

EXISTING SOIL SURVEYS AND LAND USES IN THE SNAKE RIVER BASIN KGRAS

by
Nancy Savage
Department of Biological Sciences
University of Idaho

ABSTRACT

The extent of existing soil survey data, an evaluation of this data, and land uses and capabilities will be discussed for the Mountain Home, Bruneau, Castle Creek, Crane Creek, and Vulcan KGRAs.

The Soil Conservation Service has completed or is conducting detailed soil surveys on all private lands and some public domain lands in the Mountain Home, Bruneau, Castle Creek, and Crane Creek KGRAs. The Bureau of Land Management has completed land capability (irrigability class) surveys on most BLM land in the Bruneau, Castle Creek, and Crane Creek KGRAs. The Forest Service has completed a soil-hydrologic reconnaissance and landtype survey on the Vulcan KGRA.

The SCS surveys are the most detailed, defining the characteristics and capabilities for each soil series and phase. In addition, the SCS has available county land use maps at a scale of $\frac{1}{2}$ inch to the mile delineating irrigated or non-irrigated farmlands, rangeland, forest or woodland, urban areas, etc.

SNAKE RIVER BASIN KGRA ENVIRONMENTAL REPORT

SOILS

NANCY SAVAGE
DEPARTMENT OF BIOLOGICAL SCIENCES
UNIVERSITY OF IDAHO

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SNAKE RIVER BASIN KGRA ENVIRONMENTAL REPORT

SOILS

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SOILS

EXECUTIVE SUMMARY

Soil Surveys - Who, What, Where?

Three federal agencies have conducted soil surveys on all or parts of the five KGRAs - Vulcan, Mountain Home, Bruneau, Castle Creek, and Crane Creek. These are the USDI Bureau of Land Management, USDA Forest Service, and USDA Soil Conservation Service. There is little or no overlap among the lands surveyed by each agency. The Forest Service and BLM map only public domain lands within their jurisdiction while the SCS maps only private lands in each county unless contracted by the federal agency to do otherwise. In addition, a special soil survey was conducted in Owyhee County (Bruneau and Castle Creek KGRAs) by a joint SCS/University of Idaho Ag. Experiment Station team (Chugg et al, 1968). All existing data is available on open file in agency offices or is in published agency reports.

Soil Survey Methods

Each agency or group has used a different mapping method at a different level of intensity. The SCS conducts soil surveys designed to classify, locate on a map, and describe each soil as it occurs in the field. Classification is by soil series and phase, the most detailed type of survey. Each series is minutely described as to all soil and landtype characteristics and capabilities. These soil descriptions lack only soil chemistry data, such as nitrate levels, which are determined upon the request of the individual land owner and remain his confidential information.

The other agencies generally conduct less detailed surveys. The Forest Service has mapped the Vulcan KGRA by landtypes and lists the major soil fa-

milies present on each landtype. The family category of classification is based on properties important to the growth of plant roots. Surface and subsoil texture, depth, and acidity are broadly described.

The BLM surveys in the Bruneau and Castle Creek KGRAs are being conducted to determine land capability class, primarily for irrigability. Classes are delineated on topographic maps and soil characteristics contributing to irrigability are described.

The Chugg survey in Owyhee County and the BLM survey in the Crane Cr. KGRA were conducted at the soil association level of intensity grouping soils together which are found in the same area to aid in determining land use patterns, especially irrigability. Landtype determined the basic map subdivisions in these broad-scale surveys.

Adequacy of Data in Event of Geothermal Development

The adequacy of the soil data now available depends of course on the type of geothermal development which eventually takes place. Any development involving direct use of the local soils for the growing of crops or trees would require a detailed soil analysis as prescribed by the Soil Conservation Service. Where such surveys have been completed in the Mountain Home, Bruneau, Castle Cr. and Crane Cr. KGRAs, the existing data are adequate with the exception of soil chemistries.

For developments such as feed lots and, possibly, processing plants requiring knowledge of soil drainage characteristics, the existing BLM surveys for land capability class in the Bruneau and Castle Cr. KGRAs may be adequate although additional detail is recommended. The SCS surveys contain soil and land capabilities for most types of construction and drainage impacts.

The existing soil data on Forest Service lands in the Vulcan KGRA and BLM lands in the Crane Cr. KGRA are probably not adequate for any geothermal development which involves soil impact.

