 | 256.5 |
| Total Land | | 14,080.8 | 100.0 | 14,080.8 |

1/ *Class I and 10 percent of other capability classes may be included in areas of Class II.* Up to 25 percent of other capability classes may be included in Classes III and IV. Class V and up to 40 percent of other capability classes may be included in Classes VI, VII, and VIII. In areas of rainfall less than 12 inches, large areas of Class VI can be potential Classes I through IV where irrigation water is available.
2/ Refer to Subregional Soil Association Map, figure 11.
3/ Taken from table 8.
4/ Capability Classes I and V are distributed in small segregated areas over segments of the landscape. Many small areas could not be delineated on the map. This added detail, although still generalized, is commensurate with the subregional level of generalization.
Source: National Cooperative Soil Survey and U.S.D.A. Conservation Needs Inventory adjusted.

Classified on table 69 is the dominant water storage capacity for each soil association in Subregion 2. Each class ( the table relates to a similar class on the regional map, figure Water Storage Capacity. To locate those areas having contrastir water storage capacity in the upper 5 feet of soil, refer to figure 4, to figure 11 (the subregional Soil Association Map), a to the following table. The class letter symbol in the first column and the Soil Association Map numerical symbol listed in t second column may be used to locate those areas having contrasti water storage capacity. Complete utilization of this storage ca contribute a more stable and sustained streamflow.

Table 69 - Water Storage Capacity of Soils Generalized to the Soil Associations, Subregion 2, 1966

| Classes of Water Storage Capacity 1/ | Soil Association Symbols | 1,000 Acres | Percent |
|---|---|---|---|
| Class A - Water storage in the soil profile more than 20,000 acre-feet per township. | 12-14-15-16 | 1,970.0 | 14.0 |
| Class B - Water storage in the soil profile 10,000 to 20,000 acre-feet per township. | 1-18 | 885.0 | 6.3 |
| Class C - Water storage in the soil profile 5,000 to 10,000 acre-feet per township. | 2-3-4-5-6-7 8-9-13-17-20 22 | 10,980.8 | 78.0 |
| Class D - Water storage in the soil profile less than 5,000 acre-feet per township. | 10-11-19-21 | 245.0 | 1.7 |
| Total | | 14,080.8 | 100.0 |

1/ Measurement of the water storage capacity is limited to the upper 5 feet of soil or to bedrock.
Source: National Cooperative Soil Survey.

## Cover and Land Use

The four major cover and land uses, as defined in the gl and explained in the introduction, have been summarized by acre and ownership on table 70. These broad categories have been de mined both on the basis of cover and use. Cropland is more spe fically a use category. Forest land has more than 10 percent f cover. Rangeland areas have broad range cover characteristics. Other land includes land specifically based on use, such as urb as well as that based specifically on cover characteristics suc rock and sand dune areas. The four major categories have been generalized for presentation on figure 12. Since this information has been generalized, isolated areas of different cover and uses may occur within the broad patterns.

Table 70 - Cover and Land Use by Ownership, Subregion 2, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 3,052.9 | 235.4 | 207.0 | 3,495.3 |
| Other Agriculture | - | - | - | - | - |
| | - | 3,052.9 | 235.4 | 207.0 | 3,495.3 |
| Department of the Interior | | | | | |
| Bureau of Land Management | | 60.0 | 140.0 | .6 | 200.6 |
| Bureau of Indian Affairs 1/ | 24.4 | 835.8 | 163.9 | 29.1 | 1,053.2 |
| National Park Service | - | 112.0 | 88.5 | 33.0 | 233.5 |
| Fish & Wildlife Service | .3 | 45.0 | 33.7 | 4.2 | 83.2 |
| Bureau of Reclamation | - | 5.0 | 326.1 | 30.0 | 361.1 |
| Other Interior | - | - | - | .5 | .5 |
| | 24.7 | 1,057.8 | 752.2 | 97.4 | 1,932.1 |
| Department of Defense | - | - | 89.0 | 9.3 | 98.3 |
| Other Federal | - | - | 230.7 | - | 230.7 |
| Federal Subtotal | 24.7 | 4,110.7 | 1,307.3 | 313.7 | 5,756.4 |
| State | 98.7 | 393.0 | 391.0 | 48.6 | 931.3 |
| County | - | - | - | 18.8 | 18.8 |
| Municipal | - | 7.0 | 1.3 | 7.0 | 15.3 |
| Public Total | 123.4 | 4,510.7 | 1,699.6 | 388.1 | 6,721.8 |
| Private Total | 3,185.4 | 1,141.4 | 2,884.3 | 147.9 | 7,359.0 |
| Total Land Area | 3,308.8 | 5,652.1 | 4,583.9 | 536.0 | 14,080.8 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, U.S.D.A. Forest Survey, and other sources.

## Cropland

Cropland in the Upper Columbia Subregion consists mainly of the apple producing area, the wheat producing area, and the diversified farming area of the Columbia Basin Irrigation Project.

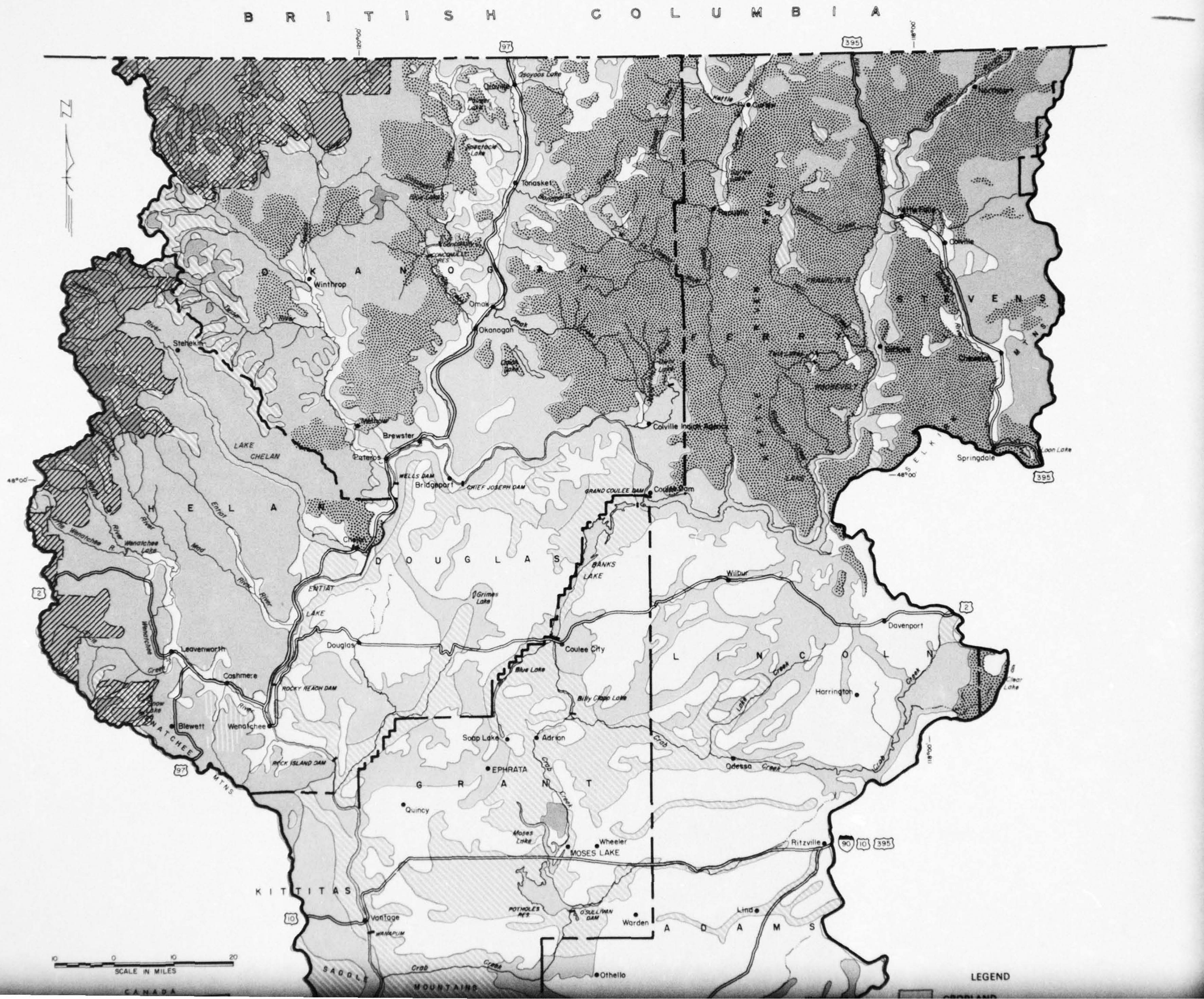
Apple production is an intensive agricultural enterprise requiring high level management and expenditures to produce a high value crop in sufficient volume to assure a margin of profit. The valley terraces, fans, and footslopes, where the major production is concentrated, generally have gravelly, shallow to moderately deep soils overlying deep beds of water-sorted sand, gravel, and cobbles. Problems of management relate mainly to droughty soils and occasional low temperatures.

*Cereal crops in wheat-fallow area on uplands with soils formed in deep beds of wind deposited silt. (S.C.S.)*

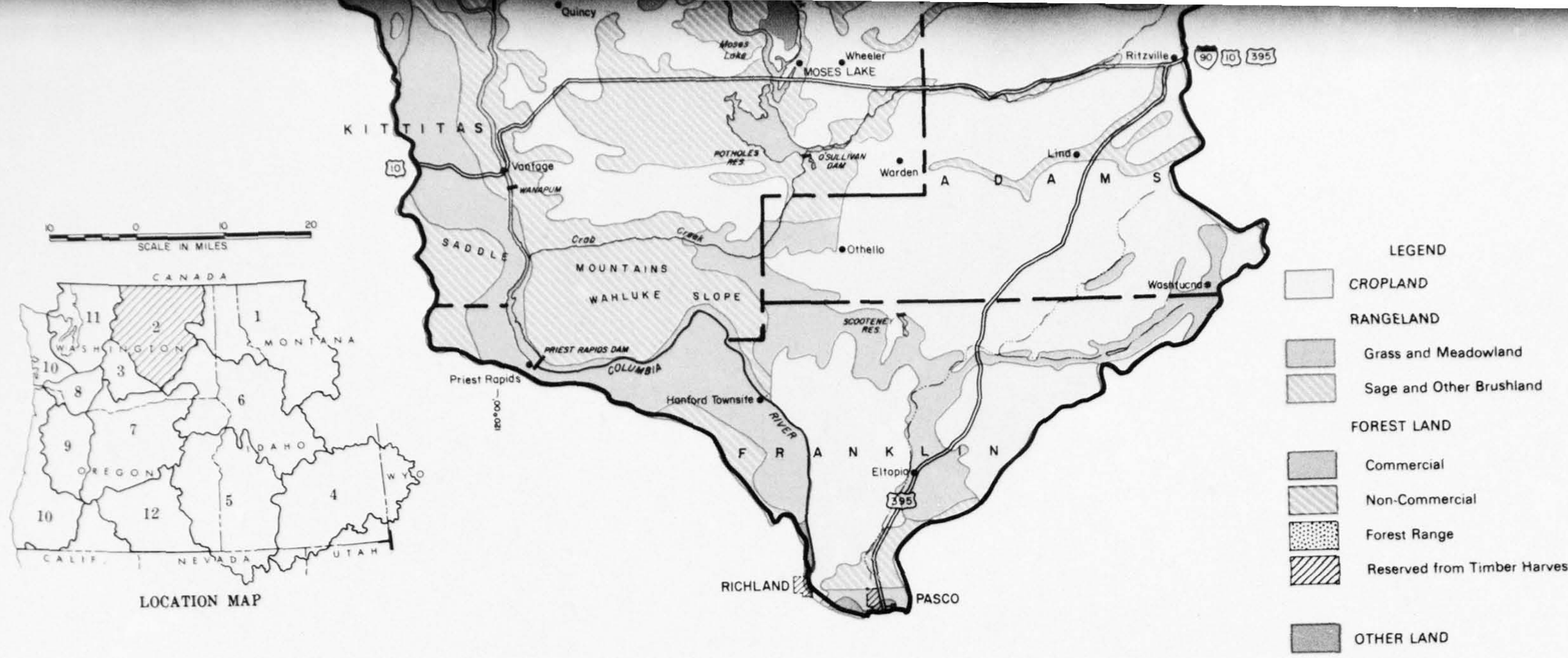
The wheat producing area, although less intensively farmed than the apple orchards, is generally under a higher level of management than comparable areas of grain production in the Columbia North Pacific Region. Deep silty soils are necessary to store moisture and mature the plants during the low rainfall period from June through August. Throughout most of the grain producing area a fallow year must be used to store sufficient moisture to grow profitable crops. Problems of management relate to strong and steep slopes and restricted infiltration or permeability of the soil.

Irrigation in the Columbia Basin provides adequate moisture so many climatically adapted crops can be grown. Thus, sugar beets, potatoes, and other row and specialty crops can be added to the hay, pasture, and grain crops to obtain a balanced agricultural enterprise. On this tremendous outwash terrace the soils are generally shallow to moderately deep, sandy or silty, frequently gravelly or cobbly, and overlay water-sorted sand, gravel and cobbles, or basalt bedrock or stratified lake sediments or lime cemented hardpan. In some parts of the area problems of alkali and restricted drainage hamper crop production.

There are many isolated upland areas in cropland that are generally farmed at a lower level of management and usually quite diversified. Table 71 shows the cropland, acreage, and extent of representative crops.



BRITISH COLUMBIA
OKANOGAN
FERRY
STEVENS
CHELAN
DOUGLAS
LINCOLN
GRANT
KITTITAS
ADAMS
Oroville
Osoyoos Lake
Tonasket
Winthrop
Omak
Okanogan
Stehekin
Brewster
Pateros
Bridgeport
WELLS DAM
CHIEF JOSEPH DAM
GRAND COULEE DAM
Coulee Dam
Colville Indian Agency
Colville
Springdale
Loon Lake
LAKE CHELAN
Chelan
ENTIAT LAKE
Leavenworth
Cashmere
Wenatchee
Blewett
ROCKY REACH DAM
ROCK ISLAND DAM
Douglas
Grimes Lake
BANKS LAKE
Wilbur
Davenport
Coulee City
Blue Lake
Billy Clapp Lake
Harrington
Clear Lake
Soap Lake
Adrian
EPHRATA
Odessa
Crab Creek
Quincy
Moses Lake
MOSES LAKE
Wheeler
Ritzville
Lind
Warden
POTHOLES RES
O'SULLIVAN DAM
Vantage
WANAPUM
Othello
SADDLE MOUNTAINS
WENATCHEE MTNS
48°00'
120°00'
118°00'
97
395
2
10
90
SCALE IN MILES
10 0 10 20
CANADA
LEGEND
CROPLAND




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# GENERALIZED COVER AND LAND USE

UPPER COLUMBIA, SUBREGION 2

1968

FIGURE 12

Table 71 - Cropland Acreage of Representative Categories of Crops, Subregion 2, 1966

| Categories of Crops | Washington (1,000 acres) | Percent |
|---|---|---|
| Dryland Cropland[1/] | | |
| Close grown field crops | 2,439.4 | 73.7 |
| Forage crops | 162.5 | 4.9 |
| Total dryland crops | 2,601.9 | 78.6 |
| Irrigated Cropland[1/] | | |
| Close grown field crops | 134.5 | 4.1 |
| Forage crops | 331.2 | 10.0 |
| Row crops | 100.5 | 3.1 |
| Orchards and vineyards | 67.4 | 2.0 |
| Specialty crops | 73.3 | 2.2 |
| Total irrigated crops | 706.9 | 21.4 |
| Total cropland | 3,308.8 | 100.0 |

1/ Does not include other land that is irrigated (table 74).
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

## Forest Land

The forested portion of Subregion 5 comprises 5,652,100 acres or 40 percent of the land area. It dominates the northern portion, extending from the Cascade Mountains on the northwest to the Selkirk Mountains on the northeast. Forests extend from the ridgetops, downslope until they intermix with range and agricultural lands below. Table 72 shows the forest land acreage by generalized type and ownership.

Over 4.5 million acres or 80 percent of the forest land is publicly owned. This public land is 70 percent National Forest, 19 percent Indian lands, 2 percent other Federal ownership, and 9 percent state and county. The private land amounts to almost 1.2 million acres. Table 70 shows the ownership in detail.

Timber Slightly over 4.6 million acres are classed as commercial forest land, nearly all softwood. The major species are Douglas-fir and ponderosa pine. Other species, found in much lesser quantities, include the white and lodgepole pine, larch, and true firs. The remaining million acres are classed as noncommercial, about one-half of which is the sub-alpine type found near timberline, the rest on lands reserved from timber harvest.

Seventy percent of the commercial forest area is in the sawtimber class. Twenty percent is classed as pole timber and 8 percent as seedlings and saplings. Only 2 percent is nonstocked. A little over 200,000 acres of the commercial forest land have been reserved

Table 72 - Forest Land, Acreage by Generalized Type and Ownership, Subregion 2, 1966

| Ownership | Commercial Forest Land | Non-Commercial Forest Land: Productive Reserved | Non-Commercial Forest Land: Unproductive Reserved | Non-Commercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 2,061.9 | 251.0 | 222.0 | 518.0 | 3,052.9 |
| Bureau of Land Management | 53.0 | - | - | 7.0 | 60.0 |
| Bureau of Indian Affairs 1/ | 829.8 | - | - | 6.0 | 835.8 |
| National Park Service | 54.0 | 47.0 | 4.0 | 7.0 | 112.0 |
| Fish & Wildlife Service | 45.0 | - | - | - | 45.0 |
| Bureau of Reclamation | 5.0 | - | - | - | 5.0 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 3,048.7 | 298.0 | 226.0 | 538.0 | 4,110.7 |
| State | 382.5 | - | - | 10.5 | 393.0 |
| County | - | - | - | - | - |
| Municipal | 7.0 | - | - | - | 7.0 |
| Public Total | 3,438.2 | 298.0 | 226.0 | 548.5 | 4,510.7 |
| Private Total | 1,108.9 | - | - | 32.5 | 1,141.4 |
| Grand Total | 4,547.1 | 298.0 | 226.0 | 581.0 | 5,652.1 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Pacific Northwest Experiment Station.

from timber harvest by wilderness type classifications. The remaining commercial forest land supports over 37 billion board feet and, as such, is available to the forest industries which furnish some 42 percent of the subregion's total manufacturing employment.

Forest Range Included in the forest range is 2.8 million acres classified as commercial forest land and 82,000 acres classified as noncommercial forest land. This 2.9 million acres represents 52 percent of the total forest land in the subregion.

Approximately 35 percent of the forest range is in good range condition, 40 percent in fair condition, and 25 percent in poor condition. The estimated carrying capacity is 243,000 AUMs.

Nearly 1.0 million acres of the forest range representing 34 percent of the forest range of the subregion is privately owned. Other significant segments of the forest range are administered by the Bureau of Indian Affairs, the Forest Service, and the State of Washington.

Native vegetation of the forest range is composed of parklike stands of ponderosa pine with an understory of beardless wheatgrass, Idaho fescue, pinegrass, and Sandbergs bluegrass. Forbs such as lupine, balsamroot, and yarrow occur together with buckbrush, bitterbrush, serviceberry, wild currant, and spiraea. This range has a high grazing potential with forage yields up to 1,600 pounds per acre. The area is best grazed in late spring and early summer. It is one of the most important big game habitat types.

Other forest range is located in the Douglas-fir, western larch, and lodgepole pine areas of the northeast portion of the subregion. The open stands and park-like areas support stands of mountain brome, pinegrass, June-grass, and various sedges. The understory includes lupine, pea vine, and such browse plants as Ocean Spray, serviceberry, wild currant, bitterbrush, and snowberry. The range resource is best used as early and midsummer range. It provides important habitat for various big game species and upland birds.

Other Uses The forest lands are as valuable as watersheds as they are the source of the forest industry's raw material. Although only 40 percent of the subregion is forested, over 90 percent of its runoff originates there. Domestic water supplies for almost 40,000 people, representing 54 percent of the subregion's urban population, originate on these lands.

The forest lands form a major part of the subregion's recreation resource, furnishing areas for hunting, fishing, and other outdoor activities. The public forest land furnished areas and facilities for over 5 million recreation visits in 1965. These included use at developed recreation sites, winter sports areas, and the general forest environment. The private forest lands furnish a lesser part of the recreation resource in this subregion. These lands also furnish the habitat for a significant portion of the big game found in the basin. In 1965, nearly 600,000 hunter visits were recorded on the forested portion of the subregion.

## Rangeland

Rangeland in Subregion 2 occupies 4.6 million acres and accounts for 33 percent of the total land area. This subregion has 8 percent of all rangeland in the region. Table 73 shows the various categories of rangeland by ownership.

Rangeland is concentrated primarily in the southwestern part of the subregion along the Columbia River and interspersed with cropland areas in the central portion. About 1.2 million acres or 25 percent is in good condition, 1.5 million acres or 34 percent is in fair condition, and 1.9 million acres or 41 percent is in poor condition. The nonforest rangeland has an estimated carrying capacity of 573,000 AUMs, with private range accounting for 63 percent and the public range 37 percent.

Table 73 - Rangeland and Forest Range Acreage by Range Type and Ownership, Subregion 2, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Grand Total |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 70.0 | 225.4 | 150.0 | 208.3 | 653.7 | 265.0 | 2,106.7 | 3,025.4 |
| Sagebrush | 52.0 | 4.0 | 1.9 | 535.9 | 593.8 | 108.2 | 643.1 | 1,345.1 |
| Brushland other than sage | 18.0 | 6.0 | 12.0 | 23.8 | 59.8 | 19.1 | 134.5 | 213.4 |
| Total | 140.0 | 235.4 | 163.9 | 768.0 | 1,307.3 | 392.3 | 2,884.3 | 4,583.9 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | 53.0 | 612.3 | 825.4 | 1.1 | 1,491.8 | 382.5 | 958.6 | 2,832.9 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 37.5 | - | - | 37.5 | 10.5 | 20.0 | 68.0 |
| Desert Fringe | 7.0 | 2.1 | - | - | 9.1 | - | 5.2 | 14.3 |
| Total (noncommercial) | 7.0 | 39.6 | - | . | 46.6 | 10.5 | 25.2 | 82.3 |
| Total (forest range) | 60.0 | 651.9 | 825.4 | 1.1 | 1,538.4 | 393.0 | 983.8 | 2,915.2 |
| Grand Total | 200.0 | 887.3 | 989.3 | 769.1 | 2,845.7 | 785.3 | 3,868.1 | 7,499.1 |

1/ Forest and woodland grazed or potentially usable for forage production. The forest range acreage is included within the total forest statistics shown on table 75.

Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Privately owned rangeland amounts to 2.9 million acres or 63 percent of the total. Another 29 percent or 1.3 million acres is under Federal management. The remaining is in state or municipal ownership.

Grasslands, including perennial grasses and forbs, cover 3.0 million acres and represent 66 percent of the rangeland. It is estimated that 27 percent of this is in good range condition, 34 percent in fair condition, and 39 percent in poor condition. Natural grasslands are found intermingled with sagebrush and other browse types and may occur on soils ranging from clay loams to sandy loams. This range type may be found on rolling hills, plateaus, or river breaks extending from the lower timberline to the valley bottoms. The important plants, which are found in abundance on the better condition ranges, include bluebunch wheatgrass, Idaho fescue, big bluegrass, and Indian Ricegrass. Giant wild ryegrass and saltgrass may occur in swales and around the lake bottoms. Less desirable plants, such as Sanbergs bluegrass, needlegrass, squirreltail, or dropseed, together with Balsamroot, yarrow, lupine, and other forbs have increased on grass ranges which are not in good condition. As a result of repeated fires, drought, or poor range management practices, perennial grasses have frequently been replaced by low value plants such as cheatgrass, annual weeds, rabbitbrush, and sagebrush.

Sagebrush dominates about 1.4 million acres or 29 percent of the rangeland. It is estimated that 23 percent is in good range condition, 33 percent in fair condition, and 44 percent in poor condition. This type is adapted to a wide range of soil conditions being found growing at intermediate and lower elevations over the south and central portions of the subregion. Good condition sagebrush range is characterized by an abundance of desirable perennial plants such as the bluebunch wheatgrass, Idaho fescue, or big bluegrass which may be found growing in association with sagebrush and scattered forbs. These grasses produce most of the forage and also serve to prevent the loss of soil and water resources. Range deterioration caused by repeated fires, drought, and poor range management practices may be evidenced on areas which now support almost pure stands of sagebrush or annual vegetation. Soil erosion is prevalent over much of this poor condition range.

Brushland other than sage occupies approximately 213,000 acres and accounts for the remaining 5 percent of the range. Condition of range in this category is similar to the sagebrush range. Principal nonforest browse types are the bitterbrush--bluebunch wheatgrass range found growing on the glaciated stony hills which border the Okanogan and Columbia Rivers and the rabbitbrush mixed grass ranges found on sandy sites in Grant and Douglas counties. The bitterbrush ranges produce important winter deer habitat as well as forage for livestock. Much of the rabbitbrush range exists on droughty soil in the 8-inch rainfall areas.

## Other Land

The other land use in Subregion 2 consists of 536,000 acres or about 4 percent of the land area. This includes barren land and rockland in alpine areas that make up about 50 percent of the total. About 44 percent of the total is urban, industrial areas, farmsteads, airports, roads, and other miscellaneous use areas. About 6 percent consists of water areas less than 40 acres and streams less than one-eighth mile wide. Table 74 shows the acreage and extent of other land.

Table 74 - Other Land, Subregion 2, 1966

| Kinds of Land Use | Washington (1,000 acres) | Percent |
|---|---|---|
| Barren | 269.5 | 50.3 |
| Roads and railroads | 127.6 | 23.8 |
| Small water1/ | 30.8 | 5.7 |
| Miscellaneous2/ | 108.1 | 20.2 |
| Total other land | 536.0 | 100.0 |

1/ Water areas less than 40 acres in size and streams less than one-eighth mile in width.
2/ Includes urban and industrial areas, farmsteads, airports, and other areas.
Source: Compiled by the Soil Conservation Service Columbia-North Pacific River Basin Staff

## MINERAL RESOURCES

The metallic mineral resources are closely related to igneous intrusive rocks, thus, their distribution is related to the distribution of these igneous rocks. The northern and western parts of the subregion (including Stevens, Ferry, Okanogan, and Chelan counties) contain large bodies of granitic intrusive rocks of Late Jurassic and Early Cretaceous age. Smaller intrusions of Tertiary igneous rocks are found in the Sanpoil River Basin in Ferry County. Large areas in the upper Columbia and Colville River basins in Stevens and Ferry Counties are underlain by Paleozoic limestones, shales, argillites, and other sedimentary and metasedimentary rocks that contain large, low grade lead and zinc deposits. The intrusive rocks of Ferry, Okanogan, and Chelan counties contain important deposits of gold, silver, and copper.

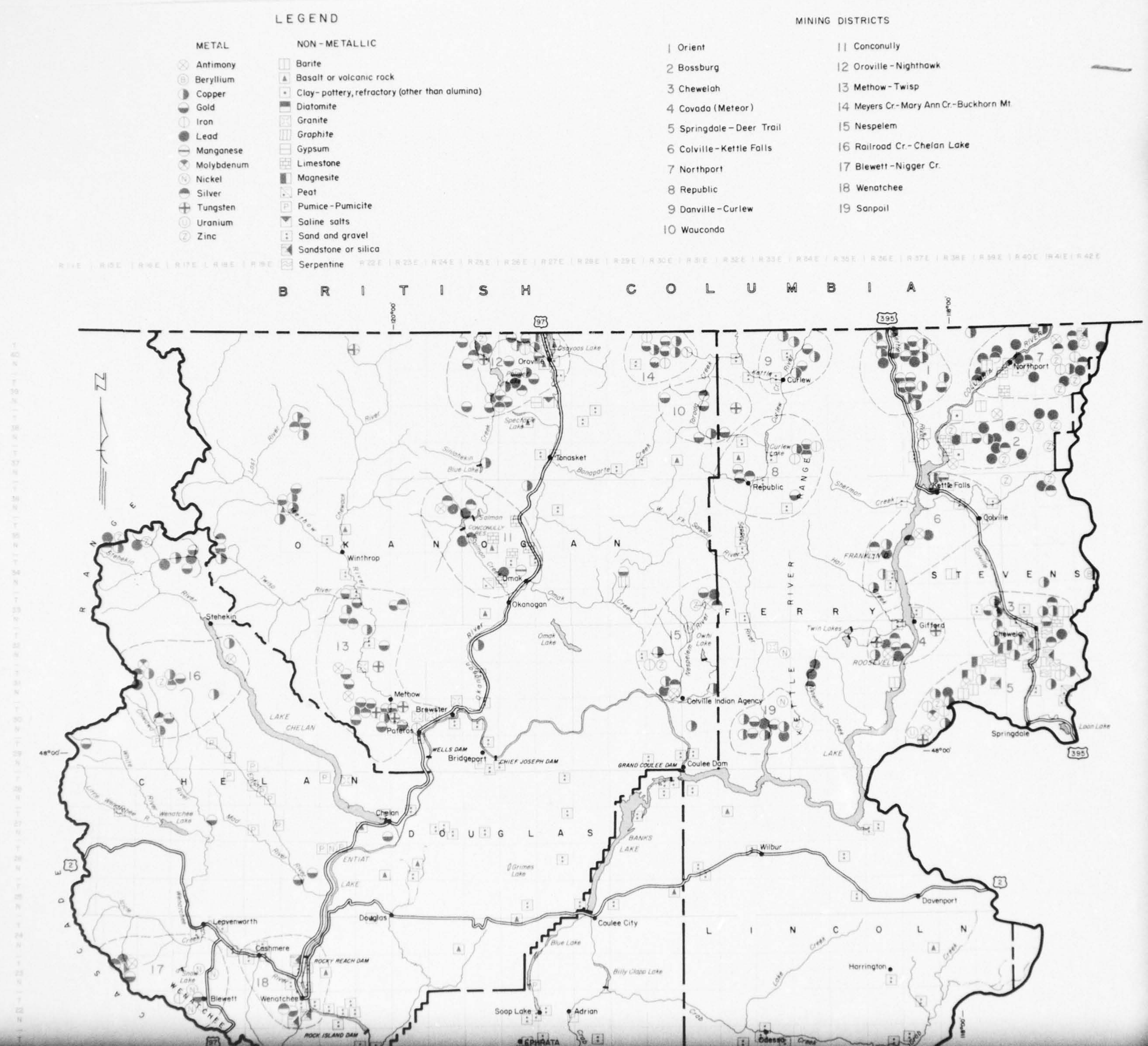
In contrast, the part lying south and east of the Columbia River, except Stevens County, is in the Columbia Basin physiographic province and is covered predominantly by Columbia River basalt and associated volcanics of Tertiary age. These basalts are an unfavorable environment for metallic mineral deposits; and thus, the minerals available in these counties consist principally of construction materials such as crushed rock, sand and gravel, and clay.

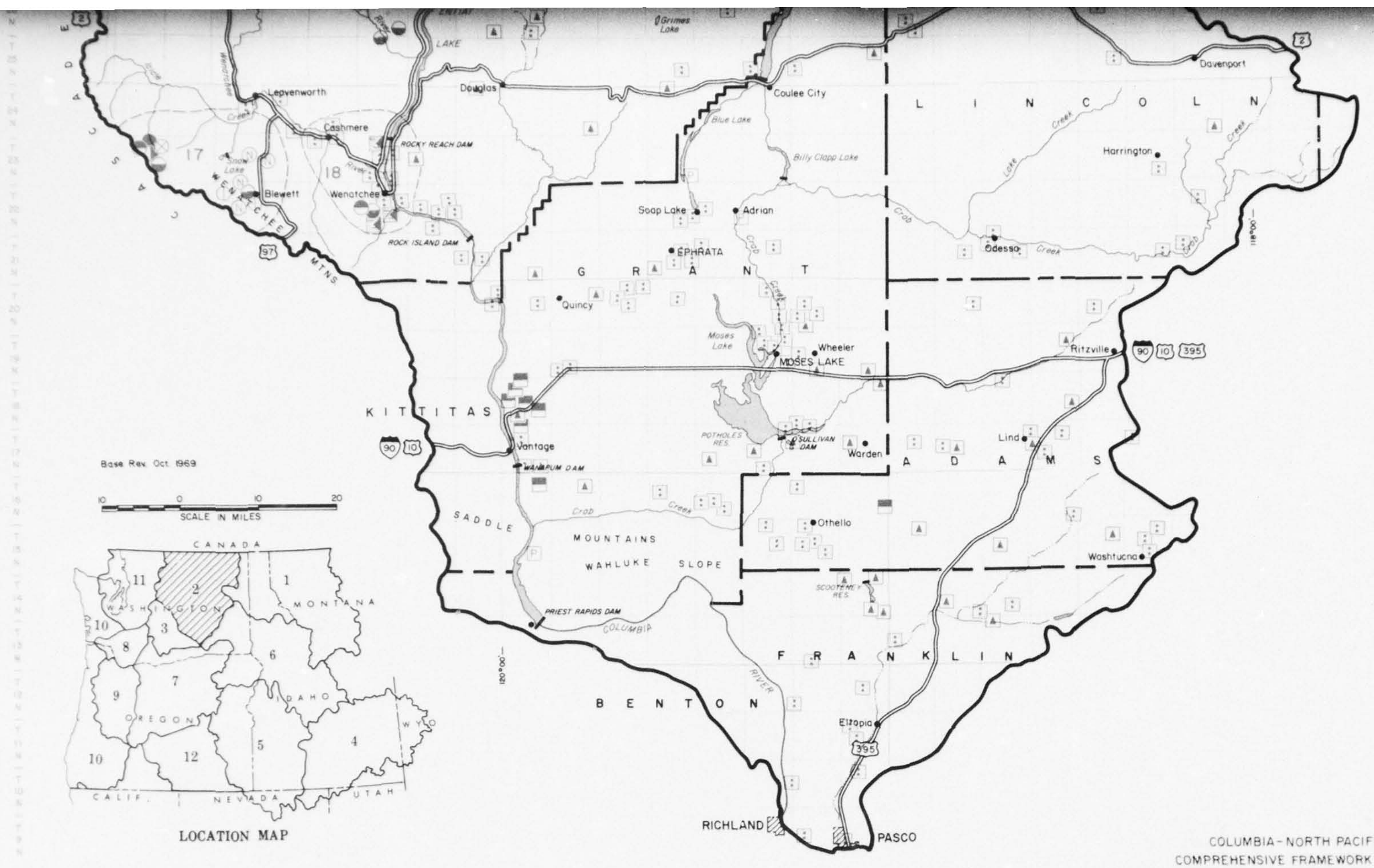
### Metals

The first prospectors were looking for gold; principally placer deposits where gold is easily recovered by simple mining methods. Early placer mining was active in the 1860's and 1870's in Okanogan, Stevens, and Chelan counties. Lode deposits were later found and developed. Important gold output has been within the last 30 years. Since 1957, Washington has ranked fifth to seventh among gold-producing states and more than 90 percent has come from this subregion. The mineral deposits and mining districts are shown in figure 13. The mining districts are described in table 75.

### Nonmetals

Stevens County is probably the most important producer of nonmetallics in the subregion. Large deposits of magnesite in the vicinity of Chewelah were quarried almost continuously between 1916 and 1968; formerly, the area was the largest magnesite producer in the Nation (figure 13) and is one of the two domestic sources of refractory magnesia from magnesite ore essential to the steel industry for furnace lining. Total production has not been published, but probably has exceeded 2 million tons. High grade silica sand is produced in Stevens County near Chewelah and metallurgical grade


LEGEND
METAL
Antimony
Beryllium
Copper
Gold
Iron
Lead
Manganese
Molybdenum
Nickel
Silver
Tungsten
Uranium
Zinc
NON-METALLIC
Barite
Basalt or volcanic rock
Clay-pottery, refractory (other than alumina)
Diatomite
Granite
Graphite
Gypsum
Limestone
Magnesite
Peat
Pumice-Pumicite
Saline salts
Sand and gravel
Sandstone or silica
Serpentine
MINING DISTRICTS
1 Orient
2 Bossburg
3 Chewelah
4 Covada (Meteor)
5 Springdale-Deer Trail
6 Colville-Kettle Falls
7 Northport
8 Republic
9 Danville-Curlew
10 Wauconda
11 Conconully
12 Oroville-Nighthawk
13 Methow-Twisp
14 Meyers Cr.-Mary Ann Cr.-Buckhorn Mt.
15 Nespelem
16 Railroad Cr.-Chelan Lake
17 Blewett-Nigger Cr.
18 Wenatchee
19 Sanpoil
BRITISH COLUMBIA
OKANOGAN
FERRY
STEVENS
CHELAN
DOUGLAS
LINCOLN
CASCADE RANGE
KETTLE RIVER RANGE
Oroville
Tonasket
Curlew
Republic
Northport
Kettle Falls
Colville
Chewelah
Gifford
Springdale
Loon Lake
Winthrop
Omak
Okanogan
Stehekin
Methow
Brewster
Pateros
Bridgeport
WELLS DAM
CHIEF JOSEPH DAM
GRAND COULEE DAM
Coulee Dam
Colville Indian Agency
Chelan
LAKE CHELAN
Leavenworth
Cashmere
Wenatchee
Blewett
ROCKY REACH DAM
ROCK ISLAND DAM
Douglas
Coulee City
BANKS LAKE
Wilbur
Davenport
Harrington
Soap Lake
Adrian
EPHRATA
Odessa
48°00'
120°00'
118°00'
97
395
2




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# MINERAL RESOURCES AND MINING DISTRICTS
UPPER COLUMBIA, SUBREGION 2

FIGURE 13

Table 75 - Mining Districts, Subregion 2

| Index No. Fig. | District | County | Drainage | Size of Districts - Production Plus Potential Reserves 1/ Gold | Silver | Copper | Lead | Zinc | References |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Orient (Pierre Lake) | Stevens | Kettle River near the town of Orient. Lode deposits | 2 1/ | 3 1/ | 3 1/ | 3 1/ | - | Fulkerson, F.B., and G. A. Kingston, 1958. BuMines Inf. Circ. 7872, 51 pp. Huntting, M.T., 1956, Washington Div. of Mines and Geol. Bull. 37. Part 2, v. 1 and 2. |
| 2 | Bossburg (Clugston Creek) | do | Columbia River (main stem) near Evans. Lode deposits | - | 2 | - | 1 | 2 1/ | do |
| 3 | Chewelah | do | Colville River near Chewelah. Lode deposits | 3 | 1 | 2 | 2 | - | do |
| 4 | Covada(Meteor) | Stevens-Ferry | Columbia River (main stem) near Gifford and Covada. Lode deposits. | 3 | 3 | - | 3 | 3 | do |
| 5 | Springdale (Loon Lake) Deer Trail | Stevens | Headwaters of Colville River near Loon Lake. Lode deposits | - | 2 | 3 | 2 | 2 | do |
| 6 | Colville-Kettle Falls | Stevens | Colville and Columbia Rivers near Colville. Lode deposits | - | 2 | - | 2 | 3 | Fulkerson, F.B., and G.A.Kingston, 1958 BuMines Inf.Circ. 7872, 51 pp. Huntting, M.T., 1956, Washington Div. of Mines and Geol. Bull. 37. Part 2, v. 1 and 2. |
| 7 | Northport (Aladdin) | do | Columbia River (main stem) and on Deep Creek near Northport. Lode deposits | - | 2 | - | 1 | 1 | do |
| 8 | Republic (Knob Hill) | Ferry | Sanpoil River at Republic. Lode deposits | 1 | 1 | - | - | - | Umpleby, J. B., 1910. Washington Geol. Survey Bull. 1, 65 pp. Muessig, S.J., 1967, USGS Bull. 1216, 135 pp. |
| 9 | Danville-Curlew | do | Curlew River near Curlew and Danville. Lode deposits | 2 | 3 | 2 | - | - | Parker, R. L., and J. A. Calkins 1964, USGS Bull. 1169, 65 pp. Huntting, M.T., 1956, Washington Div. of Mines and Geol. Bull. 37 |

AD-A036 547 PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6
COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)
JUN 70 C C BOWLSBY, R J COFFMAN, C R HUBBARD

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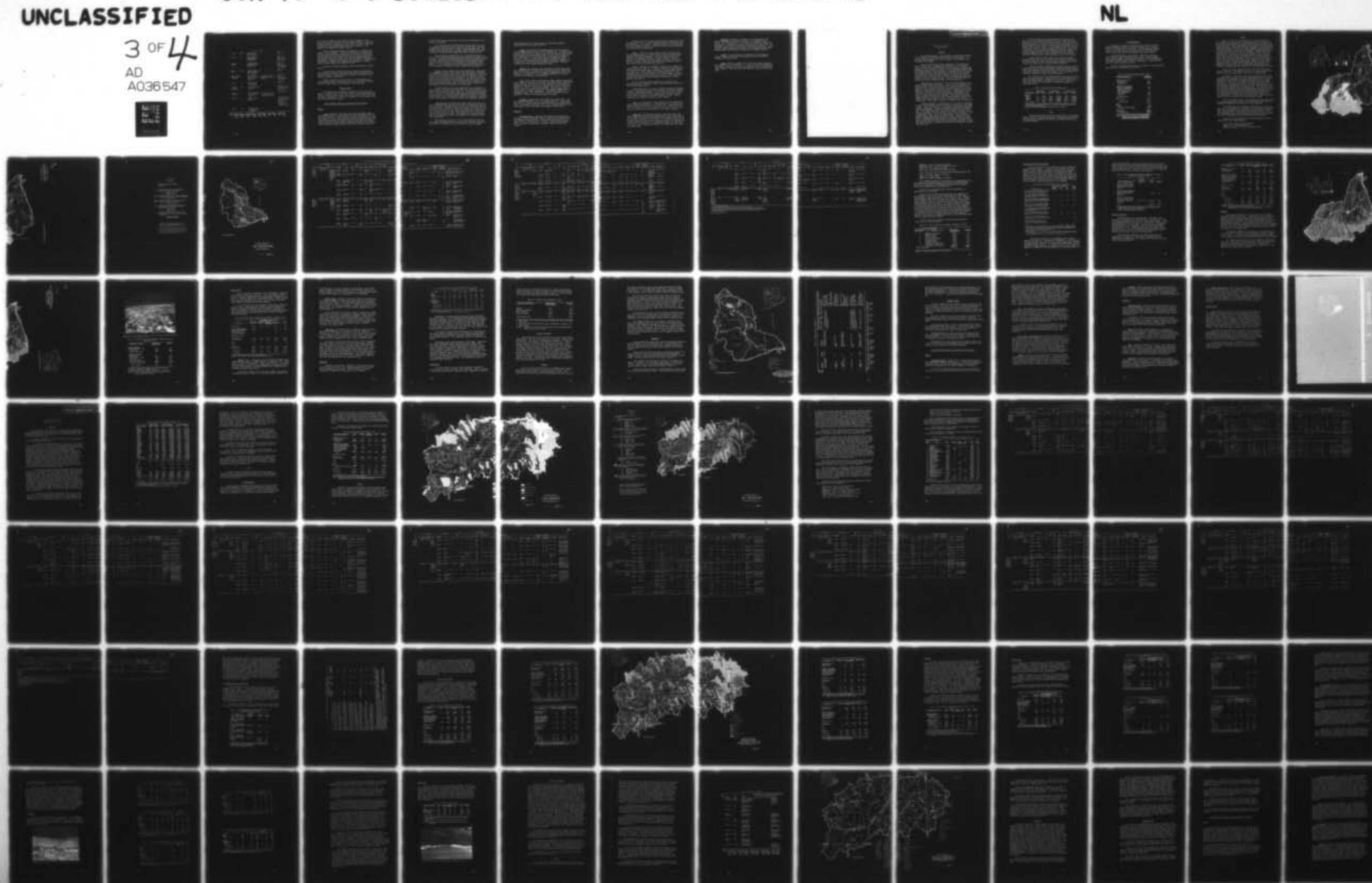

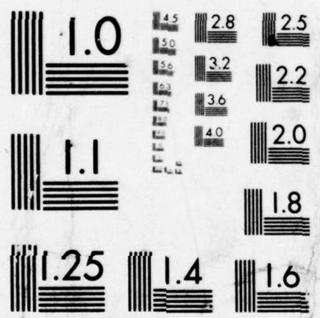


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Table 75 - continued

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 10 | Wauconda | Okanogan | Toroda Creek, Tributary to Curlew River. Lode deposits | - | 3 | - | 3 | - | Hunt 1956 |
| 11 | Conconully | do | Salmon Creek, tributary to Okanogan River near Conconully. Lode deposits | - | 2 | - | 3 | - | Hunt 1956 Jone 1917 640, |
| 12 | Oroville-Nighthawk | do | Similkomeen and Okanogan River near Nighthawk and Oroville. Placer and lode | 2 | 2 | - | 2 | 3 | Hunt 1956 Umpl 1911 Geol 5, p |
| 13 | Methow-Twisp | Okanogan | Methow River near Methow and Twisp River, tributary to Methow River. Placer & lode | 2 | 2 | 3 | 3 | - | Hunt 1956 |
| 14 | Meyers Creek-Mary Ann Creek-Buckhorn Mtn. | do | Meyers Creek near Chesaw and Buckhorn Mountain area. Lode deposits include magnetite | - | 3 | 3 | 3 | - | Hunt 1956 Umpl 1911 Geol 5, p |
| | | | | Buckhorn Mtn. estimated 18,500,000 tons of iron ore (magnetite) | | | | | |
| 15 | Nespelem | do | Columbia Rv. (main stem) and Nespelem Rv. Lode deposits | - | 2 | - | 3 | - | Hunt 1956 |
| 16 | Railroad Cr. (Chelan Lake, Holden) | Chelan | Railroad Creek, Tributary to Chelan Lake. Lode deposits | 1 | 1 | 1 | - | 1 | Hunt Your T. L Econ No. |
| 17 | Blewett-Nigger Creek | do | Peshastin Creek tributary to Wenatchee Rv., near Blewett. Lode and placer | 2 | 3 | - | 3 | - | Hunt |
| | | | | Also contains estimated 150,000 to 2,000,000 tons of nickeliferous iron ore. | | | | | |
| 18 | Wenatchee | do | Wenatchee River near Wenatchee. Lode deposits | 1 | 2 | - | - | - | Macl al. Div Rep pp. Lov A.C Min No. |
| 19 | Sanpoil | Ferry | Sanpoil Rv., near its confluence with the Columbia River. Lode deposits | 3 | | 3 | 3 | 3 | |

1/ Size

| Index | Gold (Troy ounces) | Silver (Troy ounces) | Copper (Net tons) | Lead (Net tons) | Zinc |
|---|---|---|---|---|---|
| 1 | 100,000 - 10,000,000 | 1,000,000 - 50,000,000 | 50,000 - 500,000 | 5,000 - 100,000 | 5,00 |
| 2 | 10,000 - 100,000 | 100,000 - 1,000,000 | 5,000 - 50,000 | 500 - 5,000 | 50 |
| 3 | 1,000 - 10,000 | 10,000 - 100,000 | 500 - 5,000 | 5 - 500 | |

silica rock is mined on Lane Mountain near Springdale. Silica rock has also been produced in the subregion in Chelan, Ferry, and Okanogan counties. High purity silica (+99.7% $SiO_2$) is needed for the region's electrometallurgical and glass industries. Few deposits can produce this high a purity.

Stone, including limestone and dolomite, is an important product in the subregion. Stevens and Pend Oreille counties have the most extensive limestone deposits in the State of Washington. Stevens County produces crushed limestone and marble for terrazzo and roofing chips, for smelter flux, and for cement manufacture. Flagstone is produced from quartzite in Ferry County. Crushed stone from basalt is produced for roadstone and aggregate in Douglas, Grant, Lincoln, Adams, and Franklin counties.

Important diatomite production comes from deposits in Grant County.

Sand and gravel resources are very large and widespread, occurring both as glacial and fluvial deposits and production comes from every county. Other nonmetallic minerals occurring include salines, fluorite, and gypsum.

Pumice and pumicite deposits occur in a fan-shaped area extending from Glacier Peak, the source, near the head of Railroad Creek in Chelan County, southeastward to near Soap Lake.

## Mineral Fuels

No mineral fuels of economic importance occur in the subregion. A small amount of coal for local use was produced many years ago in the Colville area from a bed of poor quality coal a few miles southwest of Wenatchee. Some peat is produced in the Okanogan County for soil conditioning purposes.

## Present Mineral Industry and Outlook for the Future

### Metals

Gold Subregion 2 has been a major gold producing region, both from primarily lode gold deposits and as a byproduct of silver and base metal mines. The Knob Hill and adjoining Gold Dollar mines near Republic are the only gold mines presently operating (they are connected underground and operate from the same shaft and surface plant) and are the third largest producing gold mines in the Nation. Total production through 1967 has been over 1 million troy ounces of gold; this is about 40 percent of all the gold produced in the State of Washington.

The Gold King mine near Wenatchee, Chelan County, has been an important producer, but was closed in February 1967. The mine produced more than 400,000 troy ounces of gold through 1966. The Holden mine on Railroad Creek, produced about 600,000 troy ounces of gold as a byproduct from copper ore before closing in 1957.

The present gold production is at a reduced rate due, in part, to the imbalance between production costs and the market price for gold. The gold mineralization extends beyond the mined area at the Gold King property in the Wenatchee area and additional gold deposits probably remain to be discovered in the Republic area. There is a very good potential for future production from several districts under a favorable economic climate for gold mining.

Silver Silver production has been substantial, principally as a byproduct of lead, zinc, copper, and gold mining. Currently, the Calhoun and Shumaker mines in the lead-zinc districts of Stevens County, and the Knob Hill-Gold Dollar mines at Republic in Ferry County are the principal silver producers. In 1965 the Gold King mine and the Knob Hill-Gold Dollar mines produced 90 percent of the state's silver production. The Gold King mine was closed in 1967, but produced about 50,000 ounces of silver in 1965; production at the Knob Hill-Gold Dollar mines is not published.

Future potential for silver production in the subregion is very favorable, the Gold Dollar mine has ore reserves equal to more than 4 years production at the 1966 rate. The recently increasing price of silver has stimulated exploration and development of gold-silver prospects in the Orient and Northport districts of northern Stevens County, and some favorable results are reported. Some small scale silver mining is currently active in the Conconully District.

Lead and Zinc The subregion contains some of the most productive lead and zinc deposits in the State of Washington; they are in the Northport, Bossburg-Clugston Creek, and Colville districts. The Holden mine, formerly a large zinc producer, was closed in 1957. The Van Stone mine in Stevens County was reopened in 1964 and produced 9,867 tons of zinc and a small amount of lead in 1965; the mine was again closed in 1967. The Calhoun mine, Stevens County, went into production in 1967; mill capacity is 1,200 tons of lead-zinc ore per day.

The potential resources in the silver-lead-zinc districts of Stevens and Okanogan counties are attractive targets for future development; the deposits are low grade, but large in tonnage.

Future production will depend largely on favorable economic conditions for silver, lead, and zinc.

Copper The subregion has produced more than 83 percent of all the copper produced in the State of Washington. The Holden mine produced 106,000 tons of copper. The mine was closed in 1957 because the operation was no longer profitable at the price of copper in 1957. Reserves of over a million tons of low grade ore remain in the Holden deposit. Several other formerly productive copper districts in the subregion hold prospects for future production at a copper price that will permit profitable operation. There is virtually no current copper production (1967).

Cadmium The lead-zinc ores produced in Stevens County contain a minor amount of cadmium and the smelting of the concentrates from this district produces a few pounds of cadmium per ton of concentrate as a byproduct. Future cadmium production is directly related to the lead and zinc production.

Iron Iron ore has been produced in minor amounts from several areas. Many of the deposits are small and others contain impurities that discourage their use in the blast furnace for iron and steel production. Much of the iron ore produced was used for cement manufacture or as flux in nonferrous smelters. The iron ore in the Blewett District contains nickel and the inferred tonnage provides some promise for future development. The Buckhorn deposit in Okanogan County is also promising as a source of future iron ore production. There is no current production (1967).

Tungsten Tungsten has been produced on a small scale. It has come from Okanogan, Ferry, and Stevens counties. Total production has been nearly 4,000 tons of concentrates of 60 percent $WO_3$. There is no present production (1967), but a future potential exists when tungsten prices are above the average of recent years.

Nonmetals

Sand and Gravel Commercial sand and gravel producers are located in Stevens, Okanogan, Chelan, Franklin, and Grant counties. The commercial operations are situated near urban areas where a market exists for the products. In 1965, sand and gravel ranked first in value of production in Okanogan, Franklin, and Grant counties.

The market price of sand and gravel ranges from $.80 to $1.25 per short ton. It is a low unit price product and, therefore, must be produced near the consumer. Adequate supplies are available for all future demands; however, in some areas other land uses conflict with sand and gravel operations.

Stone A variety of stone products comes from many areas. The most common product is crushed rock or stone used mainly for roadrock and concrete aggregate. About 60 percent of the stone quarried in Washington is basalt or other volcanics, and the counties in the southern half are largely covered by these rocks. Basalt is generally quarried intermittently at roadside sites or near urban centers when needed for local use.

Marble, limestone, and dolomitic limestone are quarried in Stevens and Chelan counties. In 1965, limestone was quarried from the Soda Springs deposit near Leavenworth by Ideal Cement Company for cement rock. This company also quarried limestone at its Limerock quarry in Stevens County for the Cement plant at Spokane. Some dimension marble came from Stevens County in 1965, and also crushed and sized marble and serpentine for terrazzo, roofing granules, and stucco.

Silica rock and crushed sandstone were produced near Springdale and near Wenatchee in 1965, and granite was produced in Ferry and Okanogan counties.

Stone ranked first in value of nonmetal commodities produced in 1965, in Adams, Douglas, and Lincoln counties, and second in Chelan, Franklin, and Okanogan counties. The resources for stone products in the subregion are virtually inexhaustible, although, locally, deposits may be depleted or become uneconomic to mine. Future production will depend on markets for the products.

Clay Clay minerals and clay products are not an important mineral product in Subregion 2. Some refractory clay deposits are present near Wenatchee and in the Clayton area. Common clay and shale suitable for heavy clay products are present in the Colville area, but there were no clay plants in 1967 in the subregion.

Magnesite The magnestie deposits in Stevens County were mined almost continuously between 1916 and 1968. More than 2 million tons of magnesite have been produced by the companies operating in the vicinity of Chewelah. For several years Stevens County was the largest producer in the Nation; production figures are confidential. The reserves of magnesite at the Red Marble quarry are sufficient for several years' production; however, the operations were closed in October 1968.

Diatomite Diatomite is produced in the subregion by the Kenite Corporation from deposits located in southwestern Grant County. The raw diatomite is processed in the company's plant near the deposits. Operations have been continuous since about 1945, and Washington ranks third in the Nation in diatomite production. Large reserves remain although the Columbia Basin irrigation project has produced some adverse effects on part of the diatomite deposits.

Gypsum A small production of gypsum comes from Okanogan County. Limited production for agricultural use will probably continue for several years.

Pumice Pumice is produced on a small scale from deposits at the southern tip of Lake Chelan. It is used for concrete aggregate. Other pumice deposits with some past production exist in Chelan and Grant counties. There are many other deposits with potential future value.

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# SUBREGION 3
# YAKIMA

## ABSTRACT

The Yakima Subregion, second smallest in the Columbia-North Pacific Region, lies wholly within the State of Washington. It is the next major drainage area of the Columbia River upstream from the mouth of the Snake.

Over one-third of the land in Subregion 3 is covered with forest, mostly with a supplementary grazing use. The forested area is on the west and north sides of the subregion on mountainous uplands on soils formed in volcanic ash and residuum/colluvium from the underlying basic igneous bedrock. Precipitation of the forested area ranges from 20 to 45 inches falling as snow and rain during the late fall, winter, and early spring. The frost-free period varies from 30 to 100 days and the elevations generally range from 4,000 to 7,000 feet above sea level. Most of the 28,700 acres of barren land occur on mountain peaks in the forested area.

Approximately 40 percent of the land of the subregion has a cover of grass, brush, and browse. Soils are mostly formed in wind deposited silty-overburden covering basic igneous bedrock, high rocky terraces of glacial material, and some terraces of lake-laid deposits. Residuum and colluvium from these underlying strata are frequently mixed with the loamy overburden. Precipitation varies from 10 to 20 inches and some isolated dryland farmed areas are used in a grain-fallow type of cropland. The frost-free period ranges from 90 to 160 days and the elevation generally varies from 2,000 to 4,000 feet above sea level. Problems of use relate to droughtiness, steep slopes, and lack of surface water for livestock.

Eighteen percent, or 686,300 acres, of the land in Subregion 3 occurs on bottomlands and low terraces in the Kittitas and Yakima valleys. Most of this area is in irrigated cropland use and under itensive management. The Yakima Highlands contribute an important part of the Washington apple crop and the balance of these areas have, in the past, been the source of the widest diversity in crops in Washington State. Soils are mostly deep, silty, frequently gravelly and in many places are restricted by a shallow depth to caliche hardpan and numerous patches of highly alkaline or saline soils. Precipitation ranges from 6 to 12 inches, the frost-free period varies from 130 to 190 days and elevations from 400 to 2,000 feet above sea level. Problems of use relate to droughty, alkaline, and salty soils.

The most important mineral produced has been coal from deposits in the Roslyn field located in the Cle Elum River Basin north of the town of Cle Elum, Kittitas County. The Roslyn field has produced more coal than any other field in Washington or in the Columbia-North Pacific Region. Total production has been about 63 million tons; most of it was used as locomotive fuel. The field is presently inactive because of change to Diesel locomotives and a lack of other consumers within the marketing area. Future potential depends in part on the feasibility of constructing a coal fired steam-electric generating plant in the Cle Elum area.

A small amount of metals has been produced in northern Kittitas County, and near the summit of the Cascades in Kittitas and Yakima counties, near areas of igneous intrusive rocks; gold, silver, and copper are the principal metals produced.

A belt of residual sedimentary iron-nickel deposits occurs in the Cle Elum River Basin and extends eastward into the Teanaway Basin; they contain several millions of tons of low grade iron ore with minor amounts of nickel and chromium. They are currently of interest as a possible source of iron and nickel.

The total area of the subregion consists of about 99 percent land and 1 percent water. Table 76 shows the land, water, and total watershed acreage of Subregion 3 by county. Except for this table, only land will be recorded in acreages throughout the following section.

Table 76 - Areas by State & County, Subregion 3, 1967

| State & County | Water Area Sq.Mi. | Water Area Acres | Land Area[1/] Sq. Mi. | Land Area[1/] Acres | Total Area Sq. Mi. | Total Area Acres |
|---|---|---|---|---|---|---|
| Washington | | | | | | |
| Benton | 01.6 | 1,000 | 593.4 | 379,800 | 595.0 | 380,800 |
| Kittitas | 28.0 | 17,900 | 1,906.4 | 1,220,100 | 1,934.4 | 1,238,000 |
| Klickitat | .0 | 0 | 65.4 | 41,900 | 65.4 | 41,900 |
| Yakima | 15.0 | 9,600 | 3,452.5 | 2,209,600 | 3,467.5 | 2,219,200 |
| Total Subregion | 44.6 | 28,500 | 6,017.7 | 3,851,400 | 6,062.3 | 3,879,900 |

1/ The term "land" is defined to include all water bodies under 40 acres and streams under one-eighth mile in width.
Source: U.S.D.A. Conservation Needs Inventory adjusted to U.S. Census.

## LAND

Of major importance to the land resource are: the ownership status, the soils, and the present use. The combination of these factors greatly influences the present and future utilization of the land resources.

## Land Ownership

Subregion 3 contains 3.9 million acres, with the largest landowner being the Federal Government owning nearly 2 million acres or 52 percent of the land area. Private ownership amounts to over 1.5 million acres or 40 percent of the total land area. State, county, and municipal ownerships make up the balance.

Over 800,000 acres of the public lands are in National Forest status. Nearly 400,000 acres are other Federal holdings within the Departments of Defense and Interior. Over 300,000 acres are owned by state, county, and local governments. Almost 800,000 acres are Indian Reservation lands.

Table 77, Land Ownership status, and figure 14, Land Ownership Map, show this information in more detail.

Table 77 - Land Ownership Acreage, Subregion 3, 1965

| Administering Agencies | Washington (1,000 acres) |
|---|---|
| Department of Agriculture | |
| Forest Service | 838.1 |
| Other Agriculture | .2 |
| Subtotal | 838.3 |
| Department of the Interior | |
| Bureau of Land Management | 30.9 |
| Bureau of Indian Affairs 1/ | 770.2 |
| National Park Service | - |
| Fish & Wildlife Service | .7 |
| Bureau of Reclamation | 31.9 |
| Other Interior | .2 |
| Subtotal | 833.9 |
| Department of Defense | 175.1 |
| Other Federal | 143.3 |
| Federal Subtotal | 1,990.6 |
| State | 306.7 |
| County | 3.8 |
| Municipal | 11.0 |
| Public Non-Federal Subtotal | 321.5 |
| Total Public | 2,312.1 |
| Total Private | 1,539.3 |
| Total Land Area | 3,851.4 |

1/ Private lands held in trust by the Federal Government.
Source: General Services Administration Real Property Owned by the United States as of June 30, 1965, adjusted by the Land and Minerals Work Group.

## Soils

Figure 15, the Soil Associations Map, shows the location and relative extent of each soil association in the subregion. The associations are numbered in a general relationship to the position in the landscape. Thus bottomlands and low terraces have the lowest numbers and alpine areas have the highest numbers. The name of each association relates to the soil series representing general kinds of soil that are most extensive in the landscape. Wherever possible, established soil series are used in the name; however, where the available soil series do not have classification status, the soil series name is not recorded. Generally up to 15 percent of any single soil association in known areas may consist of inclusions of soils other than those identified. Such inclusions may be similar soils or they may be highly contrasting. However, in many high mountainous areas, where detailed knowledge about the area is incomplete, extensive areas are included within delineations and inclusions of other soils may exceed the 15 percent general average.

Table 78 contains information about each soil association shown on figure 15. The symbol listed in the second column on the table is the same symbol shown on the Soil Associations Map.

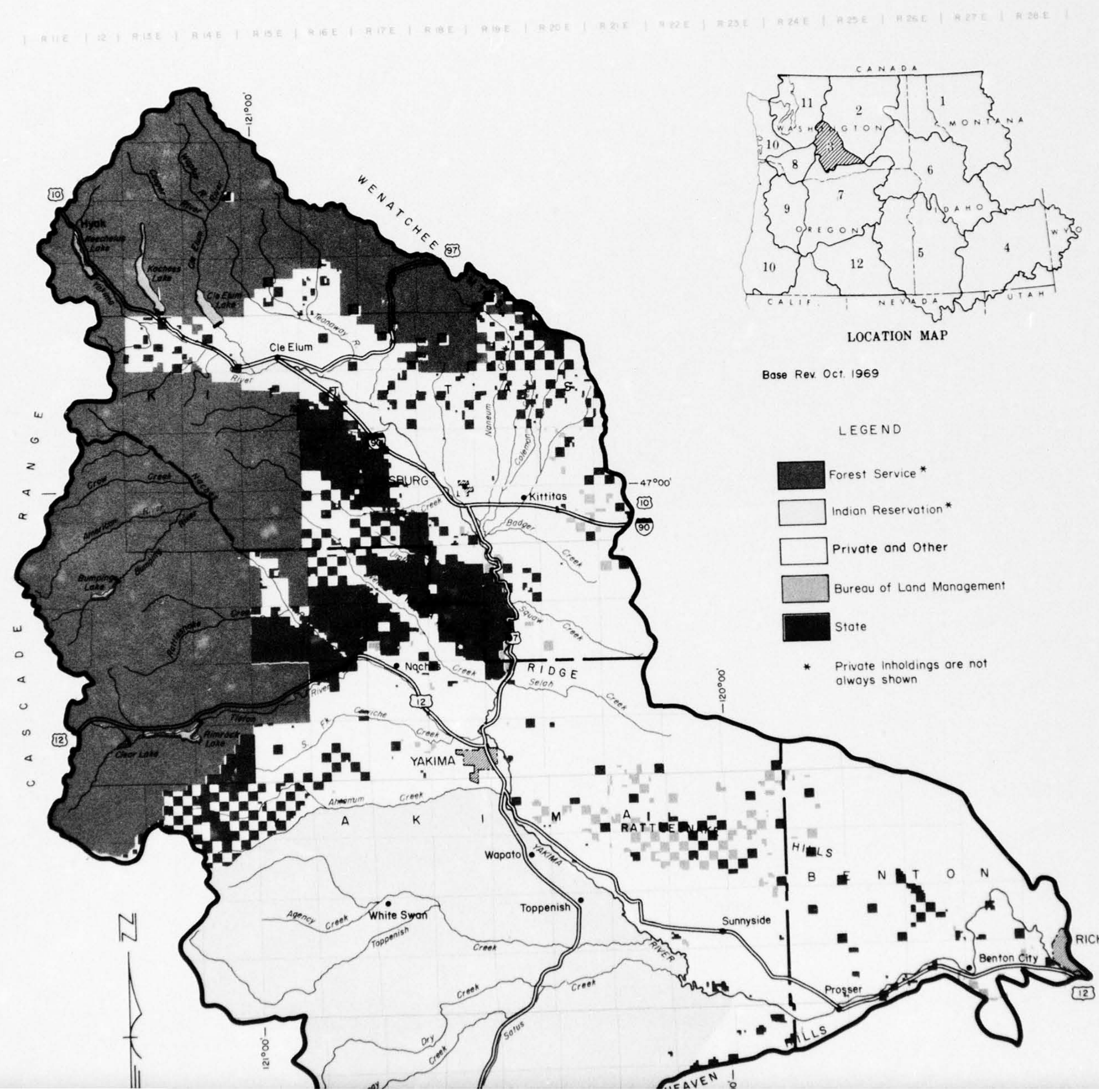
The table is organized to show land characteristics and the characteristics, qualities, and some interpretations of soil series representing the dominant and contrasting kinds of soil in each association. The first six columns show some general land characteristics for each soil association. The next 11 columns show characteristics (permanent soil facts) of individual key soil series that represent dominant and contrasting soils. The following four show qualities inferred from the characteristics of these soils, and the last four columns show interpretations concerning agricultural use based upon the foregoing soil characteristics and qualities. All of the representative soil series listed have status in classifications. A blank space in the soil series column indicates that the soil series name has no classification status.

The "soil groups" column, shows soil associations that contain soils having broad similarities in some important characteristics, frequently identified with a position on the landscape.

The "percentage of association" column shows the extent of each soil in an association. Differences of the total soil percentage in each association from 100 percent are inclusions of other soils and land types. For example, association 7 lists a total of 40. Knowledge of this area is limited, so 60 percent of the area consists of inclusions of soils that have not been defined.

Terms listed for permeability of water through the subsoil and permeability of substratum are:

Very rapid: Over 10 inches per hour.
Rapid: 5 to 10 inches per hour.
Moderately rapid: 2.50 to 5 inches per hour.



LOCATION MAP
CANADA
WASHINGTON
MONTANA
IDAHO
OREGON
CALIF.
NEVADA
UTAH
WYO.
Base Rev. Oct. 1969
LEGEND
Forest Service*
Indian Reservation*
Private and Other
Bureau of Land Management
State
* Private inholdings are not always shown
WENATCHEE
CASCADE RANGE
Cle Elum
Kittitas
Yakima
Naches
Wapato
Toppenish
White Swan
Sunnyside
Prosser
Benton City
RICHLAND
RIDGE
BENTON
RATTLESNAKE
HILLS
47°00'
121°00'
120°00'


COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# LAND OWNERSHIP

YAKIMA, SUBREGION 3

1968

USDA-SCS-PORTLAND, OREG. 1970

FIGURE 14

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LEGEND REVISED 1970

## LEGEND

| Soil Association Map Symbol * | Name of Association |
|---|---|
| | Generally silty and sandy soils formed in alluvial sediments on bottomlands and low terraces. |
| 1 | Sagemoor - Toppenish |
| 2 | Naches - Selah |
| | Generally silty and sandy soils with coarse fragments formed in glacial materials on terraces, plains and mountains. |
| 3 | Ephrata - Quincy |
| | Generally silty or sandy soils formed in wind deposited or wind worked sediments on hilly uplands. |
| 4 | Ritzville - Starbuck |
| | Generally silty soils formed in materials mixed with rocky residuum-colluvium from basic rock types on plateaus, canyons and mountains. |
| 5 | Vantage - Clerf |
| 6 | Condon - Starbuck |
| | Generally sandy soils formed in materials mixed with volcanic ash or pumice on terraces, foothills, plateaus and mountains. |
| 7 | Dominantly Argixerolls |
| 8 | Dominantly Cryandepts |

** Symbols are non-conotative and consistent only within each subregion. To compare delineations from one subregion to another refer to the name of the Soil Association.*

*NOTE: The Soil Association name may include a series that does not fit the Soil Associations Group description. The Soil Association name is based on dominant series. The dominant of five series may be only 30 percent of the Soil Association. Thus a clayey textured soil series may be included in a group accurately described as generally silty and sandy in texture.*

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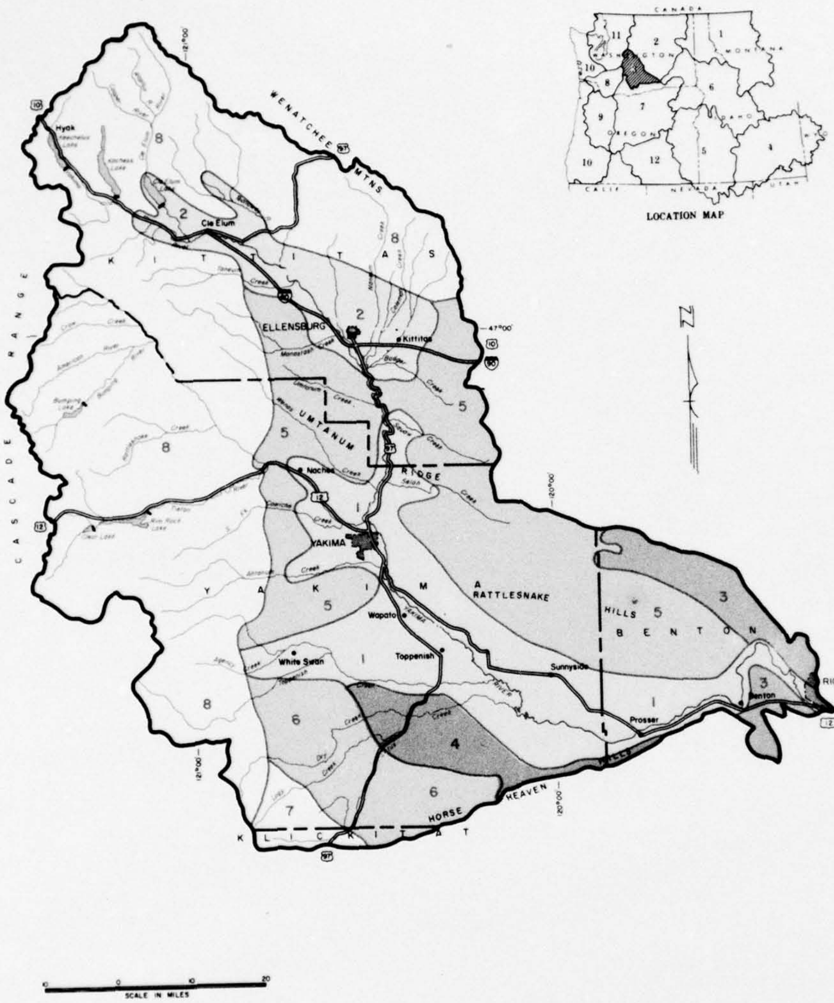


COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# SOIL ASSOCIATIONS

YAKIMA, SUBREGION 3

USDA-SCS-PORTLAND, OREG.

FIGURE 15

/

Table 78 - Characteristics and Qualities of Representative Soils, Subregion

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Per |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moderately deep to very deep soils with loamy subsoils on nearly level slopes. | 1 | 400-1,200 | 6-12 | 120-180 | Cropland(apples & other fruit orchards, alfalfa, sugar beets, mint, potatoes,beans, corn,seed crops, cereals & hops)-irrigated (cereals) - dryland | Xerollic Camborthids | Coarse-silty, mixed, mesic | Sagemoor | 30 | Terraces | Loess over lacustrine material | Silt loam | Silt loam | None | -- | 20-40" over compact sediments | Mo |
| | | | | | | Aquic Fluventic Hapludolls | Fine-loamy, mixed, mesic | Toppenish | 15 | Flood plains | Alluvium | Loam | Loam or silt loam | None | -- | 20-30" over water table | Mo |
| | | | | | Rangeland | Aridic Calcic Argixerolls | Fine-loamy over sandy or sandy-skeletal, mixed, mesic | Naches | 15 | Terraces | Alluvium over outwash | Clay loam or fine sandy loam | Clay loam | Gravel | 60 below 20-40" | 20-40" over gravel | Mo sl |
| | | | | | | Torrifluventic Haploxerolls | Coarse-silty, mixed, mesic | Esquatzel | 5 | Flood plains | Alluvium | Silt loam to fine sandy loam | Silt loam | None | -- | 60"+ | Mo |
| | | | | | | Typic Torripsamments | Sandy, mixed, mesic | Quincy | 3 | Terraces (duned) | Sand | Loamy fine sand or loamy sand | Sand or fine sand | None | -- | 60"+ | Ve |
| | | | | | | Xerollic Camborthids | Coarse-silty, mixed, mesic | Warden | 2 | Terraces | Loess | Silt loam | Silt loam | None | -- | 60"+ | Mo |
| Moderately deep to very deep soils with loamy subsoils on gentle to moderate slopes. | 2 | 2,000-2,500 | 10-20 | 100-110 | Cropland (alfalfa, clover,grass, cereals & potatoes)-irrigated (cereals)-dryland | Aridic Calcic Argixerolls | Fine-loamy over sandy or sandy-skeletal, mixed, mesic | Naches | 30 | Terraces | Alluvium over outwash | Clay loam or fine sandy loam | Clay loam | Gravel | 60 below 20-40" | 20-40" over gravel | Mo sl |
| | | | | | Rangeland | Petrocalcic Xerollic Paleargids | Fine-loamy, mixed, mesic | Selah | 25 | Terraces | Alluvium | Loam | Loam | None | -- | 20-40" over clay or caliche | Mo |
| | | | | | Forest Land | Cumulic Haploxerolls | Coarse-loamy over fragmental, mixed, mesic | Yakima | 15 | Flood plains | Alluvium | Loam or fine sandy loam | Gravelly loam | Gravel | 20-35 below 10" in profile; 60 below 20-40" | 20-40" over gravel | Mo |
| | | | | | | Typic Haplaquolls | Fine, mixed,noncalcareous, mesic | Woldale | 8 | Terraces | Alluvium over outwash | Clay loam | Clay loam | Gravel | 60 below 40-60" | 40-60" over gravel | Mo sl |
| | | | | | | Typic Hapludalfs | Fine-loamy, mixed, mesic | Teanaway | 8 | Terraces | Alluvium | Loam | Loam or clay loam | None | -- | 60"+ | Mo mo sl |
| | | | | | | Fluventic Haplaquolls | Fine-silty, mixed, calcareous, mesic | Kittitas | 4 | Flood plains & basins | Alluvium | Silt loam | Silt loam | None | -- | 40-60" over water table | Mo |

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| ...istics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ...arse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass | | | |
| ...ind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated[6/] | Major Soil Problems | Suitable Land Treatment and Structures |
| ...one | -- | 20-40" over compact sediments | Moderate | Very slow | Good | Medium and high | IIs<br>IIIe<br>IVe<br>VIe | IIs<br>IIIe<br>IVe<br>VIe | Erosion; strongly alkaline lacustrine material below 30";droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt. |
| ...one | -- | 20-30" over water table | Moderate | Impervious | Poor | High | IIw<br>IVs | I<br>IIw<br>IVs<br>IIIw | High water table alkaline subsoil | Drainage; irrigation management |
| ...avel | 60 below 20-40" | 20-40" over gravel | Moderately slow | Very rapid | Good | Low and medium | -- | I<br>IIe<br>IIs | Erosion; moderately deep over gravel; droughtiness | Residue mgmt; cropping sequence; irrigation management |
| ...one | -- | 60"+ | Moderate | Moderate | Good | High | -- | I<br>IIe<br>IIIe | Erosion; droughtiness | Residue mgmt; cropping sequence; irrigation management |
| None | -- | 60"+ | Very rapid | Very rapid | Excessive | Low | VIs<br>VIIe | IVs<br>VIs | Erosion; sandy profile; droughtiness | Residue mgmt; irrigation mgmt; rangeland management |
| ...one | -- | 60"+ | Moderate | Moderate | Good | High | IIe<br>IIIe<br>IVe | I<br>IIe<br>IIIe<br>IVe | Erosion; alkaline subsoil; droughtiness | Cross-slopes operations; residue management; cropping sequence; irrigation management |
| ...ravel | 60 below 20-40" | 20-40" over gravel | Moderately slow | Very rapid | Good | Low and medium | -- | I<br>IIe | Erosion; moderately deep over gravel | Residue mgmt; cropping sequence; irrigation management |
| None | -- | 20-40" over clay or caliche | Moderate | Slow or impervious in clay or caliche | Good | Low and medium | -- | IIIe<br>IIIs<br>IVe<br>VIe | Erosion; moderately deep over clay or caliche | Cross-slope operations; residue management; cropping sequence; irrigation management |
| Gravel | 20-35 below 10" in profile; 60 below 20-40" | 20-40" over gravel | Moderate | Very rapid | Good to excessive | Low | -- | I<br>IIIe<br>IIIs | Erosion; moder- deep over gravel; gravelly subsoil; floods in places | Residue management; irrigation management; flood protection |
| Gravel | 60 below 40-60" | 40-60" over gravel | Moderately slow | Very rapid | Somewhat poor | Medium and high | -- | IIe<br>IIIw | Erosion; wetness | Cross-slope operations; residue mgmt; cropping sequence; irrigation management |
| None | -- | 60"+ | Moderate or moderately slow | Moderate or moderately slow | Good | High | VIe | I<br>IIe<br>IIIe<br>IVe<br>VIe | Erosion | Cross-slope operations; residue management; cropping sequence; irrigation mgmt; forest land mgmt. |
| None | -- | 40-60" over water table | Moderate | Impervious | Somewhat poor | High | -- | I<br>IIIw | Alkaline; deep over water table;wetness | Residue management; cropping sequence; irrigation mgmt; soil amendments |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage of Assn.[3/] | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moderately deep to very deep soils with sandy, loamy and gravelly subsoils on gentle to strong slopes. | 3 | 800-900 | 6-8 | 180-200 | Other land<br>Rangeland | Xerollic Camborthids | Coarse-loamy over sandy or sandy-skeletal, mixed, mesic | Ephrata | 25 | Terraces | Alluvium over outwash | Sandy loam | Gravelly sandy loam | Gravel and sand | 20-35 below 10" in profile; 60 below 20-40" | 20-40" ov gravel an sand |
| | | | | | | Typic Torripsamments | Sandy, mixed, mesic | Quincy | 20 | Terraces (duned) | Sand | Loamy fine sand | Loamy sand | None | -- | 60"+ |
| | | | | | | Xerollic Camborthids | Coarse-silty, mixed, mesic | Warden | 20 | Terraces | Reworked sediments & loess | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | Xerollic Camborthids | Coarse-loamy, mixed, mesic | Royal | 20 | Terraces | Mixed loess & sediments | Very fine sandy loam | Very fine sandy loam | None | -- | 60"+ |
| Moderately deep to very deep soils with silty profiles on gentle to strong slopes. | 4 | 2,000-2,500 | 9-12 | 120-140 | Rangeland | Calciorthidic Haploxerolls | Coarse-silty, mixed, mesic | Ritzville | 60 | Uplands (hilly) | Loess | Silt loam | Silt loam | None | -- | 36-60"+ o bedrock |
| | | | | | | Lithic Xerollic Camborthids | Loamy, mixed, mesic | Starbuck | 30 | Uplands (canyon rims and side slopes) | Loess and basic igneous rock | Gravelly silt loam | Gravelly silt loam | Gravel | 20-35 in profile | 10-20" ov bedrock |
| Shallow to very deep soils with cobbly and gravelly, loamy subsoils on gentle to extremely steep slopes. | 5 | 600-3,000 | 6-14 | 120-180 | Rangeland<br>Cropland (cereals)-dryland<br>Other land | Aridic Argixerolls | Loamy-skeletal, mixed, mesic | Vantage | 30 | Uplands (south slopes & ridgetops) | Loess & basic igneous rock | Gravelly silt loam | Gravelly clay loam | Gravel | 20-35 in profile | 10-15" ov bedrock |
| | | | | | | Typic Argixerolls | Clayey-skeletal, mixed, mesic | Clerf | 20 | Uplands (north slopes & ridgetops) | Loess & basic igneous rock | Cobbly silt loam | Cobbly silty clay loam | Cobbles & gravel | 20-35 in profile | 20-40" ov bedrock |
| | | | | | | Calcic Argixerolls | Fine-loamy, mixed, mesic | Simcoe | 20 | Uplands | Loess over basic igneous rock | Silt loam | Silty clay loam | None | -- | 20-40" ov bedrock |
| | | | | | | Calciorthodic Haploxerolls | Coarse-silty, mixed, mesic | Ritzville | 10 | Uplands (plateaus & side slopes) | Loess | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | Typic Haploxerolls | Coarse-silty, mixed, mesic | Walla Walla | 3 | Uplands (north slopes) | Loess | Silt loam | Silt loam | None | -- | 60"+ |

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le 78 - Continued

| ture bsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass[6]: Dryland | Range of: Major Capability Subclass[6]: Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
|---|---|---|---|---|---|---|---|---|---|---|---|
| avelly ndy am | Gravel and sand | 20-35 below 10" in profile; 60 below 20-40" | 20-40" over gravel and sand | Rapid | Very rapid | Good | Low | IIe IIIe IVe VIe | -- | Erosion; moderately deep over gravel & sand; gravelly subsoil; droughtiness | Rangeland management |
| amy nd | None | -- | 60"+ | Very rapid | Very rapid | Excessive | Low | VIIe | -- | Erosion; sandy profile; droughtiness | Rangeland mgmt. |
| ilt loam | None | -- | 60"+ | Moderate | Moderate | Good | High | VIe | -- | Erosion; droughtiness | Rangeland mgmt. |
| ery fine andy loam | None | -- | 60"+ | Moderate | Moderate | Good | High | VIIe | -- | Erosion; droughtiness | Rangeland mgmt. |
| ilt loam | None | -- | 36-60"+ over bedrock | Moderate | Impervious | Good | Medium and high | IIIe IVe VIe VIIe | -- | Erosion;alkaline subsoil in places; droughtiness | Rangeland mgmt. |
| Gravelly silt loam | Gravel | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | -- | Shallover over bedrock;gravelly profile; droughtiness | Rangeland mgmt. |
| Gravelly clay loam | Gravel | 20-35 in profile | 10-15" over bedrock | Moderately slow | Impervious | Good | Low | VIe VIIe | -- | Erosion;shallow over bedrock; gravelly profile | Rangeland mgmt. |
| Cobbly silty clay loam | Cobbles & gravel | 20-35 in profile | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | VIIe | -- | Erosion; moderately deep over bedrock; cobbly profile | Rangeland mgmt. |
| Silty clay loam | None | -- | 20-40" over bedrock | Moderately slow | Impervious | Good | Low and medium | IIIe IVe VIe VIIe | -- | Erosion; moderately deep over bedrock; droughtiness | Rangeland mgmt; cross-slope operations; residue mgmt; cropping sequence |
| Silt loam | None | -- | 60"+ | Moderate | Moderate | Good | High | IIIe IVe VIe VIIe | -- | Erosion; free lime below 30" in places; droughtiness | Rangeland mgmt; cross-slope operations; residue mgmt; cropping sequence |
| Silt loam | None | -- | 60"+ | Moderate | Moderate | Good | High | IIe IIIe IVe VIe VIIe | -- | Erosion | Rangeland mgmt; cross-slope operation; residue mgmt; cropping sequence |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 1,500-2,500 | 11-15 | 120-140 | Rangeland | Typic Haploxerolls | Fine-silty, mixed, mesic | Condon | 30 | Uplands (plateaus) | Loess over basic igneous rock | Silt loam | Silt loam | None | -- | 20-40" over bedrock |
| | | | | | | Lithic Xerollic Camborthids | Loamy, mixed, mesic | Starbuck | 20 | Uplands (side slopes) | Loess & basic igneous rock | Silt loam | Gravelly silt loam | Gravel | 20-35 below 10" | 10-20" over bedrock |
| | | | | | | Aridic Lithic Haplustolls | Loamy-skeletal, mixed, mesic | Bakeoven | 15 | Uplands (south slopes & ridges) | Basic igneous rock | Stony silt loam | Stony silt loam | Stones, cobbles, & gravel | 20-35 in profile | 10-20" over bedrock |
| | | | | | | Calcic Argixerolls | Fine-silty, mixed, mesic | Bagdad | 15 | Uplands (plateaus) | Loess over basic igneous rock | Silt loam | Silt loam | None | -- | 40-60" over bedrock |
| | | | | | | Calciorthidic Haploxerolls | Fine-silty, mixed, mesic | Bickleton | 10 | Uplands | Loess | Silt loam | Silt loam | None | -- | 60"+ |
| Shallow to moderately deep soils with stony, fine loamy subsoils on gentle to very steep slopes | 7 | 2,500-4,500 | 17-35 | 80-120 | Principally forest land | Argrerollis plus Haploxerolls | Fine to coarse-loamy, mixed, mesic | -- | 100 | Uplands (plateaus) | Volcanic ash loess & basic igneous rock | -- | -- | -- | -- | 10-40" over bedrock |
| Moderately deep to deep frigid soils with stony, loamy subsoils on moderate to extremely steep slopes. | 8 | 2,500-6,500 | 20-120 | 0-115 | Forest land 4/ | Cryandepts and Cryumbrepts, Cryorthods, Haplumbrepts | Coarse loamy, loamy-skeletal, mixed and loamy-skeletal, mixed, mesic | -- | 100 | Uplands (plateaus & ridgetops | Loess & volcanic ash, glacial till, sedimentary & basic igneous rocks | -- | -- | -- | -- | 60"+, some shallow over gravel & bedrock |

1/ Based on data summarized during 1966.
2/ Only soil series names that have a status as reserved, tentative, or established are listed.
3/ Differences of total percentage in each soil association from 100 percent are inclusions of other soils and land types.
4/ For the upland forest soils, the above characteristics and qualities have been extended from a limited amount of survey data. Additional data and land use interpretations for forest soils are available in the Forest Land section of Appendix VIII, Land Measures and Watershed Protection. These areas include National Forest and adjacent non-Federal forest lands.
5/ Presently irrigated cropland.

SOURCE: National Cooperative Soil Survey.

ble 78 - Continued



| il Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coarse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass 6/ | | | |
| Texture Subsoil | Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| Silt loam | None | -- | 20-40" over bedrock | Moderate | Impervious | Good | Low and medium | VIe | -- | Moderately deep over bedrock; alkaline subsoil | Rangeland management |
| Gravelly silt loam | Gravel | 20-35 below 10" | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | -- | Shallow over bedrock; gravelly subsoil | Rangeland management |
| Stony silt loam | Stones, cobbles, & gravel | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | -- | Shallow over bedrock; stony profile | Rangeland management |
| Silt loam | None | -- | 40-60" over bedrock | Moderate | Impervious | Good | Medium and high | IIIe | -- | Erosion;alkaline subsoil | Rangeland management |
| Silt loam | None | -- | 60"+ | Moderate | Moderate | Good | High | IIIe IVe VIe | -- | Erosion | Rangeland management |
| -- | -- | -- | 10-40" over bedrock | Moderate | -- | Good | Medium | VIe | -- | Erosion;occurs with moderate to severe core disturbance | Continued forest land management including erosion control measures |
| -- | -- | -- | 60"+, some shallow over gravel & bedrock | Moderate | -- | Good | Low to medium | VIe VIIIe | -- | Erosion; with improper land use | Continued forest land management; cross-slope operations; residue and irrigation mgmt on agricultural areas. |

Moderate: 1.8 to 2.5 inches per hour.
Moderately slow: 0.2 to 0.8 inches per hour.
Slow: 0.05 to 0.2 inches per hour.
Very slow: Less than 0.05 inches per hour.

Terms listed for total available water-holding capacity are:

Low: Less than 6 inches in profile
Medium: 6 to 10 inches.
High: More than 10 inches in profile.

The irrigated capability subclasses are an interpretation of limitations and hazards of using only presently irrigated lands. Many areas not presently irrigated may be potentially irrigable, but are not included in this classification.

A dash in any column indicates that the information is nonexistent or not pertinent.

Tables 78 and 79 show almost one-fourth of Subregion 3 is on bottomlands and low alluvial terraces with soils that range from gravelly, sandy and shallow to very deep and silty. Distributed throughout this area are small alkali spots, caliche hardpan lenses, and wet areas. On the north and east parts of the subregion another 23 percent consists of rocky, droughty soils formed in glacial materials on terraces and foothills. About 10 percent is on plateaus and canyons on the south side with soils formed in shallow to deep beds of wind deposited loess over basalt bedrock. The remaining 40-plus percent consists of the high mountainous land on the west side of the subregion, mostly with rocky soils formed in a mixture of local and glacial materials, shallow loessial deposits, and volcanic ash and pumice mixed with residuum-colluvium from the underlying basic bedrock.

Table 79 shows the estimated acreage and proportionate extent of the soil associations.

Table 79 - Soil Associations Acreage, Subregion 3, 1966

| Soil Association | | | |
|---|---|---|---|
| Map Symbol | Name | Washington (1,000 acres) | Percent |
| 1 | Sagemoor-Toppenish | 670.0 | 17.4 |
| 2 | Naches-Selah | 240.0 | 6.2 |
| 3 | Ephrata-Quincy | 100.0 | 2.6 |
| 4 | Ritzville-Starbuck | 125.0 | 3.2 |
| 5 | Vantage-Clerf | 800.0 | 20.8 |
| 6 | Condon-Starbuck | 230.0 | 6.0 |
| 7 | Dominantly Argixerolls | 65.0 | 1.7 |
| 8 | Dominantly Cryandepts | 1,621.4 | 42.1 |
| Total Land Area | | 3,851.4 | 100.0 |

Source: National Cooperative Soil Survey.

## Interpretations and Evaluation

Table 80 relates the land capability classes to the Land Capability Map, figure 3. It must be realized that the Land Capability Map is highly generalized and a specific capability class on table 80 may not be shown. To determine the land capability of any particular area refer to the soil association symbols listed in the second column of the table and then locate the area of that symbol on the Soil Association Map, figure 15. Table 80 shows the acreage and extent of the dominant land capability class for practical segments of the landscape.

Table 80 - Summary and Distribution of Land Capability Classes, Subregion 3, 1966

| Land Capability Classes | Distribution by Soil Associations1/ Soil Association Map Symbols2/ | 1,000 Acres | Percent | Inventoried 1,000 Acres3/ |
|---|---|---|---|---|
| Class I - Soils in Class I have no limitations or hazards. They are adopted to all uses with a minimum of conservation treatment other than standard conditioning ones.4/ | - | - | - | 51.8 |
| Class II - Soils in Class II have few limitations or hazards. Simple conservation practices are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 1 | 670.0 | 17.4 | 255.3 |
| Class III - Soils in Class III have more limitations and hazards than those in Class II. They require more difficult or complex conservation practices when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 2-4 | 365.0 | 9.4 | 330.6 |
| Class IV - Soils in Class IV have greater limitations and hazards than Class III. Still more difficult or complex measures are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 3-6 | 330.0 | 8.6 | 425.2 |
| Class V - Soils in Class V have more limitations than Class IV. They are generally unsuited for cultivation, but are well suited for grazing and forestry use. They require good management practices.4/ | - | - | - | - |
| Class VI - Soils in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland or wildlife. | 5-7-8 | 2,486.4 | 64.6 | 2,576.8 |
| Class VII - Soils in Class VII have very severe limitations and hazards that make them generally unsuited for cultivation. They are suited to grazing, noncommercial, woodland or wildlife. | - | - | - | 165.2 |
| Class VIII - Soils and land forms in Class VIII have limitations and hazards that prevent their use for cultivated crops, pasture, range or woodland. They may be used for recreation, wildlife or water supply. | - | - | - | 46.5 |
| Total Land | | 3,851.4 | 100.0 | 3,851.4 |

1/ Class I and 10 percent of other capability classes may be included in areas of Class II. Up to 25 percent of other capability classes may be included in Classes III and IV. Class V and up to 40 percent of other capability classes may be included in Classes VI, VII, and VIII. In areas of rainfall less than 12 inches, large areas of Class VI can be potential Classes I through IV where Irrigation water is available.
2/ Refer to the Subregional Soil Association Map, figure 15.
3/ Taken from table 8.
4/ Capability Classes I and V are distributed in small segregated areas over segments of the landscape. Many small areas could not be delineated on the map. This added detail, although still generalized, is commensurate with the subregional level of generalization.
Source: National Cooperative Soil Survey and U.S.D.A. Conservation Needs Inventory adjusted.

Classified on table 81 is the dominant water storage capacity for each soil association in Subregion 3. Each class on the table relates to a similar class on the regional map on Water Storage Capacity, figure 4. To locate those areas having contrasting water storage capacity in the upper 5 feet of soil, refer to figure 4, to figure 15 (the subregional Soil Association Map), and to the following table. The class letter symbol in the first column and the Soil Association Map numerical symbol listed in the second column may be used to locate those areas having contrasting water storage capacity. Complete utilization of this storage can contribute a more stable and sustained streamflow.

Table 81 - Water Storage Capacity of Soils Generalized to the Soil Associations, Subregion 3, 1966

| Water Storage Capacity 1/ | Soil Association Symbols | 1,000 Acres | Percent |
|---|---|---|---|
| Class A - Water storage in the soil profile more than 20,000 acre-feet per township. | - | - | - |
| Class B - Water storage in the soil profile 10,000 to 20,000 acre-feet per township. | 1 | 670.0 | 17.4 |
| Class C - Water storage in the soil profile 5,000 to 10,000 acre-feet per township. | 2-3-4-5-6-7-8 | 3,181.4 | 82.6 |
| Total | | 3,851.4 | 100.0 |

1/ Measurement of the water storage capacity is limited to the upper 5 feet of soil or to bedrock.
Source: National Cooperative Soil Survey.

## Cover and Land Use

The four major cover and land uses, as defined in the glossary and explained in the introduction, have been summarized by acreage and ownership on table 82. These broad categories have been determined both on the basis of cover and use. Cropland is more specifically a use category. Forest land has more than 10 percent forest cover. Rangeland areas have broad range cover characteristics. Other land includes land specifically based on use such as urban, as well as that based specifically on cover characteristics such as rock and sand dune areas.

The four major categories have been generalized for presentation on figure 16. Since this information has been generalized, isolated areas of different cover and uses may occur within the broad patterns.

Table 82 - Cover and Land Use by Ownership, Subregion 3, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 784.5 | 25.0 | 28.6 | 838.1 |
| Other Agriculture | .2 | - | - | - | .2 |
| | .2 | 784.5 | 25.0 | 28.6 | 838.3 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 4.1 | 26.8 | - | 30.9 |
| Bureau of Indian Affairs1/ | 90.1 | 224.1 | 433.8 | 22.2 | 770.2 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | .5 | .2 | .7 |
| Bureau of Reclamation | - | .5 | 28.4 | 3.0 | 31.9 |
| Other Interior | - | - | - | .2 | .2 |
| | 90.1 | 228.7 | 489.5 | 25.6 | 833.9 |
| Department of Defense | - | - | 175.1 | - | 175.1 |
| Other Federal | - | - | 143.3 | - | 143.3 |
| Federal Subtotal | 90.3 | 1,013.2 | 832.9 | 54.2 | 1,990.6 |
| State | 21.9 | 97.2 | 157.6 | 30.0 | 306.7 |
| County | - | .5 | - | 3.3 | 3.8 |
| Municipal | - | .3 | - | 10.7 | 11.0 |
| Public Total | 112.2 | 1,111.2 | 990.5 | 98.2 | 2,312.1 |
| Private Total | 574.1 | 397.7 | 544.3 | 23.2 | 1,539.3 |
| Total Land Area | 686.3 | 1,508.9 | 1,534.8 | 121.4 | 3,851.4 |

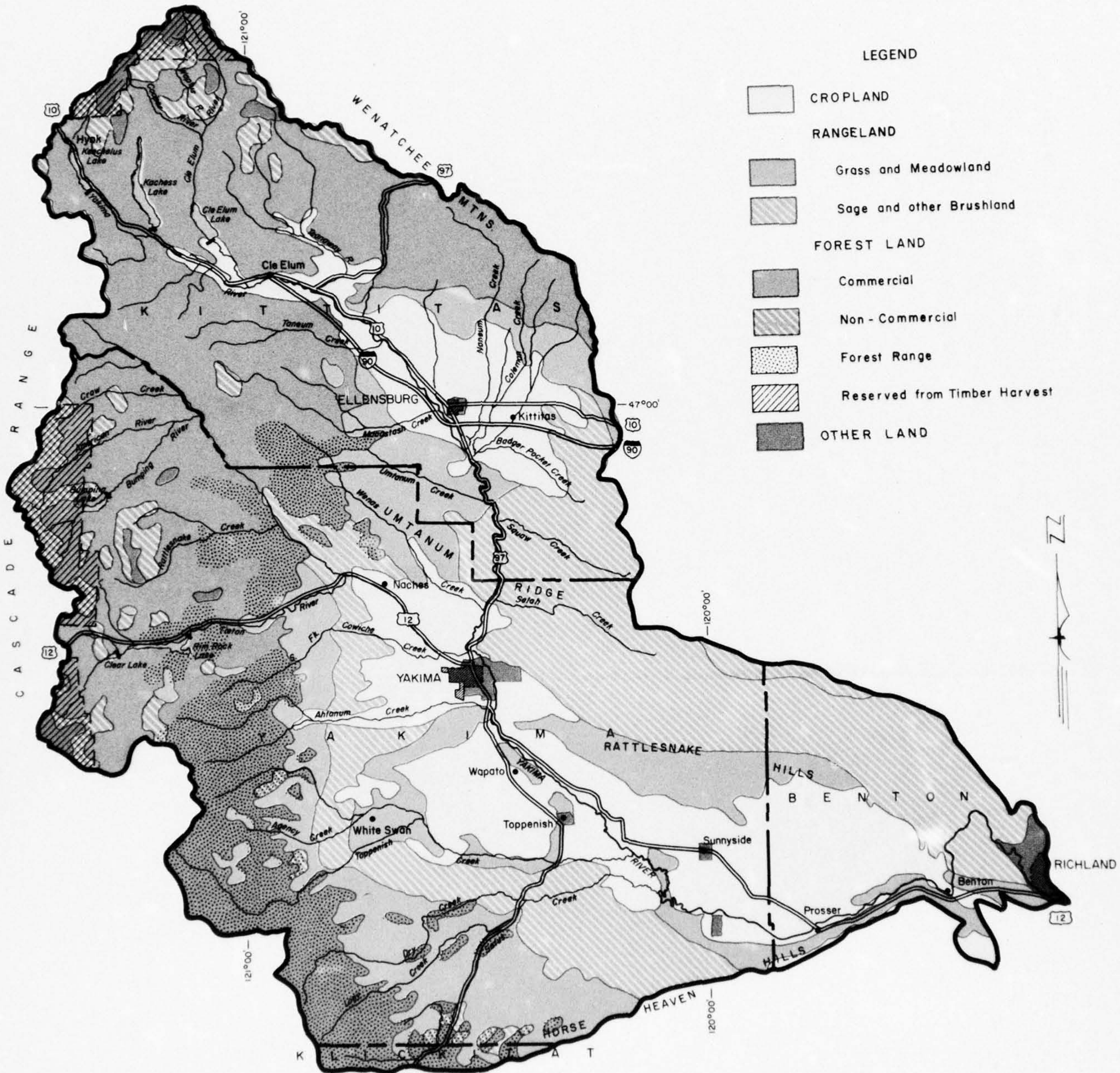
1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, U.S.D.A. Forest Survey, and other sources.

## Cropland

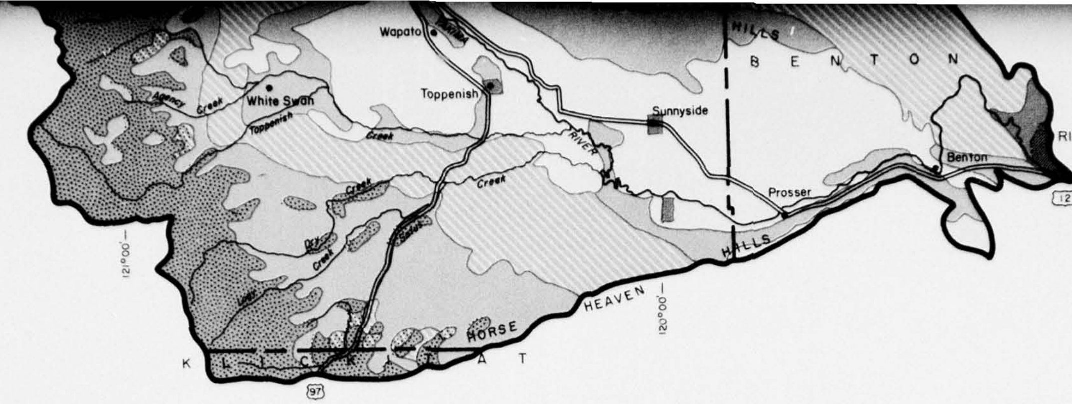
Approximately 86 percent of the cropland in the Yakima Subregion is under irrigation. Although hay, pasture, and grain crops cover the greatest acreage, they are mainly used in the cropping sequence to balance the agricultural enterprise and maintain optimum soil condition. The major value crops are fruit orchards (mostly apples) occupying about 21 percent of the cropland and row crops (mostly sugar beets and potatoes) along with specialty crops (such as mint, hops, asparagus, and nursery crops) on about 25 percent of the cropland area.

Nonirrigated cropland is restricted to the upland plateaus in select areas of suitable soils and adequate rainfall of more than 11 inches. In these areas a grain-fallow cropping sequence is used with pasture crops and wheat alternating on a long rotation.

The Yakima and Kittitas valleys are famous for their high yields of a wide range of irrigated crops. They were among the very early irrigation projects in the State of Washington. Table 83 lists the acreage of representative categories of crops and shows the extent of each category.



LEGEND
CROPLAND
RANGELAND
Grass and Meadowland
Sage and other Brushland
FOREST LAND
Commercial
Non - Commercial
Forest Range
Reserved from Timber Harvest
OTHER LAND
N
WENATCHEE MTNS.
KITTITAS
CASCADE RANGE
YAKIMA
BENTON
KLICKITAT
UMTANUM RIDGE
RATTLESNAKE HILLS
HORSE HEAVEN HILLS
ELLENSBURG
Cle Elum
Kittitas
Naches
YAKIMA
Wapato
Toppenish
White Swan
Sunnyside
Prosser
Benton
RICHLAND
Hyak
Keechelus Lake
Kachess Lake
Cle Elum Lake
Clear Lake
Rim Rock Lake
Taneum Creek
Manastash Creek
Umtanum Creek
Squaw Creek
Selah Creek
Naches Creek
Cowiche Creek
Ahtanum Creek
Badger Pocket Creek
Naneum Creek
Coleman Creek
Crow Creek
Tieton River
Bumping River
Agency Creek
Toppenish Creek
River
Yakima
47°00'
121°00'
120°00'
10
90
97
12





COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# GENERALIZED COVER AND LAND USE

YAKIMA, SUBREGION 3

1968

USDA-SCS-PORTLAND, OREG. 1970

FIGURE 16

8

*Typical land use contrasts in this subregion; cropland surrounded by rangeland with forest land and barren areas in the background. (S.C.S.)*

Table 83 - Cropland Acreage of Representative Categories of Crops, Subregion 3, 1966

| Categories of Crops | Washington (1,000 acres) | Percent |
|---|---|---|
| Dryland Cropland 1/ | | |
| Close grown field crops | 196.0 | 28.6 |
| Forage crops | .3 | Tr. |
| Total dryland crops | 196.3 | 28.6 |
| Irrigated Cropland 1/ | | |
| Forage crops | 115.9 | 16.9 |
| Orchards and vineyards | 146.3 | 21.3 |
| Row crops 2/ | 91.9 | 13.4 |
| Specialty crops 3/ | 76.7 | 11.2 |
| Close grown field crops | 59.2 | 8.6 |
| Total irrigated crops | 490.0 | 71.4 |
| Total cropland | 686.3 | 100.0 |

1/ Does not include other land that is irrigated (table 86).
2/ Includes sugar beets, potatoes, and corn.
3/ Includes mint, hops, asparagus, nursery crops, and others.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

## Forest Land

Forest land covers 1,508,900 acres of Subregion 3, amounting to 39 percent of the total land area. This cover forms a great crescent along the mountainous western and southern borders of the basin. It extends downslope to the benches where it mixes with the drier sage and grassland areas below. Table 84 shows the forest land acreage by generalized type and ownership.

Over 1 million acres, or 62 percent of the forest land, are publicly owned. Seventy percent of this is National Forest, 20 percent is Indian Reservations, and 10 percent is owned by the State of Washington. The privately owned forest land makes up the remaining 38 percent of about 400,000 acres. Refer to table 84 for detailed status.

Table 84 - Forest Land Acreage by Generalized Type and Ownership, Subregion 3, 1966

| Ownership | Commercial Forest Land | Non-Commercial Forest Land: Productive Reserved | Non-Commercial Forest Land: Unproductive Reserved | Non-Commercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Forest Service | 580.5 | 70.8 | 42.6 | 90.6 | 784.5 |
| Bureau of Land Management | 4.1 | - | - | - | 4.1 |
| Bureau of Indian Affairs 1/ | 209.1 | - | - | 15.0 | 224.1 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | .5 | - | - | - | .5 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 794.2 | 70.8 | 42.6 | 105.6 | 1,013.2 |
| State | 95.2 | - | - | 2.0 | 97.2 |
| County | .5 | - | - | - | .5 |
| Municipal | .3 | - | - | - | .3 |
| Public Total | 890.2 | 70.8 | 42.6 | 107.6 | 1,111.2 |
| Private Total | 382.7 | - | - | 15.0 | 397.7 |
| Grand Total | 1,272.9 | 70.8 | 42.6 | 122.6 | 1,508.9 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Pacific Northwest Experiment Station.

Timber About 1.3 million acres are classed as softwood-type commercial timberland. The major species is ponderosa pine. Other species include the Douglas-fir, spruce, and true firs. The remaining one-quarter million acres are noncommercial comprising both the sub-alpine types found in the high mountains near timberline and the areas reserved from cutting.

Ninety-three percent of the commercial forest land supports sawtimber and about 7 percent is in the pole-timber, sapling, and seedling class. Less than 1 percent is nonstocked. Only 70,000 acres of commercial forest land are in the reserved category. The balance supports over 29 billion board feet, furnishing raw material for the forest industry in and adjacent to the subregion.

Forest Range Included in the forest range are 637,000 acres classified as commercial forest land and 26,000 acres classified as noncommercial forest. The forest range represents 44 percent of the total forest land in this subregion. Nearly 40 percent of the forest range is in private ownership. Another 30 percent is Indian Reservations. The remainder is state owned or managed by other Federal agencies.

Native vegetation of the forest range is composed of stands of ponderosa pine with an understory including beardless wheatgrass, Idaho fescue, pinegrass, and Sandbergs bluegrass. Forbs such as lupine, balsamroot, and yarrow occur together with buckbrush, bitterbrush, serviceberry, wild currant, and spiraea. Other forest range includes the Douglas-fir, western larch, and lodgepole pine. The open areas support stands of mountain brome, pinegrass, Junegrass, and various sedges.

Other Uses The forest land is extremely valuable for more than just the production of raw material for its industries. Although only 39 percent of the area is forested, almost 92 percent of the subregion's runoff originates on these lands. Over 70,000 people, representing 57 percent of the area's urban population, depend on forest watersheds for their source of domestic water.

The forest land also provides 35 percent of the subregion's recreation resource, furnishing vast areas for hunting, fishing, and other outdoor activities. The public forest land furnished areas and facilities for over 2 million recreation visits in 1965. These included use at developed campgrounds, winter sports areas plus the general outdoor environment. The private forest land furnishes a lesser but significant part of the recreation resource including several developed campgrounds. These forest lands are also the major habitat for most of the big game in the subregion with about 243,000 hunter visits reported in 1965.

## Rangeland

Rangeland in Subregion 3 occupies 1.5 million acres or 40 percent of the land area. This subregion accounts for 2 percent of all rangeland in the region. Table 85 shows the various categories of rangeland by ownership for the subregion.

Table 85 - Rangeland and Forest Range Acreage by Range Type and Ownership, Subregion 3, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Grand Total |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 10.3 | 16.7 | 153.3 | 103.3 | 283.6 | 82.6 | 401.2 | 767.4 |
| Sagebrush | 15.5 | 7.0 | 264.9 | 234.9 | 522.3 | 67.7 | 120.2 | 710.2 |
| Brushland other than sage | 1.0 | 1.3 | 15.6 | 9.1 | 27.0 | 7.3 | 22.9 | 57.2 |
| Total | 26.8 | 25.0 | 433.8 | 347.3 | 832.9 | 157.6 | 544.3 | 1,534.8 |
| Forest Range[1] | | | | | | | | |
| Commercial Forest | 4.1 | 92.0 | 196.9 | - | 293.0 | 95.0 | 249.0 | 637.0 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 9.7 | - | - | 9.7 | 1.0 | 15.0 | 25.7 |
| Desert Fringe | - | - | - | - | - | - | - | - |
| *Total (noncommercial)* | - | 9.7 | - | - | 9.7 | 1.0 | 15.0 | 25.7 |
| Total (forest range) | 4.1 | 101.7 | 196.9 | - | 302.7 | 96.0 | 264.0 | 662.7 |
| Grand Total | 30.9 | 126.7 | 630.7 | 347.3 | 1,135.6 | 253.6 | 808.3 | 2,197.5 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 84.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Rangeland is concentrated in the eastern part of Kittitas and Yakima counties. It is interspersed with significant areas of intensive agriculture along the Yakima River and tributary streams. An estimated 384,000 acres or 25 percent of the range is in good condition, 514,000 acres or 34 percent is in fair condition, and 637,000 acres or 41 percent is in poor condition. The estimated carrying capacity is 192,000 AUMs, with private range accounting for 35 percent and the public range 65 percent.

The Federal Government has jurisdiction over 54 percent of the range, primarily administered by the Bureau of Indian Affairs and the Department of Defense. Privately owned lands represent 36 percent of the total. The remaining 10 percent is owned by the State.

Grasslands cover about 50 percent of the range. Grasslands are found intermingled with sagebrush and other browse types. This range type may be found on rolling hills, plateaus or river breaks extending from the lower timberline to the valley bottoms. Some 46 percent is sagebrush, a type adapted to a wide range of soil conditions found at intermediate and lower elevations. Good condition sagebrush range is characterized by an abundance of desirable perennial plants such as the bluebunch wheatgrass, Idaho fescue, or big bluegrass which may be found growing in association with sagebrush and scattered forbs. The remaining 4 percent is brushland other than sage.

## Other Land

The other land use in the Yakima Subregion consists of 121,400 acres or about 3 percent of the land area. About 66 percent of the other land is urban, industrial areas, farmsteads, airports, roads, and other miscellaneous use areas. Barren land makes up about 24 percent and about 10 percent is water areas less than 40 acres and streams less than one-eighth mile wide. Table 86 shows the acreage and proportionate extent of other land.

Table 86 - Other Land, Subregion 3, 1966

| Kinds of Land Use | Washington (1,000 acres) | Percent |
|---|---|---|
| Barren | 28.7 | 23.7 |
| Roads and railroad | 27.8 | 22.9 |
| Small water 1/ | 12.9 | 10.6 |
| Miscellaneous 2/ | 52.0 | 42.8 |
| Total Other Land | 121.4 | 100.0 |

1/ Water areas less than 40 acres and streams less than one-eighth mile wide.
2/ Includes urban and industrial areas, farmsteads, airports, and other areas.
Source: Compiled by the Soil Conservation Service Columbia-North Pacific River Basin Staff.

## MINERAL RESOURCES

The western part of the subregion lies in the Cascade Range physiographic province that merges into the Columbia Plateau in the eastern part. The region is predominantly underlain by Columbia River basalt and associated lava flows of Tertiary age. Recent volcanic andesites and lava flows (Quaternary) similar to the Mt. Rainier volcanics occur in the Tieton River Basin. The northeastern corner contains intrusive granitic rocks of Jurassic age and some younger Tertiary intrusives. Metallic mineral resources closely related to these intrusive rocks are found in this area. By contrast, the parts of the subregion covered by basalt and lava flows are unfavorable for metallic mineral deposits and mineral resources are largely limited to sand and gravel, stone, diatomite, pumicite, and clay. The coal beds are in continental sediments of Eocene age interbedded with basalt.

### Metals

The first mineral discoveries in the subregion were made in the Swauk-Peshastin District in northern Kittitas County; placer gold deposits were found in Swauk Creek Basin in 1860. Lode deposits of gold and silver were developed about 10 years later and the period of greatest activity and output was during 1892-1895. The district is in the Upper Swauk Creek Basin as shown in figure 19 and table 87. It has been the largest gold producing district in the subregion with a record of about 50,000 troy ounces of gold.

The Cle Elum District located in the Upper Cle Elum and Teanaway River basins is notable principally for the lateritic iron deposits containing considerable nickel and minor amounts of chromium, (figure 17, table 87). There has been no production from these deposits, but they were tested by the Bureau of Mines and others during the war years as a possible source of nickel. The test work indicated reserves of more than 6 million tons. This district has also yielded some copper and silver with minor amounts of gold, lead, and zinc.

The Snoqualmie District is located north of Snoqualmie Pass near the crest of the Cascade Range in the northwest corner of the subregion. The district produced a small amount of copper with associated silver and gold; there has been little recent activity.

The Bumping Lake District is located in the west-central part of the subregion near the crest of the Cascade Range and the headwaters of the American and Bumping Rivers. A small production of copper, gold, silver, lead, and zinc came from sporadic activity, and a small amount of tungsten concentrates were produced during the war years, mostly from one mine. A small discovery of uranium minerals caused considerable interest but no economic deposits have been developed.