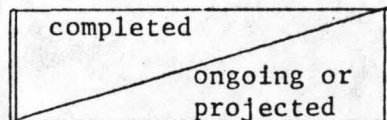
Completeness of Data

The following table shows the approximate degree of completion of soil surveys on the five KGRAs. Although all areas are projected for completion by 1983, only the SCS surveys contain data adequate for virtually all potential soil uses.

<u>Agency</u>	<u>KGRA</u>					<u>Land Surveyed</u>
	Vulcan	Mtn. Home	Bruneau	Castle Creek	Crane Creek	
SCS	N.A.	20% / 80%	10% / 40%	8% / more	15% / more	Private Lands*
FS	100% / 0	N.A.	N.A.	N.A.	N.A.	National Forest
BLM	N.A.	0	50% / 0	17% / more	100% / 0	BLM Lands
Chugg	N.A.	N.A.	100% / 0	100% / 0	N.A.	All Land Ownerships
Total by 1983	100%	100%	100%	100%	100%	

N.A. Not Applicable

*Except Mtn. Home where SCS is mapping all land ownerships



MOUNTAIN HOME KGRA

SOILS

X.1.1.1. Description of Existing Data

The Mountain Home KGRA contains both private lands and public domain lands administered by the Bureau of Land Management. The only soil survey presently available within the KGRA is a detailed soil survey conducted by the Elmore County office of the Soil Conservation Service, dated 1970, on Section 1, T4S, R8E; and Sections 6 and 7, T4S, R9E (Figs. 1 and 2). The land surveyed consists primarily of privately owned, irrigated ranch lands along the creek bottoms (Fig. 5).

Soil descriptions are summarized in the Elmore Co. Handbook and include information on soil origin, structure, texture, composition, water holding capacity, water intake rate, and permeability, as well as land slope and whether irrigated or rangeland (see legend following Fig. 2). The SCS central office in Boise (Room 345, 304 North 8th Street) has on file detailed descriptions of each soil series which include the following data:

Soil taxonomic class	Drainage
Typical pedon (soil profile)	Permeability (in/hr)
Depth	Available water capacity (in/in)
Color	Soil reaction (pH)
Texture	Salinity
Composition	Use and vegetation potentials
pH	Sanitary facilities
Range in characteristics	Community development
Mean annual soil temperature	Source materials
Mean summer soil temperature	Water management
Relative moisture content	Wildlife habitat
Depth to bedrock	Native vegetation
Organic content	Crop use and potential
Structure	
Geographic setting	
Elevation	
Slope	
Parent materials	
Climate	

X.1.1.2. Evaluation of Existing Data

The Soil Conservation Service detailed soil surveys are the most complete surveys available. The SCS has conducted a detailed survey of 3 sections (20%) of the Mountain Home KGRA (Fig. 1). The remainder of the KGRA will be surveyed during the next four years as the Elmore County Soil Survey is completed.

X.1.1.3. Recommendations for Further Study

The Soil Conservation Service detailed soil survey of Elmore County is projected for completion in 1981. At present, portions of the county are being mapped on a priority basis. The remaining unmapped sections of the KGRA (Fig. 1) may be given high priority status upon request by an authorized agency thus making the data available sooner.

X.1.1.4. Special Interests or Concerns

X.1.1.5. Resource Use Limitations

Most land within the Mountain Home KGRA is presently being utilized either as irrigated farmlands or as rangeland for livestock. Grain, corn, alfalfa, and pasture are grown for livestock feed on the irrigated lands (Fig. 5). Most of the irrigable land is in private ownership while the remaining rangelands are in public domain (Bureau of Land Management). According to an SCS source, dryland farming would be feasible on much of the nonirrigable land.

Ranchers in and near the KGRA with hot wells or springs on their property use the geothermal resource for irrigation and space heating thus establishing a historical precedent for use of the resource for these purposes.

There are no apparent physical limitations to geothermal development in this area. The land is flat to hilly and open and the soils are generally well drained.

APPENDIX A

Annotated Bibliography

Aerial photographs (1:20,000) of Section 1, T4S, R8E and Sections 6 and 7, T4S, R9E containing detailed soil survey. Legend for survey in Elmore County Handbook.