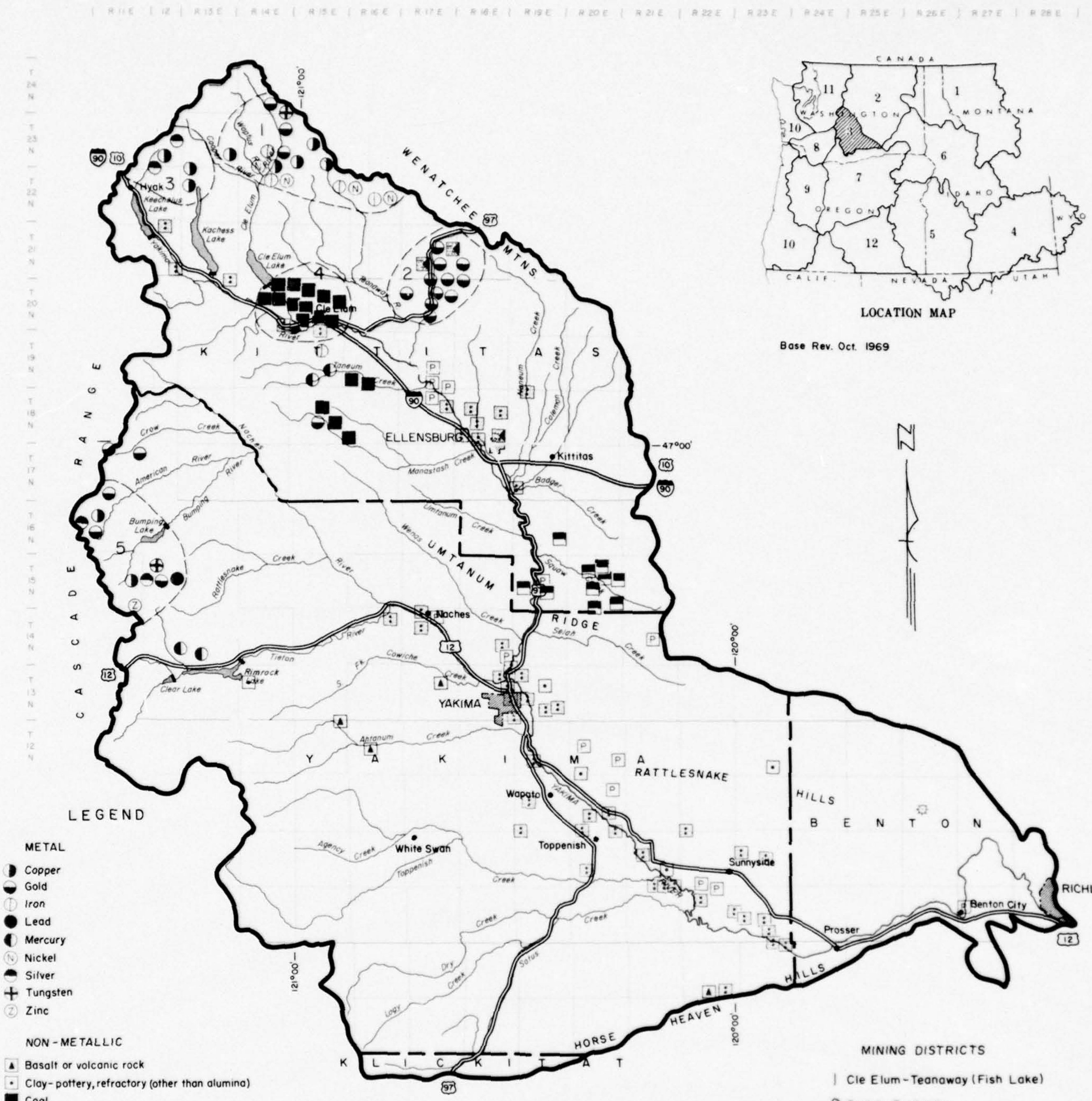
## Nonmetals

Sand and gravel has been one of the most important nonmetallic mineral products in both tonnage and value. Large deposits are near the Yakima River and its tributaries, and most producers are near the larger urban centers where nearby markets are available, figure 17.

Basalt and similar volcanic rocks are generally quarried to supply crushed rock for road building and concrete aggregate. Volcanics cover a large part of Yakima County and southern Kittitas County. Recently active quarries are shown in figure 17.

Clay suitable for brick and tile making is accessible at a number of locations in the subregion, especially in Yakima County. Several clay beds occur in the Ellensburg Formation of Tertiary age and recently active clay pits are shown in figure 17.

Pumice and pumicite deposits are widesparead in Yakima County and a few occur in Kittitas County. Many of these have been tested




## LEGEND

**METAL**

- Copper
- Gold
- Iron
- Lead
- Mercury
- Nickel
- Silver
- Tungsten
- Zinc

**NON-METALLIC**

- Basalt or volcanic rock
- Clay-pottery, refractory (other than alumina)
- Coal
- Diatomite
- Natural gas
- Pumice-Pumicite
- Sand and gravel
- Sandstone or silica

10 0 10 20
SCALE IN MILES

**MINING DISTRICTS**

1 Cle Elum-Teanaway (Fish Lake)
2 Swauk-Peshastin
3 Snoqualmie (Mineral Creek)
4 Roslyn
5 Bumping Lake (Summit)

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# MINERAL RESOURC
# AND MINING DISTRIC
YAKIMA, SUBREGION 3

FIGURE

Table 87 - Mining Districts, Subregion 3

| Index No. Fig. | District | County | Drainage | Size of Districts - Production Plus Potential Reserves 1/ Gold | Silver | Copper | Lead | Zinc | References |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Cle Elum (Fish Lake)-Teanaway | Kittitas | Headwaters of the Cle Elum and Teanaway Rivers | 3 | 2 | 2 | 3 | - | Smith, G.D., and Calkins, 1906, U.S. Geol. Survey Atlas, Folio 139, 14 pp. Zoldok, S.W., 1948, BuMines RI 4189, 8 pp. |
| | | | | Iron-nickel deposits estimated potential resources 6,500,000 tons | | | | | |
| 2 | Swauk-Peshastin | do | Upper Swauk Creek Basin | 1 | 2 | - | - | - | Huntting, M.T., 1956-60, Washington Div. Mines & Geol. Bull. 37, Pt. 2. |
| 3 | Snoqualmie (Mineral Creek) | do | Headwaters of Yakima River near Snoqualmie Mtn. | 3 | 3 | 2 | - | - | Smith and C alkins, 1906 Huntting, 1956-60 Washington Div. Mines & Geol. Bull. 37, Pt. 2. |
| 4 | Roslyn(Coal) | do | Lower Cle Elum River Basin | Coal reserves are estimated to be about 240 million tons, all classified as bituminous. Production has been about 63 million tons | | | | | Beikman, H.M., Gower and Dana, 1961, Washington Div. Mines & Geol. Bull. 47 |
| 5 | Bumping Lake-Summit | Yakima | Headwaters of Bumping and American Rivers | 2 | 2 | 3 | 3 | 3 | Huntting, M.T., 1956-60. Washington Div. Mines & Geol. Bull. 37, Pt. 2. |
| | | | | Small production of tungsten | | | | | |

1/ Size

| Index | Gold (Troy Ounces) | Silver (Troy Ounces) | Copper (Net Tons) | Lead (Net Tons) | Zinc (Net Tons) |
|---|---|---|---|---|---|
| 1 | 10,000 - 100,000 | 10,000 - 100,000 | 100 - 1,000 | 100 - 1,000 | 100 - 1,000 |
| 2 | 1,000 - 10,000 | 1,000 - 10,000 | 10 - 100 | 10 - 100 | 10 - 100 |
| 3 | 500 - 1,000 | 100 - 1,000 | 1 - 10 | 1 - 10 | 1 - 10 |

for suitability as pozzolan material in concrete admixtures. One deposit of pumice near Zillah has been mined and processed for use as lightweight aggregate. A substantial production of pumicite came from a deposit that is nearby but outside the subregion in Sec. 20, T. 14N, R23E. It was used in construction of Priest Rapids Dam.

## Mineral Fuels

The most important mineral resource is the coal deposits of Kittitas County. The Roslyn coal field, although covering an area of only 30 square miles, has produced more coal than any other field in the State of Washington. The field contains at least eight coal beds at different horizons of which five beds have been active producers.

The first coal mine in the Roslyn field was opened in 1882, and production was nearly continuous until 1962. Total coal reserves remaining in the field are estimated to be about 240 million tons.

The Taneum coal area is located along Taneum Creek and may be an extension of the Roslyn field. It covers less than 1 square mile and contains only one or two mines that were productive; reserves are estimated to be about 1 million tons.

The Manastash area is located between the South and North Forks of Manastash Creek and may also be partly an extension of the Roslyn field. It covers an area of about 7 square miles and is estimated to contain 40 million tons of coal.

Rattlesnake Hills area, Benton County, produced natural gas (over a billion cubic feet) predominantly from 1929 to 1941. The area has a small potential for future production.

## Present Mineral Industry and Outlook for the Future

### Metals

Copper and Silver Copper, silver, and gold have been the principal metals produced in Subregion 3. Copper-silver production has come chiefly from the Cle Elum-Teanaway and the Snoqualmie districts in northern Kittitas County (figure 17, table 87).

The Cle Elum and Snoqualmie districts have each produced 100 tons or less of copper and 10,000 troy ounces of silver, with small amounts of gold, lead, chromite, and molybdenum, most of it produced in the period 1905-1935. The Bumping Lake-Summit District in Yakima County has produced less than 10,000 troy ounces of gold, 10,000 troy ounces of silver, and small amounts of copper, lead, zinc, and tungsten. Little or no production has come from this district in recent years. The Snoqualmie District is part of a broad belt of mineralization along the margin of the Snoqualmie batholith (a Tertiary granodiorite intrusion) that includes the Index, Sultan, Silver Creek, and Monte Cristo districts outside the subregion. These districts contain the greatest number of copper mines in the State. There is potential for future discoveries and substantial future production of copper and silver in this area.

Gold Gold production, except as a byproduct from copper-silver ores, has come principally from the Swauk-Peshastin District in northern Kittitas County. Placer gold was discovered on the upper Swauk Creek and tributaries in 1860, and lode deposits were developed in 1874. Total production of about 50,000 troy ounces of gold has come mostly from four mines in the district. Gold Placers, Inc. has an active gold dredging operation on Williams Creek near Liberty; production figures are not disclosed.

As in other parts of the Nation, gold production is at an alltime low due, in part, to the imbalance between the controlled price at $35 per ounce and the present production cost. More favorable economic conditions would doubtless increase gold production.

Iron, Nickel, and Chrome The laterite iron deposits in the Cle Elum District are of considerable interest because of the character and size of the deposits and because of the nickel content. The deposits extend over an outcrop distance of more than 2 miles and reserves are estimated to be 6,500,000 tons or more. The average grade runs about 40 percent iron, 0.8 percent nickel, and 2.4 percent $Cr_2O_3$. If an economic process can be perfected for recovery of the iron, nickel, and chrome using the nearby coal deposits as fuel, there is potential for a future mineral industry in the subregion, especially in a period of national emergency.

Mercury Mercury was first discovered in Washington in the Keystone mine in Kittitas County before 1896. A small production of mercury has been reported from the Silver Tip and H.O.M.E. mines in the Taneum Creek drainage and the Indian Creek-Wildcat Creek drainage in Yakima County. There is little or no potential for substantial future mercury production from presently known reserves.

Tungsten Several occurrences of tungsten mineralization have been found in the Bumping Lake-Summit District, and a small amount of tungsten ore was produced during the period of high unit price for government purchased concentrates. The Bumping Lake District has potential for a small future production during national emergencies and subsidized prices.

Nonmetals

Sand and Gravel Sand and gravel production ranks first in Yakima County and second to stone in Kittitas County in order of value of mineral products for 1964-65. The principal sources of sand and gravel are alluvial deposits in the Yakima River Valley. Commercial producers are located near Ellensburg, Yakima, Prosser, and Benton City.

The market price of sand and gravel ranges from $.80 to $1.25 per short ton. It is a low unit price product and, therefore, must be produced near the consumer. Adequate supplies are available for all foreseeable future needs except locally where other land uses conflict with sand and gravel operations.

Stone Most of the stone produced in the subregion is andesite or basalt quarried for production of crushed stone for road building and aggregates. Stone ranks first in Kittitas County and third in Yakima County in order of value of mineral products in 1964-65. The resources and accessibility of stone suitable for roadstone and aggregate are adequate for all foreseeable future needs of the subregion.

Clay A deposit of bentonite located in the Tieton Basin, Yakima County was productive in 1960. Common clays suitable for brick, tile, and heavy clay products are widespread particularly in Yakima County. Brick plants are located at Granger and near Yakima. Future clay production depends on markets for the clay products within economic marketing range of the deposits.

Diatomite A number of diatomite deposits are present, particularly in Kittitas County. Two deposits have recently been productive. Several other deposits were formerly worked and future output should expand as markets develop. Most of the known deposits are within the Yakima Firing Range and are currently closed or withdrawn from mineral entry.

Pumice and Pumicite Pumice or pumicite deposits are numerous particularly east of the Yakima River in Yakima and Benton counties. Pumice from only one deposit near Zillah has been mined and processed for lightweight aggregate. Many of the deposits have been tested for pozzolan qualities and one deposit in Yakima County in the east-central part of the subregion produced about 85,000 tons for use as concrete admixture in the Priest Rapids Dam. There is potential for future pumicite mining industry to supply pozzolanic material.

## Mineral Fuels

Coal The Roslyn coalfield in Kittitas County has been the most productive coalfield in the State of Washington, and also in the Columbia-North Pacific Region. Total production was about 63 million tons. A major part of the coal produced in the Roslyn field was formerly used for locomotive fuel by Northern Pacific Railroad. Decline in coal production is largely attributed to the change from steam to Diesel locomotives. Coal output in 1958 was only 144,000 tons in contrast to more than 500,000 tons per year during the most productive period. Coal mining ceased in Kittitas County in 1963, after continuous production since about 1882.

The future of coal production in Kittitas County depends on establishment of a market and, more specifically, on the feasibility of producing electric power by a coal-fired steam-electric plant. Efforts have been made by Public Utility District No. 1 of Kittitas County to establish the feasibility of such a plant using coal from the 240 million tons reserve remaining in the Roslyn field.

The Rattlesnake Hills area in Benton County has been a productive source of natural gas for over 12 years and could be useful in the future. Additional exploration is required for any large production.

LOCATION MAP

# SUBREGION 4

# SUBREGION 4
# UPPER SNAKE

## ABSTRACT

The Upper Snake Subregion 4 is the third largest subregion in the Columbia-North Pacific study area. It includes southeast Idaho, northwestern Wyoming, a very small part of northwestern Utah, and a section of northeast Nevada.

The land in Subregion 4 consists of three general physiographic areas and four major use areas.

1. The Northern Rocky Mountains on the east and north sides of the subregion have a forest cover and constitute about 20 percent of the area. Dual use of forest land and rangeland characterizes all except some alpine areas on these high mountainous uplands. Dominantly, the area has acid igneous or sedimentary bedrock and many segregated parts of the area have been glaciated and even now are partially covered with glacial material. For all practical purposes, precipitation varies from 17 to 30 inches, falling mainly as snow in winter, spring, and fall, and as thunder showers in summer. The frost-free period ranges from 0 to 70 days, and the elevations generally average from 6,500 to 9,000 feet above sea level. Problems of use relate to the long severe winters, short growing season, steep and precipitous slopes, and shallow and rocky soils that are in many places highly erosive.

2. The high plateaus of southeastern Idaho border the Snake River Plain on the north and east sides and extend to the subregion boundary on the south. This area consists of about 63 percent of Subregion 4, with about 58 percent under grass cover and 5 percent dryland cropland. This use and cover area occurs on the high plateaus with soils mostly formed in loess and underlying basaltic residuum on the north, east, and southwest part of the area and in loess with a mixture of underlying lacustrian material in the southeast part. Precipitation ranges from 9 to 15 inches of winter rain or snowfall; the frost-free period averages from 60 to 130 days, and the elevation generally ranges from 5,000 to 7,500 feet above sea level. Problems of use relate to steep slopes and erosion on rocky and shallow soils.

3. The Snake River plains and valleys occur mainly in the central part of the subregion and extend west to the border. The land area of the Upper Snake Subregion has 17 percent devoted to cropland use that is dominantly located on the Snake River plains

Table 88 - Areas by State and County, Subregion 4, 1967

| State and County | Water Area Sq.Mi. | Water Area Acres | Land Area[1/] Sq. Mi. | Land Area[1/] Acres | Total Area Sq. Mi. | Total Area Acres |
|---|---|---|---|---|---|---|
| Idaho | | | | | | |
| Bannock | 35.3 | 22,600 | 1,024.0 | 655,400 | 1,059.3 | 678,000 |
| Bingham | 27.6 | 17,700 | 2,084.4 | 1,334,000 | 2,112.0 | 1,351,700 |
| Blaine | 14.2 | 9,000 | 2,520.4 | 1,613,100 | 2,534.6 | 1,622,100 |
| Bonneville | 57.4 | 36,700 | 1,835.6 | 1,174,800 | 1,893.0 | 1,211,500 |
| Butte | 00.6 | 400 | 2,239.4 | 1,433,200 | 2,240.0 | 1,433,600 |
| Camas | 05.7 | 3,600 | 618.4 | 395,800 | 624.1 | 399,400 |
| Caribou | 33.6 | 21,500 | 1,391.7 | 890,700 | 1,425.3 | 912,200 |
| Cassia | 16.3 | 10,400 | 2,456.7 | 1,572,300 | 2,473.0 | 1,582,700 |
| Clark | 01.2 | 800 | 1,750.8 | 1,120,500 | 1,752.0 | 1,121,300 |
| Custer | 04.5 | 2,900 | 1,359.1 | 869,800 | 1,363.6 | 872,700 |
| Elmore | .0 | 0 | 242.7 | 155,300 | 242.7 | 155,300 |
| Franklin | .0 | 0 | 01.6 | 1,000 | 01.6 | 1,000 |
| Fremont | 42.8 | 27,400 | 1,806.2 | 1,156,000 | 1,849.0 | 1,183,400 |
| Gooding | 05.0 | 3,200 | 720.0 | 460,800 | 725.0 | 464,000 |
| Jefferson | 12.9 | 8,300 | 1,096.1 | 701,500 | 1,109.0 | 709,800 |
| Jerome | 04.3 | 2,800 | 594.7 | 380,600 | 599.0 | 383,400 |
| Lemhi | 06.5 | 4,200 | 386.9 | 247,600 | 393.4 | 251,800 |
| Lincoln | 00.5 | 300 | 1,202.5 | 769,600 | 1,203.0 | 769,900 |
| Madison | 04.9 | 3,100 | 473.1 | 302,800 | 478.0 | 305,900 |
| Minidoka | 04.0 | 2,600 | 750.0 | 480,000 | 754.0 | 482,600 |
| Oneida | .0 | 0 | 96.8 | 61,900 | 96.8 | 61,900 |
| Owyhee | .0 | 0 | 78.9 | 50,500 | 78.9 | 50,500 |
| Power | 39.9 | 25,500 | 1,367.9 | 875,500 | 1,407.8 | 901,000 |
| Teton | 02.0 | 1,300 | 457.0 | 292,500 | 459.0 | 293,800 |
| Twin Falls | 13.3 | 8,500 | 1,875.2 | 1,200,100 | 1,888.5 | 1,208,600 |
| Yellowstone Park | 00.1 | 100 | 57.9 | 37,000 | 58.0 | 37,100 |
| Total | 332.6 | 212,900 | 28,488.0 | 18,232,300 | 28,820.6 | 18,445,200 |
| Nevada | | | | | | |
| Elko | .0 | 0 | 1,521.3 | 973,600 | 1,521.3 | 973,600 |
| Utah | | | | | | |
| Box Elder | .0 | 0 | 376.4 | 240,900 | 376.4 | 240,900 |
| Wyoming | | | | | | |
| Fremont | 01.5 | 1,000 | 145.0 | 92,800 | 146.5 | 93,800 |
| Lincoln | 03.8 | 2,400 | 1,141.5 | 730,600 | 1,145.3 | 733,000 |
| Sublett | 01.1 | 700 | 421.6 | 269,800 | 422.7 | 270,500 |
| Teton | 58.1 | 37,200 | 2,747.2 | 1,758,200 | 2,805.3 | 1,795,400 |
| Yellowstone Park | 19.5 | 12,500 | 599.4 | 383,600 | 618.9 | 396,100 |
| Total | 84.0 | 53,800 | 5,054.7 | 3,235,000 | 5,138.7 | 3,288,800 |
| Total, Subregion | 416.6 | 266,700 | 35,440.4 | 22,681,800 | 35,857.0 | 22,948,500 |

1/ The term "land" is defined to include all water bodies under 50 acres and streams under one-eighth mile in width.
Source: U.S.D.A. Conservation Needs Inventory adjusted to U.S. Census.

and valleys. The area is mostly a vast basalt lava plain with an overburden of loess; on bottomlands the overburden is alluvium. Precipitation ranges generally from 8 to 16 inches; the frost-free period varies from 110 to 150 days; and the elevation generally averages between 3,200 and 5,500 feet above sea level. Most of the area is irrigated; however, important dry cropped areas occur on deep soils above 4,500 feet elevation. Problems of use are related to shallow, rocky soils and soils with restricted rates of infiltration and permeability.

In recent years, by far the most valuable mineral has been phosphate. Phosphate rock deposits occur in Permian sedimentary beds in southeastern Idaho and Wyoming. This is the center of the western phosphate industry; total production has exceeded 22 million long tons valued at more than $90 million. Enormous reserves of minable phosphate rock, probably 50 percent of the estimated national resource, exist in this part of the region.

An important region of metallic mineral deposits lies in the northwestern part of the subregion. The principal metals present are silver, lead, zinc, gold, and copper.

Coal fields in Idaho have produced a little more than 100,000 tons. Coal reserves are estimated at about 10 million tons in Idaho and 121 million tons in Wyoming.

The total watershed area consists of about 99 percent land and 1 percent water. Table 88 shows the land, water, and total watershed acreages of Subregion 4 by states and counties. Except for table 88, only the areas of land will be recorded in acreages throughout the following discussion.

## LAND

Factors of major importance to the land resource are the ownership status, the soils, and the present use. The combination of these factors greatly influences the present and future utilization of the land resource.

### Land Ownership

The Upper Snake Subregion contains almost 22.7 million acres. The largest landowner is the Federal Government with 15.3 million acres or over 67 percent of the land area. Private ownerships total almost 6.3 million acres or 28 percent. State, county, and municipal ownerships, amounting to 1.1 million acres, make up the balance.

Over 6.7 million acres of the public lands are National Forest. Another 6.5 million acres are Public Domain. About 1.6 million acres are other Federal holdings, mainly National Parks, Wildlife Refuges, Reclamation project lands, Military, and Atomic Energy Commission areas. State, county, and municipal governments own 1.1 million acres. Another 523,000 acres are Indian Reservation lands.

Table 89, Land Ownership, and figure 18, Land Ownership Map, show this information in more detail.

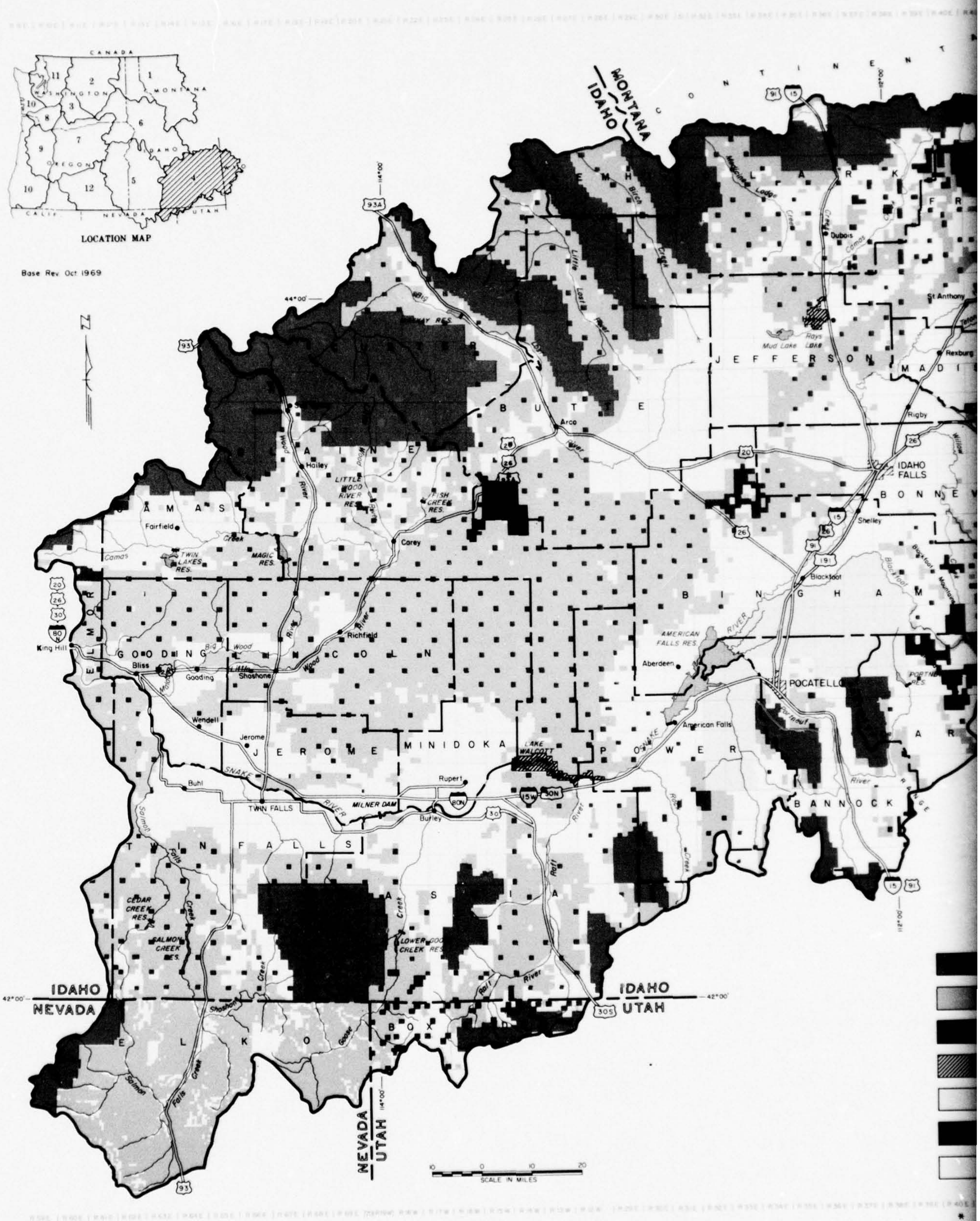
Table 89 - Land Ownership Acreage, Subregion 4, 1965

| Administering Agencies | Idaho | Wyoming | Nevada | Utah | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Department of Agriculture | | | | | |
| Forest Service | 4,333.5 | 2,274.2 | 67.5 | 46.7 | 6,721.9 |
| Other Agriculture | 32.7 | - | - | - | 32.7 |
| Subtotal | 4,366.2 | 2,274.2 | 67.5 | 46.7 | 6,754.6 |
| Department of the Interior | | | | | |
| Bureau of Land Management | 5,589.9 | 13.0 | 805.2 | 52.4 | 6,460.5 |
| Bureau of Indian Affairs 1/ | 523.5 | - | - | - | 523.5 |
| National Park Service | 84.9 | 686.1 | - | - | 771.0 |
| Fish & Wildlife Service | 16.7 | 24.6 | - | - | 41.3 |
| Bureau of Reclamation | 186.4 | - | - | - | 186.4 |
| Other Interior | - | - | - | - | - |
| Subtotal | 6,401.4 | 723.7 | 805.2 | 52.4 | 7,982.7 |
| Department of Defense | 1.6 | - | - | - | 1.6 |
| Other Federal | 572.3 | - | - | - | 572.3 |
| Federal Subtotal | 11,341.5 | 2,997.9 | 872.7 | 99.1 | 15,311.2 |
| State | 1,021.3 | 9.0 | - | 25.7 | 1,056.0 |
| County | 46.5 | - | - | - | 46.5 |
| Municipal | 18.6 | - | - | - | 18.6 |
| Public Non-Federal Subtotal | 1,086.4 | 9.0 | - | 25.7 | 1,121.1 |
| Total Public | 12,427.9 | 3,006.9 | 872.7 | 124.8 | 16,432.3 |
| Total Private | 5,804.4 | 228.1 | 100.9 | 116.1 | 6,249.5 |
| Grand Total | 18,232.3 | 3,235.0 | 973.6 | 240.9 | 22,681.8 |

1/ Private lands held in trust by the Federal Government.
Source: General Services Administration Real Property Owned by the United States as of June 30, 1965, adjusted by the Land and Minerals Work Group.

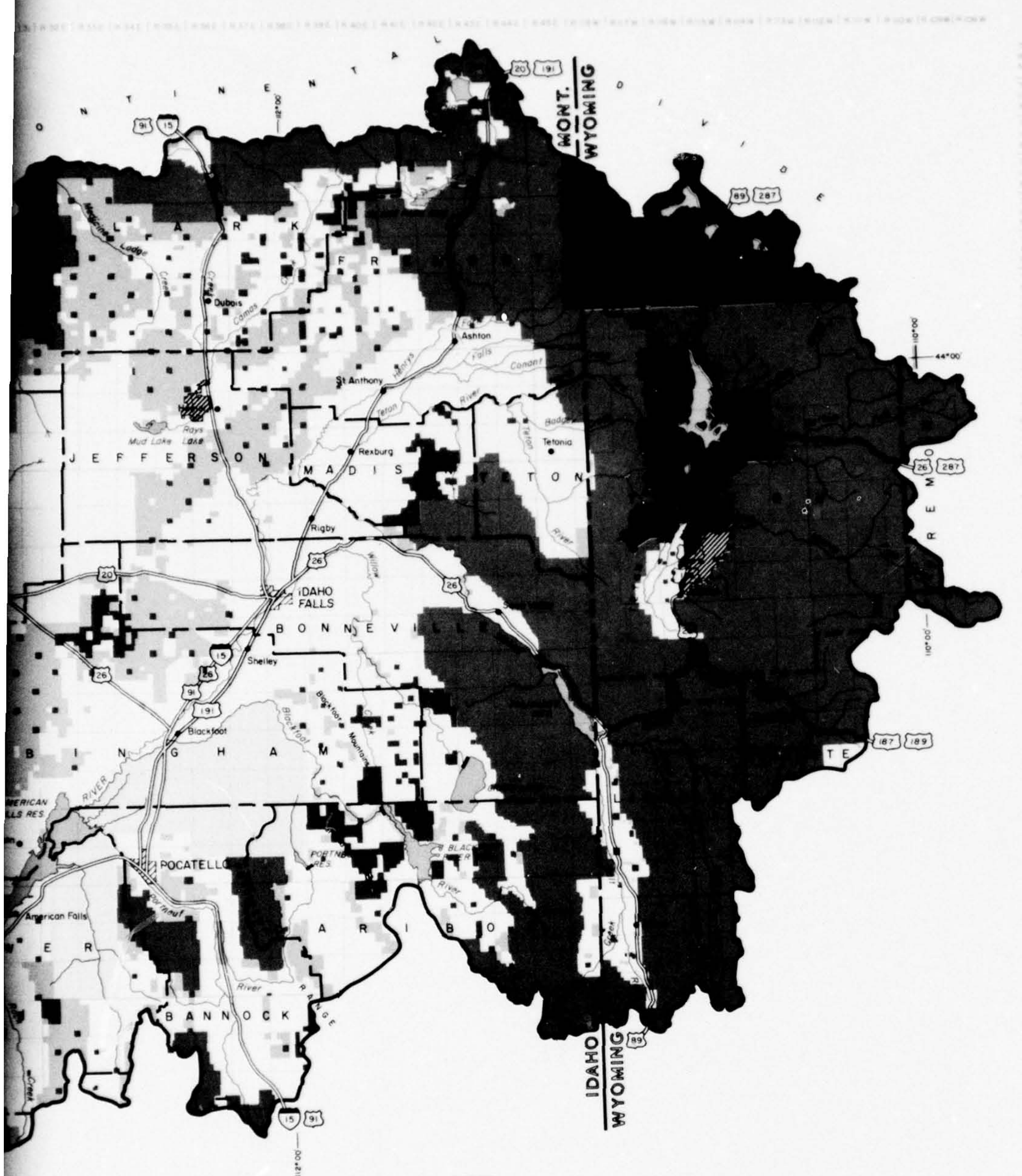
## Soils

Figure 19, Soil Associations Map, shows the location and relative extent of each soil association in the subregion. The associations are numbered in a general relationship to the position in the landscape. Thus, bottomlands and low terraces have the lowest numbers and alpine areas have the highest. The name of each association relates to the soil series representing general kinds



CANADA
WASHINGTON
MONTANA
IDAHO
OREGON
CALIF.
NEVADA
UTAH
LOCATION MAP
Base Rev. Oct 1969
MONTANA
IDAHO
JEFFERSON
BUTTE
Arco
Hailey
Fairfield
Carey
Richfield
GOODING
King Hill
Bliss
Gooding
Shoshone
Wendell
Jerome
JEROME
MINIDOKA
Rupert
LAKE WALCOTT
Burley
Buhl
TWIN FALLS
MILNER DAM
SNAKE RIVER
AMERICAN FALLS RES.
Aberdeen
American Falls
POCATELLO
BANNOCK
BINGHAM
Blackfoot
Shelley
IDAHO FALLS
Rigby
Rexburg
St Anthony
Dubois
Mud Lake
MAGIC RES.
TWIN LAKES RES.
LITTLE WOOD RIVER RES.
FISH CREEK RES.
CEDAR CREEK RES.
SALMON CREEK RES.
LOWER GOOSE CREEK RES.
IDAHO
NEVADA
IDAHO
UTAH
NEVADA
UTAH
42°00'
44°00'
114°00'
SCALE IN MILES

2




LEGEND

- Forest Service *
- Bureau of Land Management
- National Park Service *
- Fish and Wildlife Service *
- Indian Reservation *
- State
- Private and Other

* Private Inholdings are not always shown

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# LAND OWNERSHIP

## UPPER SNAKE, SUBREGION 4

1968

SM-SCS PORTLAND, OREG. 1970

FIGURE 18

LEGEND REVISED 1970

## LEGEND

*Soil Associations* *Name of Association*
Map Symbol *

Generally silty and sandy soils formed in alluvial sediments on bottomlands and low terraces.

| | |
|---|---|
| 1 | Brinegar - Houk |
| 2 | Bingham |
| 3 | Osmund - Rin |
| 4 | Bondurant - Cora |
| 5 | Bereniceton - Bannock |

Generally silty and sandy soils with coarse fragments formed in glacial materials on terraces, plains and mountains.

| | |
|---|---|
| 6 | Little Wood - Carey Lake |
| 7 | Gini - Ramshorn |
| 8 | Duripan Soils |

Generally silty or sandy soils formed in the deposited or wind worked sediments on hilly uplands.

| | |
|---|---|
| 9 | Pancheri - Tenno |
| 10 | Tetonia - Rexburg |
| 11 | Robbins - Lanark |
| 12 | Lantonia - Greys |

Generally silty soils formed in materials mixed with rocky residuum-colluvium from basic rock types on plateaus, canyons and mountains.

| | |
|---|---|
| 13 | Portneuf - Trevino |
| 14 | Clayey Soils |
| 15 | Argixerolls |
| 16 | Hecki |
| 17 | Rockland - Tenno |
| 18 | Polatis - Tenno |
| 19 | Jacoby - Mike |

Generally sandy soils formed in materials mixed with volcanic ash or pumice on terraces, foothills, plateaus and mountains.

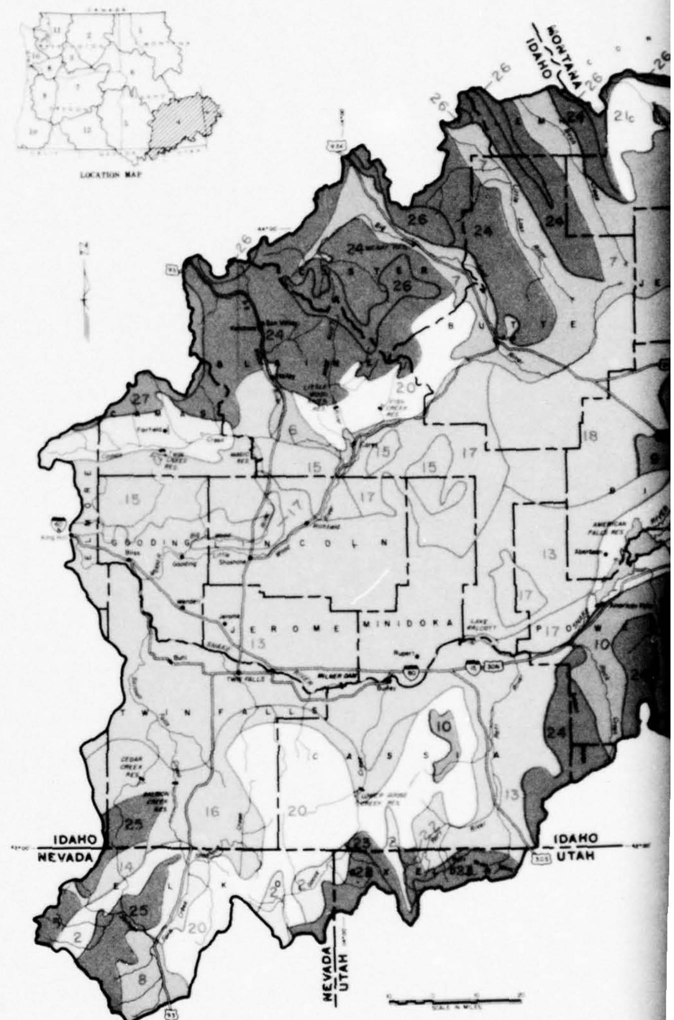
| | |
|---|---|
| 20 | Concreek |
| 21 | Dominantly Cryoboralfs |

Generally silty soils formed in materials mixed with gravelly residuum-colluvium from sedimentary bedrock on mountains.

| | |
|---|---|
| 22 | Middle - Broad |
| 23 | Broad - Yeates Hollow |
| 24 | Dominantly Argixerolls |
| 25 | Frigid Soils |
| 26 | Rockland, Cryochrepts |

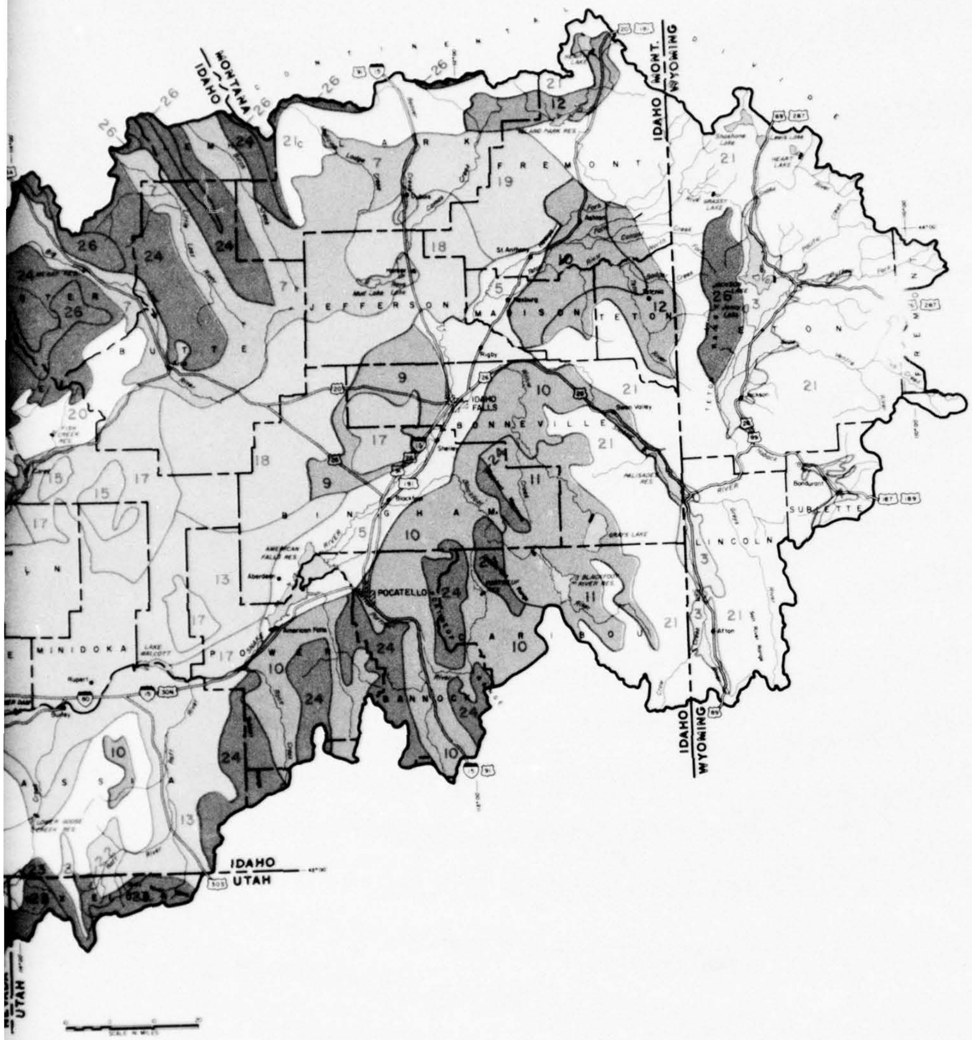
Generally sandy soils formed in materials mixed with rocky residuum-colluvium from acidic rock types on terraces, foothills and mountains.

| | |
|---|---|
| 27 | Pyle - Graylock |




* *Symbols are non-conotative and consistent only within each subregion. To compare delineations from one subregion to another refer to the name of the Soil Association.*

*NOTE: The Soil Association name may include a series that does not fit the Soil Associations Group description. The Soil Association name is based on dominant series. The dominant of five series may be only 30 percent of the Soil Association. Thus a clayey textured soil series may be included in a group accurately described as generally silty and sandy in texture.*




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# SOIL ASSOCIATIONS

UPPER SNAKE, SUBREGION 4

FIGURE 19

of soils that are most extensive in the landscape. Wherever possible, established soil series are used in the name; however, where the available soil series do not have classification status, the soil series name is not recorded. Generally up to 15 percent of any single soil association in known areas may consist of inclusions of soils other than those identified. Such inclusions may be similar soils or they may be highly contrasting. However, in many high mountainous areas where detailed knowledge about the area is incomplete, extensive areas are included within delineations and inclusions of other soils may exceed the 15 percent general average.

Table 90 contains information about each soil association shown on figure 19. The symbol listed in the second column on the table is the same symbol shown on the soil association map.

The table is organized to show land characteristics and the characteristics, qualities, and some interpretations of soil series representing the dominant and the contrasting kinds of soil in each association. The first six columns show some general land characteristics for each soil association. The next 11 columns show characteristics (permanent soil facts) of individual key soil series that represent dominant and contrasting soils. The following four show qualities inferred from the characterisitcs of these soils, and the last four columns show interpretations concerning agricultural use based upon the foregoing soil characteristics and qualities. All of the representative soil series listed have status in classifications. A blank space in the soil series column indicates that the soil series name has no classification status.

The "soil groups" column shows soil associations that contain soils having broad similarities in some important characteristics frequently identified with a position on the landscape.

The "percentage of association" column shows the extent of each soil in an association. Differences of the total soil percentage in each association from 100 percent are inclusions of other soils and land types. For example, soil association 10 lists a total of 53 percent. Knowledge of this association is limited sc that 47 percent of its area consists of inclusions of other soils that have not been defined.

Terms listed for permeability of water through the subsoil and permeability of substratum are:

Very rapid: Over 10 inches per hour.
Rapid: 5 to 10 inches per hour.
Moderately rapid: 2.50 to 5 inches per hour.
Moderate: 0.8 to 2.5 inches per hour.
Moderately slow: 0.2 to 0.8 inches per hour.
Slow: 0.05 to 0.2 inches per hour.
Very slow: Less than 0.05 inches per hour.

Terms listed for total available water-holding capacity are:
Low: Less than 6 inches in profile.
Medium: 6 to 10 inches.
High: More than 10 inches in profile.

The irrigated capability subclasses are an interpretation of limitations and hazards of using only presently irrigated lands. Many areas not presently irrigated are potentially irrigable but are not included in this classification.

A dash indicates that a column does not apply or there is insufficient knowledge to complete it.

Table 91 shows the estimated acreage and proportionate extent of the soil associations by states.

Table 91 - Soil Associations Acreage by States, Subregion 4, 1966

| Soil Association | | | | | | | |
|---|---|---|---|---|---|---|---|
| Map Symbol | Name | Idaho | Wyoming | Nevada | Utah | Total | Percent |
| | | | | (1,000 acres) | | | |
| 1 | Brinegar-Houk | 230.0 | - | - | - | 230.0 | 1.0 |
| 2 | Bingham | 35.0 | - | 259.6 | 30.0 | 324.6 | 1.5 |
| 3 | Osmund-Rin | 10.0 | 414.0 | - | - | 424.0 | 1.9 |
| 4 | Bondurant-Cora | - | 35.0 | - | - | 35.0 | 0.2 |
| 5 | Bereniceton-Bannock | 760.0 | - | - | - | 760.0 | 3.4 |
| 6 | Little Wood-Carey Lake | 95.0 | - | - | - | 95.0 | 0.5 |
| 7 | Gini-Ramshorn | 1,150.0 | - | - | - | 1,150.0 | 5.0 |
| 8 | Duripan soils | - | - | 125.0 | - | 125.0 | 0.6 |
| 9 | Pancheri-Tenno | 275.0 | - | - | - | 275.0 | 1.2 |
| 10 | Tetonia-Rexburg | 1,635.0 | - | - | - | 1,635.0 | 7.2 |
| 11 | Robin-Lanark | 600.0 | - | - | - | 600.0 | 2.7 |
| 12 | Latonia-Greys | 425.0 | 12.0 | - | - | 437.0 | 1.9 |
| 13 | Portneuf-Trevino | 3,450.0 | - | - | 25.0 | 3,475.0 | 15.3 |
| 14 | Clayey subsoils | 2.0 | - | 70.0 | - | 72.0 | 0.3 |
| 15 | Argixerolls | 715.0 | - | - | - | 715.0 | 3.2 |
| 16 | Hecki | 515.0 | - | 35.0 | - | 550.0 | 2.4 |
| 17 | Rockland-Tenno | 830.0 | - | - | - | 830.0 | 3.7 |
| 18 | Polatis-Tenno | 1,265.0 | - | - | - | 1,265.0 | 5.6 |
| 19 | Jacoby-Mike | 440.0 | - | - | - | 440.0 | 1.5 |
| 20 | Concreek | 1,030.0 | - | 230.0 | - | 1,260.0 | 5.6 |
| 21 | Dominantly Cryoboralfs | 1,849.3 | 2,574.0 | - | - | 4,423.3 | 19.5 |
| 22 | Middle-Broad | 2.0 | - | 24.0 | 90.0 | 116.0 | 0.5 |
| 23 | Broad-Yeates Hollow | 14.0 | - | - | 95.9 | 109.9 | 0.5 |
| 24 | Dominantly Argixerolls | 2,300.0 | - | - | - | 2,300.0 | 10.1 |
| 25 | Frigid soils | 75.0 | - | 230.0 | - | 305.0 | 1.4 |
| 26 | Rockland Cryochrepts | 400.0 | 200.0 | - | - | 600.0 | 2.7 |
| 27 | Pyle Graylock | 130.0 | - | - | - | 130.0 | 0.6 |
| Total | Land area | 18,232.3 | 3,235.0 | 973.6 | 240.9 | 22,681.8 | 100.0 |

Source: National Cooperative Soil Survey.

Tables 90 and 91 show the basic characteristics and qualities that make up the land resource of the Upper Snake Subregion. In the northern and eastern parts of the subregion, forest cover is common. Generally this cover is a function of climate correlated with elevation. The rainfall increase promotes tree growth, and the short growing season and cold temperatures prevent cropland use even where

Table 90 - Characteristics and Qualities of Representative Soils, Subr

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Very deep and moderately deep soils with loamy and gravelly subsoils on nearly level and gentle slopes. | 1 | 4,900-5,200 | 13-16 | 80-110 | Cropland (cereals, hay, alfalfa, and pasture)-10% irrigated | Pachic Argiborolls | Fine-loamy, mixed | Brinegar | 30 | Fans and terraces | Alluvium | Loam | Clay loam | None | -- | 60"+ |
| | | | | | Rangeland | Aquic Argiborolls | Fine, montmorillonitic | Houk | 20 | Terraces | Alluvium | Loam | Clay loam | Sand | 60 below 40-60" | 40-60" ov sand |
| | | | | | | Typic Argixerolls | Coarse-loamy, mixed, frigid | Riceton | 20 | Fans and terraces | Alluvium | Sandy loam | Coarse sandy loam | Sand | 60 below 40-60" | 40-60" ov coarse sa |
| | | | | | | Typic Argixerolls | Fine, montmorillonitic, frigid | Rands | 10 | Fans | Alluvium | Loam | Clay | None | -- | 60"+ |
| | 2 | 5,000-6,000 | 8-15 | 60-130 | Rangeland<br>Cropland (alfalfa, pasture, hay, & cereals)-irrigated | Calcic Argixerolls | Fine-loamy over sandy or sandy-skeletal, mixed, mesic | Bingham | 30 | Fans | Gravelly alluvium | Gravelly loam | Gravelly loam | Gravel | 20-35 to 10"; 35-80 below 10" | 60"+ |
| | | | | | | Aquic Fluventic Haploxerolls | Loamy, mixed, frigid | | 25 | Low terraces & bottomlands | Recent alluvium | Loam | Loam | None | -- | 60"+ |
| | | | | | | Mollic Haplargids | Fine-loamy, mixed, mesic | | 15 | Intermediate fans and terraces | Silty alluvium | Loam | Clay loam | None | -- | 60"+ |
| | | | | | | Mollic Haplargids | Fine, montmorillonitic, frigid | | 15 | High fans & terraces | Alluvium | Stony loam | Clay | Stones | 20-35 to 10" | 60"+ |
| | | | | | | Typic Calcixerolls | Loamy-skeletal, mixed, mesic | Sterling | 5 | Fans, foothills and stream terraces | Gravelly alluvium | Gravelly loam | Very gravelly loam | Gravel | 20-35 to 10"; 35-80 below 10" | 60"+ |
| | | | | | | Xerollic Haplargids | Fine-silty, mixed, mesic | Hansel | 2 | Bottomland | Recent alluvium | Silt loam | Silty clay loam | None | -- | 60"+ |

eristics and Qualities of Representative Soils, Subregion 4[1/]

| Soil Characteristics | | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coarse Fragments | | | | | | | Range of: Major Capability Subclass | | | |
| ture ce Soil | Texture Subsoil | Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated[6/] | Major Soil Problems | Suitable Land Treatment and Structures |
| | Clay loam | None | -- | 60"+ | Moderately slow | Moderately slow | Good and moderately good | High | IIIe,IIIc IVe IVs VIe | IIIe IIIc IVe IVs | Erosion | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| | Clay loam | Sand | 60 below 40-60" | 40-60" over sand | Moderately slow | Very rapid | Poor | Medium and high | IVw IIIc | IVw | High seasonal water table | Drainage; residue mgmt; cropping sequence |
| y loam | Coarse sandy loam | Sand | 60 below 40-60" | 40-60" over coarse sand | Very rapid | Very rapid | Good | Low | IIIc IIIe | IIIc IIIe | Erosion; droughtiness | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt. |
| | Clay | None | -- | 60"+ | Slow | Slow | Good | Medium | IVe IIIc IVs | IIIe IIIs IVe IVs | Erosion; clay subsoil | Cross-slope operations; residue mgmt; cropping sequence; subsurface tillage; irrigation mgmt. |
| elly | Gravelly loam | Gravel | 20-35 to 10"; 35-80 below 10" | 60"+ | Rapid | Very rapid | Good | Low | IIIs | IIIe IVe | Water erosion from outwash; droughtiness | Pastureland mgmt; irrigation mgmt; cross-slope opers; cropping sequence |
| | Loam | None | -- | 60"+ | Moderate | Moderate | Somewhat poor | High | VIc | -- | Climate | Rangeland management |
| | Clay loam | None | -- | 60"+ | Moderate | Moderate | Good | High | VIc | -- | Climate | Rangeland management |
| y loam | Clay | Stones | 20-35 to 10" | 60"+ | Slow | Slow | Good | Medium | VIIs | -- | Erosion; climate | Rangeland management |
| elly | Very gravelly loam | Gravel | 20-35 to 10"; 35-80 below 10" | 60"+ | Very rapid | Very rapid | Good | Low | IVs | -- | Water erosion from overwash; droughtiness | Rangeland management |
| t loam | Silty clay loam | None | -- | 60"+ | Moderately slow | Moderately slow | Good | Medium | IIc | IIe | Overwash; climate | Pastureland management; irrigation management; cropping sequence |

| Soil Groups | Soil Association: Map. Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Pe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Very deep and moderately deep, very cold soils with *loamy* subsoils on nearly level and gentle slopes. | 3 | 6,000-6,800 | 14-20 | 0-50 | Cropland (cereals, alfalfa, and grass hay)-65% irrigated<br>Rangeland | Pachic Cryoborolls | Fine-loamy, mixed | Osmund | 35 | Fans | Silty alluvium | Loam | Loam | None | -- | 24-30" over gravel and cobbles | Mo |
| | | | | | Forest land | Pachic Cryoborolls | Coarse-silty, mixed | Rin | 25 | Rolling hills | Loess | Silt loam | Silt loam | None | -- | 60"+ | Mo |
| | | | | | | Boralfic Cryoborolls | Fine-silty, mixed | Greys | 20 | Rolling hills | Silty colluvium | Silt loam | Silty clay loam | None | -- | 60"+ | Mo sl |
| | | | | | | *Typic* Calciaquolls | Coarse-loamy, mixed, mesic | Ironton | 5 | Bottomland | Recent alluvium | Loam to silt loam | Loam | None | -- | 17-20" over sand & gravel | Mo |
| | | | | | | Argic Cryaquolls | Fine-loamy, mixed, noncalcareous | Dutson | 5 | Bottomland | Recent alluvium | Silt loam (4" of peat over surface) | Silty clay loam | None | -- | 60"+ | Mo sl |
| | 4 | 6,500-7,000 | 18-24 | 0-50 | Rangeland<br>Cropland (hay)-irrigated | Argic Pachic Cryoborolls | Fine-loamy, mixed | Bondurant | 40 | Fans | Alluvium | Loam | Clay loam | None | -- | 60"+ | Mo sl |
| | | | | | Forest land | Histic Cryaquepts | Fine-loamy over *sandy or sandy-*skeletal, mixed, nonacid | Cora | 30 | Bottomland | Alluvium | Fine sandy loam | Clay loam | Gravel & sand | 60 below 20-30" | 20-30" over gravel & sand | Mo sl |
| Moderately deep and deep, frigid soils with gravelly, loamy subsoils on gentle to moderate slopes. | 5 | 4,400-5,000 | 8-12 | 80-120 | Cropland (cereals, hay & potatoes)-*irrigated* | Xeric Torriorthents | Fine-silty, mixed, calcareous, frigid | Bereniceton | 25 | *Fans and* terraces | Alluvium over outwash | Silt loam | Loam | Gravel & sand | 60 below 40-60" | 40-60" over gravel & sand | M |
| | | | | | Rangeland<br>Forest land | Aridic Calcixerolls | Coarse-loamy over sandy or sandy-skeletal, mixed, frigid | Bannock | 20 | Fans and terraces | Alluvium over outwash | Loam | Loam | Gravel & sand | 60 below 20-40" | 20-40" over gravel & sand | M |
| | | | | | | Aquic Fluventic Haplustolls | Fine-loamy, mixed, frigid | Blackfoot | 10 | Bottomland | Alluvium over outwash | Silt loam | Silt loam | Gravel & sand | 60 below 40-60" | 20-60" over gravel & sand | M |
| | | | | | | Aquic Xerofluvents | Coarse-loamy, mixed, calcareous, frigid | Heiseton | 10 | Bottomland | Alluvium over outwash | Fine sandy loam | Fine sandy loam | Gravel & sand | 60 below 20-60" | 20-60" over gravel & sand | M r |
| | | | | | | Aridic Calcic Argixerolls | Fine-loamy, mixed, frigid | Paul | 8 | Terraces and fans | Alluvium over outwash | Silty clay loam | Silty clay loam | Gravel & sand | 60 below 40-60" | 40-60" over gravel & sand | M s |