This information is available at the Elmore County Soil Conservation Service office in Mountain Home, Idaho. Detailed soil descriptions are available at the SCS central office in Room 345, 304 North 8th St., Boise.

- (3) Soil Conservation Service. Land use map. Elmore County (sheets 1 and 2). April, 1975.

Blue line map at scale 1:126,720 ($\frac{1}{2}$ inch:mile) available from SCS, Room 345, 304 North 8th St., Boise, Idaho. Denotes the following land uses: urban and built-up land, surface irrigated cropland, sprinkler irrigated cropland, non-irrigated cropland, rangeland, water and wetland, recreation - non-urban land, forest and woodland.

MOUNTAIN HOME KGRA

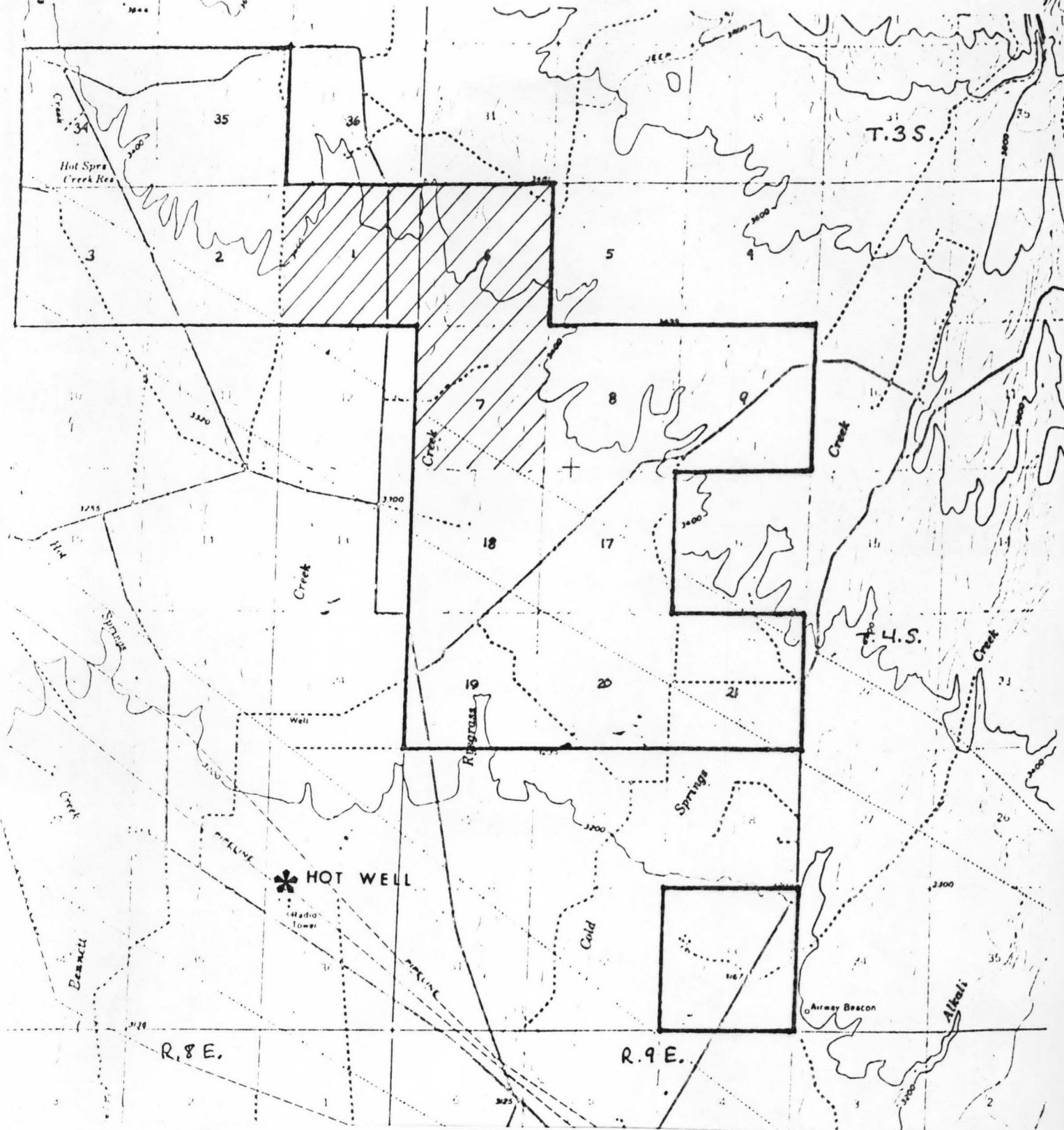


Figure 1. Location of existing soil survey data (Elmore County SCS)