- Continued

2

| acteristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coarse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass[6] | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| None | -- | 24-30" over gravel and cobbles | Moderate | Very rapid | Good | Medium to Low | IIIc IIIw | -- | Water erosion from overwash | Residue mgmt; cross-slope opers; cropping sequence |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IIIc IVe VIe | -- | Water erosion; climate | Residue mgmt; cross-slope opers; cropping sequence |
| None | -- | 60"+ | Moderately slow | Moderate | Good | High | IIIe IIIc IVe | -- | Water erosion | Residue mgmt; cross-slope opers; cropping sequence |
| None | -- | 17-20" over sand & gravel | Moderate | Very rapid | Somewhat poor and poor | Low | IIIw | -- | Wetness; droughtiness | Drainage; pastureland management |
| None | -- | 60"+ | Moderately slow | High water table | Poor | Medium to high | Vw | -- | Wetness | Drainage; pastureland management |
| None | -- | 60"+ | Moderately slow | Moderately slow | Good | High | Vc, VIc, VIIc | -- | Water erosion from overwash; climate | Pastureland management; rangeland management |
| Gravel & sand | 60 below 20-30" | 20-30" over gravel & sand | Moderately slow | Very rapid | Poor | Low | Vw VIw | -- | Wetness; climate | Drainage; pastureland mgmt; rangeland mgmt. |
| Gravel & sand | 60 below 40-60" | 40-60" over gravel & sand | Moderate | Very rapid | Good | Medium and high | VIc VIs | IIIc IIIs IIIe | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| Gravel & sand | 60 below 20-40" | 20-40" over gravel & sand | Moderate | Very rapid | Good | Low and medium | -- | IIIs, IIIe IIc, IIs, IIe, IVe | Erosion; moderately deep over gravel & sand; droughtiness | Cross-slope opers; residue management; cropping sequence; irrigation mgmt. |
| Gravel & sand | 60 below 40-60" | 20-60" over gravel & sand | Moderate | Very rapid | Somewhat poor | Medium and high | -- | IIIs, IIIe IIIw, IIe IIc, IVw | High water table | Drainage; residue mgmt; cropping sequence; irrigation management |
| Gravel & sand | 60 below 20-60" | 20-60" over gravel & sand | Moderately rapid | Very rapid | Moderately good | Low & medium | -- | IIIs, IIc, IIe, IIIe, IIIw, IVe | Flood hazard; moderately deep over gravel and sand in places | Flood protection; residue mgmt; cropping sequence; irrigation management |
| Gravel & sand | 60 below 40-60" | 40-60" over gravel & sand | Moderately slow | Very rapid | Good | Low and Medium | -- | IIc IIIc | Droughtiness | Residue management; cropping sequence |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 4,500-5,500 | 11-15 | 80-110 | Cropland (cereals, alfalfa, hay & pasture)-95% irrigated | Aridic Argixerolls | Loamy-skeletal, mixed, frigid | Little Wood | 25 | Fans | Alluvium over outwash | Very gravelly loam | Very gravelly loam | Gravel & sand | 35-80 in profile; 80 below 20-40" | 20-40" over gravel & san |
| | | | | | Rangeland | Typic Argixerolls | Fine-loamy, mixed, frigid | Carey Lake | 20 | Fans and bottomland | Alluvium over outwash | Loam | Silt loam | Gravel | 60 below 40-60" | 40-60" over gravel |
| | | | | | | Aquic Calciorthids | Fine-loamy, mixed, frigid | | 20 | Bottomland | Alluvium over outwash | Silt loam | Clay loam | Gravel | 60 below 40-60" | 40-60" over gravel |
| | | | | | | Calciorthidic Haploxerolls | Sandy-skeletal, mixed, frigid | Balaam | 10 | Fans | Alluvium over outwash | Gravelly sandy loam | Gravelly loamy sand | Gravel & sand | 20-35 in profile; 60 below 20-40" | 20-40" over gravel & san |
| | | | | | | Calcic Pachic Haploxerolls | Coarse-loamy over sandy or sandy-skeletal, mixed, Frigid | Adamson | 10 | Fans | Alluvium over outwash | Loam | Loam | Gravel | 60 below 20-40" | 20-40" over gravel |
| | | | | | | Aquic Haplustolls | Coarse-loamy over sandy or sandy-skeletal, mixed, frigid | Bruneel | 3 | Bottomland | Alluvium over outwash | Loam | Loam | Gravel & sand | 60 below 20-40" | 20-40" over gravel & san |
| | 7 | 4,000-6,000 | 6-11 | 80-120 | Rangeland | Typic Haplargids | Fine-loamy, mixed, frigid | Gini | 40 | Fans and terraces | Alluvium over outwash | Loam | Gravelly clay loam | Gravel & sand | 20-35 in profile; 60 below 20-40" | 20-40" over gravel & san |
| | | | | | Cropland (cereals,hay, potatoes) - irrigated | Xeric Torriorthents | Loamy-skeletal, carbonatic, frigid | Ramshorn | 20 | Fans and terraces | Alluvium over outwash | Loam | Very gravelly loam | Gravel | 35-80 in profile; 80 below 10-20" | 10-20" over gravel |
| | | | | | | Mollic Haplargids | Fine-silty, mixed, frigid | | 20 | Terraces | Alluvium over outwash | Silt loam | Silty clay loam | Gravel | 60 below 40-60" | 40-60" over gravel |
| | | | | | | Typic Ustorthents | Fine, montmorillonitic, frigid | | 10 | Fans and terraces | Alluvium | Clay | Clay | None | -- | 60"+ |
| | | | | | | Typic Haplaquolls | Fine-loamy, mixed, calcareous, frigid | Tew | 5 | Bottomland | Alluvium over outwash | Loam | Loam | Sand & gravel | 60 below 20-40" | 20-40" over sand & gravel |

Table 90 - Continued

| | Soil Characteristics | | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Coarse Fragments | | | | | | Total Available Water-holding | Range of: Major Capability Subclass 6/ | | | |
| l | Texture Surface Soil | Texture Subsoil | Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Capacity | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| m h | Very gravelly loam | Very gravelly loam | Gravel & sand | 35-80 in profile; 80 below 20-40" | 20-40" over gravel & sand | Moderate | Very rapid | Good | Low | VIs | IVs IVe IIIs | Erosion; moderately deep over gravel & sand; gravelly profile;droughtiness | Cross-slope opers;residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| um h | Loam | Silt loam | Gravel | 60 below 40-60" | 40-60" over gravel | Moderate | Very rapid | Good | Medium and high | IVe | IIc IIIc IIIe | Erosion | Cross-slope opers;residue mgmt; cropping sequence; irrigation mgmt. |
| um h | Silt loam | Clay loam | Gravel | 60 below 40-60" | 40-60" over gravel | Moderately slow | Very rapid | Poor | Medium and high | IIIw IVw | IIIw IVw | High seasonal water table; moderately alkaline | Drainage; irrigation mgmt; soil amendments |
| um h | Gravelly sandy loam | Gravelly loamy sand | Gravel & sand | 20-35 in profile; 60 below 20-40" | 20-40" over gravel & sand | Rapid | Very rapid | Good | Low | VIs | IVs | Moderately deep over gravel & sand; gravelly profile; droughtiness | Residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| um sh | Loam | Loam | Gravel | 60 below 20-40" | 20-40" over gravel | Moderate | Very rapid | Good | Low and medium | VIs | IIIs IIIe | Erosion; moderately deep over gravel; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt. |
| ium sh | Loam | Loam | Gravel & sand | 60 below 20-40" | 20-40" over gravel & sand | Moderate | Very rapid | Moderately good | Low and medium | IIIs | IIIs | Moderately deep over gravel and sand;droughtiness | Residue mgmt; cropping sequence; irrigation management |
| ium sh | Loam | Gravelly clay loam | Gravel & sand | 20-35 in profile; 60 below 20-40" | 20-40" over gravel & sand | Moderately slow | Very rapid | Good | Low and medium | VIc | IIIs IIIe IVe | Erosion;moderately deep over gravel & sand;gravelly profile;droughtiness | Cross-slope opers;residue mgmt; cropping sequence; irrigation management; rangeland management |
| ium sh | Loam | Very gravelly loam | Gravel | 35-80 in profile; 80 below 10-20" | 10-20" over gravel | Moderate | Very rapid | Good | Low | VIc VIIs | IVe IVs | Erosion;shallow over gravel; gravelly profile; droughtiness | Cross-slope opers;residue mgmt; cropping sequence; irrigation management; rangeland management |
| ium ash | Silt loam | Silty clay loam | Gravel | 60 below 40-60" | 40-60" over gravel | Moderately slow | Very rapid | Good | Medium & high | VIe | IIIc IIIe IVe | Erosion; droughtiness | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland management |
| rium | Clay | Clay | None | -- | 60"+ | Slow | Slow | Good | Medium | VIc | IIIs IIIe | Erosion; clay soil | Cross-slope opers;residue mgmt; cropping sequence; subsurface tillage;irrigation mgmt; rangeland mgmt. |
| vium ash | Loam | Loam | Sand & gravel | 60 below 20-40" | 20-40" over sand & gravel | Moderate | Very rapid | Poor | Low and medium | IVw | IIIw IVw | Wetness | Drainage; flood protection |

2

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze Free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Permea Sub |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shallow, frigid soils with gravelly, stony, loamy and clayey subsoils on gentle to moderate slopes. | 8 | 5,800-6,400 | 8-10 | 80-100 | Rangeland<br>Cropland (hay and pasture)-irrigated | Mollic Durargids | Fine, montmorillonitic, frigid, shallow | | 45 | Terraces and fans | Alluvium | Stony loam | Clay | Stones | 20-35 to 10" | 12-20" over duripan | Slow |
| | | | | | | Mollic Durorthids | Coarse-loamy, mixed, frigid, shallow | | 30 | Low terraces and fans | Alluvium | Gravelly loam | Gravelly loam | Gravel | 20-35 in profile | 12-20" over duripan | Modera |
| | | | | | | Mollic Haplargids | Fine-loamy, mixed, frigid | | 15 | Terraces and fans | Alluvium | Gravelly loam | Gravelly clay loam | Gravel | 20-35 in profile | 60"+ over valley fill material | Modera slow |
| Very deep & moderately deep frigid soils with silty profiles on gentle to moderate slopes. | 9 | 3,500-5,000 | 7-12 | 100-130 | Rangeland<br>Cropland (cereals) dryland (cereals, potatoes, hay and sugar beets) - irrigated | Xerollic Calciorthids | Coarse-silty, mixed, frigid | Pancheri | 60 | Lava plain | Loess | Silt loam | Silt loam | None | -- | 60"+ | Modera |
| | | | | | | Lithic Xerollic Calciorthids | Loamy, mixed, frigid | Tenno | 10 | Lava plain | Loess & basic igneous rock | Stony loam | Stony loam | Stones | 20-35 in profile | 10-20" over bedrock | Modera |
| | | | | | | Xerollic Calciorthids | Coarse-silty, mixed, frigid | Polatis | 10 | Lava plain | Loess over basic igneous rock | Silt loam | Silt loam | None | -- | 20-40" over bedrock | Modera |
| | | | | | | Lithic Xerollic Camborthids | Loamy, mixed, frigid | Bondranch | 2 | Lava plain | Loess & basic igneous rock | Fine sandy loam | Fine sandy loam | None | -- | 10-20" over bedrock | Modera rapid |
| | | | | | | Mollic Calciorthids | Coarse-loamy, mixed, frigid | | 2 | Lava plain | Loess over basic igneous rock | Fine sandy loam | Fine sandy loam | None | -- | 40-60" over bedrock | Modera rapid |
| | | | | | | Aridic Calcic Argixerolls | Fine-silty, mixed, frigid | Kimama | 1 | Bottomland | Alluvium | Silt loam | Silty clay loam | None | -- | 60"+ | Modera slow |
| | 10 | 4,500-6,500 | 12-20 | 60-120 | Cropland (cereals, potatoes)-5% irrigated<br>Rangeland | Pachic Cryoborolls | Coarse-silty, mixed | Tetonia | 20 | Hills | Loess | Silt loam | Silt loam | None | -- | 60"+ | Moder |
| | | | | | | Calcic Haploxerolls | Coarse-silty, mixed, frigid | Rexburg | 15 | Rolling hills | Loess | Silt loam | Silt loam | None | -- | 60"+ | Moder |
| | | | | | | Calciorthidic Haploxerolls | Coarse-silty, mixed, mesic | Neeley | 10 | Hills and terraces | Loess | Silt loam | Silt loam | None | -- | 60"+ | Moder |
| | | | | | | Calcic Argiustolls | Fine-silty, mixed, frigid | Bancroft | 8 | Hills | Loess | Silt loam | Silt loam | None | -- | 60"+ | Moder slow |

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| ristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| oarse Fragments | | | | | | | Range of: Major Capability Subclass [6] | | | |
| ind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| tones | 20-35 to 10" | 12-20" over duripan | Slow | Impervious | Good | Low | VIs VIIs | -- | Shallow over duripan; droughtiness | Rangeland management |
| ravel | 20-35 in profile | 12-20" over duripan | Moderate | Impervious | Good | Low | VIs VIIs | -- | Shallow over duripan; droughtiness | Rangeland management |
| ravel | 20-35 in profile | 60"+ over valley fill material | Moderately slow | Moderately rapid | Good | Medium | VIc | -- | Climate | Rangeland management |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IVc VIc | IIe IIc IIIe | Erosion; droughtiness | Cross-slope opers; residue mgmt;cropping sequence;irrigation mgmt; rangeland mgmt. |
| tones | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs VIIs | -- | Shallow over bed-rock; stony profile | Rangeland mgmt. |
| None | -- | 20-40" over bedrock | Moderate | Impervious | Good | Low and medium | VIc VIs | IIIs IIIe IVe | Erosion; moderately deep over bedrock; alkaline subsoil; droughtiness | Rangeland management; cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt. |
| None | -- | 10-20" over bedrock | Moderately rapid | Impervious | Good | Low | IVe VIIs | -- | Erosion; shallow over bedrock; alkaline subsoil | Rangeland management |
| None | -- | 40-60" over bedrock | Moderately rapid | Impervious | Good | Medium | VIc | IIe IIc IIIe IVe | Erosion;sandy profile alkaline subsoil; droughtiness | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt;rangeland mgmt. |
| None | -- | 60"+ | Moderately slow | Moderately slow | Moderately good | High | VIc | IIc IIe | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IIIe IIIc IVe VIe | IIIe IVe IIIc | Erosion; climate | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IIIe IIIc IVe VIe | IIIc IVe IIIe VIe | Erosion; climate | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IIIs IIIe IVe | IIIc IIIe | Erosion; climate; alkaline subsoil | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderately slow | Moderately slow | Good | High | IIIe IIIc IVe | IIIc IVe IIIe | Erosion; climate | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Very deep, very cold soils with silty profiles on gentle to steep slopes. | 11 | 5,000-7,000 | 13-19 | 30-110 | Rangeland<br>Cropland (cereals and hay)-40% irrigated<br>Forest land | Argic Pachic Cryoborolls | Fine-loamy, mixed | Robbins | 30 | Hills | Loess | Silt loam | Silty clay loam | None | -- | 60"+ |
| | | | | | | Argic Pachic Cryoborolls | Fine-silty, mixed | Lanark | 20 | Hills | Loess | Silt loam | Silty clay loam | None | -- | 60"+ |
| | | | | | | Pachic Cryoborolls | Coarse-silty, mixed | Tetonia | 15 | Hills | Loess | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | Lithic Argiudolls | Loamy, mixed, frigid | | 10 | Escarpments | Loess & basic igneous rock | Stony silt loam | Stony silty clay loam | Stones | 20-35 in profile | 5-20" over bedrock |
| | | | | | | Cumulic Cryaquolls | Fine-silty, mixed, noncalcareous | Enochville | 10 | Bottomland and terraces | Alluvium | Loam | Silty clay loam | None | 60 below 40-60" | 40-60" over gravel |
| | | | | | | Aquic Cryoborolls | Fine-loamy, mixed | Outlet | 10 | Bottomland | Alluvium | Silty clay loam | Clay loam | None | -- | 60"+ |
| | 12 | 6,000-7,500 | 15-22 | 50-110 | Cropland (cereals & hay)-dryland (cereals, potatoes & peas)-irrigated | Pachic Cryoborolls | Coarse-silty, mixed | Lantonia | 55 | Gently to strongly sloping hills | Loess | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | Rangeland<br>Forest land | Boralfic Cryoborolls | Fine-silty, mixed | Greys | 10 | Hills | Loess | Silt loam | Silty clay loam | None | -- | 60"+ |
| | | | | | | Argic Cryoborolls | Fine-loamy over sandy or sandy-skeletal, mixed | Driggs | 5 | Fans | Alluvium | Silt loam | Silt loam | Gravel & sand | 60 below 20-40" | 20-40" over gravel & sand |
| | | | | | | Typic Cryaquolls | Fine-loamy, mixed noncalcareous | Furniss | 2 | Bottomland | Alluvium | Silty clay loam | Silty clay loam | Gravel & sand | 60 below 40-60" | 40-60" over sand & gravel |

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| aracteristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coarse Fragments | | | | | | | Range of: Major Capability Subclass 6/ | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| None | -- | 60"+ | Moderately slow | Moderately slow | Good | High | IIIe IIIc IVe | IIIe IVe IIIc | Erosion; climate | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderately slow | Moderately slow | Good | High | IIIe IIIc IVe | IIIe IVe IIIc | Erosion; climate | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IIIe IIIc IVe | IIIe IVe IIIc | Erosion; climate | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| Stones | 20-35 in profile | 5-20" over bedrock | Moderately slow | Impervious | Good | Low | VIIs | -- | Shallow over bedrock; stony profile | Rangeland management |
| None | 60 below 40-60" | 40-60" over gravel | Moderately slow | Moderately slow | Somewhat poor and poor | High | IVw | IVw | Wetness | Drainage; pastureland management; irrigation management |
| None | -- | 60"+ | Moderately slow | Moderately slow | Somewhat poor | High | IVw | IVw | Wetness | Drainage; pastureland management; irrigation management |
| None | -- | 60"+ | Moderate | Moderate | Good | High | IIIe IIIc IVe IVc | IIIe IVe IIIc | Erosion; climate | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| None | -- | 60"+ | Moderately slow | Moderately slow | Good | High | IIIe IIIc IVe IVc | IIIe IVe IIIc | Erosion; climate | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| Gravel & sand | 60 below 20-40" | 20-40" over gravel & sand | Moderate | Very rapid | Good | Low and medium | IVs IVe | IIIs IIIe IVe | Erosion; moderately deep over gravel & sand; climate | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| Gravel & sand | 60 below 40-60" | 40-60" over sand & gravel | Moderately slow | Very rapid | Poor | Medium & High | Vw | -- | Wetness | Drainage; pastureland management |

| Soil Association | | | | | | Classification | | | | | Soil Characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil Groups | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Permea Sub |
| Shallow to very deep soils with silty profiles on gentle to moderate slopes. | 13 | 2,500-6,000 | 8-12 | 100-140 | Cropland (cereals, potatoes, beans and hay) - 80% irrigated | Xerollic Calciorthids | Coarse-silty, mixed, mesic | Portneuf | 30 | Lava plains | Loess | Silt loam | Silt loam | None | -- | 60"+ | Modera |
| | | | | | Rangeland | Lithic Xerollic Camborthids | Loamy-mixed, mesic | Trevino | 25 | Lava plains | Loess & igneous rock | Silt loam | Silt loam | None | -- | 10-20" over bedrock | Modera |
| | | | | | | Xerollic Durorthids | Coarse-silty, mixed, mesic | Minidoka | 10 | Lava plains | Loess | Silt loam | Silt loam | None | -- | 20-40" over lime pan | Modera |
| | | | | | | Xerollic Calciorthids | Coarse-silty, mixed, mesic | Portino | 10 | Lava plains | Loess over basic igneous rock | Silt loam | Silt loam | None | -- | 20-40" over bedrock | Modera |
| | | | | | | Xeric Torriorthents | Coarse-loamy, mixed, calcareous, mesic | Turbyfill | 5 | Terraces | Alluvium and lake sediments | Sandy loam | Fine sandy loam | None | -- | 60"+ | Modera rapid |
| Shallow to deep, frigid soils with stony, clayey subsoils on gentle to steep slopes. | 14 | 6,000-7,000 | 12-16 | 50-80 | Rangeland | Mollic Vertic Natrixeralfs | Very fine, montmorillonitic, frigid | | 55 | Plateaus | Loess & basic igneous rock | Very stony loam | Clay | Stones | 35-80 in surface soil | 20-40" over bedrock | Very |
| | | | | | Limited Cropland (hay) - irrigated | Lithic Argixerolls | Fine, montmorillonitic, frigid | | 20 | Plateaus | Basic igneous rock | Very stony loam | Clay | Stones | 35-80 in surface soil | 12-20" over bedrock | Very |
| | | | | | | Typic Argixerolls | Loamy-skeletal, mixed, frigid | | 10 | Escarpments | Loess & basic igneous rock | Very stony loam | Very stony clay loam | Stones | 35-80 in profile | 36-60" over bedrock | Modera slow |
| | 15 | 4,500-6,500 | 10-14 | 60-120 | Rangeland | Calcic Argixerolls | Fine, montmorillonitic, frigid | | 20 | Nearly level to rolling lava plains | Loess over basic igneous rock | Silt loam | Clay | None | -- | 20-40" over bedrock | Slow |
| | | | | | Cropland (cereals)-dryland | Lithic Argixerolls | Loamy, mixed, frigid | | 20 | Nearly level to rolling lava plains | Loess and basic igneous rock | Rocky loam | Very rocky sandy clay loam | Stones and Cobbles | 20-35 in profile | 10-20" over bedrock | Moder slow |
| | | | | | | Calcic Argixerolls | Fine-loamy, mixed, frigid | | 15 | Undulating to rolling lava plains | Loess over basic igneous rock | Silt loam | Silty clay loam | None | -- | 40-60" over bedrock | Moder slow |
| | | | | | | -- | -- | Rockland 5/ | 15 | Nearly level to rolling lava plains | Basic igneous rock | -- | -- | -- | -- | Less than 10" over bedrock | -- |
| | | | | | | Calcic Pachic Argixerolls | Fine-loamy, mixed, mesic | Sqaw | 10 | Rolling lava plains | Loess over basic igneous rock | Clay | Clay | None | -- | 40-60" over bedrock | Slow |
| | | | | | | Aridic Lithic Haploxerolls | Loamy, mixed, frigid | Cox | 5 | Undulating to rolling lava plains | Loess and basic igneous rock | Sandy loam | Sandy loam | None | -- | 10-20" over bedrock | Rapid |

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| stics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coarse Fragments | | | | | | | Range of: Major Capability Subclass | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated[6/] | Major Soil Problems | Suitable Land Treatment and Structures |
| None | -- | 60"+ | Moderate | Impervious | Good | High | VIc | IIe<br>IIc<br>IIIe<br>IVe | Erosion; droughtiness | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland management |
| None | -- | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs | IVe, IVs, VIe | Erosion; shallow over bedrock; droughtiness | Rangeland mgmt; residue mgmt; irrigation mgmt. |
| None | -- | 20-40" over lime pan | Moderate | Impervious in lime pan | Good | Low and medium | VIs<br>VIe | IIIe<br>IIIs<br>IVe | Erosion; moderately deep over lime pan; droughtiness | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland management |
| None | -- | 20-40" over bedrock | Moderate | Impervious | Good | Low and medium | VIs | IIIe<br>IIIs<br>IVe | Erosion; moderately deep over bedrock; droughtiness | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland management |
| None | -- | 60"+ | Moderately rapid | Variable | Good | Medium | VIs<br>VIIe | IIIe<br>IIIs<br>IVe | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt; rangeland management |
| Stones | 35-80 in surface soil | 20-40" over bedrock | Very slow | Impervious | Good | Medium | VIIs | -- | Droughtiness; climate | Rangeland management |
| Stones | 35-80 in surface soil | 12-20" over bedrock | Very slow | Impervious | Good | Low | VIIs | -- | Droughtiness; climate | Rangeland management |
| Stones | 35-80 in profile | 36-60" over bedrock | Moderately slow | Impervious | Good | Low | VIIs | -- | Droughtiness; climate | Rangeland management |
| None | -- | 20-40" over bedrock | Slow | Impervious | Good | Low and medium | IIIe<br>IIIs<br>IVe<br>VIIs | IIIe<br>IIIs<br>IVe | Erosion; moderately deep over bedrock; clay subsoil | Cross-slope operations; residue mgmt; cropping sequence; subsurface tillage; rangeland mgmt. |
| Stones and Cobbles | 20-35 in profile | 10-20" over bedrock | Moderately slow | Impervious | Good | Low | VIs | -- | Shallow over bedrock; rocky profile | Rangeland management |
| None | -- | 40-60" over bedrock | Moderately slow | Impervious | Good | Medium and high | IIIc<br>IIIe<br>IIIs<br>IVe, IVs | IIIc<br>IIIe | Erosion | Cross-slope operations; residue mgmt; cropping sequence; rangeland management |
| -- | -- | Less than 10" over bedrock | -- | Impervious | Good | Low | VIIIs | -- | Shallow over bedrock | Watershed use |
| None | -- | 40-60" over bedrock | Slow | Impervious | Good | Medium | IVs<br>VIIs | IIIc<br>IIIe | Erosion; clay | Cross-slope operations; residue mgmt; cropping sequence; subsurface tillage; rangeland mgmt. |
| None | -- | 10-20" over bedrock | Rapid | Impervious | Good | Low | VIIe<br>VIIs | -- | Erosion; shallow over bedrock | Rangeland management |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 16 | 4,500-6,500 | 11-16 | 60-110 | Rangeland | Aridic Durixerolls | Fine-loamy, mixed, frigid | Hecki | 40 | Lava plains | Loess over basic igneous rock | Silt loam | Silty clay loam | None | -- | 20-40" over bedrock |
| | | | | | Cropland (cereals and hay)-dryland & irrigated | Typic Argixerolls | Fine, montmorillonitic, frigid | | 20 | Plateau | Acid igneous rock | Silt loam | Stony clay | Stones | 20-35 below 10" | 20-35" over bedrock |
| | | | | | | Orthidic Durixerolls | Fine-loamy, mixed, frigid | Roseworth | 5 | Lava plains | Loess over basic igneous rock | Silt loam | Silt loam | None | -- | 16-40" over bedrock or hardpan |
| | | | | | | Aridic Calcic Argixerolls | Fine, montmorillonitic, frigid | Hoelzie | 5 | Lava plains | Loess over basic igneous rock | Silt loam | Silty clay | None | -- | 30-40" over bedrock |
| Shallow to deep, frigid soils with stony, loamy subsoils on gentle to steep slopes. | 17 | 4,500-6,000 | 7-14 | *80-120* | Rangeland | -- | -- | *Rockland*[5/] | 60 | Lava plain | Basic igneous rock | -- | -- | -- | -- | Less than 10" over bedrock |
| | | | | | | Lithic Xerollic Camborthids | Loamy, mixed, frigid | Tenno | 20 | Lava plain | Loess and basic igneous rock | Stony loam | Stony loam | Stones | 20-35 in profile | 10-20" over bedrock |
| | | | | | | Xerollic Calciorthids | Coarse-silty, mixed, frigid | Polatis | 10 | Lava plain | Loess over basic igneous rock | Silt loam | Silt loam | None | -- | 20-40" over bedrock |
| | 18 | 4,500-4,800 | 8-12 | 100-130 | Rangeland | Xerollic Calciorthids | Coarse-silty, mixed, frigid | Polatis | 40 | Lava plain | Loess over basic igneous rock | Silt loam | Silt loam | None | -- | 20-40" over bedrock |
| | | | | | Cropland (cereals)-dryland (cereals, potatoes & hay)-irrigated | Lithic Xerollic Camborthids | Loamy, mixed, frigid | Tenno | 30 | Lava plain | Loess and basic igneous rock | Stony loam | Stony loam | Stones | 20-35 in profile | 10-20" over bedrock |
| | | | | | | Xerollic Calciorthids | Coarse-silty, mixed, frigid | Pancheri | 10 | Lava plain | Loess | Silt loam | Silt loam | None | -- | 60"+ |
| | | | | | | -- | -- | Rockland[5/] | 10 | Lava plain | Basic igneous rock | -- | -- | -- | -- | Less than 10" over bedrock |

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| Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| are oil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Range of: Major Capability Subclass Irrigated 6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| r | None | -- | 20-40" over bedrock | Moderately slow | Impervious | Good | Low and medium | IVe VIIs | -- | Erosion; moderately deep over bedrock | Rangeland management; residue mgmt. |
| y | Stones | 20-35 below 10" | 20-35" over bedrock | Slow | Impervious | Good | Low | IVe VIIs | IVe IVs | Erosion; stony clay subsoil | Rangeland management |
| | None | -- | 16-40" over bedrock or hardpan | Moderate | Impervious | Good | Low and medium | VIe | -- | Erosion; moderately deep over bedrock or hardpan | Rangeland management; residue management |
| y | None | -- | 30-40" over bedrock | Slow | Impervious | Good | Low and medium | IVe | -- | Erosion; moderately deep over bedrock | Rangeland management |
| | -- | -- | Less than 10" over bedrock | -- | Impervious | Good | Low | VIIIs | -- | Very shallow over bedrock | -- |
| y | Stones | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs VIIs | -- | Shallow over bedrock; stony profile | Rangeland management |
| | None | -- | 20-40" over bedrock | Moderate | Impervious | Good | Low and medium | VIs VIc | IIIs IIIe IVe | Erosion; moderately deep over bedrock; alkaline subsoil | Rangeland management |
| | None | -- | 20-40" over bedrock | Moderate | Impervious | Good | Low and medium | VIc VIs | IIIs IIIe IVe | Erosion; moderately deep over bedrock; alkaline subsoil; droughtiness | Rangeland management; cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt. |
| y | Stones | 20-35 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs VIIs | -- | Shallow over bedrock; stony profile | Rangeland management |
| t | None | -- | 60"+ | Moderate | Moderate | Good | High | IVc VIc | IIe IIc IIIe IIIc | Erosion; droughtiness | Cross-slope operations; residue mgmt; cropping sequence; irrigation mgmt; rangeland mgmt. |
| | -- | -- | Less than 10" over bedrock | -- | Impervious | Good | Low | VIIIs | -- | Very shallow over bedrock | -- |

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| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 19 | 4,700-6,500 | 12-20 | 50-100 | Rangeland<br>Cropland (cereals)-dryland | Calcic Haploxerolls | Fine-loamy, mixed, frigid | Jacoby | 30 | Lava plain | Loess over basic igneous rock | Loam | Loam | None | -- | 20-40" over bedrock |
| | | | | | | Aridic Lithic Calcixerolls | Loamy, mixed, frigid | Mike | 20 | Lava plain | Loess and basic igneous rock | Loam | Stony loam | Stones | 20-35 below 10" | 10-20" over bedrock |
| | | | | | | Argic Pachic Cryoborolls | Fine-loamy, mixed, frigid | | 15 | Lava plain | Loess over basic igneous rock | Silt loam | Loam | None | -- | 40-60" over bedrock |
| | | | | | | Argic Pachic Cryoborolls | Fine-loamy, mixed | | 15 | Lava plain | Aeolian sand & loess over basic igneous rock | Sandy loam | Sandy clay loam | None | -- | 40-60" over bedrock |
| | | | | | | Aridic Calcixerolls | Fine-loamy, mixed, frigid | Eaglecone | 10 | Lava plain | Loess over basic igneous rock | Loam | Loam | None | -- | 20-40" over bedrock |
| Moderately deep to very deep, ashy, very cold soils with fine, loamy, rocky subsoils on moderate to extremely steep slopes. | 20 | 6,000-9,000 | 12-16 | 0-90 | Rangeland<br>Forest land (Juniper)<br>Cropland (meadow hay)-irrigated | Argiudic Cumulic Cryoborolls | Fine-loamy, mixed | | 30 | Fans and bottomland | Alluvium and volcanic material | Silt loam | Silty clay loam | None | -- | 40-60" over tuff or volcanic ash |
| | | | | | | Argiudic Cumulic Cryoborolls | Loamy-skeletal, mixed | | 20 | Mountains | Volcanic material | Silt loam | Clay loam | None | -- | 20-40" over tuff |
| | | | | | | Aridic Calcic Argixerolls | Fine-loamy, mixed, frigid | Concreek | 15 | Mountains & hills | Sedimentary & igneous rock | Stony loam | Gravelly clay to clay loam | Stones, cobbles & gravel | 20-35 in profile | 40-60" over bedrock |
| | | | | | | Lithic Argixerolls | Loamy, mixed, frigid | | 10 | Mountains | Acid igenous rock | Stony loam | Rocky silty clay loam | Cobbles & stones | 20-35 in profile | 10-20" over bedrock |
| | | | | | | Entic Haploxerolls | Sandy, mixed, frigid | | 10 | Mountains and fans | Acid igneous rock | Gravelly loamy coarse sand | Gravelly loamy coarse sand | Gravel & sand | 20-35 in profile | 20-40" over bedrock |
| | | | | | | Lithic Calcixerolls | Loamy-skeletal, carbonatic, frigid | | 5 | Mountains & ridges | Sedimentary rock (limestone) | Stony loam | Very gravelly loam | Stones cobbles and gravel | 20-80 in profile | 10-20" over lime hardpan |
| | 21 | 6,000-12,500 | 18-40 | 0-80 | Forest land[4/]<br>Rangeland<br>Cropland (hay & cereals)-irrigated & dryland | Cryoboralfs plus Cryorthods | Fine loamy to loamy-skeletal, mixed | -- | 100 | Low Mtns., fans and Uplands | Alluvium & sedimentary and acid igneous rock | -- | -- | -- | -- | Less than 10" over bedrock |

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| ristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coarse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated [6/] | Major Soil Problems | Suitable Land Treatment and Structures |
| None | -- | 20-40" over bedrock | Moderate | Impervious | Good | Medium | IIIc<br>IVs<br>VIIs | -- | Erosion; alkaline; climate | Cross-slope operations; residue mgmt; cropping sequence; soil amendments; rangeland mgmt. |
| Stones | 20-35 below 10" | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs<br>VIIs | -- | Shallow over bedrock; stony profile | Rangeland management |
| None | -- | 40-60" over bedrock | Moderate | Impervious | Good | Medium and high | IVe<br>IVc<br>VIs | -- | Erosion; alkaline; climate | Cross-slope operations; residue mgmt; cropping sequence; soil amendments; rangeland management |
| None | -- | 40-60" over bedrock | Moderately slow | Impervious | Good | Medium | IVe<br>VIs | -- | Erosion; climate | Cross-slope operations; residue mgmt; cropping sequence; rangeland mgmt. |
| None | -- | 20-40" over bedrock | Moderate | Impervious | Good | Low and medium | IIIe<br>IIIc<br>IVe | -- | Erosion; moderately deep over bedrock; alkaline; climate | Cross-slope operations; residue mgmt; cropping sequence; soil amendments; rangeland management |
| None | -- | 40-60" over tuff or volcanic ash | Moderately slow | Moderate to Impervious | Good | Medium and High | IVe | -- | Erosion; climate | Rangeland management; irrigation management |
| None | -- | 20-40" over tuff | Moderately slow | Impervious | Good | Low and medium | IVe<br>VIe<br>VIIs | -- | Erosion; moderately deep over tuff | Rangeland management; forest land management |
| Stones, cobbles & gravel | 20-35 in profile | 40-60" over bedrock | Slow and moderately slow | Impervious | Good | Low and medium | VIc<br>VIIs | -- | Stony and gravelly profile; clay subsoil in places | Rangeland management; forest land management |
| Cobbles & stones | 20-35 in profile | 10-20" over bedrock | Moderately slow | Impervious | Good | Low | VIs<br>VIIs | -- | Shallow over bedrock; stony profile | Rangeland management |
| Gravel & sand | 20-35 in profile | 20-40" over bedrock | Very rapid | Impervious | Excessive | Low | VIIs | -- | Moderately deep over bedrock; gravelly & sandy profile | Rangeland management |
| Stones cobbles and gravel | 20-80 in profile | 10-20" over lime hardpan | Moderate | Impervious in hardpan | Good | Low | VIIs | -- | Shallow over hardpan; stony and gravelly profile; alkaline subsoil | Rangeland management |
| -- | -- | Less than 10" over bedrock | Moderately slow | -- | Good | Medium | VIe<br>VIs<br>VIw | -- | Erosion; climatic limitations; severe soil loss with improper use | Continued forest & rangeland mgmt; cross-slope opers; residue mgmt; irrigation mgmt. |

Table 90 - Continued

| Soil Groups | Soil Association | | | | | Classification | | | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series[2/] | | | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth |
| Moderately deep to very deep, frigid soils with cobbly, loamy subsoils on gentle to steep slopes. | 22 | 5,500-7,500 | 15-19 | 100-120 | Rangeland | Calcic Haploxerolls | Loamy-skeletal, mixed, mesic | Middle | 50 | Low Mountains | Sedimentary rock | Cobbly loam | Very cobbly loam | Cobbles & gravel | 20-80 in profile | 20-40" over bedrock |
| | | | | | | Calcic Argixerolls | Loamy-skeletal, mixed, frigid | Broad | 30 | Low Mountains | Sedimentary rock (sandstone) | Loam or gravelly loam | Cobbly or gravelly loam or clay | Cobbles & gravel | 20-35 below 10" in places | 40-60" over bedrock |
| | | | | | | Cryic Rendoll | Loamy-skeletal, carbonatic | Ridgecrest | 20 | Low Mountains | Sedimentary rock (limestone) | Cobbly loam | Cobbly loam | Cobbles & gravel | 20-35 in profile | 40-60" over bedrock |
| | 23 | 7,000-8,000 | 18-22 | 90-110 | Rangeland | Calcic Argixerolls | Loamy-skeletal, mixed, frigid | Broad | 60 | Low Mountains | Sedimentary rock (sandstone) | Loam or gravelly loam | Cobbly or gravelly loam or clay loam | Cobbles & gravel | 20-35 below 10" in places | 40-60" over bedrock |
| | | | | | | Typic Argixerolls | Clayey-skeletal, montmorillonitic, frigid | Yeates Hollow | 20 | Low Mountains | Sedimentary rock | Very cobbly clay loam | Very cobbly clay | Cobbles & gravel | 35-80 in profile | 60"+ |
| | | | | | | Pachic Argixerolls | Loamy-skeletal, mixed, frigid | Smarts | 20 | Low Mountains | Sedimentary rock | Loam | Very cobbly loam | Cobbles & gravel | 35-80 below 10" | 60"+ |
| | 24 | 5,000-10,000 | 15-30 | 0-80 | Rangeland<br>Forest land[4/]<br>Cropland (cereals, hay)-dryland and irrigated | Argixerolls & Xcrothents (shallow), Xeralfs and Rockland | Loamy-skeletal, fine-loamy to mixed | -- | 100 | Mountains & benches | Loess over sedimentary rock, sedimentary rock (limestone) | -- | -- | -- | -- | 10" over bedrock |
| Shallow and miscellaneous rocky, very cold soils with loamy, cobbly and gravelly subsoils on strong to extremely steep slopes. | 25 | 6,000-11,000 | 10-30 | 30-90 | Rangeland<br>Cropland (meadow hay)-irrigated | Typic Argixerolls | Fine-loamy, mixed, frigid | | 25 | Mountain side slopes | Mixed basic igneous and sedimentary rock | Stony loam | Cobbly clay loam | Stones & cobbles | 20-35 in profile | 36-60" over bedrock |
| | | | | | Forest land | Lithic Haploxerolls | Loamy-skeletal, mixed, frigid | | 20 | Mountain tops and side slopes | Sedimentary rock | Stony loam | Very gravelly & stony loam | Stones & gravel | 35-80 in profile | 10-20" over bedrock |
| | | | | | | Abruptic Durixerolls | Fine, montmorillonitic, frigid | | 15 | High terraces | Alluvium | Very cobbly loam | Clay | Cobbles | 35-80 in surface soil | 20-30" over duripan |
| | | | | | | Argiudic Cumulic Cryoborolls | Fine-loamy, mixed | | 15 | High terraces | Alluvium | Loam | Gravelly loam | Gravel | 20-35 below 10" in profile; 60 below 40-60" | 40-60" over gravel |
| | | | | | | Pachic Cryoborolls | Fine-loamy, mixed | Bullrey | 10 | Fans | Alluvium | Gravelly loam | Gravelly loam | Gravel | 20-35 in profile | 60"+ |

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| eristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coarse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated[6/] | Major Soil Problems | Suitable Land Treatment and Structures |
| Cobbles & gravel | 20-80 in profile | 20-40" over bedrock | Moderate | Moderate to impervious | Good | Low | VIs VIIs | -- | Erosion; cobbly profile; calcareous | Rangeland management |
| Cobbles & gravel | 20-35 below 10" in places | 40-60" over bedrock | Moderate or moderately slow | Moderate | Good | Medium to high | VIe VIIe | -- | Erosion; cobbly or gravelly subsoil in places; alkaline | Rangeland management |
| Cobbles & gravel | 20-35 in profile | 40-60" over bedrock | Moderate | Moderate | Good | Medium | VIe VIIe | -- | Erosion; cobbly profile; calcareous | Rangeland management |
| Cobbles & gravel | 20-35 below 10" in places | 40-60" over bedrock | Moderate or moderately slow | Moderate | Good | Medium to high | VIe VIIe | -- | Erosion; cobbly or gravelly subsoil in places; alkaline | Rangeland management |
| Cobbles & gravel | 35-80 in profile | 60"+ | Slow | Slow | Good | Low | VIe VIIs | -- | Erosion; cobbly profile; clay subsoil | Rangeland management |
| Cobbles & gravel | 35-80 below 10" | 60"+ | Moderate | Moderate | Good | Low | VIe VIIe | -- | Erosion; cobbly subsoil | Rangeland management |
| -- | -- | 10" over bedrock | Moderate | -- | Good | Medium | VIe | -- | Erosion; both shallow and deep soil | Rangeland mgmt; forest land mgmt; cross-slope opers; residue mgmt; irrigation management |
| Stones & cobbles | 20-35 in profile | 36-60" over bedrock | Moderately slow | Impervious | Good | Medium and low | VIIs | -- | Droughtiness; climate; erosion | Rangeland management |
| Stones & gravel | 35-80 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | -- | Droughtiness; climate; erosion | Rangeland management |
| Cobbles | 35-80 in surface soil | 20-30" over duripan | Very slow | Impervious in duripan | Good | Low | VIIs | -- | Droughtiness; climate; erosion | Rangeland management |
| Gravel | 20-35 below 10" in profile; 60 below 40-60" | 40-60" over gravel | Moderate | Very rapid | Somewhat excessive | Low and medium | IVe | -- | Droughtiness; climate | Rangeland and irrigation management |
| Gravel | 20-35 in profile | 60"+ | Moderate | Rapid | Good | Medium | VIe | -- | Droughtiness; climate; erosion | Rangeland management |

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2] | Percentage[3] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Perme… Sub… |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 6,800-13,500 | 18-30 | 0-40 | Other<br>Forest land[4]<br>Rangeland | Cryochrepts and Rockland | Loamy-skeletal, mixed | -- | 100 | Steep mountains | Sedimentary & igneous rock, loess, & volcanic material | -- | -- | -- | -- | 10-60" over bedrock | Moder… imper… |
| Deep, frigid soils with rocky, loamy profiles high in quartz on strong to extremely steep slopes. | 27 | 3,000-9,000 | 25-60 | 0-80 | Forest land[4] | Argixerolls | Coarse loamy to fine loamy, mixed | Pyle, Graylock | 100 | Mountains | Acidic igneous rock | -- | -- | -- | -- | 40-60" over bedrock | Moder… rapid… |

1/ Based on data summarized during 1966.
2/ Only soil series names that have a status as reserved, tentative, or established are listed.
3/ Differences of total percentage in each soil association from 100 percent are inclusions of other soils and land types.
4/ For the upland forest soils, the above characteristics and qualities have been extended from a limited amount of survey data. Additional data and land use interpretations for forest soils are available in the Forest Land section of Appendix VIII, Land Measures and Watershed Protection. These areas include National Forest and adjacent non-Federal forest lands.
5/ Miscellaneous land types.
6/ Presently irrigated cropland.

SOURCE: National Cooperative Soil Survey.

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| ristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| oarse Fragments | | | | | | Total Available Water-holding | Range of: Major Capability Subclass[6] | | | |
| ind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Capacity | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| -- | -- | 10-60" over bedrock | Moderate to impervious | -- | Good to poor | Low to medium | VIIIs VIIIe | -- | Cold climate; high elevations; steep slopes | Continued forest land management |
| -- | -- | 40-60" over bedrock | Moderate to rapid | -- | Good | Low | -- | -- | Erosion; stony profile; steep slopes | Continued forest land management |

the soils and slope are suitable. On the south side of the subregion low rainfall precludes forest cover and cropland use even where the climate and soils are suitable. Therefore, this general area has a grass-sage cover and is used as rangeland. Suitable climate and unavailability of irrigation water restrict the cropland use area to the Snake River Plains and adjacent areas. Almost 63 percent of the soil associations have enough stones, cobbles, or gravel to effect the land use and management. Most of the soils have a medium textured profile with less than 4 percent of the area with a fine or very fine subsoil texture. Generally the slope of the land, the climate, the presence of coarse fragments, and the depth of the soil profile over gravel or bedrock are of major concern in planning suitable land use and management.

## Interpretations and Evaluation

Table 92 relates the land capability classes to the Land Capability Map, figure 3. It must be realized that the Land Capability Map is highly generalized and a specific capability class on table 92 may not be shown. To determine the land capability of any particular area, refer to the soil association symbols listed in the second column of the table and then locate the area of that symbol on the Soil Association Map, figure 19. Table 92 also shows the acreage and extent of the dominant land capability class for practical segments of the landscape.

Classified on table 93 is the dominant water storage capacity for each soil association in Subregion 4. Each class on the table

**Table 93 - Water Storage Capacity of Soils Generalized to the Soil Associations, Subregion 4, 1966**

| Classes of Water Storage Capacity 1/ | Soil Association Symbols | 1,000 Acres | Percent |
|---|---|---|---|
| Class A - Water storage in the soil profile more than 20,000 acre-feet per township. | 10-11 | 2,235.0 | 9.9 |
| Class B - Water storage in the soil profile 10,000 to 20,000 acre-feet per township. | 1-2-5-9-12 20-21-23-24 | 10,119.8 | 44.6 |
| Class C - Water storage in the soil profile 5,000 to 10,000 acre-feet per township. | 3-4-6-7 13-15-16-18 19-22-25-27 | 8,700.0 | 38.3 |
| Class D - Water storage in the soil profile less than 5,000 acre-feet per township. | 8-14-17-26 | 1,627.0 | 7.2 |
| Total | | 22,681.8 | 100.0 |

1/ Measurement of the water storage capacity is limited to the upper 5 feet of soil or to bedrock.
Source: National Cooperative Soil Survey.

Table 92 - Summary and Distribution of Land Capability Classes, Subregion 4, 1966

| Land Capability Classes | Distribution by Soil Associations[1/] Soil Association Map Symbols[2/] | 1,000 Acres | Percent | Inventoried 1,000 Acres[3/] |
|---|---|---|---|---|
| Class I - Soils in Class I have no limitations or hazards. They are adopted to all uses with a minimum of conservation treatment other than standard conditioning ones.[4/] | - | - | - | - |
| Class II - Soils in Class II have few limitations or hazards. Simple conservation practices are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | - | - | - | 569.2 |
| Class III - Soils in Class III have more limitations and hazards than those in Class II. They require more difficult or complex conservation practices when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 1-3-5-6-9 10-12-13 | 7,331.0 | 32.3 | 2,233.4 |
| Class IV - Soils in Class IV have greater limitations and hazards than Class III. Still more difficult or complex measures are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 7-11-16 | 2,300.0 | 10.1 | 1,124.2 |
| Class V - Soils in Class V have more limitations than Class IV. They are generally unsuited for cultivation, but are well suited for grazing and forestry use. They require good management practices.[4/] | 4 | 35.0 | 0.2 | 200.1 |
| Class VI - Soils in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland or wildlife. | 2-8-15-18-19-20 21-22-23-24-25-27 | 11,513.8 | 50.8 | 15,348.5 |
| Class VII - Soils in Class VII have very severe limitations and hazards that make them generally unsuited for cultivation. They are suited to grazing, noncommercial, woodland or wildlife. | 14-17 | 902.0 | 4.0 | 1,704.9 |
| Class VIII - Soils and land forms in Class VIII have limitations and hazards that prevent their use for cultivated crops, pasture, range or woodland. They may be used for recreation, wildlife or water supply. | 26 | 600.0 | 2.6 | 1,501.5 |
| Total Land | | 22,681.8 | 100.0 | 22,681.8 |

1/ Class I and 10 percent of other capability classes may be included in areas of Class II. Up to 25 percent of other capability classes may be included in Classes III and IV. Class V and up to 40 percent of other capability classes may be included in Classes VI, VII, and VIII. In areas of rainfall less than 12 inches, large areas of Class VI can be potential Classes I through IV where irrigation water is available.
2/ Refer to the Subregional Soil Association Map, figure 19.
3/ Taken from table 8.
4/ Capability Classes I and V are distributed in small segregated areas over segments of the landscape. Many small areas could not be delineated on the map. This added detail, although still generalized, is commensurate with the subregional level of generalization.
Source: National Cooperative Soil Survey and U.S.D.A. Conservation Needs Inventory adjusted.

relates to a similar class on the regional map on Water Storage Capacity, figure 4. To locate those areas having contrasting water storage capacity in the upper 5 feet of soil, refer to figure 4, to figure 19 (the subregional Soil Association Map), and to the following table. The class letter symbol in the first column and the Soil Association Map numerical symbol listed in the second column may be used to locate those areas having contrasting water storage capacity. Complete utilization of this storage can contribute a more stable and sustained streamflow.

## Cover and Land Use

The four major cover and land uses, as defined in the glossary and explained in the introduction have been summarized by acreage and ownership on tables 94 through 98. These broad categories have been determined both on the basis of cover and use. Cropland is more specifically a use category. Forest land has more than 10 percent forest cover. Rangelands are areas having broad range cover characteristics. Other land includes land specifically based on use, such as urban, as well as that based specifically on cover characteristics such as rock and sand dune areas. The four major categories have been generalized for presentation on figure 20. Since this information has been generalized, isolated areas of different cover and uses may occur within the broad patterns.

Table 94 - Cover and Land Use by Ownership, Subregion 4, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | | (1,000 acres) | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 3,104.6 | 3,320.3 | 297.0 | 6,721.9 |
| Other Agriculture | - | - | 32.7 | - | 32.7 |
| | - | 3,104.6 | 3,353.0 | 297.0 | 6,754.6 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 246.8 | 5,779.7 | 434.0 | 6,460.5 |
| Bureau of Indian Affairs[1/] | 75.4 | 44.0 | 392.2 | 11.9 | 523.5 |
| National Park Service | - | 494.0 | 122.8 | 154.2 | 771.0 |
| Fish & Wildlife Service | .9 | - | 34.5 | 5.9 | 41.3 |
| Bureau of Reclamation | - | - | 182.0 | 4.4 | 186.4 |
| Other Interior | - | - | - | - | - |
| | 76.3 | 784.8 | 6,511.2 | 610.4 | 7,982.7 |
| Department of Defense | - | - | 1.5 | .1 | 1.6 |
| Other Federal | - | - | 572.3 | - | 572.3 |
| Federal Subtotal | 76.3 | 3,889.4 | 10,438.0 | 907.5 | 15,311.2 |
| State | 66.3 | 69.5 | 882.9 | 37.3 | 1,056.0 |
| County | - | - | - | 46.5 | 46.5 |
| Municipal | - | - | 1.3 | 17.3 | 18.6 |
| Public Total | 142.6 | 3,958.9 | 11,322.2 | 1,008.6 | 16,432.3 |
| Private Total | 3,638.7 | 338.0 | 2,233.6 | 39.2 | 6,249.5 |
| Total Land Area | 3,781.3 | 4,296.9 | 13,555.8 | 1,047.8 | 22,681.8 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, U.S.D.A. Forest Survey, and other sources.

Table 95 - Cover and Land Use by Ownership, State of Idaho, Subregion 4, 1966

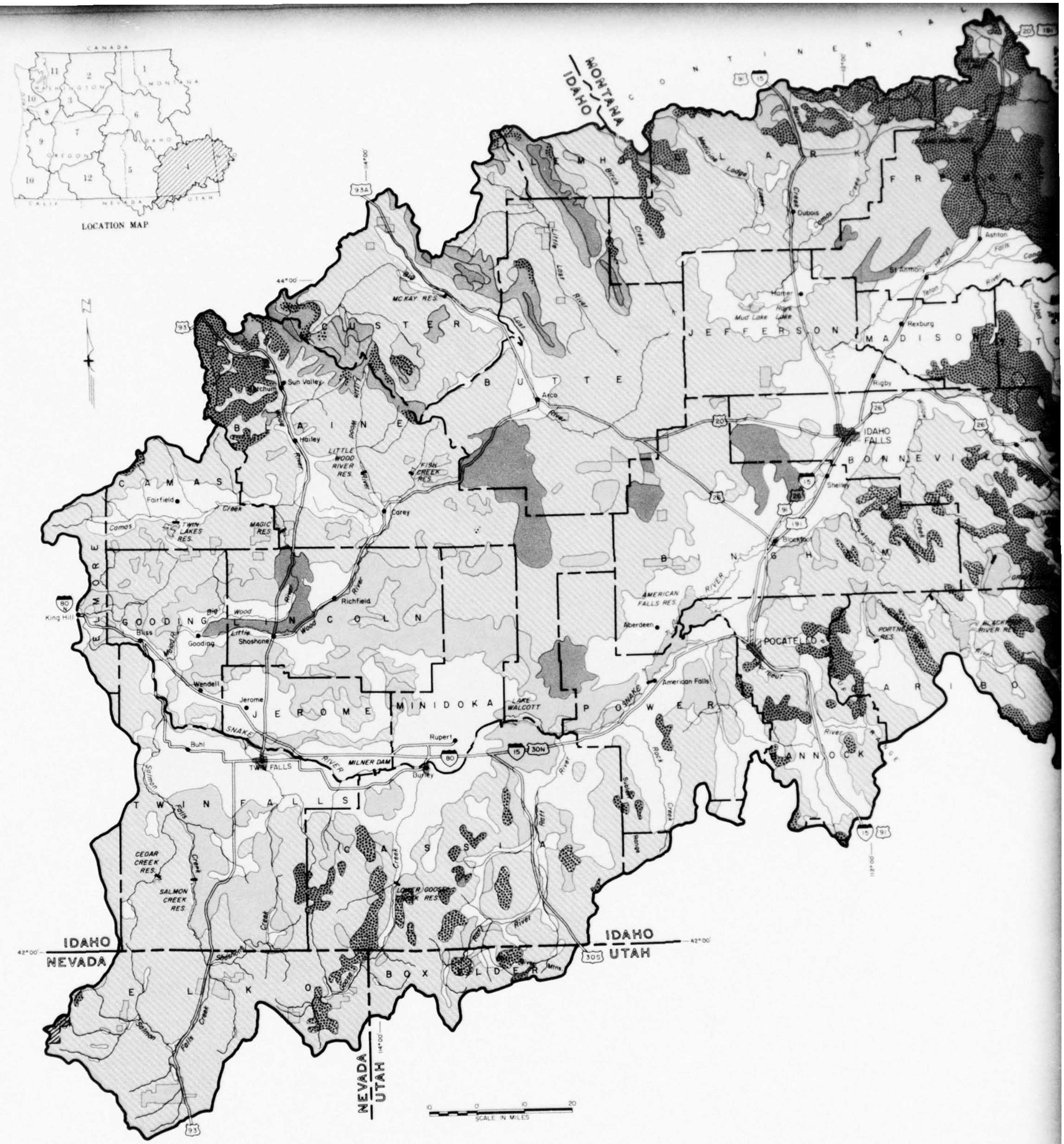
| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 1,944.0 | 2,274.5 | 115.0 | 4,333.5 |
| Other Agriculture | - | - | 32.7 | - | 32.7 |
| | - | 1,944.0 | 2,307.2 | 115.0 | 4,366.2 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 198.0 | 4,959.3 | 432.6 | 5,589.9 |
| Bureau of Indian Affairs1/ | 75.4 | 44.0 | 392.2 | 11.9 | 523.5 |
| National Park Service | - | 30.0 | 14.5 | 40.4 | 84.9 |
| Fish & Wildlife Service | .9 | - | 10.9 | 4.9 | 16.7 |
| Bureau of Reclamation | - | - | 182.0 | 4.4 | 186.4 |
| Other Interior | - | - | - | - | - |
| | 76.3 | 272.0 | 5,558.9 | 494.2 | 6,401.4 |
| Department of Defense | - | - | 1.5 | .1 | 1.6 |
| Other Federal | - | - | 572.3 | - | 572.3 |
| Federal Subtotal | 76.3 | 2,216.0 | 8,439.9 | 609.3 | 11,341.5 |
| State | 58.3 | 68.0 | 857.7 | 37.3 | 1,021.3 |
| County | - | - | - | 46.5 | 46.5 |
| Municipal | - | - | 1.3 | 17.3 | 18.6 |
| Public Total | 134.6 | 2,284.0 | 9,298.9 | 710.4 | 12,427.9 |
| Private Total | 3,469.5 | 291.0 | 2,025.8 | 18.1 | 5,804.4 |
| Total Land Area | 3,604.1 | 2,575.0 | 11,324.7 | 728.5 | 18,232.3 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, U.S.D.A. Forest Survey, and other sources.

Table 96 - Cover and Land Use by Ownership, State of Nevada, Subregion 4, 1966

| Ownership | Cropland | Forest Land | Rangeland (1,000 acres) | Other Land | Total |
|---|---|---|---|---|---|
| Department of Agriculture | | | | | |
| Forest Service | - | 7.0 | 60.5 | - | 67.5 |
| Other Agriculture | - | - | - | - | |
| | - | 7.0 | 60.5 | - | 67.5 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 30.0 | 775.2 | - | 805.2 |
| Bureau of Indian Affairs1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | - | - | - | - |
| | - | 30.0 | 775.2 | - | 805.2 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | - | 37.0 | 835.7 | - | 872.7 |
| State | - | - | - | - | - |
| County | - | - | - | - | - |
| Municipal | - | - | - | | - |
| Public Total | - | 37.0 | 835.7 | - | 872.7 |
| Private Total | 12.9 | 6.0 | 76.2 | 5.8 | 100.9 |
| Total Land Area | 12.9 | 43.0 | 911.9 | 5.8 | 973.6 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, U.S.D.A. Forest Survey, and other sources.



LOCATION MAP
CANADA
MONTANA
IDAHO
CONTINENTAL
LEMHI
CLARK
FREMONT
CUSTER
BUTTE
JEFFERSON
MADISON
BLAINE
CAMAS
BONNEVILLE
ELMORE
GOODING
LINCOLN
BINGHAM
JEROME
MINIDOKA
POWER
CARIBOU
BANNOCK
TWIN FALLS
CASSIA
ELKO
BOX ELDER
IDAHO
NEVADA
UTAH
Arco
Ashton
St Anthony
Rexburg
Rigby
Dubois
Hamer
Mud Lake
IDAHO FALLS
Shelley
Blackfoot
POCATELLO
American Falls
Aberdeen
AMERICAN FALLS RES.
LAKE WALCOTT
Rupert
Burley
MILNER DAM
TWIN FALLS
Buhl
Jerome
Wendell
Gooding
Bliss
King Hill
Shoshone
Richfield
Carey
Hailey
Ketchum
Sun Valley
Fairfield
MAGIC RES.
TWIN LAKES RES.
MCKAY RES.
LITTLE WOOD RIVER RES.
FISH CREEK RES.
CEDAR CREEK RES.
SALMON CREEK RES.
LOWER GOOSE CREEK RES.
PORTNEUF RES.
SNAKE RIVER
SCALE IN MILES
42°00'
44°00'
114°00'

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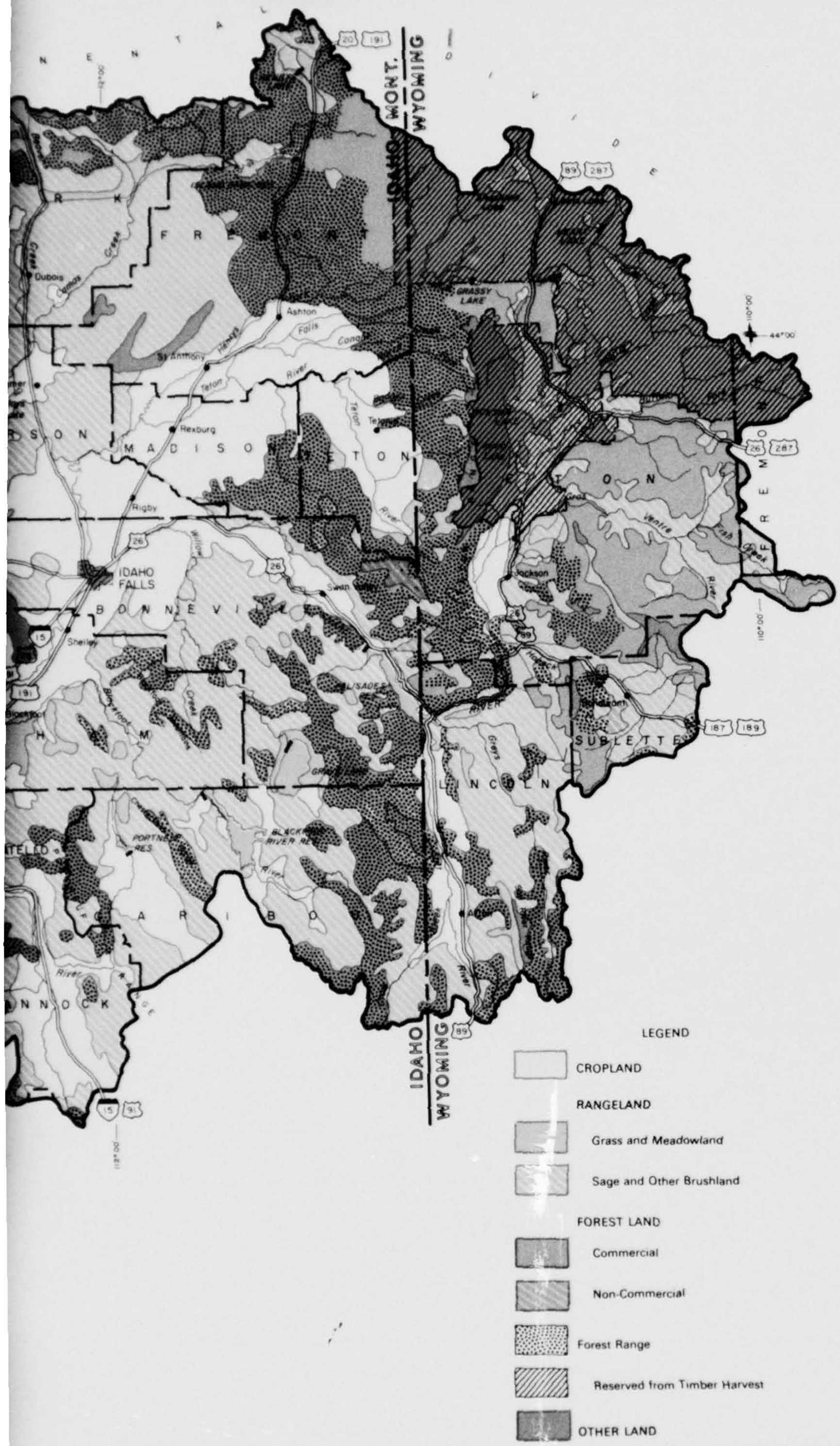



COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# GENERALIZED COVER AND LAND USE

UPPER SNAKE, SUBREGION 4
1968

USDA SCS PORTLAND, OREG. 1970

FIGURE 20

Table 97 - Cover and Land Use by Ownership, State of Utah, Subregion 4, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 17.0 | 29.7 | - | 46.7 |
| Other Agriculture | - | - | - | - | - |
| | - | 17.0 | 29.7 | - | 46.7 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 8.9 | 42.1 | 1.4 | 52.4 |
| Bureau of Indian Affairs1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | - | - | - | - |
| | - | 8.9 | 42.1 | 1.4 | 52.4 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | - | 25.9 | 71.8 | 1.4 | 99.1 |
| State | 3.5 | - | 22.2 | - | 25.7 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 3.5 | 25.9 | 94.0 | 1.4 | 124.8 |
| Private Total | 4.7 | - | 109.6 | 1.8 | 116.1 |
| Total Land Area | 8.2 | 25.9 | 203.6 | 3.2 | 240.9 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, U.S.D.A. Forest Survey, and other sources.

Table 98 - Cover and Land Use by Ownership, Subregion 4, State of Wyoming, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 1,136.6 | 955.6 | 182.0 | 2,274.2 |
| Other Agriculture | - | - | - | - | - |
| | - | 1,136.6 | 955.6 | 182.0 | 2,274.2 |
| Department of Interior | | | | | |
| Bureau of Land Management | - | 9.9 | 3.1 | - | 13.0 |
| Bureau of Indian Affairs1/ | - | - | - | - | - |
| National Park Service | - | 464.0 | 108.3 | 113.8 | 686.1 |
| Fish & Wildlife Service | - | - | 23.6 | 1.0 | 24.6 |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | - | - | - | - |
| | - | 473.9 | 135.0 | 114.8 | 723.7 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | - | 1,610.5 | 1,090.6 | 296.8 | 2,997.9 |
| State | 4.5 | 1.5 | 3.0 | - | 9.0 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 4.5 | 1,612.0 | 1,093.6 | 296.8 | 3,006.9 |
| Private Total | 151.6 | 41.0 | 22.0 | 13.5 | 228.1 |
| Total Land Area | 156.1 | 1,653.0 | 1,115.6 | 310.3 | 3,235.0 |

1/ Private lands held in trust by the Federal Government.
Source: Compiled by the Land and Minerals Work Group from the U.S.D.A. Conservation Needs Inventory, U.S.D.A. Forest Survey, and other sources.

## Cropland

The Upper Snake Subregion has more cropland than any other subregion in the Columbia-North Pacific Region. About 35 percent of the area having some cropland occurs at elevations above 5,500 feet. These croplands are highly restricted in adapted crops and production by the short growing season and cold temperatures. About 22 percent of the area has croplands that are moderately restricted in adapted crops and production because of elevations of 4,000 to 5,500 feet above sea level. Approximately 17 percent of the area having some cropland occurs at elevations of 2,500 to 4,000 feet and is only slightly restricted in crops because of climate. About 64 percent of the cropland is irrigated by a number of extensive irrigation projects. It is this irrigation that makes possible production of potatoes and sugar beets. About three-fourths of the irrigated cropland of southern Idaho is in Subregion 4 and one-fourth is in Subregion 5. In addition to potatoes and sugar beets, crops such as beans, corn, peas, peppermint, and seed crops are irrigated. Forage crops such as hay and pasture, and the close grown field crops, like wheat and other grain crops, fill out a balanced cropping sequence on irrigated farms.

Bordering the irrigated areas at higher elevations on the more desirable soil areas, grain-fallow crops are grown without irrigation. Hay and pasture also make up an important segment of the dryland crops. Table 99 lists the acreage of the representative categories of crops and the extent of each category.

Table 99 - Cropland Acreage of Representative Categories of Crops by States, Subregion 4, 1966

| Categories of Crops | Idaho | Wyoming | Nevada | Utah | Total | Percent |
|---|---|---|---|---|---|---|
| | | (1,000 acres) | | | | |
| Dryland Cropland 1/ | | | | | | |
| Close grown field crops | 1,194.7 | 14.4 | - | 1.4 | 1,210.5 | 32.0 |
| Forage crops | 152.2 | 7.8 | .4 | - | 160.4 | 4.2 |
| Total dryland crops | 1,346.9 | 22.2 | .4 | 1.4 | 1,370.9 | 36.2 |
| Irrigated Cropland 1/ | | | | | | |
| Forage crops | 918.9 | 115.8 | 12.5 | 6.2 | 1,053.4 | 27.8 |
| Close grown field crops | 652.5 | 17.8 | - | .6 | 670.9 | 17.8 |
| Row crops 2/ | 683.7 | - | - | - | 683.7 | 18.1 |
| Specialty crops 3/ | 2.1 | .3 | - | - | 2.4 | .1 |
| Total irrigated crops | 2,257.2 | 133.9 | 12.5 | 6.8 | 2,410.4 | 63.8 |
| Total cropland | 3,604.1 | 156.1 | 12.9 | 8.2 | 3,781.3 | 100.0 |

1/ Does not include other land that is irrigated (table 110).
2/ Includes sugar beets, potatoes, beans, corn, etc.
3/ Includes mint, vegetable seed, and other special and inextensive crops.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group

## Forest Land

Forests cover 4,296,900 acres or 19 percent of the total land area in Subregion 4. Within the boundaries of this subregion, 14 percent of Idaho, 51 percent of Wyoming, 4 percent of Nevada, and 10 percent of Utah are forested. The bulk of this forest cover is situated in the northeast portion with the balance being scattered along the southern and northwest high mountain zones.

Nearly 4 million acres, or 93 percent, of the forest land is publicly owned. Of this, 77 percent is National Forest, 21 percent on areas administered by agencies of the Department of the Interior, and 2 percent state owned. Private ownership presently amounts to 299,000 acres.

Tables 100 through 104 show the forest land acreage by generalized type and ownership for the subregion and for each state.

Table 100 - Forest Land Acreage by Generalized Type and Ownership, Subregion 4, 1966

| Ownership | Commercial Forest Land | Non-Commercial Forest Land: Productive Reserved | Non-Commercial Forest Land: Unproductive Reserved | Non-Commercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 2,220.6 | 232.0 | 1.0 | 651.0 | 3,104.6 |
| Bureau of Land Management | 47.4 | - | - | 199.4 | 246.8 |
| Bureau of Indian Affairs 1/ | 10.0 | - | - | 34.0 | 44.0 |
| National Park Service | - | 445.0 | 49.0 | - | 494.0 |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 2,278.0 | 677.0 | 50.0 | 884.4 | 3,889.4 |
| State | 40.0 | - | - | 29.5 | 69.5 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 2,318.0 | 677.0 | 50.0 | 913.9 | 3,958.9 |
| Private Total | 197.0 | - | - | 141.0 | 338.0 |
| Grand Total | 2,515.0 | 677.0 | 50.0 | 1,054.9 | 4,296.9 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 101 - Forest Land Acreage by Generalized Type and Ownership, State of Idaho, Subregion 4, 1966

| Ownership | Commercial Forest Land | Non-Commercial Forest Land: Productive Reserved | Non-Commercial Forest Land: Unproductive Reserved | Non-Commercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Forest Service | 1,542.0 | 6.0 | 1.0 | 395.0 | 1,944.0 |
| Bureau of Land Management | 47.0 | - | - | 151.0 | 198.0 |
| Bureau of Indian Affairs 1/ | 10.0 | - | - | 34.0 | 44.0 |
| National Park Service | - | 29.0 | 1.0 | - | 30.0 |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 1,599.0 | 35.0 | 2.0 | 580.0 | 2,216.0 |
| State | 39.0 | - | - | 29.0 | 68.0 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 1,638.0 | 35.0 | 2.0 | 609.0 | 2,284.0 |
| Private Total | 157.0 | - | - | 134.0 | 291.0 |
| Grand Total | 1,795.0 | 35.0 | 2.0 | 743.0 | 2,575.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 102 - Forest Land Acreage by Generalized Type and Ownership, State of Nevada, Subregion 4, 1966

| Ownership | Commercial Forest Land | Non-Commercial Forest Land: Productive Reserved | Non-Commercial Forest Land: Unproductive Reserved | Non-Commercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Forest Service | - | 3.0 | - | 4.0 | 7.0 |
| Bureau of Land Management | - | - | - | 30.0 | 30.0 |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | - | 3.0 | - | 34.0 | 37.0 |
| State | - | - | - | - | - |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | - | 3.0 | - | 34.0 | 37.0 |
| Private Total | 4.0 | - | - | 2.0 | 6.0 |
| Grand Total | 4.0 | 3.0 | - | 36.0 | 43.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 103 - Forest Land Acreage by Generalized Type and Ownership, State of Utah, Subregion 4, 1966

| Ownership | Commercial Forest Land | Non-Commercial Forest Land: Productive Reserved | Non-Commercial Forest Land: Unproductive Reserved | Non-Commercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 5.0 | - | - | 12.0 | 17.0 |
| Bureau of Land Management | - | - | - | 8.9 | 8.9 |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 5.0 | - | - | 20.9 | 25.9 |
| State | - | - | - | - | - |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 5.0 | - | - | 20.9 | 25.9 |
| Private Total | - | - | - | - | - |
| Grand Total | 5.0 | - | - | 20.9 | 25.9 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 104 - Forest Land Acreage by Generalized Type and Ownership, State of Wyoming, Subregion 4, 1966

| Ownership | Commercial Forest Land | Non-Commercial Forest Land: Productive Reserved | Non-Commercial Forest Land: Unproductive Reserved | Non-Commercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 673.6 | 223.0 | - | 240.0 | 1,136.6 |
| Bureau of Land Management | .4 | - | - | 9.5 | 9.9 |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | 416.0 | 48.0 | - | 464.0 |
| Fish and Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 674.0 | 639.0 | 48.0 | 249.5 | 1,610.5 |
| State | 1.0 | - | - | .5 | 1.5 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 675.0 | 639.0 | 48.0 | 250.0 | 1,612.0 |
| Private Total | 36.0 | - | - | 5.0 | 41.0 |
| Grand Total | 711.0 | 639.0 | 48.0 | 255.0 | 1,653.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Timber Commercial forest land amounts to 2.5 million acres, principally softwoods. Douglas-fir and lodgepole pine make up the bulk of the inventoried volume with some true-fir and Engelmann spruce in the higher elevations. The remaining 1.8 million acres are noncommercial forest land, 40 percent in classified or other designated areas reserved from cutting, the balance being unproductive. There is little or no commercial forest land in Utah or Nevada.

Eithty-three percent of the commercial forest land is in the sawtimber class, 12 percent in pole timber, and 4 percent in seedlings and saplings. One percent is nonstocked. Most of the sawtimber stands, except those withdrawn from cutting in reserved areas, are available to the forest products industry on a sustained-yield basis. This amounts to some 16 billion board feet. This industry furnishes 3 percent of the total manufacturing employment in the subregion.

Forest Range Included in the forest range are 1.5 million acres classified as commercial forest land and 786,000 acres classified as noncommercial forest land. This 2.3 million acre forest range represents 54 percent of the total forest land. Most of the forest range is located in the northeastern part of the subregion with scattered areas found along the northern and southern boundaries. Approximately 85 percent of the forest range is in the national forests.

About 40 percent is in good condition, 35 percent in fair condition, and 25 percent in poor condition. Carrying capacity varies from 2 acres per AUMs to in excess of 40 acres per AUMs with an estimated average of 15 acres per AUMs for an approximate 154,000 AUMs.

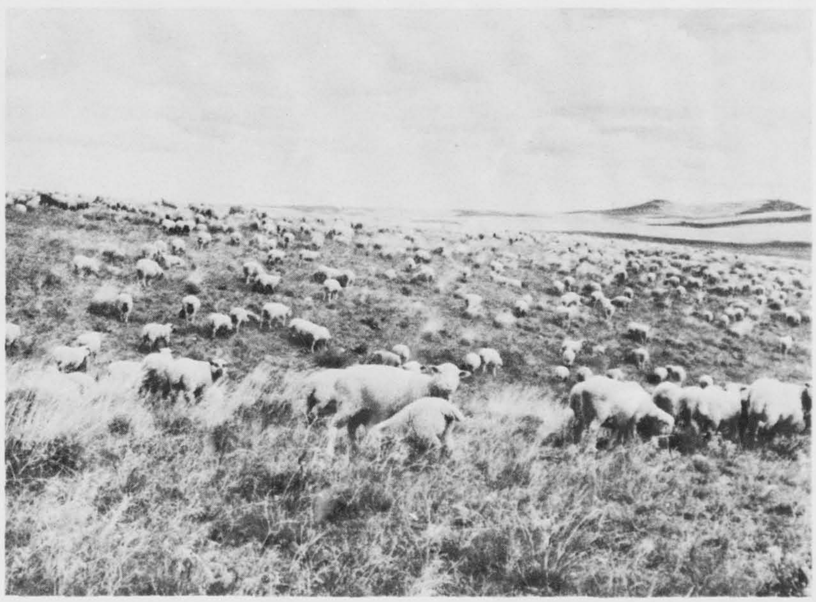
Forage species consist mainly of sagebrush, antelope bitterbrush, and mountain mahogany. Various other brush species such as ceanothus, chokecherry, elderberries, and serviceberry are also found. Grass understory is mostly bluebunch wheatgrass. Also found are pinegrass, Idaho fescue, bluegrass, and cheatgrass. Carex and various meadow species are found in the open wetter sites. Forest rangelands are located primarily on the north and east slopes and are generally characterized by moderate slopes with elevations ranging from 5,000 feet to just under 10,000 feet.

Other Uses As in other lightly timbered subregions, the forest lands are more important as watersheds than the producers of the forest industry's raw material. Only 19 percent of the land area is forested, but 52 percent of its total runoff originates there. Over 60,000 people, representing 46 percent of the area's urban population, depend on these forested watersheds for their source of domestic water.

These forest lands are also extremely important as part of the subregion's recreation resource, furnishing the environment for 57 percent of its recreation use. In 1965, over 6.7 million people visited recreational developments on the forest areas. These were nearly all on public lands with most of them going to the National Parks and National Forests. Of primary interest to the recreation visitor are the Island Park, Teton Wilderness, Grand Canyon of the Snake, Grand Teton, and a portion of Yellowstone National Park. These areas provide a variety of campgrounds, winter sports areas, and other opportunities for forest experiences. All of the forested acres provide habitat for deer, elk, moose, and many other smaller game and nongame animals. Of particular interest are the 10,000 to 13,000 elk that winter in and around the National Elk Refuge at Jackson, Wyoming, just south of Grand Teton National Park.

## Rangeland

There are 13.6 million acres of rangeland in the subregion, accounting for 60 percent of the total land area. This subregion accounts for 23 percent of all rangeland in the region. Tables 105 through 109 show the different categories of rangeland by ownership and state in the subregion.



*Typical rangelands provide seasonal forage for thousands of domestic livestock and big game in the Snake River Plains. (S.C.S.)*

Table 105 - Rangeland and Forest Range Acreage by Range Type and Ownership, Subregion 4, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Total |
| | (1,000 acres) | | | | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 1,232.7 | 766.0 | 150.2 | 58.2 | 2,207.1 | 179.6 | 489.7 | 2,876.4 |
| Sagebrush | 4,501.7 | 2,252.2 | 227.0 | 867.6 | 7,848.5 | 678.0 | 1,666.4 | 10,192.9 |
| *Brushland other than sage* | 45.3 | 302.1 | 15.0 | 20.0 | 382.4 | 26.6 | 77.5 | 486.5 |
| Total | 5,779.7 | 3,320.3 | 392.2 | 945.8 | 10,438.0 | 884.2 | 2,233.6 | 13,555.8 |
| Forest Range1/ | | | | | | | | |
| *Commercial Forest* | 47.4 | 1,093.0 | 9.5 | 161.0 | 1,310.9 | 39.5 | 179.0 | 1,529.4 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | 21.8 | - | - | - | 21.8 | - | - | 21.8 |
| Desert Fringe | 177.6 | 380.0 | 34.0 | 5.0 | 596.6 | 29.5 | 138.5 | 764.6 |
| Total (noncommercial) | 199.4 | 380.0 | 34.0 | 5.0 | 618.4 | 29.5 | 138.5 | 786.4 |
| Total (forest range) | 246.8 | 1,473.0 | 43.5 | 166.0 | 1,929.3 | 69.0 | 317.5 | 2,315.8 |
| Grand Total | 6,026.5 | 4,793.3 | 435.7 | 1,111.8 | 12,367.3 | 953.2 | 2,551.1 | 15,871.6 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 100.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 106 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Idaho, Subregion 4, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Total |
| | (1,000 acres) | | | | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 1,185.9 | 274.0 | 150.2 | 53.2 | 1,663.3 | 177.6 | 433.6 | 2,274.5 |
| Sagebrush | 3,728.4 | 1,842.5 | 227.0 | 740.7 | 6,538.6 | 654.8 | 1,527.2 | 8,720.6 |
| Brushland other than sage | 45.0 | 158.0 | 15.0 | 20.0 | 238.0 | 26.6 | 65.0 | 329.6 |
| Total | 4,959.3 | 2,274.5 | 392.2 | 813.9 | 8,439.9 | 859.0 | 2,025.8 | 11,324.7 |
| Forest Range1/ | | | | | | | | |
| Commercial Forest | 47.0 | 790.0 | 9.5 | - | 846.5 | 39.0 | 157.0 | 1,042.5 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | 18.8 | - | - | - | 18.8 | - | - | 18.8 |
| Desert Fringe | 132.2 | 233.0 | 34.0 | - | 399.2 | 29.0 | 134.0 | 562.2 |
| Total (noncommercial) | 151.0 | 233.0 | 34.0 | - | 418.0 | 29.0 | 134.0 | 581.0 |
| Total (forest range) | 198.0 | 1,023.0 | 43.5 | - | 1,264.5 | 68.0 | 291.0 | 1,623.5 |
| Grand Total | 5,157.3 | 3,297.5 | 435.7 | 813.9 | 9,704.4 | 927.0 | 2,316.8 | 12,948.2 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 100.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 107 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Nevada, Subregion 4, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Grand Total |
| | (1,000 acres) | | | | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 46.6 | 9.0 | - | - | 55.6 | - | 13.0 | 68.6 |
| Sagebrush | 728.6 | 24.0 | - | - | 752.6 | - | 63.2 | 815.8 |
| *Brushland other than sage* | - | 27.5 | - | - | 27.5 | - | - | 27.5 |
| Total | 775.2 | 60.5 | - | - | 835.7 | - | 76.2 | 911.9 |
| Forest Range1/ | | | | | | | | |
| Commercial Forest | - | 3.0 | - | - | 3.0 | - | 4.0 | 7.0 |
| Noncommercial forest | | | | | | | | |
| Sub-alpine | - | - | - | - | - | - | - | - |
| Desert Fringe | 30.0 | 4.0 | - | - | 34.0 | - | 2.0 | 36.0 |
| Total (non commercial) | 30.0 | 4.0 | - | - | 34.0 | - | 2.0 | 36.0 |
| Total (forest range) | 30.0 | 7.0 | - | - | 37.0 | - | 6.0 | 43.0 |
| Grand Total | 805.2 | 67.5 | - | - | 872.7 | - | 82.2 | 954.9 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 100.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 108 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Utah, Subregion 4, 1966

| Category | Federal | | | | | Non-Federal | | |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | Total |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | - | 3.0 | - | - | 3.0 | - | 28.1 | 31.1 |
| Sagebrush | 42.1 | 16.7 | - | - | 58.8 | 22.2 | 69.0 | 150.0 |
| Brushland other than sage | - | 10.0 | - | - | 10.0 | - | 12.5 | 22.5 |
| Total | 42.1 | 29.7 | - | - | 71.8 | 22.2 | 109.6 | 203.6 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | - | 5.0 | - | - | 5.0 | - | - | 5.0 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | - | - | - | - | - | - | - |
| Desert Fringe | 8.9 | 12.0 | - | - | 20.9 | - | - | 20.9 |
| Total (noncommercial) | 8.9 | 12.0 | - | - | 20.9 | - | - | 20.9 |
| Total (forest range) | 8.9 | 17.0 | - | - | 25.9 | - | - | 25.9 |
| Grand Total | 51.0 | 46.7 | - | - | 97.7 | 22.2 | 109.6 | 229.5 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics on table 100.

Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 109 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Wyoming, Subregion 4, 1966

| Category | Federal | | | | | Non-Federal | | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | |
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | .2 | 480.0 | - | 5.0 | 485.2 | 2.0 | 15.0 | 502.2 |
| Sagebrush | 2.6 | 369.0 | - | 126.9 | 498.5 | 1.0 | 7.0 | 506.5 |
| Brushland other than sage | .3 | 106.6 | - | - | 106.9 | - | - | 106.9 |
| Total | 3.1 | 955.6 | - | 131.9 | 1,090.6 | 3.0 | 22.0 | 1,115.6 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | .4 | 295.0 | - | 161.0 | 456.4 | .5 | 18.0 | 474.9 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | 3.0 | - | - | - | 3.0 | - | - | 3.0 |
| Desert Fringe | 6.5 | 131.0 | - | 5.0 | 142.5 | .5 | 2.5 | 145.5 |
| Total (noncommercial) | 9.5 | 131.0 | - | 5.0 | 145.5 | .5 | 2.5 | 148.5 |
| Total (forest range) | 9.9 | 426.0 | - | 166.0 | 601.9 | 1.0 | 20.5 | 623.4 |
| Grand Total | 13.0 | 1,381.6 | - | 297.9 | 1,692.5 | 4.0 | 42.5 | 1,739.0 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 100.

Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Rangeland is generally distributed throughout the subregion except for the forested northeastern portion and the concentrations of cultivated cropland directly adjacent to the Snake River.

About 2.5 million acres or 19 percent of the range is in good condition, 8.6 million acres or 63 percent is in fair condition, and 2.5 million acres or 18 percent is in poor condition. The estimated carrying capacity is 1.9 million AUMs, with the private range accounting for 20 percent and the public range 80 percent.

The Federal Government has jurisdiction over 10.4 million acres or 77 percent of the range, with 5.8 million acres administered by the Bureau of Land Management, 3.3 million acres managed by the Forest Service, and 1.4 million acres controlled by other Federal agencies. Privately owned range amounts to 2.2 million acres and 884,000 acres are in state and local government ownership.

Grasslands which include perennial grasses and forbs and small areas of meadowland occupy 2.9 million acres and account for 21 percent of the total. It is estimated that 50 percent of this range is in good condition, 45 percent in fair condition, and 5 percent in poor condition. The predominant grasslands of the area lie within the lava plains of the west-central portion of the subregion. The grasslands are located in the 8-inch to 16-inch rainfall areas. The annual grass-forb type is confined to those areas which have been misused. The meadow type, which lies either within the forest types or in moist drainage bottoms, occupies a relatively small percent of the broad category.

Rangelands which are dominated by sagebrush and similar shrubs cover 10.2 million acres and account for 75 percent of range in the subregion. It is estimated that 10 percent of the range is in good condition, 70 percent in fair condition, and 20 percent in poor condition. The sagebrush type, including rabbitbrush and other desert shrubs, occupies level to rather steep terrain on all expanses to an elevation of 7,000 feet. Precipitation in this zone ranges from 8 to 20 inches, with the greater portion coming as snow or winter rain. Drouths during the summer are common.

The "other brush" cover type includes all lands where shrubs other than sagebrush dominate the aspect of the vegetation. This cover type characteristically occupies the foothills, and plateau areas, covering some 487,000 acres and accounting for less than 4 percent of the total range. It is estimated that 10 percent is in good condition, 30 percent in fair condition, and 60 percent in poor condition. Annual precipitation may vary from 6 to 30 inches with the greater part occurring during the winter months as snow. This type may be found in small scattered areas from the driest deserts to the coniferous forest and within the grassland and sagebrush types.

## Other Land

The other land use in the Upper Snake Subregion consists of 1,047,800 acres or about 4.5 percent of the land area. This includes barren land and rockland in alpine areas that make up about 79 percent of the other land total. About 18 percent of the total is urban, industrial areas, farmsteads, airports, roads, and other miscellaneous use areas. About 3 percent consists of water areas less than 40 acres and streams less than one-eighth mile wide. Table 110 shows the other land acreage by states and the total and proportionate extent in the subregion.

Table 110 - Other Land, Subregion 4, 1966

| Kinds of Land Use | Idaho | Wyoming | Nevada | Utah | Total | Percent |
|---|---|---|---|---|---|---|
| | | (1,000 acres) | | | | |
| Barren | 550.0 | 276.0 | 2.6 | 2.8 | 831.4 | 79.3 |
| Roads and Railroads | 70.9 | 8.7 | 1.7 | .2 | 81.5 | 7.8 |
| Small water1/ | 11.6 | 15.0 | 1.3 | .1 | 28.0 | 2.7 |
| Miscellaneous2/ | 96.0 | 10.6 | .2 | .1 | 106.9 | 10.2 |
| Total other land | 728.5 | 310.3 | 5.8 | 3.2 | 1,047.8 | 100.0 |

1/ Water areas less than 40 acres in size and streams less than one-eighth mile in width.
2/ Includes urban and industrial areas, farmsteads, airports, and other areas.
Source: Compiled by Soil Conservation Service Columbia-North Pacific River Basin Staff.

*Barren sand dune land has some use for recreation and aesthetic values. (S.C.S.)*

## MINERAL RESOURCES

About one-half of the Idaho part of the subregion north of the Snake River is in the Snake River Plains underlain by basalts and interlayered sedimentary rocks of Quaternary and late Tertiary age. Rising from the plains in the northwest part of the subregion is a mountainous area, drained by the Wood and Little Wood Rivers, that is largely underlain by Challis volcanics of Tertiary age and by Palezoic sedimentary rocks. Adjoining on the northeast is a less rugged, more rolling mountainous topography drained by the Lost, Henry's Fork, and Teton Rivers, and by Birch, Medicine Lodge, and Camas Creeks. This region is underlain by Paleozoic sedimentary rocks and Tertiary volcanic rocks related to the Snake River basalt Bedrock is covered over large areas by Quaternary alluvial deposits of sand, silt, and gravel of fluvial and outwash origin. Rising to the east of this region in Wyoming is the rugged Teton Range composed of crystalline and metasedimentary rocks of Precambrian age flanked by Palezoic and Carboniferous sedimentary rocks. Younger Mesozoic sedimentary rocks occur in the Buffalo and Gros Ventre River drainages to the east, and Tertiary sediments are present in headwaters of the Hoback River drainage. Paleozoic and Mesozoic sedimentary rocks are exposed in the Greys River drainage. In the Blackfoot River drainage, Permian and Carboniferous sedimentary rocks together with Snake River basalt and associated volcanic rocks predominate. South of the Snake in the Portneuf, Raft River, and Falls Creek drainages, the rocks are predominantly sedimentary of Permian and Carboniferous age together with large areas of Snake River basalt and associated volcanics.

In recent years, by far the most valuable mineral production has been phosphate rock occurring in the Permian sediments. This is the center of the western phosphate industry where production of phosphate fertilizers, elemental phosphorus, and phosphoric acid has been increasing from year to year.

An important area of metallic mineral deposits with a substantial record of past production is in the northwestern part of the subregion in the Wood, Little Wood, Big and Little Lost Rivers, and Birch Creek drainages. The principal metals present are silver, lead, zinc, gold, and copper. A commercially producing barite deposit is also present, along with several tungsten occurrences.

Coal fields in the Teton River Basin have been the most productive in the State of Idaho.

### Metals

As in other parts of the Columbia-North Pacific Region, the first prospectors in the Upper Snake River Subregion were looking for gold, principally placer deposits where gold was easily recovered. Many gold placer deposits are present on the main stem of the Snake River or on tributary streams nearby from Jackson Lake, Wyoming, downstream to the western boundary of the subregion at Upper Salmon Falls. Twelve or more localities have been mined at some period in the past, and have produced a moderate amount of gold. The gold particles are generally very fine, and recovery was often difficult. Early production records were inadequate and probably do not represent the total output. The total recorded gold production from Snake River placers was about 50,000 to 70,000 ounces. There has been little activity since the 1930's. The approximate locations of Snake River placers and principal mining districts are shown on figure 21 and described in table 111.

In the Wood River drainage, the Camas-Soldier-Willow Creek District has produced about 102,000 ounces of gold, more than 100,000 ounces of silver, 1,000 tons of lead, 1,000 tons of zinc, and a minor amount of copper, mostly from lode deposits. Most of the production was before 1910.

The Mineral Hill District near Hailey and Bellevue has been a major silver-lead-zinc producer and is presently active with a modern concentrator located near Bellevue. This district has produced more than 5 million ounces of silver, 50,000 tons of lead, 50,000 tons of zinc, 500 tons of copper, and some byproduct gold from lode deposits.

Also the Warm Springs District near Ketchum has been an outstanding silver-lead-zinc producer with a record of more than 5 million ounces of silver, 50,000 tons of lead, 50,000 tons of zinc, and 2,000 tons of copper with about 76,000 ounces of gold produced as a byproduct. Additional minerals occurring in the Wood River Basin include barite, tungsten, antimony, and others.

The Muldoon and Lava Creek districts on Little Wood River and Antelope Creek have produced more than 100,000 ounces of silver, 1,000 tons of lead, 1,000 tons of zinc, and a small amount of copper. Barite, tungsten, and manganese deposits are also present.

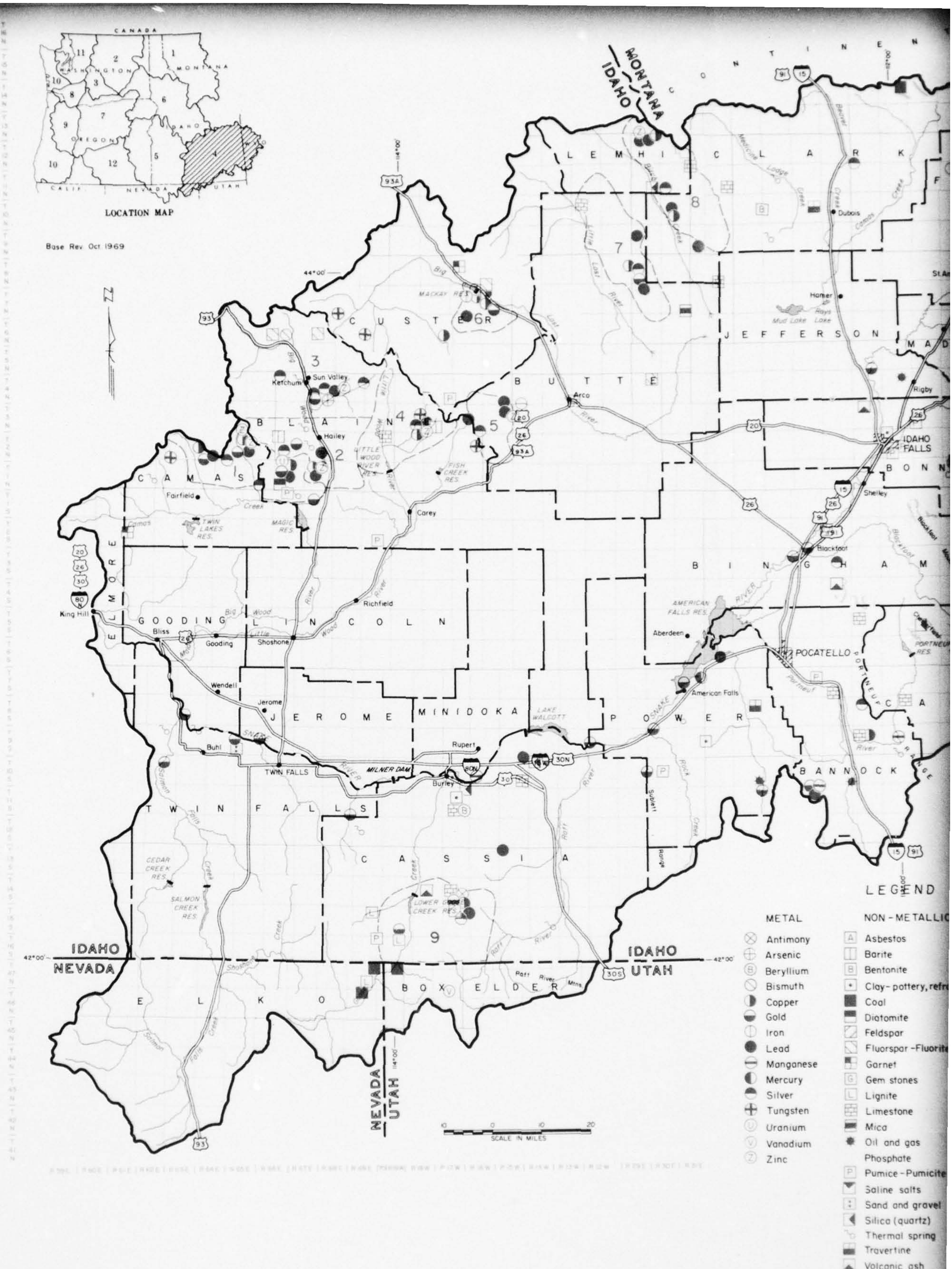
In the Big Lost Creek drainage, the Alder Creek District near Mackay has been a major Idaho copper producer. About 29,000 tons of copper, 34,000 ounces of gold, more than 100,000 ounces of silver, 1,000 tons of lead, and 1,000 tons of zinc have come from this district. There are also iron deposits related to the copper lodes that have a good potential as a future source of iron ore, and also some tungsten.

In the Little Lost River drainage, the Dome-Hamilton Districts have produced about 50 tons of copper, some byproduct gold, more than 100,000 ounces of silver, and 1,000 tons of lead.

Table 111 - Mining Districts, Subregion 4

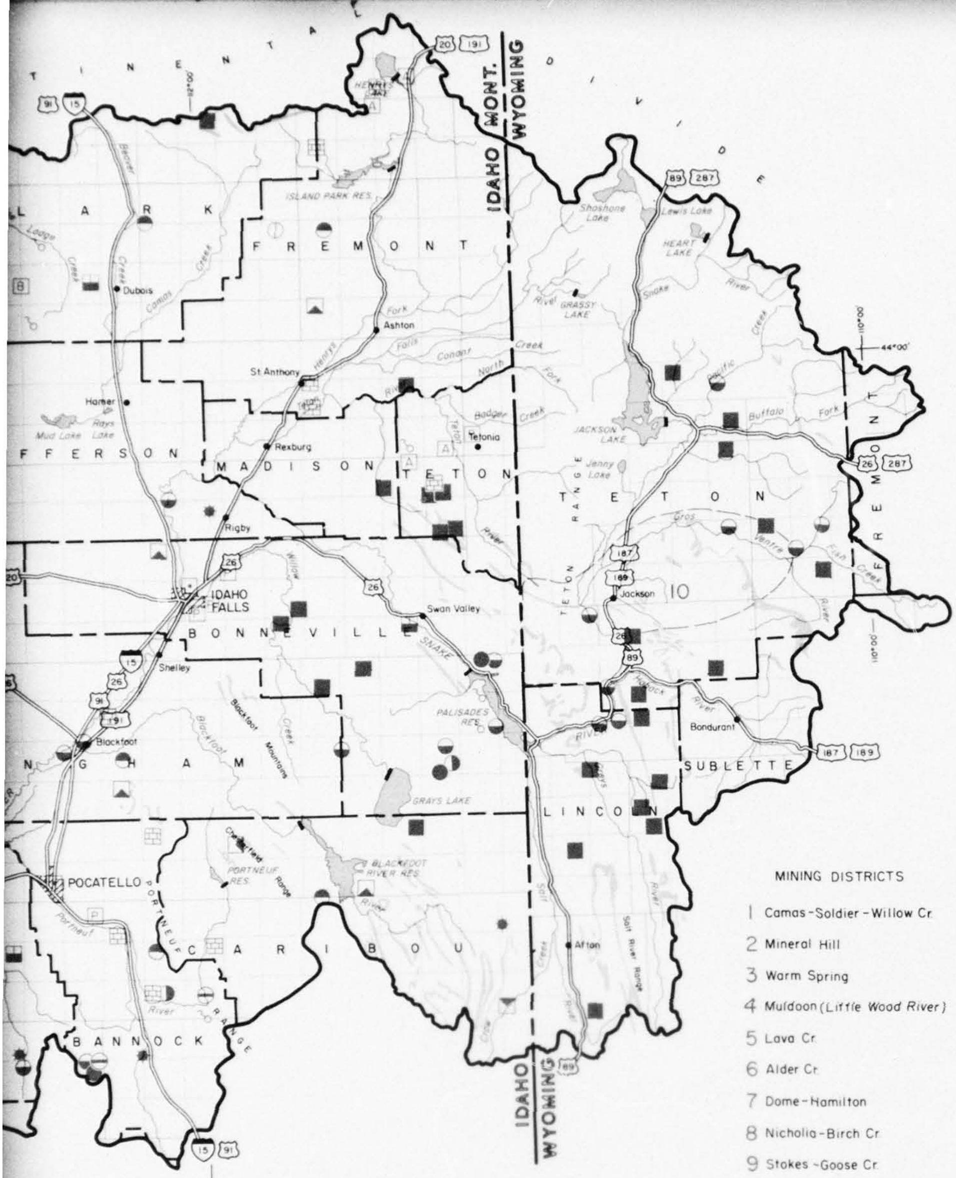
| Index No. Fig. | District | County | Drainage | Size of Districts - Production Plus Potential Reserves 1/ Gold | Silver | Copper | Lead | Zinc | References |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Camas-Soldier-Willow Creek | Idaho Camas-Blaine | Soldier, Willow, Brush, and Rock Creeks, tributaries to Camas Creek. Lode deposits with some placer | 1 1/ | 2 1/ | - | 3 1/ | 3 1/ | Anderson, A.L., and Wagner, 1946. Idaho Bur.Mines & Geol. Pamph. 76, pp. 4-10 |
| 2 | Mineral Hill | Blaine | Lode deposits near Lower Wood River and tributaries | - | 1 | 3 1/ | 2 | 2 | do |
| 3 | Warm Spring | do | Lode deposits near Upper Wood River and tributaries | 2 | 1 | 3 | 2 | 2 | do |
| 4 | Muldoon (Little Wood River) | do | Lode deposits near Copper Creek and Little Wood River | - | 2 | - | 2 | 2 | Anderson, A.L., and Wagner, 1946. Idaho Bur.Mines & Geol.Pamph. 75, 22 pp. |
| 5 | Lava Creek | Butte-Blaine | Lode deposits at head of Antelope Creek and Dry Creek tributary | - | 2 | - | 3 | 3 | Anderson, A.L., 1929, Idaho Bur. Mines & Geol. Pamph. 32, 69 pp. |
| 6 | Alder Creek | Custer | Lode deposits on Alder and Cliff Creeks tributaries to Big Lost River | 2 | 2 | 2 | 3 | 3 | Umpleby, J.B., 1917, U.S. Geol. Survey Prof. Paper 97 |
| 7 | Dome-Hamilton | Butte | Lode deposits in Little Lost River Basin | 3 | 2 | 3 | 3 | - | Ross, C.P., 1933 Idaho Bur. Mines & Geol.Pamph. 39 |
| 8 | Nicholia-Birch Creek | Lemhi-Clark | Lode deposits in the Birch Creek Basin | - | 2 | 3 | 3 | 3 | Anderson, A.L., and Wagner, 1944 Idaho Bur. Mines & Geol.Pamph 70, 43 pp. |
| 9 | Stokes-Goose Creek | Cassia | Lode deposits at head of Raft River and placer deposits on Goose Creek | 3 | 3 | 3 | 3 | - | |
| 10 | Jackson Hole | Teton-Wyo. | Disseminated gold in Pinyon Conglomerate | 1 | - | - | - | - | Antweiler, J.C., and Love, 1967. U.S.Geol.Survey Circ. 541, 12 pp. |

| 1/ Size Index | Gold (Troy Ounces) | Silver (Troy Ounces) | Copper (Net Tons) | Lead (Net Tons) | Zinc (Net Tons) |
|---|---|---|---|---|---|
| 1 | 100,000-1,000,000 | 5,000,000-50,000,000 | 100,000-1,000,000 | 100,000-1,000,000 | 100,000-1,000,000 |
| 2 | 10,000- 100,000 | 100,000- 5,000,000 | 10,000- 100,000 | 10,000- 100,000 | 10,000- 100,000 |
| 3 | 1,000- 10,000 | 1,000- 100,000 | 1,000- 10,000 | 1,000- 10,000 | 1,000- 10,000 |



LOCATION MAP
CANADA
WASHINGTON
MONTANA
OREGON
IDAHO
CALIF.
NEVADA
UTAH
Base Rev. Oct 1969
MONTANA
IDAHO
CONTINENTAL
LEMHI
CLARK
CUSTER
BUTTE
JEFFERSON
BLAINE
CAMAS
ELMORE
GOODING
LINCOLN
BINGHAM
JEROME
MINIDOKA
POWER
BANNOCK
TWIN FALLS
CASSIA
ELKO
BOX ELDER
IDAHO
NEVADA
IDAHO
UTAH
NEVADA
UTAH
Ketchum
Sun Valley
Hailey
Fairfield
Carey
Arco
Dubois
Rigby
IDAHO FALLS
Shelley
Blackfoot
Aberdeen
POCATELLO
American Falls
Richfield
King Hill
Bliss
Gooding
Shoshone
Wendell
Jerome
Buhl
TWIN FALLS
MILNER DAM
Rupert
Burley
MACKAY RES.
TWIN LAKES RES.
MAGIC RES.
FISH CREEK RES.
AMERICAN FALLS RES.
LAKE WALCOTT
CEDAR CREEK RES.
SALMON CREEK RES.
LOWER GOOSE CREEK RES.
Mud Lake
SCALE IN MILES
LEGEND
METAL
Antimony
Arsenic
Beryllium
Bismuth
Copper
Gold
Iron
Lead
Manganese
Mercury
Silver
Tungsten
Uranium
Vanadium
Zinc
NON-METALLIC
Asbestos
Barite
Bentonite
Clay-pottery, refr
Coal
Diatomite
Feldspar
Fluorspar-Fluorite
Garnet
Gem stones
Lignite
Limestone
Mica
Oil and gas
Phosphate
Pumice-Pumicite
Saline salts
Sand and gravel
Silica (quartz)
Thermal spring
Travertine
Volcanic ash

2




MINING DISTRICTS

1 Camas-Soldier-Willow Cr.
2 Mineral Hill
3 Warm Spring
4 Muldoon (Little Wood River)
5 Lava Cr.
6 Alder Cr.
7 Dome-Hamilton
8 Nicholia-Birch Cr.
9 Stokes-Goose Cr.
10 Jackson Hole

LEGEND

METAL
- Antimony
- Arsenic
- Beryllium
- Bismuth
- Copper
- Gold
- Iron
- Lead
- Manganese
- Mercury
- Silver
- Tungsten
- Uranium
- Vanadium
- Zinc

NON-METALLIC
- Asbestos
- Barite
- Bentonite
- Clay-pottery, refractory (other than alumina)
- Coal
- Diatomite
- Feldspar
- Fluorspar-Fluorite
- Garnet
- Gem stones
- Lignite
- Limestone
- Mica
- Oil and gas
- Phosphate
- Pumice-Pumicite
- Saline salts
- Sand and gravel
- Silica (quartz)
- Thermal spring
- Travertine
- Volcanic ash

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# MINERAL RESOURCES AND MINING DISTRICTS

UPPER SNAKE, SUBREGION 4

FIGURE 21

The Nicholia-Birch Creek District, in the Birch Creek drainage, has produced 280 tons of copper, more than 100,000 ounces of silver, 1,000 tons of lead, and 1,000 tons of zinc.

Most of the manganese production in Idaho has come from the Lava Hot Springs District in the Portneuf River Basin and the Cleveland District in the Bear River Basin. Production of manganese in Idaho has been approximately 12,000 tons.

A small production of gold, silver, copper, and lead has come principally from a mine in the Stokes District near the head of the Raft River and from the Goose Creek placers south of Burley. A few flasks of mercury have also been produced in this district.

In Wyoming, a small amount of gold has come from placers on the Snake River and on the Hoback and Gros Ventre Rivers, tributaries to the Snake. The gold in this area is similar to that in Idaho, occurring in very fine particles, difficult to recover. A large area underlain by conglomerate of Paleocene age northeast of Jackson, Wyoming, has a very low grade but widespread gold content. This conglomerate is presently being investigated by the U.S.D.I. Geological Survey as a future source of gold (table 111).

## Nonmetals

Principal nonmetallic mineral deposits are phosphate rock, sand and gravel, stone, clay, barite, pumice, perlite, and volcanic cinder. Of minor occurrence are gem stones, nitrate, fluorspar, feldspar, gypsum, and salt. Currently, in the subregion, the major mineral production for total value is phosphate rock. Enormous reserves, probably in the range of 6 billion tons of minable phosphate rock, exist in the eastern part of the subregion in the Snake, Blackfoot, Teton, and Portneuf River basins in Idaho, and the Snake, Salt, Greys, and Hoback River basins in Wyoming. This is 50 to 60 percent of the total national resources of phosphate rock. From 1920 to 1964, total production of phosphate rock exceeded 22 million long tons valued at more than $100 million. The distribution of phosphate outcrops is shown in figure 21. The phosphate rock mined in Bingham and Caribou counties, Idaho, contains minor amounts of vanadium and uranium. Vanadium pentoxide is recovered by processing ferrophosphorus. Total production to 1964 has been 1,000 tons of contained vanadium. No recovery of the uranium has been made to date, although the total amount of uranium in phosphate rock deposits is enormous.

Sand and gravel deposits are plentiful, occurring along the Snake River and its tributaries as terraces and bars bordering the rivers. Where convenient to a market, the deposits are exploited.

Basalt is quarried for crushed stone for road material at relatively few localities; two or three quarries are located in the Teton River drainage east of Rexburg. Limestone deposits are widespread. The largest production is probably in the Portneuf River drainage near Pocatello, where a large deposit is quarried for cement. Quartzite is also quarried near Pocatello and in other places in the phosphate district in southeastern Idaho for use in the elemental phosphorus furnaces. Pumice and volcanic cinder deposits are widespread, and resources are very large in southeastern Idaho in the Blackfoot, Portneuf, and Raft River drainages. Only small amounts are used for road material and lightweight building blocks despite the enormous resources that are available.

Clay is mined for common brick and tile near Burley and Idaho Falls, Idaho. It is an alluvial, silty clay from the Snake River flood plain.

Barite deposits are found in the Wood River drainage near Hailey and in the Little Wood River drainage near Muldoon. The Sun Valley barite mine near Hailey has been the largest producer in Idaho. Production is limited by the available market. Resources are adequate for much greater output. A small amount of barite was produced in the Muldoon area in 1950, but again output was very limited due to the market availability.

## Mineral Fuels

Coal is the only significant mineral fuel occurring in the subregion. Most of the production has come from the Horseshoe Creek District in the Teton River Basin near Driggs, Idaho. This field has produced about 100,000 tons mostly from the Horseshoe and Brown Bear mines. The coal was of good quality, but was difficult and costly to mine because of the physical nature of the deposits. The coal field covers about 6 square miles and contains an estimated 8 to 10 million tons of coal. The Pine Creek District is south of the Horseshoe Creek District and is part of the Teton Basin field.

The Willow Creek-Caribou District is in the Willow Creek-Gray's Lake outlet drainage east of Idaho Falls. The coal is very poor quality; only a small amount has been mined for local use.

Coal beds up to 2 feet in thickness are exposed in northern Fremont County at the head of Cottonwood Creek. The coal is of good quality, ranking from subbituminous to bituminous. No production has been recorded from this area.

The Goose Creek coal field is in the Goose Creek drainage south of Burley, Idaho. It is near the southern boundary of Idaho and extends into northern Utah and Nevada. The field covers about

260 square miles. The coal beds consist of carbonaceous shales and lignite, some of which contain a minor amount of uranium. The beds range from 1 foot to 10 feet in thickness. A small amount has been mined for local use.

The Jackson Hole coal field is in the basin of the headwaters of the Snake and in the Buffalo Fork drainage east of Jackson Lake, Wyoming; it covers an area of about 700 square miles and contains an estimated 121 million tons of subbituminous coal. No significant production has come from this field.

Part of the Hams Fork coal area is in the Hoback, Snake, Grey's, and Salt River basins south of Jackson, Wyoming. Most of the coal reserves in this area are in the Kemmerer field south of the subregion, and most of the production has come from outside the subregion.

Oil and gas have not been produced, although favorable formations in southeastern Idaho and adjoining Wyoming have been test drilled.

## Present Mineral Industry and Outlook for the Future

### Metals

Gold The principal gold-producing areas in the Upper Snake Subregion are in Blaine and Camas counties, Idaho, and from Snake River placers on the Snake and its tributaries in Idaho and Wyoming. Currently, the gold production is at an alltime low (total gold production in Idaho for 1966 was only 5,056 ounces valued at $177,000). This low output is due in part to the imbalance between the price of gold and costs of production. With a change in the unfavorable economic climate for gold similar to that during the 1930's and early 1940's, gold production would doubtless increase substantially.

Present gold production is chiefly that recovered as a byproduct from the mining of ores containing silver, lead, and zinc. In 1965, Blaine, Camas, Jerome, and Twin Falls counties in Idaho and Teton County, Wyoming, reported some gold production. The production in the Blaine and Camas counties was from lode deposits of silver, lead, and zinc ores, and the production in Jerome, Twin Falls, and Teton counties was from Snake River placers.

Silver, Lead, and Zinc The Federal Resources Corporation's new concentrating mill located at Bellevue, Blaine County, mills silver-lead-zinc ores from the Silver Star-Queens mine and from several smaller mines and mine dumps in the area. It is the largest silver producer in Idaho outside the Coeur d'Alene District, and also had a substantial production of lead, zinc, and a small output of gold and copper in 1965 and 1966. Production figures are not disclosed. Camas County also reported a production of 5,900 ounces of silver, 20 tons of lead, and 3 tons of zinc in 1965. The Mineral Hill-Warm Springs districts in Blaine County, the Alder Creek District, Custer County, the Lava Creek and Dome districts, Butte County, and Nicholia-Birch Creek District in Lemhi County have the greatest future potential for silver-lead-zinc production in the subregion.

Copper Principal copper production comes from the Alder Creek District near Mackay, Custer County. The Empire mine operated during 1965, producing about 300 tons of copper. Some byproduct copper comes from silver-lead-zinc ores produced in Blaine, Butte, and Camas counties. Potential for future copper production rests mainly with further developments in the Mackay area, Custer County. The Nicholia-Birch Creek District produced mostly copper ores, but there has been little recent activity, and the future is uncertain. Some copper will continue to come from those areas producing mainly silver-lead-zinc.

Manganese Except for a small amount from one deposit in Washington County, virtually all the manganese production in Idaho amounting to about 12,000 tons has come from deposits in this subregion. These deposits are near Cleveland in Franklin County, near Lava Hot Springs in Bannock County, and in the Lava Creek District, Butte County. No manganese has been produced from these deposits since U.S. Government buying and stockpiling ceased in the late 1950's. Production is not presently economically feasible; future potential depends on strategic need or unavailability of manganese from other world sources.

Tungsten Principal tungsten production has come from deposits in Custer County. In the Alder Creek District tungsten is a byproduct of copper ore in the Empire, Phoenix, Vaught, Copper Queen, and Harris mines. The tungsten mineralization is very localized. Production has been in the range of 1,000 to 63,000 units (a unit equals 20 pounds of $WO_3$). In the Wildhorse District, production has been in the same range. Tungsten mineralization is also found in Blaine, Camas, and Butte counties, but very little production has come from these areas. Much of the tungsten mineralization has been found or recognized only in the past

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20 years, and there has been little production, largely because of economic factors. Potential for future production is good under an improved economic relationship between price and production costs.

Iron Ore Magnetite and hematite iron ore is found associated with the copper deposits in the Mackay District, Custer County. A few hundred tons have been shipped for use as heavy aggregate in concrete. There is a potential for the development of a substantial tonnage if a profitable market were available for the ore.

Vanadium and Uranium Vanadium and uranium occur in minor amounts in phosphate rock mined in Bingham and Caribou counties. Part of the vanadium is recovered as a ferrophosphorus byproduct. About 1,000 tons of contained vanadium (about 1.5 percent of the total United States production) was recovered in 1964. The production for 1965 more than doubled the production in 1964. Up to now, no attempt has been made to recover the uranium content, although the potential resource is very large.

## Nonmetals

Phosphate Rock Bingham, Caribou, and Bannock counties are the center of the western phosphate industry. This is one of the fastest growing industries in the west. Idaho production of phosphate rock, all from within the subregion, has been a total of more than 22 million long tons. The production for 1965 was 3.7 million long tons. All of this output came from four large surface mines in Bingham and Caribou counties.

The phosphate rock is used to produce phosphate fertilizers, elemental phosphorus, and phosphoric acid.

The Gay and Conda mines in Bingham and Caribou counties, respectively, are operated by J. R. Simplot Company. This firm produces phosphate fertilizers and phosphoric acid at its fertilizer plant at Pocatello. The Ballard mine near Conda, Caribou County, is operated by Monsanto Company, which produces elemental phosphorus at its elemental phosphorus plant at Soda Springs. The El Paso Products Company operated the Mabie Canyon mine in Caribou County and constructed a new fertilizer plant near Conda but has recently ceased operation. Reserves of phosphate rock are adequate for many years in the future.