DETAILED SOIL SURVEY LEGEND FROM ELMORE COUNTY HANDBOOK
Soil Conservation Service
Mountain Home, Idaho

(Irrigated Areas)

VWA	Vanderhoff sandy loam	0-2% slope
VWB		2-4
VWC		4-7
VWD		7-12

Moderately deep, well drained soil formed in lake sediments. Surface and underlying layers are sandy loam. Substratum is laminated loam or sandy loam. The laminations occur at a depth of 20-40 inches. Available water holding capacity is 2.4-4.8 inches. Water intake rate is 0.8-1.4 inches per hour. Permeability of underlying layer is 0.6-2.0 and of the substratum, 0.2-0.6 inches per hour.

GFA	Goose Cr. clay loam, moderately deep variant	0-2% slope
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Moderately deep, somewhat poorly drained soil formed in alluvium. Surface is loam; underlying layer and substratum are loam or clay loam. Sand and gravel occurs between 20 and 40 inches. A seasonal water table is at 30 in. and recedes to over 60 in. late summer. Available water holding capacity is 4.0- 7.5 in. Intake rate is 0.7-1.4 in./hr. Permeability of the underlying layer is 0.6-2.0 in./ hr.

EJB	Elijah-View loams	2-4% slope
EJC		4-7
EJF		12-30

This complex is about 55-70% Elijah loam and 30-45% View loam. These soils have loam surfaces and clay loam subsoils. Elijah is 20-40 in. to a hardpan. View is 20-40 in. to gravel. The available water holding capacity is 3.5-7.5 in. Water intake rate is 0.6-1.2 in./hr. Permeability of the subsoil is 0.6-2.0 in./hr.

EhB	Elijah silt loam	2-4% slope
EhD		7-12

Moderately deep will drained soil developed in loess. Surface texture is silt loam, subsoil is clay loam, substratum is loam. A indurated hardpan is at 20-40 in. Basalt bedrock or loamy material is under the hardpan. The available water holding capacity is 3.5-7.5 in. Water intake rate is 0.6-1.2 in./hr. Permeability of the subsoil in 0.6-2.0 and of the hardpan less than 0.06 in./hr.

CLB (CtB) Chilcote silt loam 2-4% slope

Moderately deep, well drained soil formed in loess or loess-like alluvium. Surface is loam. Subsoil is clay and substratum is silt loam, loam or sandy loam. A indurated hardpan occurs between 20 and 40 in. Available water holding capacity is 4.5-7.5 in. Water intake rate is 0.6-1.2 in./hr. Permeability of the subsoil is 0.2-0.6 and of the hardpan, less than 0.06 in./hr.

HaA Harpt loam 0.2% slope
HaB 2.4

Deep well drained soil formed in alluvium. Surface, underlying layer and substratum have loam texture. Stratified sand and gravel is below 40 in. but may occur at the 30 in. depth. There is a possibility of overflow by floodwaters in one year out of ten. Available water holding capacity is 7-10 in. Water intake rate is 0.8-1.4 in./hr. Permeability of the underlying layer is 0.6-2.0 in./hr.

PuF Power-Purdam silt loams 20-30% slope

This complex consists of 60-70% Power silt loam and 30-40% Purdam. Power soils have a silt loam surface, clay loam subsoil and silt loam substratum over mixed alluvium or hardpan below 40 in. Purdam soils have a silt loam surface, clay loam subsoil and silt loam substratum over a hardpan between 20 and 40 in. The available water holding capacities are: Power, 8-10 in.; Purdam 4-8 in. Water intake rates are 0.4-0.8 in./hr. Permeability of the subsoil is 0.6-2.0 in./hr.

(Rangeland Areas)

JnD Jenness loam 7-12% slope

Deep well drained soil in alluvium. Surface, underlying layer and substratum have loam textures. Sand and gravel occurs at depths below 40 in. Available water holding capacity is 7-10 in. Water intake rate is 0.6-1.2 in./hr. Permeability of the underlying layer is 0.6-2.0 in./hr.

LtF Lanktree loam 0-30% slope
LtG 30-60

Deep well drained soils formed in mixed alluvium. Surface layer is loam, subsoil is clay loam or clay and substratum is loam over sand or gravel at depths of 40-60 in. Available water holding capacity is 7.0-10 in. Permeability of subsoil is 0.06-0.2 in./hr.

CaF Chilcote-Lanktree loam 0-30%

This complex consists of about 60% Chilcote loam and 40% Lanktree loam. Chilcote soils have a loam surface, a clay subsoil and a loam substratum over an indurated hardpan at 20-40 in. Lanktree soils have a loam surface, a clay subsoil and a loam substratum over sand and gravel at 40 to over 60 in. Available water holding capacity is: Chilcote 3-6 in.; Lanktree 6-10 in. Permeability of the subsoils are 0.06-0.2 in./hr.

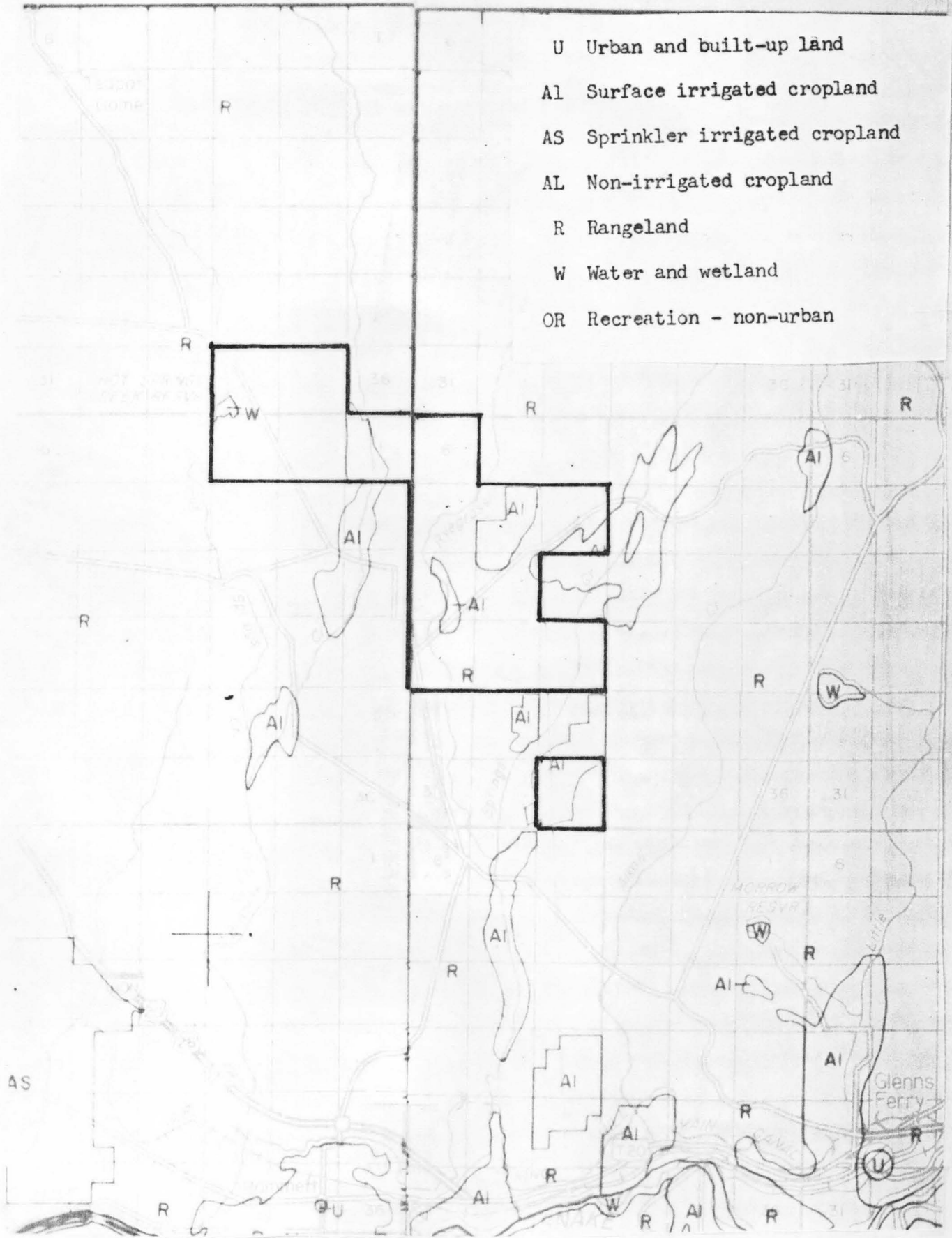


Figure 3. Mountain Home KGRA. SCS land use map, 1975.