No phosphate rock has been produced recently from the large areas of phosphate deposits in the Wyoming part of the subregion. However, active exploration projects are being pursued by several large companies. The Wyoming phosphate resources are large, and potential for future production is good.

Sand and Gravel Production of sand and gravel ranks second to phosphate rock in tonnage and value. Idaho production in 1965 for highway purposes (largely contractor produced for Federal, State, and county agencies) accounted for 5.9 million tons, and commercial production was 2.8 million tons. Bannock County was the largest producer with output exceeding 1.6 million tons. Production in Bonneville, Clark, Fremont, and Twin Falls counties exceeded 500,000 tons each. Sand and gravel production in the Wyoming part of the subregion was about 200,000 tons in 1964.

Sand and gravel is a low-value product and must be produced near the consumer; the price ranges from $0.80 to $1.25 per short ton. Adequate supplies are available for future demand except in local areas where other land uses conflict with sand-gravel operations. Future production will, as in the past, be contingent on the demand by the construction industry.

Stone Principal limestone production is at Inkom, Bannock County, where the Idaho Portland Cement Company's quarry produces cement rock for the portland cement processing plant adjoining the quarry site. This plant has a reported capacity of 950,000 barrels of cement per year and utilizes about 180,000 tons of limestone produced in its quarry. Limestone is calcined for use as lime in sugar refining in Twin Falls, Minidoka, and Bonneville counties; quarries are located in the Goose Creek, Henry's Fork, and Portneuf River drainages. Production data are not available.

Quartzite is quarried at Inkom, Pocatello, and at Soda Springs for use as silica flux in the phosphate furnaces. Annual production is about 100,000 tons.

A minor amount of crushed stone (basalt, quartzite, and limestone) is quarried mostly by contractors (noncommercial) for state and county agencies and utilized for road surfacing material. Future potential for production of stone will be contingent on the market for its products. Resources are adequate for all foreseeable future demands.

Travertine, processed for decorative building stone, is quarried northeast of Dubois and near Swan Valley, Idaho, by the Idaho Travertine Corporation.

Pumice, Perlite, and Volcanic Cinder Pumice, perlite, and volcanic cinder are all closely related as they are all products of volcanic activity. Principal pumice-producing areas are near Idaho Falls and Ammon where the Idaho Falls Pumice Company and Idaho Concrete Products, Inc., produce a small tonnage of pumice or pumicite, mostly for use as aggregate in lightweight concrete blocks manufacture.

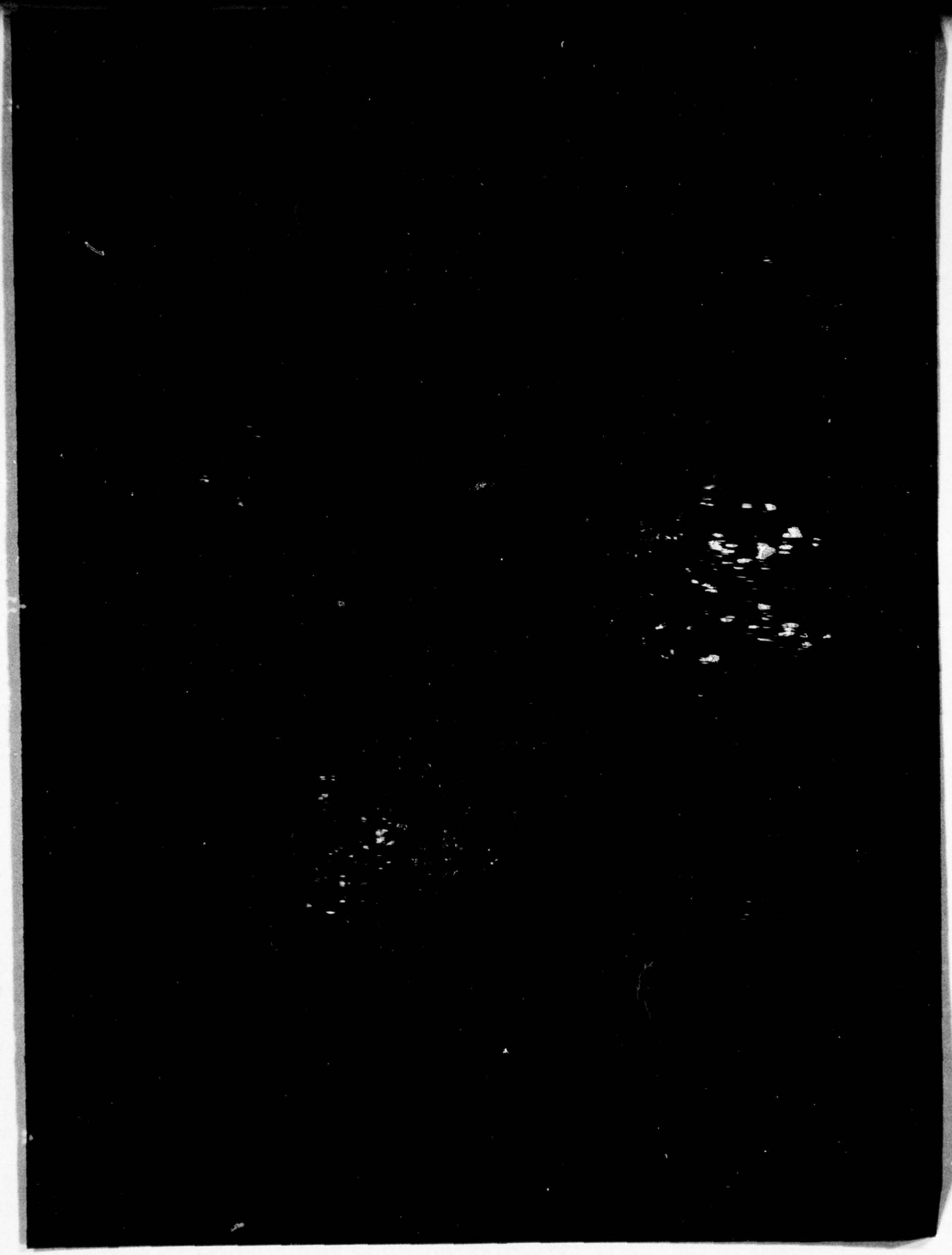
Perlite is mined from a deposit about 25 miles north of Malad, Oneida County, by the Oneida Perlite Corporation; the mined perlite is expanded to produce a lightweight aggregate. A small amount of pumice is also produced from the Wrights Creek deposit near Malad.

Volcanic cinders are produced for road material at several locations. There are enormous quantities of volcanic cinders and substantial resources of pumice in the subregion. Production has been relatively insignificant because the utilization of these resources within the marketing range of the deposits has been small. Some potential uses, as for pozzolan, have not been developed. Future production will depend on development of wider markets and new uses. The resources are large enough for greatly increased production.

Barite Barite was mined intermittently from 1922 to 1959. The production in 1959 was about 25,000 tons. Most of the production has come from the Sun Valley mine near Hailey, Idaho, operated by the J. R. Simplot Company. Some barite has been shipped from stockpiles at the mine since 1959, but the mine has been idle. A small amount of barite was mined for the Muldoon District in Blaine County in 1959. Barite is a low-value commodity, and the cost of transportation from the Idaho deposits to the major markets discourages production. The Sun Valley mine contains adequate reserves for a significant future production if a profitable market can be developed.

Clay In 1965, miscellaneous clay suitable for making heavy clay products such as common brick, tile, and pipe was produced from pits in Cassia, Minidoka, and Bonneville counties. The Burley Brick and Sand Company operates a brick plant at Burley and obtains its raw clay from nearby pits in Cassia and Minidoka counties. The Idaho Falls Brick and Tile Company operates a brick plant at Idaho Falls and produces about 4 million bricks annually; raw clay is obtained from pits at Ammon and Bone east of Idaho Falls. The resources of miscellaneous clay suitable for manufacture of heavy clay products are virtually inexhaustible. Depletion of local pits or changing requirements may require occasional adjustments in the source of raw materials. The future potential of clay production is contingent on the market demands.

<u>Gem Stones</u> Gems or gem materials provide recreation for a large number of amateur collectors and "rockhounds." There are no commercial mining operations for gem stones. Agate and petrified wood are the most common gem materials; they are found in the Goose Creek, Wood River, Lost River, and Henry's Fork drainages. Total gem material collected in Idaho for 1965 was valued at about $150,000. These materials will continue to provide an interesting hobby for tourists and collectors at about the same level in the future as they have in the past.



2

# SUBREGION 5
# CENTRAL SNAKE

## ABSTRACT


The Central Snake Subregion is the largest subregion in the Columbia-North Pacific study area. It includes southwest Idaho, southeast Oregon, and a small area in the north-central part of Nevada.

The land resource of the subregion presents three main areas of use:

1. About 72 percent of the land area is rangeland. This area occurs mainly on the Owyhee uplands south and west of the Snake River and extends to the south and west side of the subregion. It is dominantly a basalt lava plain with a shallow overburden of wind deposited silt partly mixed with residuum from the bedrock. Precipitation varies generally from 9 to 16 inches, the frost-free period from 90 to 120 days, and the elevation generally averages from 2,500 to 5,000 feet above sea level. Problems of use relate to the shallow, rocky soils, the scarcity of surface and ground water, and, in places, the short growing season.

2. About 18 percent of the land area is devoted to forest cover and has a dual use for forest products and grazing for livestock. The area includes the Blue and Payette Mountains on the northwest and north margin of the subregion. This area is dominantly composed of acid igneous bedrock of granitic types with soils mostly formed in granitic residuum mixed with volcanic ash. Precipitation varies generally from 18 to 30 inches, the frost-free period ranges from 60 to 90 days, and the elevation generally averages 5,000 to 7,500 feet above sea level. Problems of use relate to the highly erodible soils and the steep broken topography.

3. Approximately 7 percent of the land area in Subregion 5 is devoted to cropland use. The cropland area is composed generally of two parts. The irrigated cropland on bottomlands, terraces, and on some fans and footslopes. Soils are generally gravelly, moderately deep and loamy on bottomlands, alluvial terraces and fans. On terraces of lake-laid sediments the soils are silty, clayey, and generally not gravelly. Generally the rainfall is not sufficient to support a prolific agriculture in these areas, even by use of a fallow-year system. On foothills and high terraces bordering the irrigated areas are isolated patches of dry farmed cropland. Generally the elevation and precipitation are higher and

grain-fallow system of agriculture can be used. Throughout the cropland area precipitation ranges from 8 to 14 inches, the frost-free period from 120 to 150 days, and the elevation generally varies from about 2,000 to 3,500 feet. Problems of use relate to shallow and rocky soils in alluvium, clayey subsoils, and restricted permeability in soils overlying basalt bedrock and old lake-laid sediments.

The 3 percent of the land area devoted to other land uses varies from barren lava flows and alpine areas associated with rangeland and forest land to the roads, farmsteads, and urban areas.

The principal metals in Subregion 5 are gold, silver, mercury, and copper. A small production of lead, zinc, and manganese has come from this area. Nonmetals of importance are sand and gravel, limestone, clay, diatomite, and silica. Mineral fuels are unimportant.

The Idaho batholith and marginal zones that cover Valley and Boise counties and extend into Elmore, Gem, and Ada counties, together with some plutons of related granitic intrusions in Owyhee, Washington, and Adams counties, contain most of the gold, silver, and copper deposits in the Idaho part of the subregion. The Bald Mountain batholith that forms the Elkhorn Mountains and other intrusive granitic igneous rocks of the Wallowa Range are the source for most of the gold and silver deposits in Baker County, Oregon. The gold, silver, and copper deposits at Mountain City and other mining districts in Elko County Nevada, are related to smaller bodies of intrusive granitic rocks.

Gold and silver have been a major contributor to the metal output. Principal producing areas have been in Boise and Owyhee counties, Idaho; Baker County, Oregon; and Elko County, Nevada. One of the most productive mercury districts in the Columbia-North Pacific Region is in Washington County, Idaho. Copper production has come principally from Washington County, Idaho, and Elko County, Nevada.

The subregion contains cement and lime plants (using limestone as raw material), a silica sand producer, and a brick and tile plant.

Mining is currently at a much reduced scale, but has potential for a substantial future mineral production.

The total area consists of more than 99 percent land and less than 1 percent water. Table 112 shows the land, water, and total acreage by states and counties. Except for table 112, the areas of land will be recorded in acreages throughout the following discussion.

Table 112 - Areas by State and County, Subregion 5, 1967

| State and County | Water Area Sq.Mi. | Water Area Acres | Land Area1/ Sq. Mi. | Land Area1/ Acres | Total Area Sq. Mi. | Total Area Acres |
|---|---|---|---|---|---|---|
| Idaho | | | | | | |
| Ada | 8.6 | 5,500 | 1,043.4 | 667,800 | 1,052.0 | 673,300 |
| Adams | 6.1 | 3,900 | 949.6 | 607,700 | 955.7 | 611,600 |
| Boise | 7.3 | 4,700 | 1,907.8 | 1,221,000 | 1,915.1 | 1,225,700 |
| Camas | .0 | 0 | 435.9 | 278,900 | 435.9 | 278,900 |
| Canyon | 19.5 | 12,500 | 578.5 | 370.200 | 598.0 | 382,700 |
| Elmore | 32.0 | 20,500 | 2,805.3 | 1,795,400 | 2,837.3 | 1,815,900 |
| Gem | 5.8 | 3,700 | 555.2 | 355,300 | 561.0 | 359,000 |
| Owyhee | 22.6 | 14,500 | 7,561.5 | 4,839,300 | 7,584.1 | 4,853,800 |
| Payette | 6.1 | 3,900 | 401.9 | 257,200 | 408.0 | 261,100 |
| Valley | 57.1 | 36,500 | 1,279.4 | 818,900 | 1,336.5 | 855,400 |
| Washington | 19.5 | 12,500 | 1,462.5 | 936,000 | 1,482.0 | 948,500 |
| Twin Falls | .0 | 0 | 71.5 | 45,800 | 71.5 | 45,800 |
| Total | 184.6 | 118,200 | 19,052.5 | 12,193,500 | 19,237.1 | 12,311,700 |
| Nevada | | | | | | |
| Elko | 3.4 | 2,200 | 3,280.7 | 2,099,600 | 3,284.1 | 2,101,800 |
| Humboldt | .0 | 0 | 348.9 | 223,300 | 348.9 | 223,300 |
| Total | 3.4 | 2,200 | 3,629.6 | 2,322,900 | 3,633.0 | 2,325,100 |
| Oregon | | | | | | |
| Baker | 22.4 | 14,300 | 3,054.2 | 1,954,700 | 3,076.6 | 1,969,000 |
| Grant | 0.2 | 200 | 390.2 | 249,700 | 390.4 | 249,900 |
| Harney | 4.1 | 2,600 | 1,309.2 | 837,900 | 1,313.3 | 840,500 |
| Malheur | 51.0 | 32,600 | 8,845.4 | 5,661,100 | 8,896.4 | 5,693,700 |
| Union | 0.4 | 300 | 261.9 | 167,600 | 262.3 | 167,900 |
| Wallowa | .0 | 0 | 15.8 | 10,100 | 15.8 | 10,100 |
| | 78.1 | 50,000 | 13,876.7 | 8,881,100 | 13,954.8 | 8,931,100 |
| Total Subregion | 266.1 | 170,400 | 36,558.8 | 23,397,500 | 36,824.9 | 23,567,900 |

1/ The term "land" is defined to include all water bodies under 40 acres and streams under one-eighth mile in width.

Source: U.S.D.A. Conservation Needs Inventory adjusted to U.S. Census.

## *LAND*

Factors of major importance to the land resource are: the ownership status, the soils, and the present use. The combination of these factors greatly influences the present and future utilization of the land resource.

### Land Ownership

The Central Snake Subregion contains almost 23.4 million acres. The largest single landowner is the Federal Government with 16.1 million acres or nearly 69 percent of the land area. Private ownerships amount to about 6.1 million acres or 26 percent of the land area. State, county, and municipal ownerships make up the balance.

Over 10.8 million acres of the public lands are Public Domain, administered by the Bureau of Land Management. Nearly 4.5 million acres are national forest. Over a half million acres are other Federal holdings administered mainly by the Bureau of Reclamation and the Department of Defense. Almost 1.2 million acres are owned by state, county, and municipal governments. About 300,000 acres are Indian Reservations.

Table 113, Land Ownership, and figure 22, Land Ownership Map, show this information in detail.

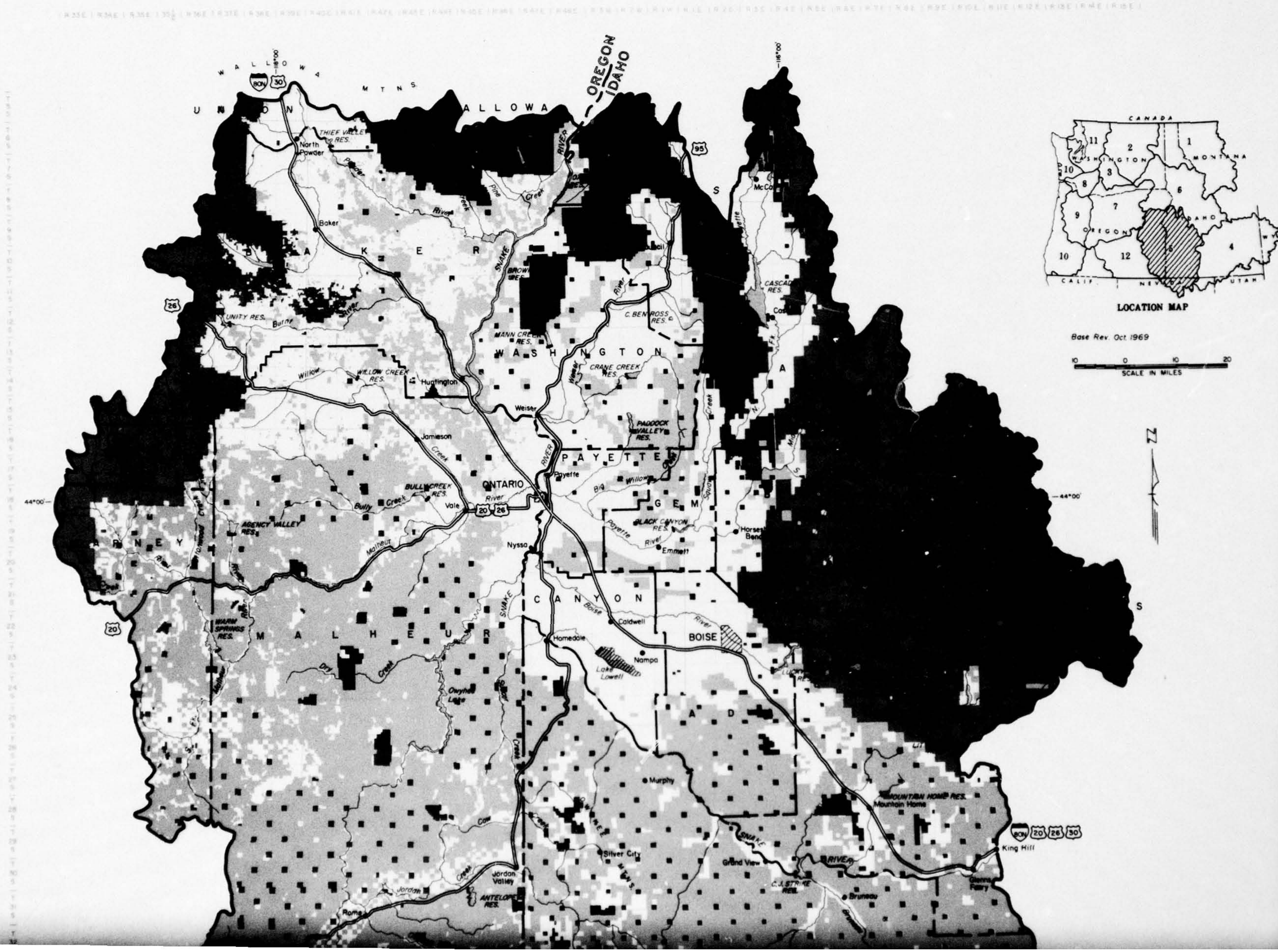
Table 113 - Land Ownership Acreage, Subregion 5, 1965

| Administering Agencies | Idaho | Oregon | Nevada | Total |
|---|---|---|---|---|
| | | (1,000 acres) | | |
| Department of Agriculture | | | | |
| Forest Service | 2,817.9 | 1,043.4 | 608.0 | 4,469.3 |
| Other Agriculture | - | - | - | - |
| *Subtotal* | 2,817.9 | 1,043.4 | 608.0 | 4,469.3 |
| Department of the Interior | | | | |
| Bureau of Land Management | 4,875.1 | 4,901.5 | 1,066.3 | 10,842.9 |
| Bureau of Indian Affairs 1/ | 145.5 | - | 144.3 | 289.8 |
| *National Park Service* | - | - | - | - |
| Fish & Wildlife Service | 1.2 | - | - | 1.2 |
| Bureau of Reclamation | 392.8 | 77.5 | - | 470.3 |
| Other Interior | - | - | - | - |
| Subtotal | 5,414.6 | 4,979.0 | 1,210.6 | 11,604.2 |
| Department of Defense | 48.1 | - | - | 48.1 |
| Other Federal | .1 | .1 | - | .2 |
| Federal Subtotal | 8,280.7 | 6,022.5 | 1,818.6 | 16,121.8 |
| State | 855.0 | 291.1 | - | 1,146.1 |
| County | 23.0 | 4.3 | - | 27.3 |
| Municipal | 10.4 | 3.8 | - | 14.2 |
| Public Non-Federal Subtotal | 888.4 | 299.2 | - | 1,187.6 |
| Total Public | 9,169.1 | 6,321.7 | 1,818.6 | 17,309.4 |
| Total Private | 3,024.4 | 2,559.4 | 504.3 | 6,088.1 |
| Grand Total | 12,193.5 | 8,881.1 | 2,322.9 | 23,397.5 |

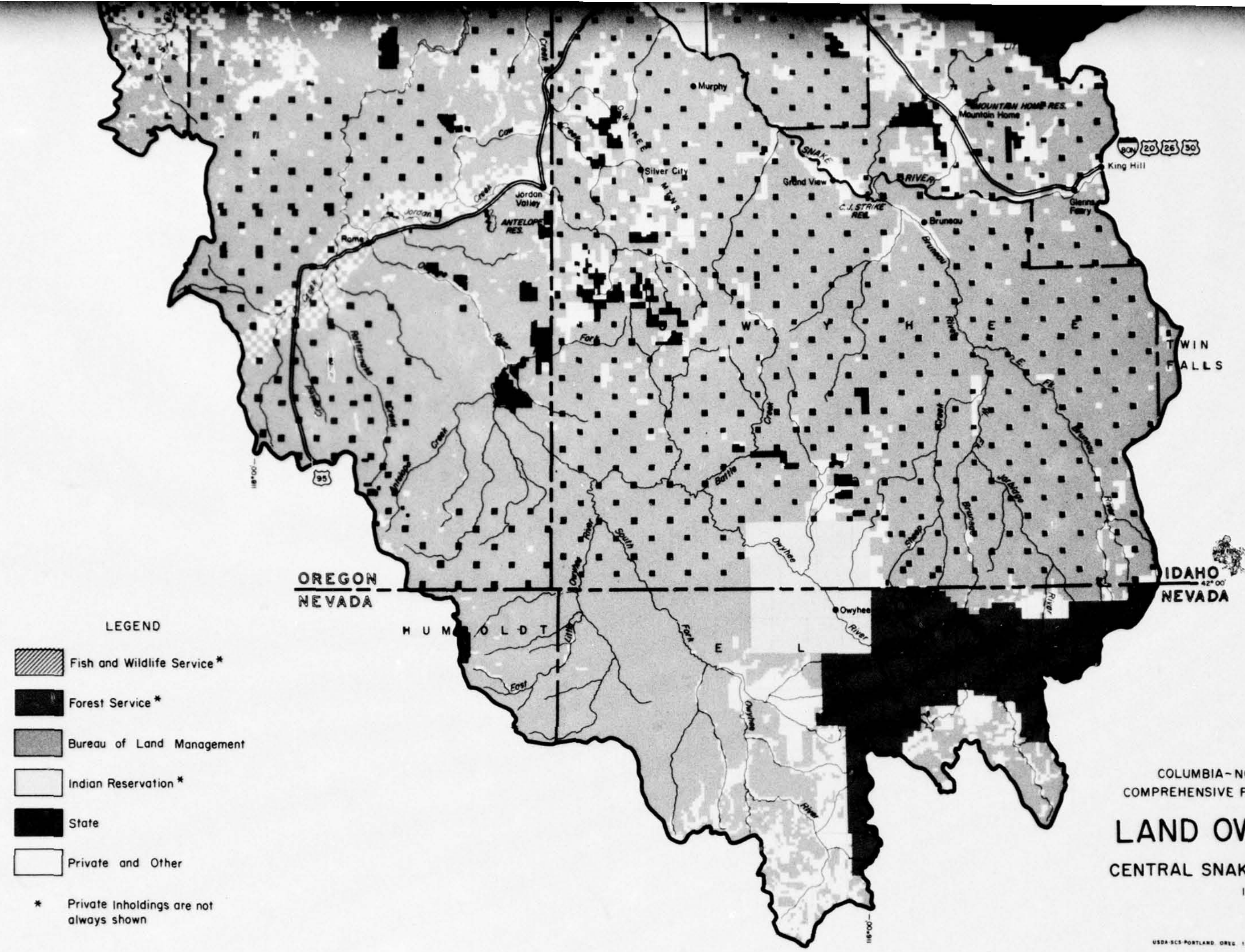
1/ Private lands held in trust by the Federal Government.
Source: General Services Administration Real Property Owned by the United States as of June 30, 1965, adjusted by the Land and Minerals Work Group.

## Soils

Figure 23, the Soil Associations Map, shows the location and relative extent of each soil association. The associations are numbered in a general relationship to the position in the landscape. Thus bottomlands and low terraces have the lowest numbers and alpine areas have the highest. The name of each association relates to the soil series representing general kinds of soil that are most extensive in the landscape. Wherever possible, established soil series are used in the name; however, where the available soil



OREGON
IDAHO
WALLOWA MTNS.
UNION
WALLOWA
BAKER
WASHINGTON
PAYETTE
GEM
CANYON
MALHEUR
ADA
BOISE
ONTARIO
North Powder
THIEF VALLEY RES.
Baker
UNITY RES.
Burnt
WILLOW CREEK RES.
Huntington
Weiser
MANN CREEK RES.
CRANE CREEK RES.
C. BEN ROSS RES.
CASCADE RES.
PADDOCK VALLEY RES.
Jamieson
BULLY CREEK RES.
Vale
Payette
Big Willow
BLACK CANYON RES.
Emmett
Horseshoe Bend
AGENCY VALLEY RES.
Nyssa
Caldwell
Homedale
Nampa
Lake Lowell
WARM SPRINGS RES.
Malheur
Dry Creek
Owyhee Lake
Murphy
Silver City
Jordan Valley
ANTELOPE RES.
Rome
Grand View
C.J. STRIKE RES.
Bruneau
MOUNTAIN HOME RES.
Mountain Home
King Hill
SNAKE RIVER
44°00'
118°00'
116°00'
LOCATION MAP
CANADA
WASHINGTON
MONTANA
OREGON
IDAHO
CALIF.
NEVADA
UTAH
Base Rev. Oct 1969
10 0 10 20
SCALE IN MILES




COLUMBIA - NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# LAND OWNERSHIP

CENTRAL SNAKE, SUBREGION 5

1968

USDA-SCS PORTLAND, OREG. 1970

FIGURE 22

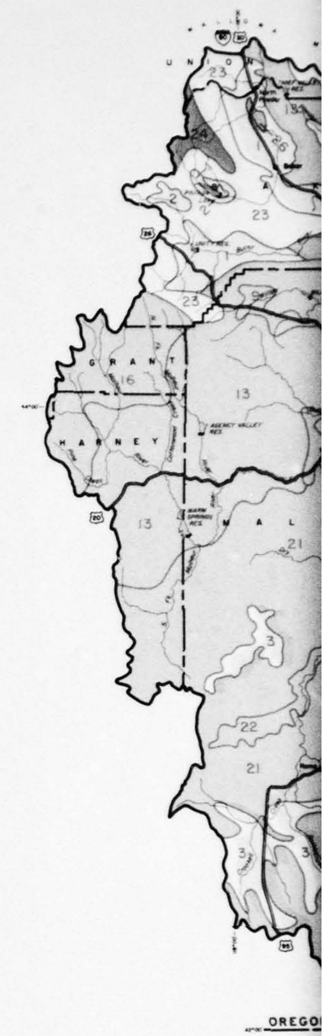
26

# LEGEND

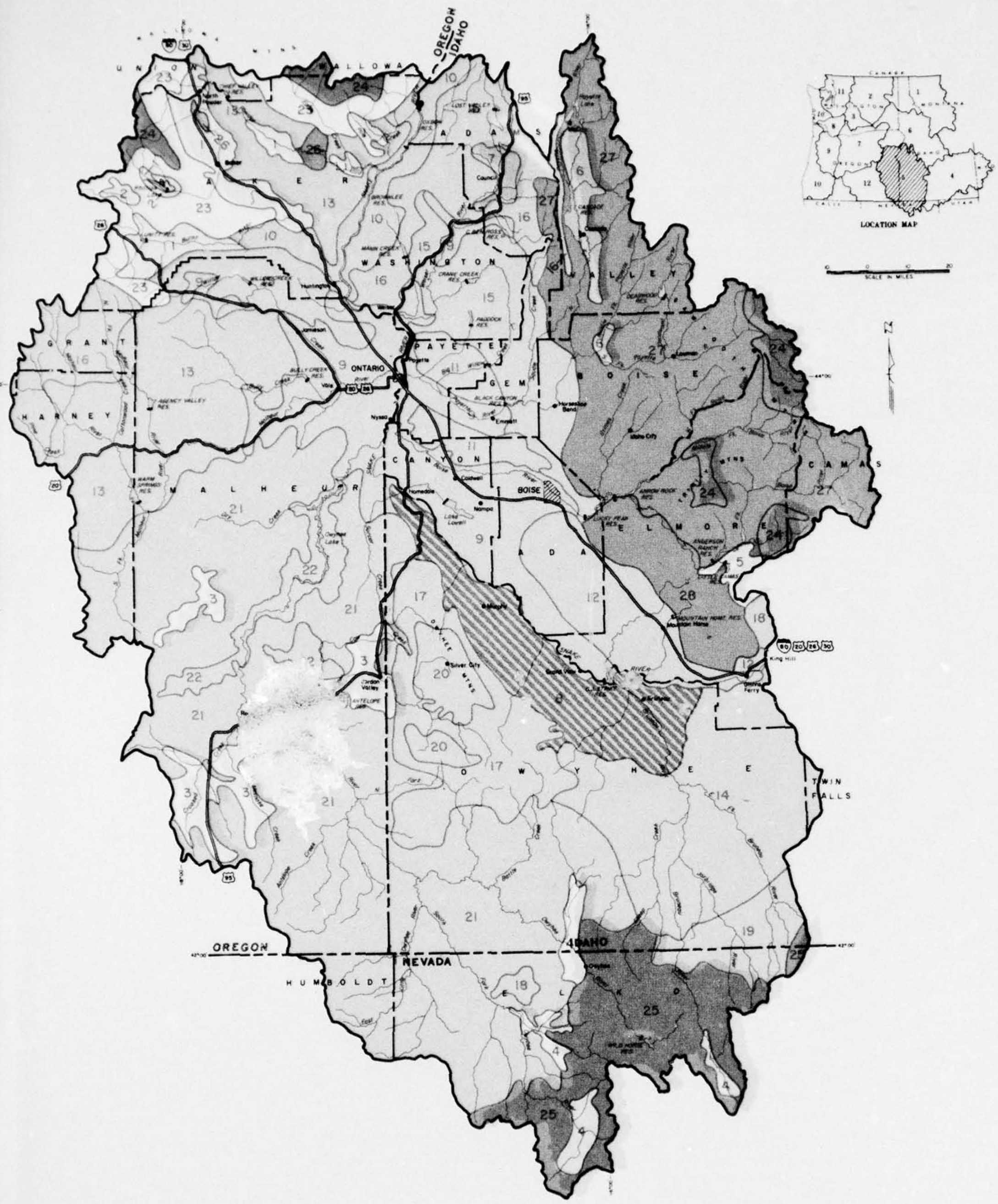
| Soil Associations Map Symbol * | Name of Association |
|---|---|
| | Generally silty and sandy soils formed in alluvial sediments on bottomlands and low terraces. |
| 1 | Baker |
| 2 | Haploxeralfs |
| 3 | Powder |
| 4 | Frigid Soils |
| 5 | Brinegar - Houk |
| | Generally silty and sandy soils with coarse fragments formed in glacial materials on terraces, plains and mountains. |
| 6 | Roseberry |
| 7 | Archabal - Blackwell |
| | Generally silty and clayey soils with somewhat restricted subsoil and substrata permeability formed in stratified sediments on terraces, basins and hilly uplands. |
| 8 | Nannyton - Vanderhoff |
| | Generally silty soils formed in materials mixed with rocky residuum-colluvium from basic rock types on plateaus, canyons and mountains. |
| 9 | Power - Minidoka |
| 10 | Kuhl - Lacy |
| 11 | Chilcott - Lanktree |
| 12 | Trevino - McCain |
| 13 | Keating - Durkee |
| 14 | Portneuf - Trevino |
| 15 | Gem - Gwin |
| 16 | Weedmark - Klicker |
| 17 | Gem - Farrot |
| 18 | Argixerolls |
| 19 | Hecki |
| 20 | Harmehl - Searla |
| 21 | Bakeoven - Squaw |
| 22 | Rockland |
| | Generally sandy soils formed in materials mixed with volcanic ash or pumice on terraces, foothills, plateaus and mountains. |
| 23 | Dominantly Argixerolls |
| | Generally silty soils formed in materials mixed with gravelly residuum-colluvium from sedimentary bedrock on mountains. |
| 24 | Dominantly Cryandepts |
| 25 | Stony frigid soils |
| | Generally sandy soils formed in materials mixed with rocky residuum-colluvium from acidic rock types on terraces, foothills and mountains. |
| 26 | Brownlee - North Powder |
| 27 | Pyle - Graylock |
| 28 | Brownlee - Rainey |

** Symbols are non-conotative and consistent only within each subregion. To compare delineations from one subregion to another refer to the name of the Soil Association.*

*NOTE: The Soil Association name may include a series that does not fit the Soil Associations Group description. The Soil Association name is based on dominant series. The dominant of five series may be only 30 percent of the Soil Association. Thus a clayey textured soil series may be included in a group accurately described as generally silty and sandy in texture.*



2




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# SOIL ASSOCIATIONS

CENTRAL SNAKE, SUBREGION 5

USDA-SCS PORTLAND, OREG. 1970

FIGURE 23

series do not have classification status, the soil series name is not recorded. Generally up to 15 percent of any single soil association in known areas may consist of inclusions of soils other than those identified. Such inclusions may be similar soils or they may be highly contrasting. However, in many high mountainous areas where detailed knowledge about the area is incomplete, extensive areas are included within delineations and inclusions of other soils may exceed the 15 percent general average.

Table 114 contains information about each soil association shown on figure 23. The symbol listed in the second column on the table is the same symbol shown on the soil associations map.

The table is organized to show land characteristics and the characteristics, qualities, and some interpretations of soil series representing the dominant and the contrasting kinds of soil in each association. The first six columns show some general land characteristics for each soil association. The next 11 columns show characteristics (permanent soil facts) of individual key soil series that represent dominant and contrasting soils. The following four show qualities inferred from the characteristics of these soils and the last four columns show interpretations concerning agricultural use based upon the foregoing soil characteristics and qualities. All of the representative soil series listed have status in classifications. A blank space in the soil series column indicates that the soil series name has no classification status.

The "soil groups" column lists soil associations that contain soils having broad similarities in some important characteristics, frequently identified with a position on the landscape.

The "percentage of association" column shows the extent of each kind of soil in an association. Differences of the total soil percentage in each association from 100 percent are inclusions of other soils and land types. For example, soil association 11 lists a total of 70 percent. Knowledge of this association is limited so that 30 percent of its area consists of inclusions of other soils that have not been defined.

Terms listed for permeability of water through the subsoil and permeability of substratum are:

Very rapid: Over 10 inches per hour.
Rapid: 5 to 10 inches per hour.
Moderately rapid: 2.50 to 5 inches per hour.
Moderate: 0.8 to 2.5 inches per hour.
Moderately slow: 0.2 to .8 inches per hour.
Slow: 0.05 to 0.2 inches per hour.
Very slow: Less than 0.05 inches per hour.

Terms listed for total available water-holding capacity are:

Low: Less than 6 inches in profile.
Medium: 6 to 10 inches.
High: More than 10 inches in profile.

The irrigated capability subclasses are an interpretation of limitations and hazards of using only presently irrigated lands. Many areas not presently irrigated may be potentially irrigable but are not included in this classification.

A dash indicates that a column does not apply to a soil or land type.

Soils, as they are characterized in tables 114 and 115, also reflect the environment and extent of the land resource. About three-fourths of the land area has problems of use and management caused by the presence of coarse fragments, stones, cobbles or gravel in the soil profiles. Almost a third of the land area, having at least partial cropland use, is moderately restricted in

Table 115 - Soil Associations Acreage by States, Subregion 5, 1966

| Soil Association | | | | | | |
|---|---|---|---|---|---|---|
| Map Symbol | Name | Idaho | Oregon | Nevada | Total | Percent |
| | | | (1,000 acres) | | | |
| 1 | Baker | - | 450.0 | - | 450.0 | 1.9 |
| 2 | Haploxeralfs | - | 33.0 | - | 33.0 | 0.1 |
| 3 | Powder | 15.0 | 390.0 | - | 405.0 | 1.7 |
| 4 | Frigid soils | 45.0 | - | 160.0 | 205.0 | 0.9 |
| 5 | Brinegar-Houk | 60.0 | - | - | 60.0 | 0.3 |
| 6 | Roseberry | 180.0 | - | - | 180.0 | 0.8 |
| 7 | Archabal-Blackwell | 60.0 | - | - | 60.0 | 0.3 |
| 8 | Nannyton-Vanderhoff | 830.0 | - | - | 830.0 | 3.5 |
| 9 | Powder-Minidoka | 970.0 | 690.0 | - | 1,660.0 | 7.1 |
| 10 | Kuhl-Lacey | 250.0 | 230.0 | - | 480.0 | 2.0 |
| 11 | Chilcott-Lanktree | 300.0 | - | - | 300.0 | 1.3 |
| 12 | Trevino-McCain | 600.0 | - | - | 600.0 | 2.6 |
| 13 | Keating-Durkee | - | 2,130.0 | - | 2,130.0 | 9.1 |
| 14 | Portneuf-Trevino | 1,500.0 | - | - | 1,500.0 | 6.4 |
| 15 | Gem-Gwin | 855.0 | - | - | 855.0 | 3.7 |
| 16 | Weedmark-Klicker | 720.0 | 415.0 | - | 1,135.0 | 4.8 |
| 17 | Gem-Farrot | 800.0 | - | - | 800.0 | 3.4 |
| 18 | Argixerolls | 45.0 | - | 40.0 | 85.0 | 0.4 |
| 19 | Hecki | 215.0 | - | 115.0 | 330.0 | 1.4 |
| 20 | Harmehl-Searla | 245.0 | - | - | 245.0 | 1.0 |
| 21 | Bakeoven-Squaw | 1,160.5 | 3,288.1 | 1,007.9 | 5,456.5 | 23.3 |
| 22 | Rockland | - | 360.0 | - | 360.0 | 1.5 |
| 23 | Dominantly Arigixerolls | - | 690.0 | - | 690.0 | 2.9 |
| 24 | Dominantly Cryandepts | 260.0 | 160.0 | - | 420.0 | 1.9 |
| 25 | Stony frigid soils | 90.0 | - | 1,000.0 | 1,090.0 | 4.7 |
| 26 | Brownlee-North Powder | - | 45.0 | - | 45.0 | 0.2 |
| 27 | Pyle-graylock | 2,523.0 | - | - | 2,523.0 | 10.8 |
| 28 | Brownlee-Rainey | 470.0 | - | - | 470.0 | 2.0 |
| Total land area | | 12,193.5 | 8,881.1 | 2,322.9 | 23,397.5 | 100.0 |

Source: National Cooperative Soil Survey.

Table 114- Characteristics and Qualities of Soils Subregion 5 1

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series2/ | Percentage3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Dep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moderately deep soils with loamy and clayey subsoils on nearly level slopes. | 1 | 2,300-3,500 | 9-18 | 110-145 | Cropland (cereals and hay)-95% irrigated | Aridic Durixerolls | Coarse-loamy, mixed, mesic | Baker | 25 | Fans | Alluvium | Silt loam | Silt loam | None | - | 32-36" over hardpan |
| | | | | | Rangeland | Typic Durixerolls | Fine, montmorillonitic, mesic | | 25 | Terraces | Alluvium | Clay loam | Clay | None | - | 18-24" over silica hard |
| | | | | | | Xerollic Durargids | Fine-silty, mixed, mesic | Virtue | 10 | Fans | Alluvium | Silt loam | Silty clay loam | None | - | 26-34" over hardpan |
| | | | | | | Calcic Argixerolls | Fine, montmorillonitic, mesic | Hibbard | 5 | Fans | Alluvium | Silty clay loam | Clay | None | - | 30-34" over hardpan |
| | | | | | | Typic Haplaquepts | Fine-loamy, mixed, calcareous, mesic | Baldock | 5 | Bottomlands | Alluvium | Silt loam | Silt loam | None | - | 30-36" over water table |
| | | | | | | Cumulic Haplaquolls | Fine-silty, mixed, calcareous, mesic | Wingville | 5 | Bottomlands | Alluvium | Silt loam | Silt loam | None | - | 30-36" over water table |
| Moderately deep to very deep, frigid soils with loamy subsoils and intermittent duripans on nearly level slopes. | 2 | 3,800-3,900 | 17-21 | 80-100 | Rangeland; Forest land; Cropland (hay)-irrigated | Typic Haploxeralfs (Mollic) | Fine-loamy, mixed, frigid | | 95 | Terraces | Alluvium | Silt loam | Clay loam | None | - | 32-36" over silica hard |
| | 3 | 4,000-5,500 | 8-12 | 90-120 | Rangeland; Cropland (hay)-irrigated | Haplic Durargids | Fine-loamy, mixed, frigid | | 80 | Fans and terraces | Alluvium | Gravelly loam | Gravelly loam | Gravel | 20-35 in profile | 8-20" over silica duri |
| | | | | | | Aridic Cumulic Haploxerolls | Coarse, silty, mixed, mesic | Powder | 10 | Fans and flood plains | Alluvium | Silt loam | Loam | None | - | 60"+ |
| | | | | | | Typic Camborthids | Fine-silty, mixed, frigid | | 5 | Basins and playas | Alluvium | Silt loam | Silt loam | None | - | 16-20" over semi-consoli dated sediments |
| | 4 | 5,200-6,000 | 10-14 | 80-100 | Rangeland | Haplic Durixerolls | Fine-loamy, mixed, frigid | | 40 | Fans and terraces | Alluvium | Loam | Clay loam | None | - | 20-40" over duripan |
| | | | | | Cropland (meadow hay, alfalfa, cereals, and pasture)-irrigated | Fluventic Haplaquolls | Fine-loamy, mixed, calcareous, frigid | | 30 | Flood plains & terraces | Alluvium | Loam | Loam & clay loam | None | - | 60"+ |
| | | | | | | Calcic Haploxerolls | Coarse-loamy, mixed, frigid | | 20 | Fans | Alluvium | Gravelly loam | Loam | Gravel | 20-35 in surface soil | 60"+ |

cteristics and Qualities of Soils Subregion 5 [1/]

| Soil Characteristics | | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coarse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass | | | |
| e Soil | Texture Subsoil | Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated[6/] | Major Soil Problems | Suitable Land Treatment and Structures |
| m | Silt loam | None | - | 32-36" over hardpan | Moderate | Impervious in hardpan | Good | Low & Medium | IIe, IIIe | IIe, IIIe | Erosion; mod. deep over hardpan | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; rangeland mgmt. |
| m | Clay | None | - | 18-24" over silica hardpan | Slow | Impervious in hardpan | Good | Low | IIIe, IVe | IIIe, IVe | Erosion; shallow and mod. deep over hardpan; clay subsoil | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; rangeland mgmt. |
| m | Silty clay loam | None | - | 26-34" over hardpan | Moderately slow | Impervious in hardpan | Good | Low | IIe, IIIe, IVe | IIe, IIIe, IVe | Erosion; mod. deep over hardpan | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; rangeland mgmt. |
| lay | Clay | None | - | 30-34" over hardpan | Slow | Impervious in hardpan | Good | Low | IIe, IIIe, IVe | IIe, IIIe, IVe | Erosion; mod. deep over hardpan | Cross-slope opers; residue mgmt; cropping sequence; subsurface tillage; rangeland mgmt. |
| oam | Silt loam | None | - | 30-36" over water table | Moderate | - | Poor | High | IIIw | IIIw | Mod. deep over water table; alkaline | Drainage; soil amendments |
| oam | Silt loam | None | - | 30-36" over water table | Moderate | - | Poor | High | IIw | IIw | Mod. deep over water table | Drainage |
| oam | Clay loam | None | - | 32-36" over silica hardpan | Moderately slow | Impervious in hardpan | Good | Low & Medium | IIIe, IVe | IIIe, IVe | Erosion; mod. deep over hardpan | Cross-slope opers; residue mgmt; cropping seq; subsurface tillage; rangeland and forest land management |
| ly | Gravelly loam | Gravel | 20-35 in profile | 8-20" over silica duripan | Moderate | Impervious in duripan | Good | Low | VIe | IIIs, IIIe | Erosion; shallow over duripan; gravelly profile | Rangeland management |
| loam | Loam | None | - | 60"+ | Moderate | Moderate | Good | High | IIc | IIc | Droughtiness | Irrigation, residue, and rangeland management |
| loam | Silt loam | None | - | 16-20" over semi-consolidated sediments | Moderate | Impervious in substratum | Good | Low | VIe | IIIs | Erosion; shallow over sediments | Rangeland management |
| | Clay loam | None | - | 20-40" over duripan | Moderately slow | Impervious in duripan | Good | Low & Medium | VIc | - | Moderately deep over duripan | Rangeland management |
| | Loam & clay loam | None | - | 60"+ | Moderate & moderately slow | Moderate & moderately slow | Poor | High | IIIw | IIIw | Wetness; mod. alkaline surface soil | Drainage; soil amendments |
| lly | Loam | Gravel | 20-35 in surface soil | 60"+ | Moderate | Moderate | Good | High | VIc | - | Gravelly surface soil; mod. alkaline subsoil | Rangeland management |

Table 114 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Perm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 4,900-5,200 | 13-16 | 80-110 | Cropland (cereals, hay, alfalfa, and pasture)-10% irrigated | Pachic Argiborolls | Fine-loamy, mixed | Brinegar | 30 | Fans and terraces | Alluvium | Loam | Clay loam | None | - | 60"+ | Mode slow |
| | | | | | Rangeland | Aquic Argiborolls | Fine, montmorillonitic | Houk | 20 | Bottomlands | Alluvium | Loam | Clay loam | Sand | 60 below 40-60" | 40-60" over sand | Mode slow |
| | | | | | | Typic Argixerolls | Coarse-loamy, mixed, frigid | Riceton | 20 | Fans and terraces | Alluvium | Sandy loam | Coarse sandy loam | Sand | 60 below 40-60" | 40-60" over coarse sand | Very |
| | | | | | | Typic Argixerolls | Fine, montmorillonitic, frigid | Rands | 10 | Fans | Alluvium | Loam | Clay | None | - | 60"+ | Slow |
| Deep, very cold soils with sandy and gravelly profiles on gentle and moderate slopes. | 6 | 4,200-5,500 | 19-24 | 60-90 | Cropland (clover, hay, pasture, cereals, seed potatoes)-95% irrigated | Typic Cryaquolls (Aquic Cryoborolls) | Coarse-loamy, mixed, noncalcareous | Roseberry | 25 | Bottomlands | Alluvium over outwash | Sandy loam | Coarse sandy loam | Sand and gravel | 80 below 40-60" | 40-60" over sand and gravel | Very |
| | | | | | Rangeland | Typic Cryochrepts | Sandy-skeletal, micaceous over mesic (sandy, skeletal, mesic) | | 15 | Fans and terraces | Alluvium | Loam | Loamy sand | Sand | 60-80 below 40-60" | 40-60" over sand | Very |
| | | | | | Forest land | Argic Cryoborolls | Fine-loamy, mixed | Archabal | 15 | Fans and terraces | Alluvium over outwash | Loam | Loam | Sand and gravel | 60-80 below 40-60" | 40-60" over sand and gravel | Mode |
| | | | | | | Typic Cryaquolls | Fine-loamy, mixed, noncalcareous | Blackwell | 10 | Bottomlands | Alluvium over outwash | Clay loam | Sandy clay loam | Sand and gravel | 80 below 20-40" | 20-40" over sand and gravel | Mode slow |
| | | | | | | Pachic Cryoborolls | Coarse-loamy, mixed | Sizemore | 10 | Flood plains and terraces | Alluvium over outwash | Coarse sandy loam | Coarse sandy loam | Sand and gravel | 80 below 40-60" | 40-60" over sand and gravel | Very |
| | 7 | 4,800-6,800 | 18-25 | 30-75 | Cropland (cereals and hay)-80% irrigated | Argic Cryoborolls | Fine-loamy, mixed | Archabal | 40 | Fans and terraces | Alluvium over outwash | Loam | Loam | Sand and gravel | 60-80 below 40-60" | 40-60" over sand and gravel | Mode |
| | | | | | Rangeland | Typic Cryaquolls | Fine-loamy, mixed, noncalcareous | Blackwell | 15 | Bottomlands | Alluvium over outwash | Clay loam | Sandy clay loam | Sand and gravel | 80 below 20-40" | 20-40" over sand and gravel | Mode slow |
| | | | | | | Cumulic Haplaquolls | Fine-silty, mixed, noncalcareous, mesic | Catherine | 15 | Bottomlands | Alluvium | Silt loam | Silt loam | None | - | 60"+ | Mode |
| | | | | | | Typic Argixerolls (Udic Argiustolls) | Fine-loamy, mixed, mesic | Mehlhorn | 15 | Uplands (hills) | Loess over basic igneous rock | Loam | Cobbly clay loam | Cobbles | 20-35 below 10" | 20-40" over bedrock | Mode slow |

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| teristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coarse Fragments | | | | | | | Range of: Major Capability Subclass [6] | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated | Major Soil Problems | Suitable Land Treatment and Structures |
| None | - | 60"+ | Moderately slow | Moderately slow | Good and moderately good | High | IIIc, IIIe | IIIc, IIIe | Erosion | Cross-slope opers; residue mgmt; rangeland mgmt |
| Sand | 60 below 40-60" | 40-60" over sand | Moderately slow | Very rapid | Poor | Medium & High | IVw | - | High seasonal water table | Drainage |
| Sand | 60 below 40-60" | 40-60" over coarse sand | Very rapid | Very rapid | Good | Low | IIIe, IIIs, IIIc | IIIe, IIIs, IIIc | Erosion; droughtiness | Cross-slope opers; residue mgmt; irrigation management |
| None | - | 60"+ | Slow | Slow | Good | Medium | IVe, IVs, IVc | IVe, IVs, IVc | Erosion; clay subsoil | Cross-slope opers; residue mgmt; subsurface tillage |
| Sand and gravel | 80 below 40-60" | 40-60" over sand and gravel | Very rapid | Very rapid | Somewhat poor | Low & Medium | IVw | IVw | Wetness | Drainage |
| Sand | 60-80 below 40-60" | 40-60" over sand | Very rapid | Very rapid | Good and moderately good | Medium & High | IVs, IVc, IVe | IVs, IVc, IVe | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt. |
| Sand and gravel | 60-80 below 40-60" | 40-60" over sand and gravel | Moderate | Very rapid | Good | Medium & High | IVc, IVe | IVc, IVe | Erosion; droughtiness | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt. |
| Sand and gravel | 80 below 20-40" | 20-40" over sand and gravel | Moderately slow | Very rapid | Poor | Low & Medium | Vw, IVw | IVw | Wetness | Drainage |
| Sand and gravel | 80 below 40-60" | 40-60" over sand and gravel | Very rapid | Very rapid | Good and somewhat excessive | Low & Medium | IVs | IVs | Droughtiness; sandy profile | Rangeland mgmt; residue mgmt; irrigation mgmt. |
| Sand and gravel | 60-80 below 40-60" | 40-60" over sand and gravel | Moderate | Very rapid | Good and moderately good | Medium & High | IVc | IVc, IVe | Droughtiness; erosion | Cross-slope opers; residue mgmt; cropping sequence; irrigation mgmt. |
| Sand and gravel | 80 below 20-40" | 20-40" over sand and gravel | Moderately slow | Very rapid | Poor | Low & Medium | IVw | IVw | Wetness | Drainage |
| None | - | 60"+ | Moderate | Moderate and moderately slow | Somewhat poor or poor | High | IVw | IVw | Wetness | Drainage |
| Cobbles | 20-35 below 10" | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | IVe | IVe | Erosion; cobbly subsoil; mod. deep over bedrock | Cross-slope opers; residue mgmt; cropping sequence rangeland mgmt. |

Table 114 - Continued

| Soil 1/ Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moderately deep to very deep soils with loamy subsoils on gentle to moderate slopes. | 8 | 2,000-3,000 | 7-12 | 120-165 | Rangeland<br>Cropland (cereals, potatoes, mint, hops, vegetables, and hay)-irrigated | Typic Haplargids | Fine-loamy, mixed, mesic | Nanyton | 25 | Terraces | Alluvium | Gravelly loam | Gravelly clay loam | Gravel | 20-35 in profile | 60"+ |
| | | | | | | Typic Torriorthents | Coarse-loamy, mixed, calcareous, mesic | Vanderhoff | 20 | Terraces | Lake-laid sediments | Silt loam | Silt loam | None | - | 20-40" over siltstone |
| | | | | | | Xeric Torriorthents | Coarse-loamy, mixed, calcareous, mesic | Turbyfill | 15 | Fans and Terraces | Alluvium and lake sediments | Sandy loam | Fine sandy loam | None | - | 60"+ |
| | | | | | | Typic Haplargid | Fine-loamy, mixed, mesic | | 10 | Terraces and fans | Alluvium | Loam | Loam | None | - | 60"+ |
| | | | | | | Typic Torriorthents | Coarse-silty, mixed, calcareous, mesic | Garbutt | 10 | Terraces and fans | Lake-laid sediments over outwash | Silt loam | Silt loam | Sand and gravel | 60-80 below 40-60" | 40-60" over sand and gravel |
| | | | | | | Aridic Calcic Argixerolls | Fine-loamy, mixed, mesic | Tollgate | 10 | Fans | Alluvium | Gravelly loam | Cobbly clay loam | Gravel and cobbles | 20-35 in profile | 60"+ |
| Moderately deep to very deep soils with silty subsoils on gentle to strong slopes. | 9 | 2,000-3,000 | 7-11 | 120-160 | Cropland (cereals, potatoes, sugar beets, beans, and hay)-irrigated | Xerollic Haplargids | Fine-silty, mixed, mesic | Power | 20 | Terraces | Alluvium | Silt loam | Silt loam | None | - | 60"+ |
| | | | | | Rangeland | Xerollic Durorthids | Coarse-silty, mixed, mesic | Minidoka | 15 | Uplands (lava plains-nearly level to rolling) | Loess | Silt loam | Silt loam | None | - | 20-40" over lime pan |
| | | | | | | Haplic Xerollic Durargids | Fine-silty, mixed, mesic | Purdam | 15 | Terraces | Alluvium | Silt loam | Silt loam | None | - | 20-40" over lime silica pan |
| | | | | | | Mollic Durargids | Fine-silty, mixed, mesic | | 10 | Terraces | Alluvium | Silt loam | Silt loam | None | - | 20-40" over lime silica pan |
| | | | | | | Xerollic Calciorthids | Coarse-silty, mixed, mesic | Bahem | 10 | Terraces and fans | Alluvium | Loam | Loam | None | - | 40-60" over fine sandy loam |

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| stics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| rse Fragments | | | | | | | | | | |
| d | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Irrigated6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| vel | 20-35 in profile | 60"+ | Moderately slow | Moderately slow | Good | Medium | VIc, VIe | IIIe, IIe, IVe | Erosion; alkaline; gravelly profile; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| e | - | 20-40" over siltstone | Moderate | Impervious | Good and somewhat excessive | Low & Medium | VIe, VIc | IIIe, IVe, IIIs | Erosion;alkaline; mod. deep over siltstone; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| e | - | 60"+ | Moderately rapid | Moderately rapid | Good | Medium | VIe, VIc | IIe, IIs, IIIe | Erosion; alkaline; sandy profile; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| e | - | 60"+ | Moderate | Moderate | Good | High | VIc, VIe | IIe, IIIe, IVe | Erosion;alkaline; droughtiness | Cross-slope opers; residue mgmt; cropping seq; Soil amendments; irrig. mgmt; rangeland mgmt. |
| nd d avel | 60-80 below 40-60" | 40-60" over sand and gravel | Moderate | Very rapid | Good | Medium & high | VIc, VIe | I, IIe, IIIe, IVe | Erosion;alkaline; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| avel d bbles | 20-35 in profile | 60"+ | Moderately slow | Moderately slow | Good | Medium | VIe | IIIe, IIe, IVe | Erosion; gravelly and cobbly profile; droughtiness | Cross-slope opers; residue mgmt; cropping seq; irrig. mgmt; rangeland management |
| ne | - | 60"+ | Moderate | Moderate | Good | High | VIc, VIe | I, IIe, IIIe, IVe | Erosion;alkaline subsoil; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| one | - | 20-40" over lime pan | Moderate | Impervious in lime pan | Good | Low & Medium | VIc, VIe | IIIs, IIIe, IVe | Erosion;alkaline; mod.deep over duripan; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| one | - | 20-40" over lime silica pan | Moderate | Impervious in lime-silica pan | Good | Low & Medium | VIc, VIe | IIIs, IIIe | Erosion;alkaline subsoil; mod. deep over lime-silica pan; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| one | - | 20-40" over lime silica pan | Moderate | Impervious in lime-silica pan | Good | Low & Medium | VIc, VIe | IIIs, IIIe, IVe | Erosion; mod. deep over lime-silica pan; droughtiness | Cross-slope opers; residue mgmt; cropping seq; irrig. mgmt; rangeland mgmt. |
| one | - | 40-60" over fine sandy loam | Moderate | Moderately rapid | Good | High | VIc, VIe | I, IIe, IIIe | Erosion, alkaline; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |

*Table 114 - Continued*

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Perm… S… |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 750-5,000 | 13-28 | 80-200 | Rangeland | Calcic Lithic Haploxerolls | Loamy, mixed, mesic | Kuhl | 40 | Uplands (hills) | Loess & basic igneous rock | Very stony silt loam | Very stony silt loam | Cobbles and stones | 35-80 in profile | 10-20" over bedrock | Mode… |
| | | | | | Forest land 4/<br>Cropland (cereals, hay, fruit orchards, truck crops, and pasture)- some irrigated | Typic Haploxerolls | Coarse-silty, mixed, mesic | Walla Walla | 20 | Uplands (hills) | Loess | Silt loam | Silt loam | None | - | 60"+ | Mode… |
| | | | | | | Lithic Argiudolls (Argixerolls) | Loamy-skeletal, mixed, mesic | Lacy | 15 | Uplands (hills) | Loess & basic *igneous* rock | Shaley loam | Very shaley clay loam | None | 35-50 below 12" | 10-20" over bedrock | Mode… |
| | | | | | | Calciorthidic Haploxerolls | Coarse-loamy over sandy, or sandy-skeletal, mixed, mesic | Magallon | 10 | Terraces | Alluvium *over* glacial outwash | Very fine *sandy loam* | Very fine sandy loam | Gravel and sand | 35-60 be*low 20"* | 20-40" over stratified sand, gravel, and silt | Mode… |
| | | | | | | Pachic Argixerolls | Fine-loamy, mixed, mesic | Linville | 10 | Uplands (hills) | Loess & basic igneous rock | Silt loam | Silt loam | Cobbles and stones | 5-20 in profile | 40-60" over bedrock | Mode… |
| Moderately deep to very deep soils with clayey and loamy sub*soils on* gentle to moderate slopes. | 11 | 2,200-3,000 | *7-12* | *120-140* | Rangeland<br>Cropland (cereals, potatoes, and hay)- 85% irrigated | Abruptic Xerollic Durargids | Fine, *montmoril*lonitic, mesic | *Chilcott* | *40* | *Terraces* | Alluvium | Silt loam | Clay | None | - | 20-40" over lime-silica pan | Slo… |
| | | | | | | Xerollic Paleargids | Fine, montmorillonitic, mesic | Lanktree | 25 | Uplands (hills and terraces) | Alluvium | Loam | Clay loam to clay | Sand & gravel | 60-80 below 40-60" | 40-60" over sand and/or gravel | Mode… slo… |
| | | | | | | Mollic Durargids | Fine-silty, mixed, mesic | | 20 | Terraces | *Alluvium* | *Silt loam* | Silt loam | *None* | - | *20-40" over* lime silica pan | Mode… |
| | | | | | | Xeric Torriorthents | Coarse-loamy, mixed, non-acid, mesic | Lolalita | 5 | Uplands (hills & terraces) | Alluvium | Coarse sandy loam | Coarse sandy *loam* | Sand | 60-80 below 40-*60"* | 40-60" over sand | Very… |
| | | | | | | Typic Naturargid | Fine-silty, mixed, mesic | Sebree | 2 | Terraces | Alluvium | Silty clay loam | Silty clay loam | None | - | 20-40" over lime silica pan | Mode… slo… |

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Soil Qualities and Interpretations

| | Fragments Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Irrigated 6/ | Major Soil Problems | Suitable Land Treatment and Structures |
|---|---|---|---|---|---|---|---|---|---|---|
| s | 35-80 in profile | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIIs | - | Shallow over bedrock;stony profile;steep slopes | Rangeland management |
| | - | 60"+ | Moderate | Moderate | Good | High | IIe, IIIe, IVe, VIe | I, IIIe, IIIs, IVe | Erosion | Terrace-diversions; cross-slope opers;residue mgmt; irrig. mgmt; rangeland management |
| | 35-50 below 12" | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIe, VIIe | - | Erosion;shallow over bedrock | |
| l | 35-60 below 20" | 20-40" over stratified sand,gravel, and silt | Moderate | Rapid | Good and somewhat excessive | Low & Medium | IVe, VIe, VIIe, VIIs | IIIe, VIs | Erosion; mod. deep over gravel & sand; droughtiness | Cross-slope opers; residue mgmt; irrig. mgmt. |
| es s | 5-20 in profile | 40-60" over bedrock | Moderate | Impervious | Good | Medium & High | VIIe | - | Erosion;steep slopes;cobbly and stony profile | Rangeland management |
| | - | 20-40" over lime-silica pan | Slow | Impervious in lime-silica pan | Good | Low & Medium | VIc, VIe | IIIe, IIIs, IVe | Erosion; clay subsoil restricts water & roots; mod. deep over lime-silica pan; droughtiness | Cross-slope opers; residue mgmt; cropping seq; subsurface tillage; irrig. mgmt; rangeland mgmt. |
| & l | 60-80 below 40-60" | 40-60" over sand and/or gravel | Moderately slow & slow | Very rapid | Good | Medium & High | VIc, VIe | IIe, IIIe | Erosion;alkaline subsoil;clayey subsoil restricts water and roots; droughtiness | Cross-slope opers; residue mgmt; cropping seq; subsurface tillage;irrig. mgmt;rangeland mgmt. |
| | - | 20-40" over lime silica pan | Moderate | Impervious in lime-silica pan | Good | Low & Medium | VIc, VIe | IIIs, IIIe, IVe | Erosion;mod.deep over lime-silica pan;droughtiness | Cross-slope opers; residue mgmt; cropping seq; irrig. mgmt; rangeland management |
| | 60-80 below 40-60" | 40-60" over sand | Very rapid | Very rapid | Good & somewhat excessive | Low & Medium | VIe, VIIe | IIIe | Droughtiness; sandy profile | Rangeland management |
| | - | 20-40" over lime silica pan | Moderately slow | Impervious in lime-silica pan | Good | Low & Medium | VIs | - | Alkaline soil; mod. deep over lime-silica pan | Rangeland management |

Table 114 - Continued

| Soil Groups | Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series2/ | Percentage3/ of Assn. | Position on Landscape | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth | Perme... Sub... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12 | 2,300-4,000 | 7-11 | 120-140 | Rangeland<br>Cropland (cereals, alfalfa, & potatoes)-70% irrigated | Xerollic Camborthids | Loamy, mixed, mesic | Trevino | 20 | Uplands (lava plains) | Loess & basic igneous rock | Silt loam | Silt loam | None | - | 10-20" over bedrock | Moder... |
| | | | | | | Xerollic Haplargids | Fine-loamy, mixed mesic | McCain | 15 | Uplands (lava plains-gently rolling) | Loess over basic igneous rock | Silt loam | Silty clay loam | None | - | 20-40" over bedrock | Moder... slow |
| | | | | | | Abruptic Xerollic Durargids | Fine, montmorillonitic, mesic | Chilcott | 15 | Terraces | Alluvium | Silt loam | Clay | None | - | 20-40" over lime silica pan | Slow |
| | | | | | | Aridic Calcic Argixerolls | Fine-loamy, mixed mesic | Ada | 10 | Uplands (hills-undulating to hilly) | Alluvium | Gravelly loam | Very gravelly clay loam | Gravel and sand | 20-60 in profile; 60-80 below 40-60" | 40-60" over gravel and sand | Moder... slow |
| | | | | | | Mollic Durargids | Fine-silty, mixed, mesic | | 10 | Terraces | Alluvium | Silt loam | Silt loam | None | - | 20-40" over lime-silica pan | Moder... |
| | | | | | | Mollic Durargids | Fine-silty, mixed, mesic | | 10 | Terraces | Alluvium | Silt loam | Silt loam | None | - | 10-20" over duripan | Moder... |
| Shallow to very deep soils with loamy and cobbly subsoils and cold winters on gentle to steep slopes. | 13 | 2,500-3,900 | 11-15 | 90-120 | Rangeland<br>Cropland (hay and cereals)-irrigated | Typic Argixerolls | Fine, montmorillonitic, mesic | Keating | 25 | Uplands (hills) | Loess & basic igneous rock | Silt loam | Clay loam | None | - | 20-40" over bedrock | Moder... slow |
| | | | | | | Calcic Argixerolls | Fine, montmorillonitic, mesic | Durkee | 25 | Uplands (hills) | Loess & basic igneous rock | Silt loam | Clay loam | None | - | 10-18" over bedrock | Moder... slow |
| | | | | | | Aridic Lithic Argixerolls | Clayey-skeletal, montmorillonitic, mesic | Ruckles | 20 | Uplands (hills) | Loess & basic igneous rock | Stony loam | Stony clay | Cobbles and stones | 20-35 in profile | 10-20" over bedrock | Slow |
| | | | | | | Xerollic Durargids | Fine, montmorillonitic, mesic | Lookout | 15 | Uplands (hills) | Loess & basic igneous rock | Stony loam | Clay | Cobbles and stones | 20-35 in surface soil | 18-22" over duripan | Slow |
| | | | | | | Calcic Argixerolls | Fine, montmorillonitic, mesic | Gem | 10 | Uplands (hills) | Loess & basic igneous rock | Stony loam | Stony clay loam | Cobbles and stones | 20-35 in profile | 20-40" over bedrock | Moder... slow |

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| eristics | | Soil Qualities and Interpretations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| arse Fragments | | | | | | Total Available Water-holding Capacity | Range of: Major Capability Subclass | | | |
| nd | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | | Dryland | Irrigated6/ | Major Soil Problems | Suitable Land Treatment and Structures |
| one | - | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs, VIIs | IVe, IVs | Erosion; shallow over bedrock;alkaline subsoil; droughtiness | Rangeland management |
| one | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low & Medium | VIe | IIIe, IIIs, IVe, IVs | Erosion;alkaline;mod.deep over bedrock; droughtiness | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| one | - | 20-40" over lime silica pan | Slow | Impervious in lime-silica pan | Good | Low & Medium | VIe | IIe, IIIe, IVe | Erosion;clay subsoil;rstrcts water & roots;mod.deep over lime-silica pan;droughtiness | Cross-slope opers; residue mgmt; cropping seq; subsurface tillage;irrig. mgmt; rangeland mgmt. |
| ravel nd sand | 20-60 in profile; 60-80 below 40-60" | 40-60" over gravel and sand | Moderately slow | Very rapid | Good | Low | VIe | - | Erosion; gravelly profile | Rangeland management |
| one | - | 20-40" over lime-silica pan | Moderate | Impervious in lime-silica pan | Good | Low & Medium | VIe | IIIe, IIIs, IVe | Erosion;mod. deep over lime-silica pan;droughtiness | Cross-slope opers; residue mgmt; cropping seq; irrigation mgmt; rangeland mgmt. |
| one | - | 10-20" over duripan | Moderate | Impervious in duripan | Good | Low | VIe, VIs | IVe | Erosion;shallow over duripan | Rangeland management |
| one | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | IIIe, IVe, VIe | IIIe, IVe | Erosion;mod. deep over bedrock | Cross-slope opers; residue mgmt; cropping seq; rangeland mgmt. |
| None | - | 10-18" over bedrock | Moderately slow | Impervious | Good | Low | VIe | - | Erosion;shallow over bedrock | Rangeland management |
| Cobbles and stones | 20-35 in profile | 10-20" over bedrock | Slow | Impervious | Good | Low | VIe, VIIe | - | Erosion;stony profile;clay subsoil;shallow over bedrock | Rangeland management |
| Cobbles and stones | 20-35 in surface soil | 18-22" over duripan | Slow | Impervious in duripan | Good | Low | VIe | - | Erosion;stony surface soil; clay subsoil; shallow over duripan | Rangeland management |
| Cobbles and stones | 20-35 in profile | 20-40" over bedrock | Moderately slow | Impervious | Good | Low & Medium | VIe, VIIe | - | Erosion;stony profile; clay subsoil; mod. deep over bedrock | Rangeland management |

Table 114 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Perme Sub |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 14 | 2,500-6,000 | 8-12 | 100-140 | Cropland (cereals, potatoes, beans, & hay)-80% *irrigated* | Xerollic Calciorthids | Coarse-silty, mixed, mesic | Portneuf | 30 | Uplands (lava plains) | Loess | Silt loam | Silt *loam* | None | - | 60"+ | Moder |
| | | | | | *Rangeland* | *Xerollic* Camborthids | *Loamy*, mixed, mesic | Trevino | 25 | Uplands (lava plains) | Loess & basic igneous rock | Silt loam | Silt loam | None | - | 10-20" over bedrock | Moder |
| | | | | | | Xerollic Durorthids | Coarse-silty, mixed, mesic | Minidoka | 10 | Uplands (lava plains-nearly level to rolling) | Loess | Silt loam | Silt loam | None | - | 20-40" over lime pan | Moder |
| | | | | | | Mollic Calciorthids | Coarse-silty, mixed, mesic | | 10 | Uplands (hills nearly level to rolling) | Loess over basic igneous rock | Silt loam | Silt *loam* | None | - | 20-40" over bedrock | Moder |
| | | | | | | Xeric Torriorthents | Coarse-loamy, *mixed, calcareous*, mesic | Turbyfill | 5 | Terraces | Alluvium and lake sediments | Sandy loam | Fine sandy loam | None | - | 60"+ | Moder rapid |
| | 15 | 3,000-5,000 | 12-18 | 80-140 | Rangeland<br>Cropland (cereals, hay, pasture, and potatoes)-25% irrigated | Calcic Argixerolls | Fine, montmorillonitic, mesic | Gem | 20 | Uplands (*hills*) | Loess over basic igneous rock | Loam | Clay loam | None | - | 20-40" over bedrock | Moder slow |
| | | | | | | Lithic Argixerolls | Loamy-skeletal, mixed, mesic | Gwin | 20 | Uplands (hills) | Loess & basic igneous rock | *Very stony silt loam* | *Very stony* silty clay loam | *Cobbles and* stones | 35-*80 in profile* | *10-20"* over bedrock | Moder slow |
| | | | | | | Typic Argixerolls (Udic Argiustolls) | *Fine-loamy*, mixed, mesic | Mehlhorn | 15 | Uplands (hills) | Loess over basic igneous rock | Loam | Cobbly clay loam | Cobbles | 20-35 below 10" | 20-40" over bedrock | Moder slow |
| | | | | | | Pachic Argixerolls | Fine, montmorillonitic, mesic | Jacknife | 15 | Fans | Loess *over* basic igneous rock | Loam | Cobbly clay or clay loam | Cobbles | 0-35 below 10" | 40-60" over bedrock | Moder *slow* slow |
| | | | | | | Calcic Argixerolls | Fine-loamy, mixed, mesic | Elmore | 10 | Uplands (hills) | Acid igneous rock | Loam | Clay loam | None | - | 20-40" over bedrock | Moder slow |

le 114 - Continued

| il Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coarse Fragments | | | | | | | Range of: Major Capability Subclass | | | |
| Texture Subsoil | Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated b/ | Major Soil Problems | Suitable Land Treatment and Structures |
| Silt loam | None | - | 60"+ | Moderate | Impervious | Good | High | VIc, VIe | IIc, IIe, IIIe | Erosion; droughtiness | Cross-slope opers; residue mgmt; irrig. mgmt.; rangeland management |
| Silt loam | None | - | 10-20" over bedrock | Moderate | Impervious | Good | Low | VIs, VIe, IVe | IVe, IVs | Erosion; shallow over bedrock;droughtiness;alkaline subsoil | Rangeland management; residue mgmt; irrig. management |
| Silt loam | None | - | 20-40" over lime pan | Moderate | Impervious in lime pan | Good | Low & Medium | VIc, VIe | IIIs, IIIe, IVe | Erosion;alkaline;mod.deep over duripan; droughtiness | Cross-slope opers;residue mgmt; cropping seq; soil amendments; irrig. mgmt;rangeland mgmt. |
| Silt loam | None | - | 20-40" over bedrock | Moderate | Impervious | Good | Low & Medium | VIc, VIe, VIs | IIIe, IIIs, IVe, IVs | Erosion;mod. deep over bedrock;droughtiness | Cross-slope opers;residue mgmt; irrig. mgmt; rangeland mgmt. |
| Fine sandy loam | None | - | 60"+ | Moderately rapid | Moderately rapid | Good | Medium | VIc, VIe | IIe, IIs, IIIe | Erosion; droughtiness; alkaline | Cross-slope opers; residue mgmt; cropping seq; soil amendments; irrig. mgmt; rangeland mgmt. |
| Clay loam | None | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low & Medium | IIIe, IVe, VIe | IIIe, IVe | Erosion; mod. deep over bedrock | Cross-slope opers; residue mgmt; cropping seq; rangeland management |
| Very stony silty clay loam | Cobbles and stones | 35-80 in profile | 10-20" over bedrock | Moderately slow | Impervious | Good | Low | VIs, VIe, VIIs | | Shallow over bedrock;stony profile | Rangeland management |
| Cobbly clay loam | Cobbles | 20-35 below 10" | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | IVe, VIe, VIs, VIIs | IVe | Erosion;cobbly subsoil;mod. deep over bedrock | Cross-slope opers;residue mgmt; cropping seq; rangeland management |
| Cobbly clay or clay loam | Cobbles | 0-35 below 10" | 40-60" over bedrock | Moderately slow and slow | Impervious | Good | Low to High | IIIe, IIe, IIc, IVe | IIIe, IIe, IIc, IVe | Erosion;clayey subsoil(cobbly in places) restricts water and roots | Cross-slope opers; residue mgmt; cropping seq. |
| Clay loam | None | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low & Medium | IVe, VIe, VIIe | IIIe, IVe | Erosion; mod. deep over bedrock | Cross-slope opers; residue mgmt; cropping seq; rangeland management |

Table 114 - Continued

| Soil Groups | Soil Association: Map Sym. | Soil Association: Elevation Feet | Soil Association: Precip. Inches | Soil Association: Freeze free Season Days | Soil Association: Major land use | Classification: Great Group or Subgroup | Classification: Family | Classification: Series[2/] | Percentage[3/] of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Soil Characteristics: Texture Surface Soil | Soil Characteristics: Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 16 | 4,000-6,000 | 16-30 | 60-110 | Forest land 4/<br>Rangeland | Mollic Hapludalfs (Typic Argiudolls) | Fine-loamy, mixed, mesic | Weedmark | 40 | Uplands (mountains) | Loess & basic igneous rock | Loam | Clay loam | None | - | 20-40" over bedrock |
| | | | | | | Typic Argixerolls | Fine-loamy,mixed, frigid | Klicker | 35 | Uplands (mountains) | Loess & basic igneous rock | Silt loam | Stony clay loam | Cobbles and stones | 20-35 below 10" | 20-40" over bedrock |
| | | | | | | Lithic Argixerolls | Loamy-skeletal, mixed, mesic | Gwin | 15 | Uplands (mountains) | Loess & basic igneous rock | Very stony silt loam | Very stony silty clay loam | Cobbles and stones | 35-80 in profile | 10-20" over bedrock |
| | 17 | 4,500-6,000 | 12-16 | 80-130 | Rangeland<br>Cropland (hay and some cereals)-irrigated | Calcic Argixerolls | Fine, montmorillonitic, mesic | Gem | 35 | Uplands (hills-undulating to steep) | Loess over basic igneous rock | Loam | Clay loam | None | - | 20-40" over bedrock |
| | | | | | | Calcic Argixerolls | Fine-loamy,mixed, mesic | Farrot | 20 | Uplands (hills-undulating to steep) | Acid igneous rock | Coarse sandy loam | Coarse sandy clay loam | None | - | 20-40" over bedrock |
| | | | | | | Lithic Argixerolls | Loamy-skeletal, mixed, frigid | Gabica | 15 | Uplands (hills-undulating to very steep) | Basic igneous rock | Gravelly loam | Very gravelly clay loam | Gravel | 20-80 in profile | 7-20" over bedrock |
| | | | | | | Typic Argixerolls | Fine, montmorillonitic, frigid | | 15 | Uplands (hills-level to moderately sloping) | Loess over basic igneous rock | Loam | Clay | None | - | 20-40" over bedrock |
| | | | | | | Calcic Argixerolls | Fine-loamy,mixed, mesic | Elmore | 10 | Uplands (hills-rolling to steep) | Acid igneous rock | Sandy loam | Coarse sandy clay loam | None | - | 40-60" over bedrock |

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| ...ure ...oil | Characteristics: Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Soil Qualities and Interpretations: Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass: Dryland | Range of: Major Capability Subclass: Irrigated 6/ | Major Soil Problems | Suitable Land Treatment and Structures |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | None | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low & Medium | IVe, VIe, VIs | - | Erosion;mod. deep over bedrock; steep slopes | Forest land management |
| ...y | Cobbles and stones | 20-35 below 10" | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | IVe, VIe | - | Mod. deep over bedrock; stony profile; steep slopes | Forest land mgmt; rangeland management |
| ...y ...ty | Cobbles and stones | 35-80 in profile | 10-20" over bedrock | Moderately slow | Impervious | Good | Low | VIs, VIIs, VIe | - | Shallow over bedrock; stony profile; steep slopes | Rangeland management |
| ...y | None | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low & Medium | IIIe, IVe, VIe | IIIe, IVe | Erosion; moderately deep over bedrock | Cross-slope opers; residue mgmt; cropping seq; rangeland mgmt. |
| ...rse ...dy ...y | None | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | IVe, VIe, VIIe | IVe | Erosion; sandy profile;alkaline subsoil; mod. deep over bedrock | Cross-slope opers; residue mgmt; cropping seq; rangeland mgmt. |
| ...y ...velly ...y | Gravel | 20-80 in profile | 7-20" over bedrock | Moderately slow | Impervious | Good | Low | VIe, VIIe | - | Erosion; shallow over bedrock | Rangeland management |
| ...y | None | - | 20-40" over bedrock | Slow | Impervious | Good | Low & Medium | VIe | - | Erosion; clay subsoil restricts water & roots; alkaline subsoil; mod.deep over bedrock | Rangeland management |
| ...rse ...ndy ...ay | None | - | 40-60" over bedrock | Moderately slow | Impervious | Good | Medium | IIIe, IVe, VIe | IIIe, IVe | Erosion; sandy profile | Cross-slope opers; residue mgmt; cropping seq; rangeland mgmt. |

Table 114 - Continued

| Soil Association | | | | | | Classification | | | Per-cent-age[3/] of Assn. | Position on Landscape | Soil Characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil Groups | Map Sym. | Eleva-tion Feet | Precip. Inches | Freeze free Season Days | Major land use | Great Group or Subgroup | Family | Series[2/] | | | Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments Kind | Coarse Fragments Percent | Profile Depth |
| Shallow to deep, frigid soils with cobbly clayey and loamy sub-soils on gentle to steep slopes. | 18 | 4,500-6,500 | 10-14 | 60-120 | Rangeland<br>Cropland (cereals)-dryland | Calcic Argixerolls | Fine, montmoril-lonitic, frigid | | 20 | Uplands (lava plains-nearly level to rolling) | Loess over basic igneous rock | Silt loam | Clay | None | - | 20-40" over bedrock |
| | | | | | | Lithic Argixerolls | Loamy, mixed, frigid | | 20 | Uplands (lava plains-nearly level to rolling) | Loess & basic igneous rock | Rocky loam | Very rocky sandy clay loam | Stones and cobbles | 20-35 in profile | 10-20" over bedrock |
| | | | | | | Calcic Argixerolls | Fine-loamy, mixed, frigid | | 15 | Uplands (lava plains-undulating to rolling) | Loess over basic igneous rock | Silt loam | Silty clay loam | None | - | 40-60" over bedrock |
| | | | | | | - | - | Rockland 5/ | 15 | Uplands (lava plains-nearly level to rolling) | Basic igneous rock | - | - | - | - | 0-10" over bedrock |
| | | | | | | Entic Chromoxerert | Fine, montmoril-lonitic, frigid | | 10 | Uplands (lava plains-rolling) | Loess over basic igneous rock | Clay | Clay | None | - | 40-60" over bedrock |
| | | | | | | Aridic Lithic Haploxerolls | Loamy, mixed, frigid | Cox | 5 | Uplands (lava plains-undulating to rolling) | Loess & basic igneous rock | Sandy loam | Sandy loam | None | - | 10-20" over bedrock |
| | 19 | 5,000-7,000 | 11-16 | 60-110 | Cropland (cereal, hay, grain)<br>Rangeland | Aridic Durixerolls | Fine-loamy, mixed, frigid | Hecki | 40 | Uplands (lava plains-level to rolling) | Loess & residuum over basic igneous bedrock | Silt loam | Silty clay loam & clay | None | - | 20-40" over bedrock |
| | | | | | | Typic Argixerolls | Fine, montmoril-lonitic, frigid | | 20 | Uplands (plateaus) | Acid igneous bedrock residuum | Silt loam | Stony clay | Stones | 20-35 be-low 10" | 20-35" over rhyolitic tuff bedrock |
| | | | | | | Orthidic Durixerolls (Entic) | Fine-loamy, mixed, frigid | Roseworth | 5 | Uplands (lava plains - level to strongly sloping) | Loess & residuum over basic igneous bedrock | Silt loam | Silt loam | None | - | 20-40" over bedrock or hardpan |
| | | | | | | Aridic Calcic Argixerolls | Fine, montmoril-lonitic, frigid | Hoelzie | 5 | Uplands (lava plains-level to strongly sloping) | Residuum over basic igneous bedrock | Silt loam | Silty clay | Stones and cobbles | 10-20 in surface soil; 10-15 in sub-soil | 30-40" over basalt bedrock |

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114 - Continued

| Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ture soil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass: Dryland | Range of: Major Capability Subclass: Irrigated[6/] | Major Soil Problems | Suitable Land Treatment and Structures |
| y | None | - | 20-40" over bedrock | Slow | Impervious | Good | Low & Medium | IVe, IVs, VIc | IIIs, IIIe | Erosion;mod. deep over bedrock; clay subsoil | Cross-slope opers; residue mgmt; subsurface tillage; rangeland mgmt. |
| y<br>ky<br>dy<br>y<br>m | Stones and cobbles | 20-35 in profile | 10-20" over bedrock | Moderately Slow | Impervious | Good | Low | VIs, VIe | - | Shallow over bedrock;rocky profile | Rangeland management |
| ty<br>y<br>m | None | - | 40-60" over bedrock | Moderately slow | Impervious | Good | Medium & High | IVe, IVc | IIIe, IIIc | Erosion | Cross-slope opers; residue mgmt; rangeland mgmt. |
| - | - | - | 0-10" over bedrock | - | Impervious | Good | Low | VIIIs | - | Very shallow over bedrock | Watershed use |
| ay | None | - | 40-60" over bedrock | Slow | Impervious | Good | Medium | IVe, IVc, VIs | IIIe, IIIc | Erosion; clay | Cross-slope opers; residue mgmt; subsurface tillage; rangeland mgmt. |
| dy<br>m | None | - | 10-20" over bedrock | Rapid | Impervious | Good | Low | VIs, VIe, VIIe, VIIs | - | Erosion; shallow over bedrock | Rangeland management |
| lty<br>lay<br>oam &<br>lay | None | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Medium | IVe, VIIs | - | Moderate water erosion | Rangeland mgmt; residue management |
| tony<br>lay | Stones | 20-35 below 10" | 20-35" over rhyolitic tuff bedrock | Slow | Impervious | Good | Low & Medium | IVe | - | Moderate water erosion; slow permeability | Rangeland management |
| ilt<br>oam | None | - | 20-40" over bedrock or hardpan | Moderate | Impervious | Good | Medium & High | VIs | - | Moderate water erosion | Rangeland mgmt; residue management |
| ilty<br>lay | Stones and cobbles | 10-20 in surface soil; 10-15 in subsoil | 30-40" over basalt bedrock | Slow | Impervious | Good | Low | IVe | - | Moderate water erosion | Rangeland management |

Table 114 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | 5,500-8,000 | 15-25 | 20-80 | Rangeland<br>Forest land | Argic Pachic Cryoborolls | Fine-loamy, mixed | Harmehl | 15 | Uplands (hills-level to steep) | Loess & basic igneous rock | Gravelly loam | Gravelly clay loam | Gravel | 20-35 in profile | 20-40" over bedrock |
| | | | | | | Calcic Argixerolls | Loamy-skeletal, mixed, frigid | Searla | 15 | Fans | Alluvium | Gravelly loam | Channery clay loam | Gravel | 20-35 in profile | 60"+ |
| | | | | | | Typic Argixerolls (Argiudolls) | Fine-loamy, mixed frigid | Kanlee | 10 | Uplands (mountains) | Acid igneous rock | Coarse sandy loam | Sandy clay loam | None | - | 20-40" over bedrock |
| | | | | | | Lithic Argixerolls | Loamy-skeletal, mixed, frigid | Gabica | 10 | Uplands (mountains) | Basic igneous rock | Gravelly loam | Very gravelly clay loam | Gravel | 20-60 in profile | 7-20" over bedrock |
| | | | | | | Pachic Cryoborolls | Fine-loamy, mixed | Bullrey | 10 | Alluvial fans | Gravelly Alluvium | Gravelly loam | Gravelly loam | Gravel | 20-35 in profile | 60"+ |
| | | | | | | Argic Pachic Cryoborolls | Fine-loamy, mixed | Demast | 10 | Uplands (mountains) | Loess & basic igneous rock | Loam | Gravelly clay loam | Gravel | 20-35 below 10" in profile | 40-60" over bedrock |
| Shallow to very deep soils with stony, loamy profiles on gentle to extremely steep slopes. | 21 | 4,800-5,700 | 8-16 | 60-100 | Rangeland<br>Cropland (isolated patches of hay-grain-pasture)-irrigated | Aridic Lithic Haploxerolls | Loamy-skeletal, mixed, mesic | Bakeoven | 25 | Uplands (lava plains-nearly level to very steep) | Basic igneous rock | Stony loam | Stony clay loam | Stones cobbles and gravel | 20-35 in profile | 10-20" over bedrock |
| | | | | | | Calcic Pachic Argixerolls | Fine-loamy, mixed, mesic (loamy-skeletal) | Squaw | 20 | Fans | Alluvium | Stony loam | Very stony clay loam | Stones cobbles and gravel | 20-80 in profile | 60"+ |
| | | | | | | Typic Haplargids | Fine-loamy, mixed, mesic | Nannyton | 20 | Fans and terraces | Alluvium | Gravelly loam | Gravelly clay loam | Gravel | 20-35 in profile | 60"+ |
| | | | | | | Lithic Haplargids | Loamy-skeletal, mixed, frigid | Hoot | 15 | Fans and terraces | Alluvium | Gravelly loam | Clay | Gravel | 20-35 in surface soil | 12-20" over duripan |
| Miscellaneous rocky soils on strong to extremely steep slopes. | 22 | 4,800-5,700 | 8-16 | 60-100 | Rangeland<br>Forest land 4/ (scattered) | - | - | Rockland 5/ | 85 | Uplands (plateaus) | Basalt bedrock | Variable | Variable | Gravel cobbles and stones | 0-80 in profile | 0-10" over basalt bedrock |

114 - Continued

| Characteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ture soil | Coarse Fragments Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Range of: Major Capability Subclass Dryland | Irrigated[6/] | Major Soil Problems | Suitable Land Treatment and Structures |
| elly y m | Gravel | 20-35 in profile | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | VIe, VIIs | - | Erosion; gravelly profile | Rangeland management |
| nery y m | Gravel | 20-35 in profile | 60"+ | Moderately slow | Moderately slow | Good | Medium | VIe, VIIs | - | Erosion; alkaline subsoil; gravelly and channery profile | Rangeland management |
| dy y m | None | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | IVe, VIe | - | Erosion; sandy profile; mod. deep over bedrock | Rangeland and forest land management |
| y velly y m | Gravel | 20-60 in profile | 7-20" over bedrock | Moderately slow | Impervious | Good | Low | VIe, VIIe | - | Erosion; shallow over bedrock | Rangeland management |
| velly m | Gravel | 20-35 in profile | 60"+ | Rapid | Rapid | Good and somewhat excessive | Medium | VIe | - | Erosion; gravelly profile; climate | Rangeland management |
| velly ay m | Gravel | 20-35 below 10" in profile | 40-60" over bedrock | Moderately slow | Impervious | Good and somewhat excessive | Low & Medium | VIe | - | Erosion; gravelly profile | Forest land and rangeland management |
| ny ay m | Stones cobbles and gravel | 20-35 in profile | 10-20" over bedrock | Moderately slow | Impervious | Good | Low | VIIs, VIIIs | - | Shallow over bedrock; stony profile | Rangeland management |
| ry tony lay oam | Stones cobbles and gravel | 20-80 in profile | 60"+ | Moderately slow | Moderately slow | Good | Low & Medium | IIIe, IVe, VIs | - | Erosion; alkaline; stony profile | Rangeland management |
| ravelly lay oam | Gravel | 20-35 in profile | 60"+ | Moderately slow | Moderately slow | Good | Medium | IVe, VIc | IIIe, IVe, IIe | Erosion; alkaline; gravelly profile; droughtiness | Rangeland mgmt; cross-slope opers; residue mgmt; cropping seq; soil amends; irrig. mgmt |
| lay | Gravel | 20-35 in surface soil | 12-20" over duripan | Slow | Impervious in duripan | Good | Low | VIs, VIIs | - | Shallow over duripan; gravelly surface soil; clay subsoil | Rangeland management |
| ariable | Gravel cobbles and stones | 0-80 in profile | 0-10" over basalt bedrock | - | Impervious | Good | Very low | VIIIs | - | Shallow over bedrock | - |

Table 114 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series2/ | Percentage3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Percent | Profile Depth | Perm Su |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moderately deep to deep, frigid ashy soils with loamy subsoils on moderate to extremely steep slopes. | 23 | 3,000-7,500 | 22-50 | 20-130 | Forest land 4/ Rangeland | Argixerolls plus Vitrandepts Haploxerolls | Fine-loamy, mixed, and ashy over loamy, mixed, frigid | - | 100 | Uplands, hills & mountains | Volcanic ash and Loess & basic igneous rock | - | - | - | - | 20-60" over bedrock | Mode |
| Miscellaneous, very cold rocky soils on strong to extremely steep slopes. | 24 | 6,000-12,000 | 18-60 | None | Other Forest land 4/ Rangeland | Cryandepts plus Cryochrepts and Cryorthods | Ashy over loamy | - | 100 | Uplands (mountains) | Sedimentary & igneous rock | - | - | - | - | 0-10" over bedrock | Mode impe |
| Shallow and moderately deep, frigid soils with gravelly, loamy and clayey subsoils on strong to extremely steep slopes. | 25 | 6,000-11,000 | 10-30 | 30-90 | Rangeland Forest land | Typic Argixerolls | Fine-loamy,mixed, frigid | | 25 | Mountain-side slopes | Mixed basic igneous & sedimentary residuum | Stony loam | Cobbly clay loam & clay | Stones and cobbles | 20-35 in profile | 36-60" over bedrock | Slow |
| | | | | | Cropland (irrigated meadow hayland) | Lithic Haploxerolls | Loamy-skeletal, mixed, frigid | | 20 | Mountain tops and side slopes | Sedimentary rock residuum | Stony loam | Very gravelly and stony loam | Stones and gravel | 35+" in profile | 10-20" over bedrock | Rapi |
| | | | | | | Abruptic Durixerol | Fine, montmorillonitic, frigid | | 15 | High terraces | Very cobbly alluvium | Very cobbly loam | Clay | Cobbles | 35 in topsoil | 20-30" over clayey material | Very |
| | | | | | | Argiudic Cumulic Cryoborolls | Fine, loamy,mixed | | 15 | High terraces | Gravelly alluvium | Loam | Gravelly loam | Gravel | 20-35 below 10" in profile; 60 below 40-60" | 40-60" over gravel | Rapi |
| | | | | | | Pachic Cryoborolls | Fine-loamy,mixed | Bullrey | 10 | Alluvial fans | Gravelly alluvium | Gravelly loam | Gravelly loam | Gravel | 20-35 in profile | 60"+ | Rapi |
| Moderately deep and deep soils with coarse-loamy subsoils high in quartz and cold winters on moderate to very steep slopes. | 26 | 3,000-3,700 | 11-16 | 90-120 | Rangeland Cropland (cereals and hay)-mostly dryland Forest land 4/ | Typic Argixerolls | Fine-loamy,mixed, mesic | Brownlee | 50 | Uplands (hills) | Acid igneous rock | Silty clay loam | Sandy clay loam | None | - | 20-30" over bedrock | Mod slo |
| | | | | | | Calciorthidic Haploxerolls | Coarse-loamy,mixed, mesic | North Powder | 25 | Uplands (hills) | Acid igneous rock | Loam | Loam | None | - | 20-30" over bedrock | Mod |
| | | | | | | Typic Argixerolls | Fine-loamy,mixed, frigid | Ladd | 20 | Fans | Alluvium | Loam | Silty clay loam | None | - | 36-60" over cobbles and gravel | Mod slo |

2

- Continued

| acteristics | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Coarse Fragments* | | | | | | Total Avail- *able Water-* holding | Range of: *Major Capability* Subclass | | | |
| Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Capacity | Dryland | Irrigated[5/] | Major Soil Problems | Suitable Land Treatment and Structures |
| - | - | 20-60" over bedrock | Moderate | - | Good | Low to Medium | VIe, VIs | - | Erosion; volcanic ash material. Moves with serious ground disturbance | Continued forest land management. |
| - | - | 0-10" over bedrock | Moderate to impervious | - | Good | Low | VIIIs | - | Shallow over bedrock;steep *slopes. Cold* climate; high elevations; steep slopes. | Continued forest land management protection *of all resources* |
| Stones and cobbles | 20-35 in profile | 36-60" over bedrock | Slow | Impervious | Good | Medium *& Low* | VIs | - | Droughtiness; climate; erosion | Rangeland management |
| Stones and gravel | 35+" in profile | 10-20" over bedrock | Rapid | Impervious | Good | Very low | VIs | - | Droughtiness; climate; erosion | Rangeland management |
| Cobbles | 35 in topsoil | 20-30" over clayey material | Very slow | Impervious | Good | Low | VIIs | - | Droughtiness; climate; erosion | Rangeland management |
| Gravel | 20-35 below 10" in profile; 60 below 40-60" | 40-60" over gravel | Rapid | Very rapid | Somewhat excessive | Low | IVe | IVe, IVc | Droughtiness; climate | Rangeland and irrigation management |
| Gravel | 20-35 in profile | 60"+ | Rapid | Rapid | Good and *somewhat* excessive | Medium | VIe | - | Droughtiness; *climate; ero-* sion | Rangeland management |
| None | - | 20-30" over bedrock | Moderately slow | Impervious | Good | Low | IVe, VIe, VIIe | - | Erosion; mod. deep over bedrock | Rangeland management |
| None | - | 20-30" over bedrock | Moderate | Impervious | Good | Low | IVe, IIIe, VIe | - | Erosion; mod. deep over bedrock | Rangeland management; cross-slope opers; residue mgmt; cropping seq. |
| None | - | 36-60" over cobbles and gravel | Moderately slow | Very rapid | Good | Medium & High | IIIe, IVe, IIe | - | Erosion | Cross-slope opers; residue mgmt; cropping seq; rangeland management |

Table 114 - Continued

| Soil Groups | Soil Association: Map Sym. | Elevation Feet | Precip. Inches | Freeze free Season Days | Major land use | Classification: Great Group or Subgroup | Family | Series 2/ | Percentage 3/ of Assn. | Position on Landscape | Soil Characteristics: Parent Material | Texture Surface Soil | Texture Subsoil | Coarse Fragments: Kind | Coarse Fragments: Percent | Profile Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 27 | 3,000-9,000 | 25-60 | 0-80 | Forest land 4/ | Argixerolls plus Xerorthents (shallow) Xeralfs and Rockland | Loamy-skeletal, and fine to coarse-loamy mixed, frigid | Pyle, Graylock | 100 | Uplands (mountains-steep slopes) | Acid igneous rock | - | - | - | - | 40-60" over bedrock |
| | 28 | 3,500-7,500 | 12-15 | 100-140 | Rangeland<br>Cropland (cereals and hay)-some irrigated | Typic Argixerolls | Fine-loamy, mixed, mesic | Brownlee | 30 | Uplands (hills) | Acid igneous rock | Coarse sandy loam | Coarse sandy clay loam | None | - | 40-60" over bedrock |
| | | | | | | Entic Haploxerolls | Coarse-loamy, mixed, mesic | Rainey | 20 | Uplands (hills-steep south slopes) | Acid igneous rock | Coarse sandy loam | Coarse sandy loam | None | - | 20-40" over bedrock |
| | | | | | | Typic Argixerolls | Fine-loamy, mixed, frigid | | 15 | Uplands (hills-moderately sloping to steep) | Acid igneous rock | Loam | Clay loam | None | - | 40-60" over bedrock |
| | | | | | | Calcic Argixerolls | Fine-loamy, mixed, mesic | Farrot | 15 | Uplands (hills-undulating to steep) | Acid igneous rock | Coarse sandy loam | Coarse sandy clay loam | None | - | 20-40" over bedrock |
| | | | | | | Aridic Calcic Argixerolls | Fine-loamy, mixed, mesic | Haw | 10 | Uplands (hills-nearly level to steep) | Alluvium | Silt loam | Loam | None | - | 40-60" over impervious sediments |

1/ Based on data summarized during 1966.
2/ Only soil series names that have a status as reserved, tentative, or established are listed.
3/ Differences of total percentage in each soil association from 100 percent are inclusions of other soils and land types.
4/ For the upland forest soils, the above characteristics and qualities have been extended from a limited amount of survey data. Additional data and land use interpretations for forest soils are available in the Forest Land section of Appendix VIII, Land Measures and Watershed Protection. These areas include National Forest and adjacent non-Federal forest lands.
5/ Miscellaneous land types.
6/ Presently irrigated cropland.

SOURCE: National Cooperative Soil Survey.

4 - Continued

| (Chara)cteristics | | | | Soil Qualities and Interpretations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coarse Fragments | | | | | | | Range of: Major Capability Subclass | | | |
| e l | Kind | Percent | Profile Depth | Permeability Subsoil | Permeability Substream | Drainage Class | Total Available Water-holding Capacity | Dryland | Irrigated b/ | Major Soil Problems | Suitable Land Treatment and Structures |
| | - | - | 40-60" over bedrock | Moderate to rapid | - | Good | Low | VIe | - | Erosion;with improper land use | Continued forest land management |
| | None | - | 40-60" over bedrock | Moderately slow | Impervious | Good | Medium | IIIe, IVe, VIe, VIIe | IIIe, IVe | Erosion;sandy profile | Cross-slope opers; residue mgmt; cropping seq; rangeland management |
| | None | - | 20-40" over bedrock | Very rapid | Impervious | Good and somewhat excessive | Low | IVe, VIe, VIs | IVe | Erosion;sandy profile;mod. deep over bedrock | Cross-slope opers; residue mgmt; cropping seq; rangeland management |
| | None | - | 40-60" over bedrock | Moderately slow | Impervious | Good | Medium & high | IIIe, IVe, VIe, VIIe | IIIe, IVe | Erosion | Cross-slope opers; residue mgmt; cropping seq; rangeland management |
| e | None | - | 20-40" over bedrock | Moderately slow | Impervious | Good | Low | IVe, VIe, VIIe | IVe | Erosion;sandy profile;alkaline subsoil; mod. deep over bedrock | Cross-slope opers; residue mgmt; cropping seq; rangeland management |
| | None | - | 40-60" over impervious sediments | Moderate | Variable | Good | Medium & high | IIIe, IVc, VIe | IIIe, IVe | Erosion | Cross-slope opers; residue mgmt; cropping seq; rangeland management |

range of adapted crops and production by adverse climatic conditions resulting from elevations of more than 4,000 feet above sea level. A large contiguous area adjacent to the Snake River, commonly referred to as the Snake River Plain, lies mostly on gentle to moderate slopes that adapt well to irrigation in places where soils are suitable. Coarse fragments in the soil, climate, and soil profile depth are most important in deciding proper use and management.

Table 115 shows the acreage and extent of the soil associations by states.

## Interpretations and Evaluation

Table 116 relates the land capability classes to the Land Capability Map, figure 3. It must be realized that the Land Capability Map is highly generalized and a specific capability class on table 116 may not be shown. To determine the land capability of any particular area, refer to the soil association symbols listed in the second column of the table and then locate the area of that symbol on the Soil Associations Map, figure 23. Table 116 also shows the acreage and extent of the dominant land capability class for practical segments of the landscape.

Classified on table 117 is the dominant water storage capacity for each soil association in Subregion 5. Each class on the table relates to a similar class on the regional map on Water Storage Capacity, figure 4. To locate those areas having contrasting water storage capacity in the upper 5 feet of soil, refer to figure 4, to figure 23 (the subregional Soil Association Map), and to the following table. The class letter symbol in the first column and the Soil Association Map numerical symbol listed in the second column may be used to locate those areas having contrasting water storage capacity. Complete utilization of this storage can contribute a more stable and sustained streamflow.

Table 116 - Summary and Distribution of Land Capability Classes, Subregion 5, 1966

| Land Capability Classes | Distribution by Soil Associations 1/ | | | |
|---|---|---|---|---|
| | Soil Association Map Symbols 2/ | 1,000 Acres | Percent | Inventoried 1,000 Acres 3/ |
| Class I - Soils in Class I have no limitations or hazards. They are adopted to all uses with a minimum of conservation treatment other than standard conditioning ones. 4/ | - | - | - | 43.6 |
| Class II - Soils in Class II have few limitations or hazards. Simple conservation practices are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 9 | 1,660.0 | 7.1 | 478.3 |
| Class III - Soils in Class III have more limitations and hazards than those in Class II. They require more difficult or complex conservation practices when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 1-2-5-14 | 2,043.0 | 8.7 | 857.0 |
| Class IV - Soils in Class IV have greater limitations and hazards than Class III. Still more difficult or complex measures are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland or wildlife. | 6-7-8-11-12-19-28 | 2,770.0 | 11.8 | 489.6 |
| Class V - Soils in Class V have more limitations than Class IV. They are generally unsuited for cultivation, but are well suited for grazing and forestry use. They require good management practices. 4/ | - | - | - | 100.6 |
| Class VI - Soils in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland or wildlife. 5/ | 3-4<br>13-15-16-17-18<br>20-21-23-25-26-27 | 15,664.5 | 66.9 | 18,036.2 |
| Class VII - Soils in Class VII have very severe limitations and hazards that make them generally unsuited for cultivation. They are suited to grazing, noncommercial, woodland or wildlife. | 10 | 480.0 | 2.1 | 2,058.7 |
| Class VIII - Soils and land forms in Class VIII have limitations and hazards that prevent their use for cultivated crops, pasture, range or woodland. They may be used for recreation, wildlife or water supply. | 22-24 | 780.0 | 3.4 | 1,333.5 |
| Total Land | | 23,397.5 | 100.0 | 23,397.5 |

1/ Class I and 10 percent of other capability classes may be included in areas of Class II. Up to 25 percent of other capability classes may be included in Classes III and IV. Class V and up to 40 percent of other capability classes may be included in Classes VI, VII, and VIII. In areas of rainfall less than 12 inches, large areas of Class VI can be potential Classes I through IV where irrigation water is available.
2/ *Refer to the Subregional Soil Association Map, figure 23.*
3/ Taken from table 8.
4/ Capability Classes I and V are distributed in small segregated areas over segments of the landscape. Many small areas could not be delineated on the map. This added detail, although still generalized, is commensurate with the subregional level of generalization
5/ About 4.8 million acres could be classed I through IV when irrigated.
Source: National Cooperative Soil Survey and U.S.D.A. Conservation Needs Inventory adjusted.

Table 117 - Water Storage Capacity of Soils Generalized to the Soil Associations, Subregion 5, 1966

| Classes of Water Storage Capacity[1/] | Association Symbols | 1,000 Acres | Percent |
|---|---|---|---|
| Class A - Water storage in the soil profile more than 20,000 acre-feet per township. | 8 | 830.0 | 3.5 |
| Class B - Water storage in the soil profile 10,000 to 20,000 acre-feet per township. | 4-5-6-7 9-16-23 | 3,990.0 | 17.1 |
| Class C - Water storage in the soil profile 5,000 to 10,000 acre-feet per township. | 1-2-3-10-11 12-13-14-15-17 18-19-20-21-25 26-27-28 | 17,797.5 | 76.1 |
| Class D - Water storage in the soil profile less than 5,000 acre-feet per township. | 22-24 | 780.0 | 3.3 |
| Total | | 23,397.5 | 100.0 |

1/ Measurement of water storage capacity is limited to the upper 5 feet of soil or to bedrock.
Source: National Cooperative Soil Survey.

## Cover and Land Use

The four major cover and land uses as defined in the glossary and explained in the introduction have been summarized by acreage and ownership on tables 118 through 121. These broad categories have been determined both on the basis of cover and use. Cropland is more specifically a use category. Forest land has more than 10 percent forest cover. Rangeland areas have broad range cover characteristics. Other land includes land specifically based on use, such as urban as well as that based specifically on cover characteristics such as rock and sand dune areas. The four major categories have been generalized for presentation on figure 24. Since this information has been generalized, isolated areas of different cover and uses may occur within the broad patterns.

### Cropland

The major part of the cropland in Subregion 5 is irrigated and under an intense level of management. Cash crops consist mainly of sugar beets, potatoes, apples, prunes, wheat, and alfalfa. There are many other crops common to the area, such as onions

Table 118 - Cover and Land Use by Ownership, Subregion 5, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 3,024.7 | 1,234.2 | 210.4 | 4,469.3 |
| Other Agriculture | - | - | - | - | - |
| | - | 3,024.7 | 1,234.2 | 210.4 | 4,469.3 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 336.0 | 10,287.7 | 219.2 | 10,842.9 |
| Bureau of Indian Affairs1/ | 11.0 | - | 271.9 | 6.9 | 289.8 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | 1.2 | - | 1.2 |
| Bureau of Reclamation | - | - | 443.6 | 26.7 | 470.3 |
| Other Interior | - | - | - | - | - |
| | 11.0 | 336.0 | 11,004.4 | 252.8 | 11,604.2 |
| Department of Defense | - | - | 39.9 | 8.2 | 48.1 |
| Other Federal | - | - | - | .2 | .2 |
| Federal Subtotal | 11.0 | 3,360.7 | 12,278.5 | 471.6 | 16,121.8 |
| State | .5 | 231.5 | 819.2 | 94.9 | 1,146.1 |
| County | - | 1.0 | - | 26.3 | 27.3 |
| Municipal | - | - | 1.0 | 13.2 | 14.2 |
| Public Total | 11.5 | 3,593.2 | 13,098.7 | 606.0 | 17,309.4 |
| Private Total | 1,617.4 | 597.3 | 3,740.0 | 133.4 | 6,088.1 |
| Total Land Area | 1,628.9 | 4,190.5 | 16,838.7 | 739.4 | 23,397.5 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Conservation Needs Inventory and U.S.D.A. Forest Survey adjusted by the Land and Minerals Work Group.

Table 119 - Cover and Land Use by Ownership, State of Idaho, Subregion 5, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 2,097.0 | 537.0 | 183.9 | 2,817.9 |
| Other Agriculture | - | - | - | - | - |
| | - | 2,097.0 | 537.0 | 183.9 | 2,817.9 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 230.0 | 4,570.2 | 74.9 | 4,875.1 |
| Bureau of Indian Affairs1/ | - | - | 139.3 | 6.2 | 145.5 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | 1.2 | - | 1.2 |
| Bureau of Reclamation | - | - | 366.1 | 26.7 | 392.8 |
| Other Interior | - | - | - | - | - |
| | - | 230.0 | 5,076.8 | 107.8 | 5,414.6 |
| Department of Defense | - | - | 39.9 | 8.2 | 48.1 |
| Other Federal | - | - | - | .1 | .1 |
| Federal Subtotal | - | 2,327.0 | 5,653.7 | 300.0 | 8,280.7 |
| State | .5 | 228.0 | 549.9 | 76.6 | 855.0 |
| County | - | - | - | 23.0 | 23.0 |
| Municipal | - | - | - | 10.4 | 10.4 |
| Public Total | .5 | 2,555.0 | 6,203.6 | 410.0 | 9,169.1 |
| Private Total | 1,019.3 | 368.0 | 1,590.3 | 46.8 | 3,024.4 |
| Total Land Area | 1,019.8 | 2,923.0 | 7,793.9 | 456.8 | 12,193.5 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Conservation Needs Inventory and U.S.D.A. Forest Survey adjusted by the Land and Minerals Work Group.

Table 120 - Cover and Land Use by Ownership, State of Nevada, Subregion 5, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 63.0 | 545.0 | - | 608.0 |
| Other Agriculture | - | - | - | - | - |
| | - | 63.0 | 545.0 | - | 608.0 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | - | 1,066.3 | - | 1,066.3 |
| Bureau of Indian Affairs 1/ | 11.0 | - | 132.6 | .7 | 144.3 |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Other Interior | - | - | - | - | - |
| | 11.0 | - | 1,198.9 | .7 | 1,210.6 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 11.0 | 63.0 | 1,743.9 | .7 | 1,818.6 |
| State | - | - | - | - | - |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 11.0 | 63.0 | 1,743.9 | .7 | 1,818.6 |
| Private Total | 131.2 | - | 356.6 | 16.5 | 504.3 |
| Total Land Area | 142.2 | 63.0 | 2,100.5 | 17.2 | 2,322.9 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Conservation Needs Inventory and U.S.D.A. Forest Survey adjusted by the Land and Minerals Work Group.

Table 121 - Cover and Land Use by Ownership, State of Oregon, Subregion 5, 1966

| Ownership | Cropland | Forest Land | Rangeland | Other Land | Total |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Department of Agriculture | | | | | |
| Forest Service | - | 864.7 | 152.2 | 26.5 | 1,043.4 |
| Other Agriculture | - | - | - | - | - |
| | - | 864.7 | 152.2 | 26.5 | 1,043.4 |
| Department of the Interior | | | | | |
| Bureau of Land Management | - | 106.0 | 4,651.2 | 144.3 | 4,901.5 |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | 77.5 | - | 77.5 |
| Other Interior | - | - | - | - | - |
| | - | 106.0 | 4,728.7 | 144.3 | 4,979.0 |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | .1 | .1 |
| Federal Subtotal | - | 970.7 | 4,880.9 | 170.9 | 6,022.5 |
| State | - | 3.5 | 269.3 | 18.3 | 291.1 |
| County | - | 1.0 | - | 3.3 | 4.3 |
| Municipal | - | - | 1.0 | 2.8 | 3.8 |
| Public Total | - | 975.2 | 5,151.2 | 195.3 | 6,321.7 |
| Private Total | 466.9 | 229.3 | 1,793.1 | 70.1 | 2,559.4 |
| Total Land Area | 466.9 | 1,204.5 | 6,944.3 | 265.4 | 8,881.1 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Conservation Needs Inventory and U.S.D.A. Forest Survey adjusted by the Land and Minerals Work Group.

sweet corn, silage, barley, oats, pears, cherries, peaches, peppermint, and seed crops.

The nonirrigated cropland generally follows a grain-fallow rotation for the cash crop and various mixtures of a legume with grass to provide hay and pasture in the rotation. In Idaho, alfalfa seed is an important crop.

Table 122 shows the cropland acreage and extent by representative categories of crops and figure 24 shows cover and land use that locate the cropland area.

Table 122 - Cropland Acreage of Representative Categories of Crops by States, Subregion 5, 1966

| Categories of Crops | Idaho | Oregon | Nevada | Total | Percent |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Dryland Cropland | | | | | |
| Forage Crops | 122.0 | 13.0 | - | 135.0 | 8.3 |
| Close grown field crops | 44.0 | 28.9 | - | 72.9 | 4.5 |
| Total dryland crops | 166.0 | 41.9 | - | 207.9 | 12.8 |
| Irrigated Cropland 1/ | | | | | |
| Forage crops | 434.9 | 256.2 | 141.9 | 833.0 | 51.1 |
| Close grown field crops | 99.0 | 35.9 | .3 | 135.2 | 8.3 |
| Row crops 2/ | 306.8 | 130.9 | - | 437.7 | 26.8 |
| Orchards and vineyards | 8.9 | 2.0 | - | 10.9 | .7 |
| Specialty crops 3/ | 4.2 | - | - | 4.2 | .3 |
| Total irrigated crops | 853.8 | 425.0 | 142.2 | 1,421.0 | 87.2 |
| Total cropland | 1,019.8 | 466.9 | 142.2 | 1,628.9 | 100.0 |

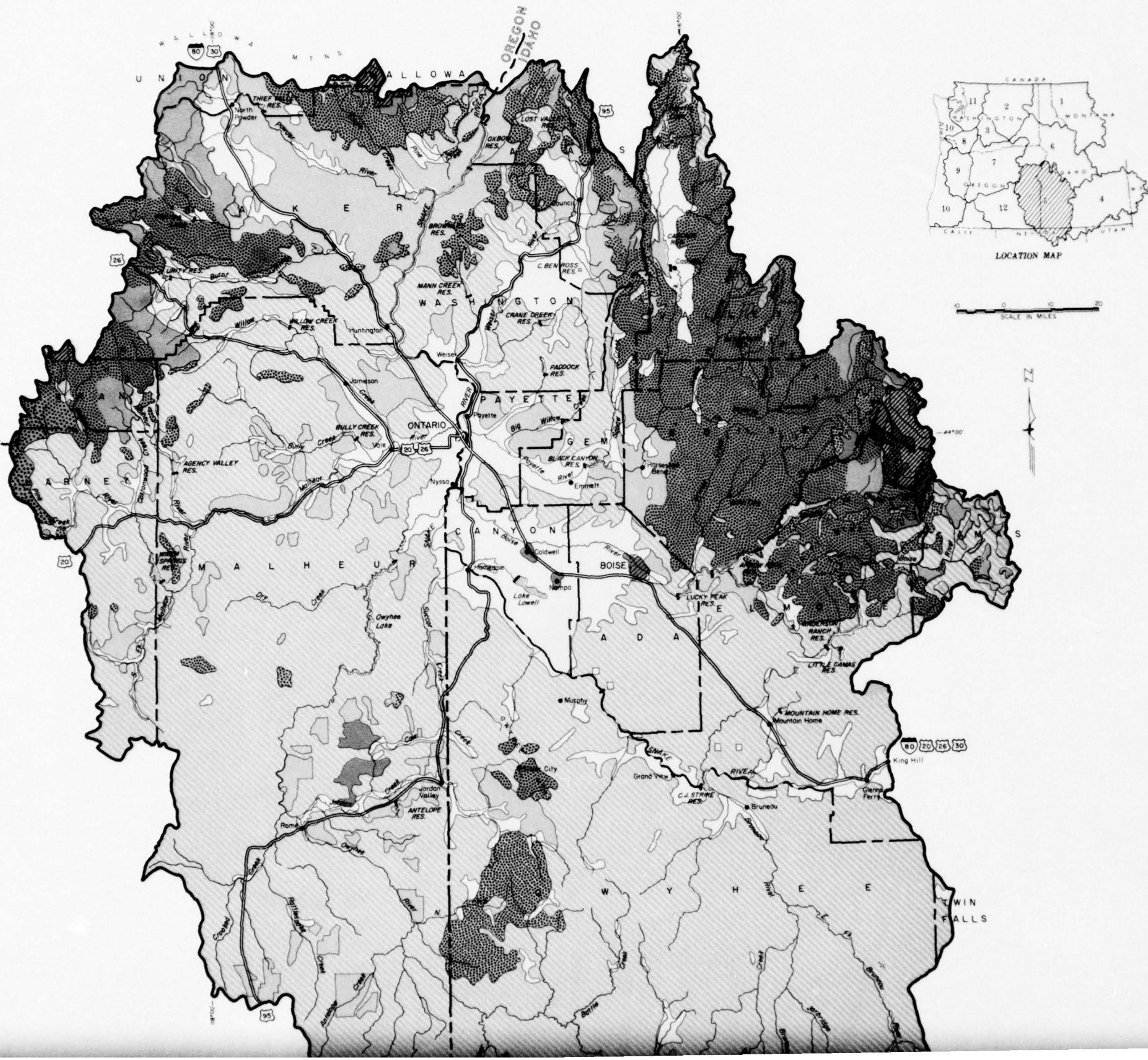
1/ Does not include other land that is irrigated (table 131).
2/ Includes sugar beets, potatoes, beans, corn, etc.
3/ Includes mint, vegetable seed, and other special and inextensive crops.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

## Forest Land

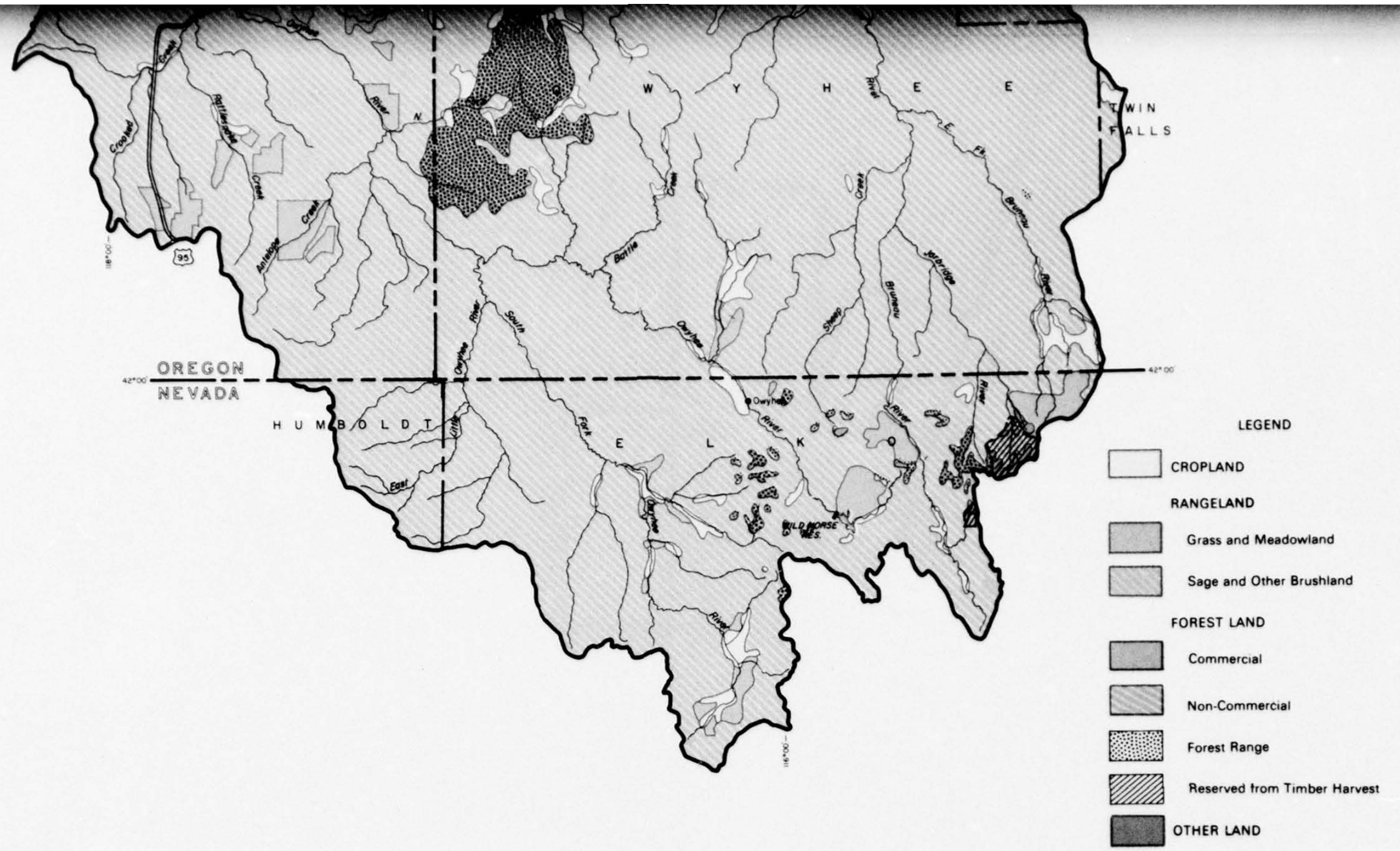
Forested lands cover 4,190,500 acres or 18 percent of the total land area in Subregion 5. Within its boundaries, 24 percent of Idaho, 14 percent of Oregon, and 3 percent of Nevada are forested. Most of the forest cover is located in the mountainous northeast portion extending down slope until it mixes with the drier sage and grasslands below.

Over 3-1/2 million acres or 87 percent of the forested land is publicly owned. Of this, 83 percent is national forest, 11 percent Public Domain, and 6 percent state owned. Private ownership of forest land amounts to 532,300 acres.

Tables 123 through 126 show the forest land acreage by type and ownership for each state.



LOCATION MAP
SCALE IN MILES
OREGON
IDAHO
WALLOWA MTNS
UNION
WALLOWA
BAKER
WASHINGTON
PAYETTE
GEM
CANYON
ADA
BOISE
ONTARIO
MALHEUR
HARNEY
OWYHEE
TWIN FALLS
ELMORE
CANADA
MONTANA
WASHINGTON
OREGON
IDAHO
CALIF.
NEVADA
UTAH
THIEF VALLEY RES.
North Powder
LOST VALLEY RES.
OXBOW RES.
BROWNLEE RES.
MANN CREEK RES.
C. BEN ROSS RES.
CRANE CREEK RES.
PADDOCK RES.
UNITY RES.
WILLOW CREEK RES.
Huntington
Weiser
Jamieson
BULLY CREEK RES.
Vale
AGENCY VALLEY RES.
Payette
BLACK CANYON RES.
Emmett
Horseshoe Bend
Nyssa
Caldwell
Nampa
Homedale
Lake Lowell
LUCKY PEAK RES.
LITTLE CAMAS RES.
MOUNTAIN HOME RES.
Mountain Home
King Hill
Glenns Ferry
Murphy
Grand View
C.J. STRIKE RES.
Bruneau
Jordan Valley
ANTELOPE RES.
Rome
Owyhee Lake
SNAKE RIVER
44°00'




COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# GENERALIZED COVER AND LAND USE

CENTRAL SNAKE, SUBREGION 5

1968

USDA-SCS PORTLAND, OREG. 1970

FIGURE 24

2

Table 123 - Forest Land Acreage by Generalized Type and Ownership, Subregion 5, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive Reserved | Noncommercial Forest Land: Unproductive Reserved | Noncommercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 2,092.5 | 112.5 | 69.7 | 750.0 | 3,024.7 |
| Bureau of Land Management | 65.0 | - | - | 271.0 | 336.0 |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 2,157.5 | 112.5 | 69.7 | 1,021.0 | 3,360.7 |
| State | 179.5 | - | - | 52.0 | 231.5 |
| County | 1.0 | - | - | - | 1.0 |
| Municipal | - | - | - | - | - |
| Public Total | 2,338.0 | 112.5 | 69.7 | 1,073.0 | 3,593.2 |
| Private Total | 481.3 | - | - | 116.0 | 597.3 |
| Grand Total | 2,819.3 | 112.5 | 69.7 | 1,189.0 | 4,190.5 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Northwest and Intermountain Experiment Stations.

Table 124 - Forest Land Acreage by Generalized Type and Ownership, State of Idaho, Subregion 5, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive Reserved | Noncommercial Forest Land: Unproductive Reserved | Noncommercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 1,277.0 | 92.0 | 42.0 | 686.0 | 2,097.0 |
| Bureau of Land Management | 37.0 | - | - | 193.0 | 230.0 |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 1,314.0 | 92.0 | 42.0 | 879.0 | 2,327.0 |
| State | 179.0 | - | - | 49.0 | 228.0 |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 1,493.0 | 92.0 | 42.0 | 928.0 | 2,555.0 |
| Private Total | 300.0 | - | - | 68.0 | 368.0 |
| Grand Total | 1,793.0 | 92.0 | 42.0 | 996.0 | 2,923.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 125 - Forest Land Acreage by Generalized Type and Ownership, State of Nevada, Subregion 5, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive Reserved | Noncommercial Forest Land: Unproductive Reserved | Noncommercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| | (1,000 acres) | | | | |
| Forest Service | 16.5 | 8.5 | 5.0 | 33.0 | 63.0 |
| Bureau of Land Management | - | - | - | - | - |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 16.5 | 8.5 | 5.0 | 33.0 | 63.0 |
| State | - | - | - | - | - |
| County | - | - | - | - | - |
| Municipal | - | - | - | - | - |
| Public Total | 16.5 | 8.5 | 5.0 | 33.0 | 63.0 |
| Private Total | - | - | - | - | - |
| Grand Total | 16.5 | 8.5 | 5.0 | 33.0 | 63.0 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Intermountain Experiment Station.

Table 126 - Forest Land Acreage by Generalized Type and Ownership, State of Oregon, Subregion 5, 1966

| Ownership | Commercial Forest Land | Noncommercial Forest Land: Productive Reserved | Noncommercial Forest Land: Unproductive Reserved | Noncommercial Forest Land: Unproductive | Total |
|---|---|---|---|---|---|
| Forest Service | 799.0 | 12.0 | 22.7 | 31.0 | 864.7 |
| Bureau of Land Management | 28.0 | - | - | 78.0 | 106.0 |
| Bureau of Indian Affairs 1/ | - | - | - | - | - |
| National Park Service | - | - | - | - | - |
| Fish & Wildlife Service | - | - | - | - | - |
| Bureau of Reclamation | - | - | - | - | - |
| Department of Defense | - | - | - | - | - |
| Other Federal | - | - | - | - | - |
| Federal Subtotal | 827.0 | 12.0 | 22.7 | 109.0 | 970.7 |
| State | .5 | - | - | 3.0 | 3.5 |
| County | 1.0 | - | - | - | 1.0 |
| Municipal | - | - | - | - | - |
| Public Total | 828.5 | 12.0 | 22.7 | 112.0 | 975.2 |
| Private Total | 181.3 | - | - | 48.0 | 229.3 |
| Grand Total | 1,009.8 | 12.0 | 22.7 | 160.0 | 1,204.5 |

1/ Private lands held in trust by the Federal Government.
Source: U.S.D.A. Forest Survey, Northwest Experiment Station.

Timber Commercial forests total 2,815,300 acres, almost 100 percent softwood. Most of the inventoried volume is in ponderosa pine and Douglas-fir with small amounts of true fir, Engelmann spruce, and lodgepole pine scattered throughout the higher areas. The remaining 1,375,200 acres are noncommercial forest land, 13 percent in classified or other designated areas reserved from cutting, the rest is unproductive.

Eighty-seven percent of the commercial forest land is in the sawtimber class, 6 percent in pole timber, 6 percent in seedlings and saplings, and only 1 percent is classed as nonstocked. Except for some 100,000 acres in the reserved category, the forest areas support some 35 billion board feet of commercial sawtimber. This volume supplies raw material for the forest products industry, furnishing 27 percent of its total manufacturing employment.

Forest Range Forest range amounting to 3.4 million acres represents 82 percent of the total forest land. Included in the forest range are 2.4 million acres classified as commercial land and 1.0 million acres classified as noncommercial forest land.

It is estimated that 23 percent of the forest range is in good range condition, 40 percent in fair condition, and 37 percent in poor condition. Carrying capacity varies from 2 acres per AUM to in excess of 40 acres per AUM, with an estimated average of 15 acres per AUM. The forest range thus has an approximate 235,000 AUM capacity of which the public accounts for 82 percent and the private 18 percent.

The Federal Government has jurisdiction of 81 percent of the forest range, with 2.4 million acres managed by the Forest Service and 329,000 acres under Bureau of Land Management control. Private ownership accounts for 561,000 acres and 110,000 acres are owned by state or county government.

They are primarily concentrated in the northeastern portion of the subregion with lesser but significant concentrations in the northwestern and south-central parts.

Forage species consist mainly of sagebrush, antelope bitterbrush, and mountain mahogany. Various other brush species such as snowbrush, chokecherry, elderberry, and serviceberry also occur. Grass understory is predominantly bluebunch wheatgrass, along with pinegrass, Idaho fescue, bluegrass, and cheatgrass. Sedges and various meadowgrass species occur in the open wetter sites.

Forest range is generally characterized by gentle to moderately steep slopes with elevations ranging from 2,300 feet at the desert fringe to just under 10,000 feet at Eagle Cap on the northern edge of the subregion.

Other Uses Although only 18 percent of the land area is forested, 65 percent of the total stream runoff originates here. Tributary streams within the forest area are the location for most of the fish spawning areas in the region.

These forest lands also form a significant portion of the recreation resource. In 1965, there were an estimated 3.6 million visits to forest lands, the majority being to State Park areas. An estimated 400,000 hunter visits tallied in 1965 were on the forest lands. The wood, water, forage, recreation, and wildlife resources supplied by the forested acres of the subregion are vital to the economy and growth of the immediate area and contribute significantly to the progress of the entire region.

## Rangeland

There are 16.8 million acres of rangeland in the subregion representing 72 percent of the total land area. This subregion accounts for 29 percent of all rangeland in the region. Tables 127 through 130 show the different categories of rangeland by ownership and state.

Rangeland is spread extensively throughout the subregion except in the forested mountain lands in the northeastern part of the area. It is interspersed with forest lands in the northern and northwestern portions of the subregion and surrounds concentrations of agricultural cropland principally along the Snake River and its confluence with the Boise and Owyhee Rivers. About 2.2 million acres or 13 percent of this range is in good range condition, 8.0 million acres or 48 percent is in fair condition, and 6.6 million acres or 39 percent is in poor condition. The rangeland has an estimated carrying capacity of 1.4 million AUMs, with private range accounting for 27 percent and the public range 73 percent.

The Federal Government has jurisdiction over 73 percent of the range with 10.3 million acres administered by the Bureau of Land Management, 1.2 million acres managed by the Forest Service, and 757,000 acres controlled by other Federal agencies. Privately owned rangeland totals 3.7 million acres, and 820,000 acres are in state and local government ownership.

Open grasslands and meadows containing perennial grasses and forb types cover 1.8 million acres and account for 11 percent of the range. It is estimated that 24 percent is in good condition, 35 percent in fair condition, and 41 percent in poor condition. The grassland areas have a gentle slope with smooth to irregular surface and may be stony. They are located in the 8 to 16-inch rainfall areas. In open grasslands, dominant vegetation is bluebunch wheatgrass, squirrel tail, Sandberg bluegrass, and Idaho fescue. Forbs are phlox, mountain dandelion hawksbeard, lupine, and larkspur. Meadowlands contain Kentucky bluegrass, sedge, rush, meadow barley, and brome. The meadowlands account for a relatively small part of the broad grassland category.

Sagebrush, including all untimbered land where sagebrush or similar shrubby species predominate, occupies 13.8 million acres and accounts for 82 percent of the rangeland. It is estimated that 12 percent is in good range condition, 50 percent in fair condition, and 38 percent in poor condition. This range is dominated by big sagebrush, with lesser amounts of shadscale, rabbitbrush, and an increasing amount of snakewood. Grass understory consists of bluebunch wheatgrass, squirreltail, Sandberg bluegrass, and cheatgrass. Indian ricegrass and Western wheat are also important species. Cheatgrass covers a large part of the Snake River Plain, especially

Table 127 - Rangeland and Forest Range Acreage by Range Type and Ownership, Subregion 5, 1966

| Category | Federal | | | | | Non-Federal | | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | BLM | FS | BIA | Other | Total | State & County | Private | |
| | (1,000 acres) | | | | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 538.3 | 430.6 | 12.3 | 6.1 | 987.3 | 96.5 | 762.0 | 1,845.8 |
| Sagebrush | 9,239.5 | 436.8 | 184.6 | 467.8 | 10,328.7 | 665.0 | 2,761.1 | 13,754.8 |
| Brushland other than sage | 509.9 | 366.8 | 75.0 | 10.8 | 962.5 | 58.7 | 216.9 | 1,238.1 |
| Total | 10,287.7 | 1,234.2 | 271.9 | 484.7 | 12,278.5 | 820.2 | 3,740.0 | 16,838.7 |
| Forest Range 1/ | | | | | | | | |
| Commercial Forest | 58.4 | 1,788.5 | - | - | 1,846.9 | 84.0 | 445.3 | 2,376.2 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 589.3 | - | - | 589.3 | 2.0 | 6.5 | 597.8 |
| Desert Fringe | 271.0 | 64.5 | - | - | 335.5 | 23.9 | 109.5 | 468.9 |
| Total (noncommercial) | 271.0 | 53.8 | - | - | 924.8 | 25.9 | 116.0 | 1,066.7 |
| Total (forest range) | 329.4 | 2,442.3 | - | - | 2,771.7 | 109.9 | 561.3 | 3,442.9 |
| Grand Total | 10,617.1 | 3,676.5 | 271.9 | 484.7 | 15,050.2 | 930.1 | 4,301.3 | 20,281.6 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 123.
Source: *U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.*

Table 128 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Idaho, Subregion 5, 1966

| Category | Federal: BLM | Federal: FS | Federal: BIA | Federal: Other | Federal: Total | Non-Federal: State & County | Non-Federal: Private | Grand Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 8.4 | 237.0 | 11.7 | 4.5 | 261.6 | 34.0 | 77.8 | 373.4 |
| Sagebrush | 4,509.8 | 187.0 | 109.0 | 398.3 | 5,204.1 | 487.9 | 1,456.2 | 7,148.2 |
| Brushland other than sage | 52.0 | 113.0 | 18.6 | 4.4 | 188.0 | 28.0 | 56.3 | 272.3 |
| Total | 4,570.2 | 537.0 | 139.3 | 407.2 | 5,653.7 | 549.9 | 1,590.3 | 7,793.9 |
| Forest Range1/ | | | | | | | | |
| Commercial Forest | 37.0 | 1,316.0 | - | - | 1,353.0 | 82.5 | 264.0 | 1,699.5 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 574.0 | - | - | 574.0 | 2.0 | 6.5 | 582.5 |
| Desert Fringe | 193.0 | 3.0 | - | - | 196.0 | 20.9 | 61.5 | 278.4 |
| Total (noncommercial) | 193.0 | 577.0 | - | - | 770.0 | 22.9 | 68.0 | 860.9 |
| Total (forest range) | 230.0 | 1,893.0 | - | - | 2,123.0 | 105.4 | 332.0 | 2,560.4 |
| Grand Total | 4,800.2 | 2,430.0 | 139.3 | 407.2 | 7,776.7 | 655.3 | 1,922.3 | 10,354.3 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 123.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

Table 129 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Nevada, Subregion 5, 1966

| Category | Federal: BLM | Federal: FS | Federal: BIA | Federal: Other | Federal: Total | Non-Federal: State & County | Non-Federal: Private | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 14.4 | 82.0 | .6 | - | 97.0 | - | 59.0 | 156.0 |
| Sagebrush | 1,051.9 | 210.0 | 75.6 | - | 1,337.5 | - | 297.6 | 1,635.1 |
| Brushland other than sage | - | 253.0 | 56.4 | - | 309.4 | - | - | 309.4 |
| Total | 1,066.3 | 545.0 | 132.6 | - | 1,743.9 | - | 356.6 | 2,100.5 |
| Forest Range1/ | | | | | | | | |
| Commercial Forest | - | 25.0 | - | - | 25.0 | - | - | 25.0 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | - | - | - | - | - | - | - |
| Desert Fringe | - | 38.0 | - | - | 38.0 | - | - | 38.0 |
| Total (noncommercial) | - | 38.0 | - | - | 38.0 | - | - | 38.0 |
| Total (forest range) | - | 63.0 | - | - | 63.0 | - | - | 63.0 |
| Grand Total | 1,066.3 | 608.0 | 132.6 | - | 1,806.9 | - | 356.6 | 2,163.5 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 123.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

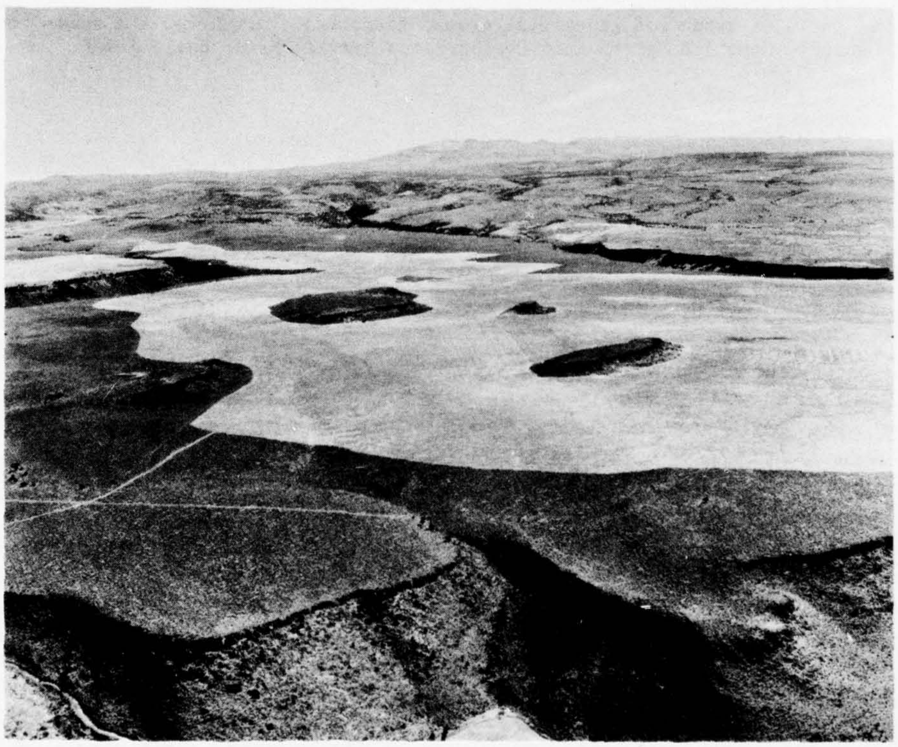
Table 130 - Rangeland and Forest Range Acreage by Range Type and Ownership, State of Oregon, Subregion 5, 1966

| Category | Federal: BLM | Federal: FS | Federal: BIA | Federal: Other | Federal: Total | Non-Federal: State & County | Non-Federal: Private | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | (1,000 acres) | | | | |
| Rangeland | | | | | | | | |
| Grasslands | 515.5 | 111.6 | - | 1.6 | 628.7 | 62.5 | 625.2 | 1,316.4 |
| Sagebrush | 3,677.8 | 39.8 | - | 69.5 | 3,787.1 | 177.1 | 1,007.3 | 4,971.5 |
| Brushland other than sage | 457.9 | .8 | - | 6.4 | 465.1 | 30.7 | 160.6 | 656.4 |
| Total | 4,651.2 | 152.2 | - | 77.5 | 4,880.9 | 270.3 | 1,793.1 | 6,944.3 |
| Forest Range1/ | | | | | | | | |
| Commercial Forest | 21.4 | 447.5 | - | - | 468.9 | 1.5 | 181.3 | 651.7 |
| Noncommercial Forest | | | | | | | | |
| Sub-alpine | - | 15.3 | - | - | 15.3 | - | - | 15.3 |
| Desert Fringe | 78.0 | 23.5 | - | - | 101.5 | 3.0 | 48.0 | 152.5 |
| Total (noncommercial) | 78.0 | 38.8 | - | - | 116.8 | 3.0 | 48.0 | 167.8 |
| Total (forest range) | 99.4 | 486.3 | - | - | 585.7 | 4.5 | 229.3 | 819.5 |
| Grand Total | 4,750.6 | 638.5 | - | 77.5 | 5,466.6 | 274.8 | 2,022.4 | 7,763.8 |

1/ Forest and woodland grazed or potentially usable for forage production. Forest range acreage is included within the total forest statistics shown on table 123.
Source: U.S.D.A. Conservation Needs Inventory adjusted by the Land and Minerals Work Group.

where wildfires have occurred over the years. Annual precipitation ranges from 4 to 20 inches with the greatest abundance in the winter months as snow or winter rain. The summers are hot and dry making deep rooted vegetation most adaptable and valuable. Elevation ranges from 9,595 feet at Eagle Cap to 1,633 feet at the Baker-Wallowa County line, with the average nearly 5,000 feet.

Brushland other than sage includes all untimbered lands where mountain shrubs, except sagebrush types, represent predominant vegetation and characteristically occupy the transition zone of the lower mountain slopes, foothills, and plateau areas. This category covers 1.2 million acres and accounts for the remaining 7 percent of the rangeland in this subregion. It is estimated that 15 percent is in good condition, 41 percent in fair condition, and 44 percent in poor condition. Annual precipitation may vary from 6 to 30 inches with the greater part occurring during the winter months as snow. This type is found in small scattered areas from the driest desert to the coniferous forest, and interspersed within the grassland and sagebrush types. These areas are frequently interspersed with open stands of Juniper, bitterbrush, and sagebrush.



*Rangeland on basaltic plateau showing area of range reseeding and rockland areas on sideslopes. (S.C.S.)*

## Other Land

The other land use in Subregion 5 consists of 739,400 acres, or about 3 percent of the land area. This includes barren land and rock in alpine areas that make up about 74 percent of the total. Almost 21 percent of the total is urban, industrial areas, farmsteads, airports, roads, and other miscellaneous use areas. About 5 percent consists of water areas less than 40 acres and streams less than one-eighth mile wide. Table 131 shows the acreage and extent of other land in Subregion 5.

Table 131 - Other Land, Subregion 5, 1966

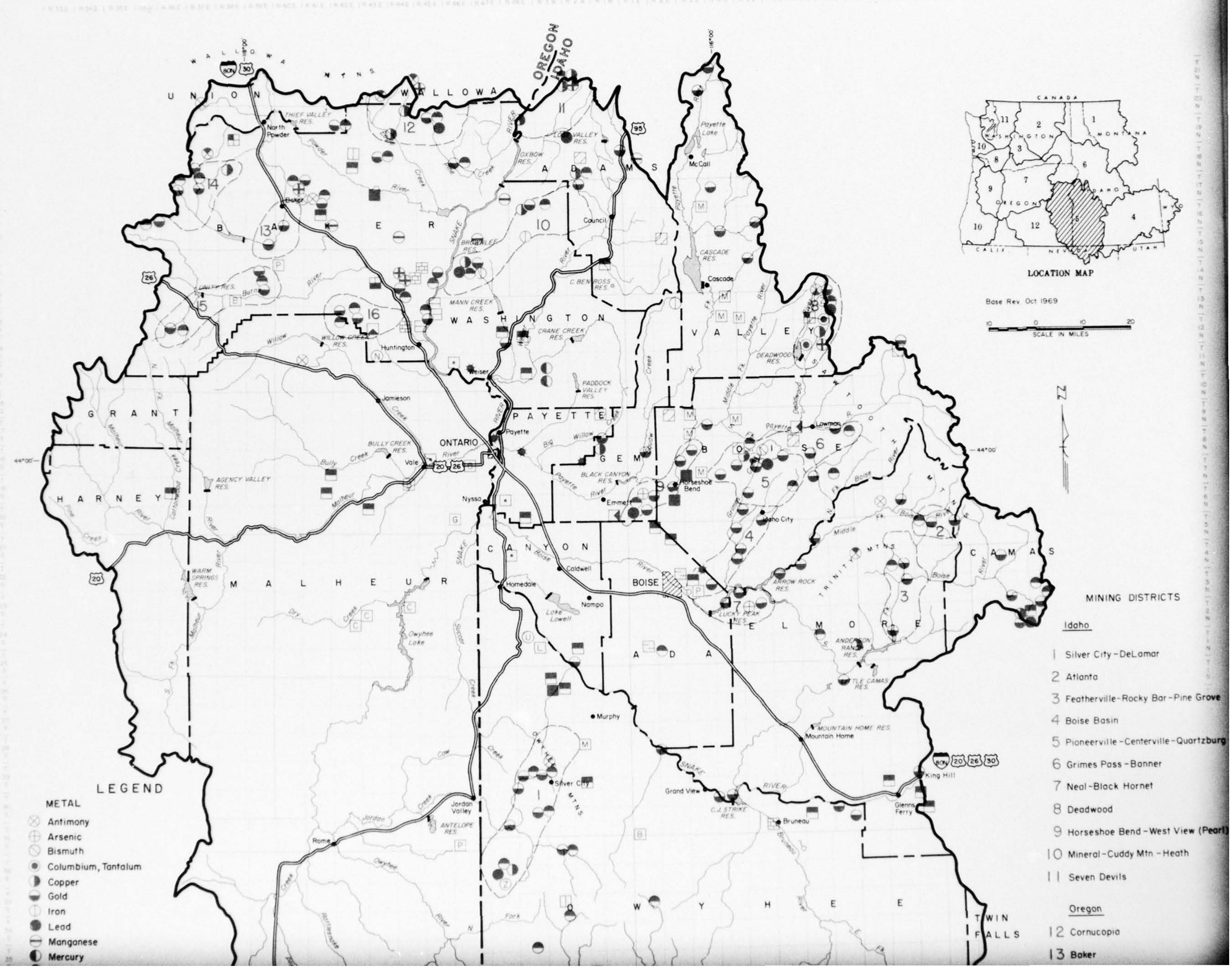
| Kinds of Land Use | Idaho | Oregon | Nevada | Total | Percent |
|---|---|---|---|---|---|
| | | (1,000 acres) | | | |
| Barren | 340.2 | 204.3 | 5.4 | 549.9 | 74.3 |
| Roads and railroads | 50.6 | 26.0 | 2.4 | 79.0 | 10.7 |
| Small water 1/ | 10.2 | 18.3 | 9.0 | 37.5 | 5.1 |
| Miscellaneous 2/ | 55.8 | 16.8 | .4 | 73.0 | 9.9 |
| Total other land | 456.8 | 265.4 | 17.2 | 739.4 | 100.0 |

1/ Water areas less than 40 acres in size and streams less than one-eighth mile in width.
2/ Includes urban and industrial areas, farmsteads, airports, and other areas.
Source: Compiled by the Soil Conservation Service River Basin Staff.

## MINERAL RESOURCES

The metallic mineral deposits in the subregion are located in or near areas of igneous intrusions and, hence, these intrusions determine the distribution of mineral resources.

The Idaho part of the subregion is mostly underlain by the Idaho batholith, a very large mass of intrusive granitic type rock of late Mesozoic and early Cenozoic age. The batholith covers Boise and Valley counties, and parts of Gem, Elmore, and Ada counties, and outliers of the batholith composed of closely related igneous rocks occur in Owyhee, Washington, and Adams counties. Washington and Adams counties are predominantly covered by Columbia River basalt of Tertiary age. Older volcanic and sedimentary rocks of Mesozoic age are exposed along the Snake River Canyon and cover a large part of Baker County. In the Snake River plain, most of Elmore and Ada counties are underlain by Snake River basalt and associated volcanic rocks of Quaternary age; similar Quaternary volcanics cover a large part of Malheur County, Oregon. South of the river, the plain is underlain by the Payette Formation of Tertiary age comprising poorly consolidated beds of sand, silt, and gravels of lacustrine and fluvial origin. This formation also



LOCATION MAP
Base Rev. Oct 1969
SCALE IN MILES
MINING DISTRICTS
Idaho
1 Silver City-DeLamar
2 Atlanta
3 Featherville-Rocky Bar-Pine Grove
4 Boise Basin
5 Pioneerville-Centerville-Quartzburg
6 Grimes Pass-Banner
7 Neal-Black Hornet
8 Deadwood
9 Horseshoe Bend-West View (Pearl)
10 Mineral-Cuddy Mtn-Heath
11 Seven Devils
Oregon
12 Cornucopia
13 Baker
LEGEND
METAL
Antimony
Arsenic
Bismuth
Columbium, Tantalum
Copper
Gold
Iron
Lead
Manganese
Mercury
OREGON
IDAHO
ONTARIO
BOISE


3 Featherville-Rocky B... ...ne Grove
4 Boise Basin
5 Pioneerville-Centerville-Quartzburg
6 Grimes Pass-Banner
7 Neal-Black Hornet
8 Deadwood
9 Horseshoe Bend-West View (Pearl)
10 Mineral-Cuddy Mtn.-Heath
11 Seven Devils

Oregon

12 Cornucopia
13 Baker
14 Cable Cove-Cracker Cr-Sumptor
15 Upper-Lower Burnt Cr.
16 Mormon Basin

Nevada

17 Mountain City
18 Jawbridge
19 Edgemont
20 Tuscarora
21 Ama
22 Cornucopia

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

# MINERAL RESOURCES AND MINING DISTRICTS

CENTRAL SNAKE, SUBREGION 5

USDA-SCS PORTLAND, OREG. 1970

FIGURE 25

2

extends over parts of Owyhee, Canyon, and Payette counties, Idaho, and Malheur County, Oregon. Columbia River basalt covers areas in northwestern Owyhee County, Idaho, and adjacent Malheur County, Oregon. The southwestern part of Owyhee County, Idaho, southern Malheur County, Oregon, and northern Humboldt County, Nevada, are covered by Snake River basalts and associated volcanic rocks of Tertiary and Quaternary age.

The subregion has been an important producer of gold, silver, mercury, and copper. There has been a small production of lead, zinc, and manganese. One of the largest mercury producers in the Pacific Northwest is in Washington County, Idaho. There are important cement, lime, sand and gravel, and silica sand industries in the subregion.

Mining is currently at a low ebb, but a very good potential exists for future production. Approximate location of mineral deposits and mining districts are shown on figure 25 and listed in table 132.

## Metals

Subregion 5 was formerly a large gold producer. Placer deposits were the first worked and account for most of the early gold output. Many of the early mining districts contained chiefly placer deposits that have been depleted or exhausted; they have seen little mining activity for many years; other districts containing lodes of silver and gold have known reserves, or are believed to have some undeveloped resources that, under changing economic conditions favorable to gold, may again become important producers. Most of the potential for future production is in areas of known mineralization or established mining districts.

The main stem of the Snake River in Subregion 5 contains several gold placer deposits that have been worked periodically mostly in the early 1900's. At least seven localities are known where placer work has been done along the Snake River; they are near the mouths of King Hill Creek, Canyon Creek, Sailor Creek, Browns Creek, Shoofly Creek, Castle Creek, and Reynolds Creek. Past production records are inadequate and probably do not account for much of the early production. From the records available, an output of at least 7,000 to 8,000 ounces of gold is estimated.

The Silver City-DeLamar District, in the Jordan Creek drainage, tributary to the Owyhee River, Owyhee County, was outstanding in the early mining history as a silver producer and also produced a substantial amount of gold. DeLamar and Silver City produced from 5 million to 50 million ounces of silver each, and about 1 million ounces of gold from lode and placer deposits.

Table 132 - Mining Districts, Subregion 5

| Index No. Fig. | District | County | Drainage | Size of Districts - Production Plus Potential Reserves 1/ Gold | Silver | Copper | Lead | Zinc | References |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Silver City-DeLamar | Owyhee | Jordan Creek, tributary to Owyhee River. Gold, placer and silver-gold lode deposits | 1 1/ | 1 1/ | 3 1/ | - | - | Piper, A.M., and F.B. Laney, 1926, Idaho Bur. Mines & Geol. Bull. 11, 154 pp. |
| 2 | Atlanta | Elmore | Headwater of Middle Fork of Boise River. Gold-silver lode deposits | 1 | 2 | - | - | - | Anderson, A.L. 1939, Idaho Bur. Mines & Geol. Pamph. 49, 71 pp. |
| 3 | Featherville-Rocky Bar-Pine Grove | do | Headwaters of South Fork of Boise River. Gold placer and lode deposits | 1 | 1 | - | - | - | Ballard, S.M. 1928, Idaho Bur.Mines & Geol. Pamph. 26, 41 pp. |
| 4 | Boise Basin | Boise | Along Moore Creek, tributary to Boise River gold placer deposits. Most productive in the region | 1 | - | - | - | - | Anderson, A. L. 1947, U.S. Geol. Survey Bull. 944-C, pp. 119-139. |
| 5 | Pioneerville-Centerville-Quartzburg | do | In Grimes and Granite Creek drainages. Mostly lode deposits. Major producers | 1 | 3 | 3 | - | - | Anderson, A.L. 1947, U.S. Geol. Survey Bull. 944-C, pp. 119-139 & Ballard, S.M. 1924. Idaho Bur. Mines & Geol. Bull. 9 100 pp. |
| 6 | Grimes Pass-Banner | Boise | Headwaters of Grimes and Granite Creeks. Lode deposits | - | 2 | - | - | - | Anderson, A.L., 1947, U.S. Geol. Survey Bull. 944-C, pp. 119-139 |
| 7 | Neal-Black Hornet | Elmore Ada | Near Boise River, (main stem) east of Boise. Lode gold deposits | 2 | - | - | - | - | Lindgren. W., 1898, U.S. Geol. Survey 18th Ann. Rept. pt. 3, pp. 617-719 |
| 8 | Deadwood | Valley | Headwater of Deadwood River, tributary to S. Fork of Payette. Lode deposits | - | 2 | 3 | 3 1/ | 3 1/ | Campbell, S., 1930, 32nd Ann. Rept. of *Mining Industry of Idaho* |
| 9 | Horseshoe Bend-West View (Pearl) | Gem Boise | Near Payette River at Horseshoe Bend. Lode deposits | - | 2 | - | - | - | Anderson, A.L., 1934, Idaho Bur. Mines & Geol. Pamph. 41, 36 pp. |
| 10 | Mineral-Cuddy Mtn.-Heath | Washington | Headwaters of the Weiser River. Lode deposits | - | 2 | 3 | - | - | Anderson, A.L., & Wagner, 1952, Idaho Bur. Mines & Geol. Pamph. 95, 26 pp. |
| 11 | Seven Devils | Adams | Headwater of Indian and Wild Horse Creeks tributary to Weiser River. Lode deposits | - | - | 2 | - | - | Cook, E. F., 1954, Idaho Bur.Mines & Geol.Pamph. 97, 22 pp. |

Table 132 - continued

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12 | Cornucopia | Baker | Headwaters of Pine Creek, tributary to the Snake River. Lode deposits. | 1 | 2 | 3 | 3 | - | The Staff, Oregon Dept. of Geol. & Miner. Ind., 1939, Bull. 14-A. Oregon Metal Mines Handbook, pp. 13-110 |
| 13 | Baker | do | Lower Powder River Basin. Placer and lode deposits. | 3 | - | - | - | - | do |
| 14 | Cable Cove-Cracker Creek-Sumptor | do | Upper Powder River Basin. Predominantly placer deposits with a few lodes. | 1 | 2 | 3 | 3 | - | do |
| 15 | Upper-Lower Burnt River | do | Burnt River Basin. Placer and lode deposits. | 3 | 3 | - | - | - | do |
| 16 | Mormon Basin | Baker-Malheur | Dixie Creek Basin. Placer deposits. | 1 | 3 | - | - | - | do |
| | | | NEVADA | | | | | | |
| 17 | Mountain City | Elko | Upper Owyhee River Basin. Lode deposits. | 3 | 2 | 1 | - | - | Granger, H. E., Bell, Simmons, & Lee, 1957, Nevada Bur. Mines Bull. 54 190 pp. |
| 18 | Jarbidge | Elko | Jarbidge River Basin, tributary to Bruneau River. Placer and lode deposits. | 1 | 2 | - | - | - | Granger, H.E., Bell, Simmons, & Lee, 1957, Nevada Bur. Mines Bull. 54, 190 pp. |
| 19 | Edgemont | do | Bull Run Creek drainage, tributary to South Fork Owyhee River | 2 | - | - | - | - | do |
| 20 | Tuscarora | do | Upper South Fork Owyhee River. Lode deposits. Some mercury deposits. | 1 | 2 | - | - | - | do |
| 21 | Ama | do | Headwater of Silver Creek. Lode deposits | 1 | 2 | - | - | - | do |
| 22 | Cornucopia | do | South Fork Owyhee River basin. Lode deposits. | - | 2 | - | - | - | do |

1/

| Size Index | Gold (Troy ounces) | Silver (Troy ounces) | Copper (Net tons) | Lead (Net tons) | Zinc (Net tons) |
|---|---|---|---|---|---|
| 1 | 100,000 - 1,000,000 | 5,000,000 - 50,000,000 | 100,000 - 1,000,000 | 100,000 - 1,000,000 | 100,000 - 1,000,000 |
| 2 | 10,000 - 100,000 | 100,000 - 5,000,000 | 10,000 - 100,000 | 10,000 - 100,000 | 10,000 - 100,000 |
| 3 | 1,000 - 10,000 | 1,000 - 100,000 | 1,000 - 10,000 | 1,000 - 10,000 | 1,000 - 10,000 |

The Boise River Basin has contributed an important amount of gold and silver production; the Atlanta District, near the headwaters of the Middle Fork, produced about 385,000 ounces of gold, and 100,000 to 5 million ounces of silver from lode deposits; the Featherville-Rocky Bar-Pine Grove District, near the headwaters of the South Fork, produced about 300,000 ounces of gold and more than 100,000 ounces of silver from lode and placer deposits. The Boise Basin District on Moore Creek has been one of the major gold placer areas in Idaho; production has been aproximately 2,300,000 ounces of gold, mostly from placers. The Pioneerville-Centerville-Quartzburg District, on Granite and Grimes Creeks, produced about 425,000 ounces of gold and 40 tons of copper, mostly from lode deposits. The Grimes Pass-Banner District has produced more than 100,000 ounces of silver from lode deposits. The Neal-Black Hornet District, on the main stem of the Boise River, east of Boise, has produced about 30,000 ounces of gold from lode deposits.

The Deadwood District near the headwaters of Deadwood River, tributary to the South Fork of the Payette River, has produced 280 tons of copper, more than 100,000 ounces of silver, 1,000 tons of lead, and 1,000 tons of zinc. The Horseshoe Bend-West View (Pearl) District, near the main stem of the Payette River, has produced more than 100,000 ounces of silver from lode deposits.

The Mineral-Cuddy Mountain-Heath District, on the upper tributaries of the Weiser River, has produced 170 tons of copper and more than 100,000 ounces of silver; some iron ore has come from Iron Mountain and Cuddy Mountain. The Seven Devils District, on the headwaters of Indian and Wild Horse Creeks, has produced 5,000 tons of copper.

Baker County, Oregon, is an important mining area. The county has produced about 400 tons of manganese, a few hundred tons of copper and lead, and a very substantial amount of gold and silver. It also produces limestone for cement and lime manufacture.

The Cornucopia District, near the town of Cornucopia, near the headwaters of Pine Creek, produced about 280,000 ounces of gold, 1,090,000 ounces of silver, 321 tons of copper, and 52 tons of lead. The Baker District, near Baker in the Powder River Basin, produced about 6,000 ounces of gold. The Virture area, included on figure 25 under the Baker District, produced over $3.3 million in gold. The Cable Cove-Cracker Creek-Sumptor District, in the upper Powder River and tributaries, produced about 397,000 ounces of gold, 347,000 ounces of silver, 17 tons of copper, and 12 tons of lead. The Upper Burnt River-Lower Burnt River District, in the Burnt River drainage, produced about 5,000 ounces of gold and about 1,000 ounces of silver. The Mormon Basin District, in the Dixie Creek drainage, tributary to the Burnt River, in both Baker and Malheur counties, produced about 121,000 ounces of gold, 23,000 ounces of silver, and a few tons of copper.

The part of Elko County, Nevada, included in the subregion, contains several mining districts. The Mountain City District located near the town of Mountain City on the upper Owyhee River produced more than 100,000 tons of copper and 1 million ounces of silver from lode deposits; the Jarbidge District in the Upper Jarbidge River drainage, tributary to the Bruneau River, produced about 218,000 ounces of gold and more than 1 million ounces of silver. The Edgemont District in the Bull Run Creek drainage, tributary to the South Fork Owyhee River, produced about 49,000 ounces of gold from lode deposits. The Tuscarora District near the town of Tuscarora, in the Upper South Fork Owyhee River drainage, produced about 100,000 ounces of gold, more than 1 million ounces of silver, and several hundred flasks of mercury. The Ama District at the head of Silver Creek, tributary to Bull Run Creek, produced more than 1 million ounces of silver. The Cornucopia District in the South Fork Owyhee River drainage produced more than 100,000 ounces of silver.

## Nonmetals

A large variety of nonmetallic minerals exists in the Central Snake Subregion 5; however, except for construction materials used for roads and buildings, only small amounts of nonmetals have been produced because of lack of adequate markets within economic range. Principal products are sand and gravel, limestone, crushed rock, silica, and clay. Other nonmetallic minerals occurring are diatomite, barite, garnet, gem materials, gypsum, and mica.

Sand and gravel deposits are widespread. They are mostly alluvial in origin occurring as gravel bars and terraces in and along the present stream channels. Former dredging operations have left enormous deposits of gravels as dredge tailings. Readily accessible deposits are used for road construction and repair. Aggregate deposits close to a market or near urban centers are mined on a commercial basis.

Stone has been produced as dimension stone, crushed rock, and cement rock. Crushed rock used as aggregate and road stone is quarried mostly from basalt flows. The quarries are generally worked only when rock is needed locally. Dimension stone is a minor product. A sandstone quarry located at Table Rock southeast of Boise, Ada County, produced dimension stone in the 1920's and provided stone for the State Capitol. Cement rock includes limestone, shale or slate, and silica rock, all used in the manufacture of portland cement. Limestone deposits are found in northern Ada and adjoining Gem counties, and along the Snake River in Washington County, Idaho, and in Baker County, Oregon. Limestone is used for manufacture of lime in Canyon County southwest of Boise, and in

Baker County at Wingville, northwest of Baker, and for cement manufacture at Lime, Oregon

Common clay is available at many localities in the subregion. Clay deposits in the vicinity of Payette and Boise, Idaho, have been mined to supply brick plants at these localities. Silty clays near Hagerman are mined and used for pottery and other ceramic objects. Clay and shales are also widely available in Baker County, Oregon.

Diatomite deposits are widespread. Only a few hundred tons have been produced, but the deposits are a significant potential mineral resource. Diatomite is found in Ada and Boise counties near Boise, Idaho, in the Boise River drainage; in Elmore County near Glenns Ferry and King Hill; in Owyhee County near Reynolds, Succor, and Pup Creeks; and in Washington County near Monroe Creek and the Weiser River. Deposits of diatomite occur in Oregon east of Baker in the Powder River drainage, and in the Malheur River drainage basin near Beulah and Harper.

The most productive gypsum deposits in Idaho are in Washington County, Idaho, along the Snake River about 30 miles north of Weiser. The gypsum beds are just above the river level. Gypsum has also been produced from Iron Mountain east of Mineral. Production has been small.

Among the largest silica sand producers in Idaho, the operation about 4 miles south of Emmett in Gem County, has been a steady producer for many years. Other silica deposits are located near Weiser in Washington County.

## Mineral Fuels

Search for oil and gas has been more extensive in this part of Idaho than in any other section of the State. The Payette Formation and Idaho Group have shown traces of oil and gas. In the Payette-Weiser area one exploratory well is reported to have yielded 75 million cubic feet of gas per day for a short period. Exploratory wells have been drilled in Washington, Payette, Canyon, Gem, and Owyhee counties, but no commercial quantities of oil or gas have been produced.

Coal-bearing formations are found in the subregion. The Horseshoe Bend coal field has produced a small amount of coal. This field is in the drainage of the Payette River near the town of Horseshoe Bend, Boise County, Idaho. Thin beds of lignite and subbituminous coal occur in an area 15 miles long and 1 to 5 miles wide along the east side of the river. A small amount of coal was produced several years ago for local consumption. Coal outcrops are present in the Reynolds Creek and Succor Creek drainages in Owyhee County, Idaho, and in the Powder River drainage near Goose Creek in Baker County, Oregon; none of these occurrences has been productive.

## Present Mineral Industry and Outlook for the Future

### Metals

Gold Presently, the principal gold producing areas in the Central Snake Subregion 5 are Owyhee, Boise, and Gem counties, Idaho; Baker County, Oregon; and Elko County, Nevada. The current gold production is at an alltime low, as it is in other parts of the Columbia-North Pacific Region due, in part, to the imbalance between production costs and market price. Gold was the metal of highest value produced in Gem County in 1965; production of 384 ounces of gold came from the Gem State Consolidated Mines, Inc. Exploration and development work were active in Boise County. Owyhee County yielded $200,000 in mineral products in 1965; gold led in value for metals produced. Gold was recovered from ore shipped from the Silver Star mine near Contact, Elko County, Nevada, in 1965.

Many of the placer gold districts that were bonanza producers in the early years of mining are now depleted or nearly exhausted and a revival of productivity is unlikely. However, some lower grade placers and numerous lode deposits still have potential for future production under a more favorable economic climate for gold mining. Under improved conditions, gold production would doubtless increase substantially.

Silver, Lead, and Zinc Present production of silver, lead, and zinc is very small despite the history of bonanza silver production from the Silver City District of Owyhee County in the 1860's and early 1870's, and again in the early 1900's. Present production comes chiefly from the Gem State Consolidated Mines, Inc. in the Pearl-Westview District, Gem County, where 929 ounces of silver and a small amount of lead and zinc were produced in 1965. Other counties with some silver-lead-zinc production in 1965 were Boise, Owyhee, and Washington counties in Idaho; Baker and Malheur counties in Oregon; and Elko County, Nevada. The greatest future potential for silver-lead-zinc production will continue to be from these counties.

Copper Principal copper production has come from Washington County, Idaho, and Elko County, Nevada. During 1965, in Elko County, copper was produced from the Silver Star mine in the Contact District and in Washington County copper was shipped from the Railroad mine in the Heath District. Exploration was active in Adams and Washington counties, Idaho. A small amount of copper was recovered from concentrate shipped by the Gem State Consolidated Mines, Inc. in Gem County.

Future potential for copper production is in Washington and Adams counties, Idaho, Baker County, Oregon, and Elko County, Nevada. Production will probably be small as compared with some other parts of the Columbia-North Pacific Region.

Mercury The most productive mercury mine in the Columbia-North Pacific Region is in Subregion 5.

The Idaho-Almaden mine near Weiser, Washington County, Idaho, has produced more than 15,000 flasks of mercury since discovery in 1936. The property is presently owned and operated by Rare Metals Corporation of America, a subsidiary of El Paso Natural Gas Co. In 1965, this mine produced 1,059 flasks.

Future potential for mercury production is good. Washington County has several areas of mercury mineralization north and west of the Idaho-Almaden mine that might be developed. Exploration for additional ore is currently in progress.

Iron Ore Currently, the principal iron ore production in the Columbia-North Pacific Region is in Subregion 5. The Iron Mountain deposits are about 20 miles north of Weiser, Washington County, Idaho, in the Mann Creek drainage. From 2,000 to 6,000 long tons are shipped from these deposits annually. The Cuddy Mountain deposits are on upper Pine Creek near Cambridge, Washington County. A few thousand tons were shipped annually from these deposits. The Porter Bros. Corp. ship a small tonnage of magnetite iron ore annually from their stockpile of black sands accumulated at Lowman, Boise County.

## Nonmentals

Sand and Gravel Production of sand and gravel probably ranks first in tonnage value of minerals produced. Total production for Idaho in 1965 was 12.2 million short tons valued at $13.2 million. In 1965, sand and gravel ranked first in mineral value in Ada, Canyon, Elmore, Gem, Owyhee, and Payette counties, Idaho; Malheur County, Oregon; and Elko County, Nevada. Canyon and Elko counties produced more than 500,000 short tons each in 1965.

The market price of sand and gravel ranges from $.80 to $1.25 per short ton. It is a low unit value product and, therefore, must be produced near the consumer. Adequate supplies are available for all future demands except where other land uses conflict with sand and gravel operations.

Stone Limestone produced for cement and lime manufacture is presently mined. Limestone is calcined for use as lime in sugar refining in Canyon County, Idaho. Baker County, Oregon, is the leading producer of limestone for cement and lime manufacture. Total production in 1965 was about 450,000 tons.

Production of crushed stone is primarily dependent on local demand for the product; resources are adequate for all foreseeable future demands.

Clay and Bentonite Common clay is mined near Barber, Ada County, by the Pullman Birch Company for use in manufacture of brick and tile products. Bentonite is mined at Oreana and Grandview, Owyhee County, and used for sealing irrigation ditches, potato cellars, and reservoirs.

Common clay suitable for making brick and tile is present in inexhaustible supply, and large amounts of impure bentonite are also found. The future potential depends on available markets and the marketability of the clay minerals and their products.

Diatomite Potential economic deposits of diatomite are found in the subregion. A preliminary estimate indicates 4 million tons or more are present in one deposit located 56 miles southwest of Grandview in Owyhee County. A few hundred tons have been mined and treated in a calcining plant at Grandview. Production of diatomite in the Nation has grown rapidly in the past few years, due to increasing uses. It is likely that deposits in Idaho and Oregon will be exploited in the near future.

Gypsum Gypsum has been produced recently for agricultural use (soil conditioner) in Washington County on Iron Mountain and near the Snake River, north of Weiser in Idaho.

Gypsum was formerly produced in Baker County, Oregon. The deposits are small, and it is unlikely that future production will exceed a few hundred tons annually.

Silica  Silica is produced from sand and poorly consolidated sandstone deposits 3 to 4 miles south of Emmett in Gem County. The Del Monte Properties, Inc. produce a high quality sand for use in plaster, glass, foundry, and abrasives. A deposit similar to that being mined near Emmett occurs near Weiser, Washington County. The potential for future silica production depends on the marketability of the products. Reserves are adequate for foreseeable future demands for many years.

Gem Stones  Gems or gem materials provide recreation for large numbers of amateur collectors and "rockhounds." There are no commercial mining operations based on gem stone production. Opal, agate, and petrified wood are found in Owyhee, Gem, and Washington counties, Idaho, and Malheur County, Oregon. Humboldt and Elko counties, Nevada, contain deposits of turquoise and fire opal.

PARTICIPATING STATES AND AGENCIES

## STATES

| | | | |
|---|---|---|---|
| Idaho | Nevada | Utah | Wyoming |
| Montana | Oregon | Washington | |

## FEDERAL AGENCIES

Department of Agriculture
- Economic Research Service
- Forest Service
- Soil Conservation Service

Department of the Army
- Corps of Engineers

Department of Commerce
- Economic Development Administration
- Weather Bureau

Dept. of Health, Education, & Welfare
- Public Health Service

Dept. of Housing & Urban Development

Dept. of Transportation

Department of the Interior
- Bonneville Power Administration
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Mines
- Bureau of Outdoor Recreation
- Bureau of Reclamation
- Fed. Water Pollution Control Adm.
- Fish and Wildlife Service
- Geological Survey
- National Park Labor

Department of Labor

Federal Power Commission

GPO 997-447