BRUNEAU KGRA

SOILS

X.1.1.1. Description of Existing Data

The Bruneau KGRA contains both private lands and public domain lands administered by the Bureau of Land Management. Each constitutes about 50% of the area. At least three soil surveys have been conducted on parts or all of the KGRA at three levels of intensity.

(1) The Soil Conservation Service has completed detailed soil surveys on two parcels of private land within the KGRA (Fig. 1). Fig. 2 shows the aerial photo map with accompanying soil description of one of these parcels. The other was impossible to copy with the facilities available but is on open file at the Grandview office of the SCS.

The SCS central office in Boise (Room 345, 304 North 8th Street) has on file detailed descriptions of each soil series which include the following data:

Soil taxonomic class	Drainage
Typical pedon (soil profile)	Permeability (in/hr)
Depth	Available water capacity (in/in)
Color	Soil reaction (pH)
Texture	Salinity
Composition	Use and vegetation potentials
pH	Sanitary facilities
Range in characteristics	Community development
Mean annual soil temperature	Source materials
Mean summer soil temperature	Water management
Relative moisture content	Wildlife habitat
Depth to bedrock	Native vegetation
Organic content	Crop use and potential
Structure	
Geographic setting	
Elevation	
Slope	
Parent materials	
Climate	

(2) The BLM has completed land capability class surveys on public domain lands within the KGRA (Figs. 1 and 3). This survey was designed to determine irrigability and is less detailed than the SCS method. A system of map symbols is used such as $2 \frac{2a_1m3v}{AlY}$ to describe a soil body. Each letter or number refers to the following soil characteristics which are contained in a legend:

Land capability class (irrigability class)
Soil depth
Soil limiting factor
Surface and subsurface texture
Parent material
Slope and slope modifier
Drainage factor

(3) Chugg et al (1968) conducted a special soil survey in Owyhee County which included all of the Bruneau KGRA. This reconnaissance survey was intended for determination of irrigability class and for broad county planning (Figs. 1 and 4). The mapping units used in this survey reveal general information on relative soil depth, drainage characteristics, slope, underlying materials, and geomorphic features and refer to the soils found in the mapping unit by number. Detailed descriptions of each of these soils are given; however, these cannot be pinpointed on the map.

X.1.1.2. Evaluation of Existing Data

(1) The Soil Conservation Service detailed soil survey on two parcels of private land within the Bruneau KGRA is the most complete soil data available. All of the private lands in the KGRA will be surveyed in detail within the next few years.

(2) The Bureau of Land Management land capability class survey on the public domain lands within the KGRA (about 50% of the area) was conducted primarily to determine irrigability of the lands in question. Mapping was accomplished by delineating discrete land types on an aerial photograph and then spot checking them on the ground for soil characteristics.

This is not as detailed a survey method as that employed by the SCS. However, the soil data documented is probably adequate for most geothermal resource development. This soil survey will be incorporated in Agriculture and Grazing Environmental Statements for Owyhee County now being prepared by the BLM.

(3) The special soil survey of Chugg et al (1968) was also intended for determination of irrigability class and for broad county planning and includes all lands within the county. While the soils descriptions are quite detailed and complete, there is no way to locate soil bodies on the soil mapping units displayed on the small scale map. The SCS and BLM surveys now being prepared will supercede this survey and eventually include all lands within the KGRA.

X.1.1.3. Recommendations for Further Study

The existing Soil Conservation Service and Bureau of Land Management soil surveys on the Bruneau KGRA are probably adequate for most geothermal resource development projects. However, any development involving use of the soil for growing of crops will require an SCS detailed soil analysis. The present surveys cover about 60% of the KGRA. The SCS will complete detailed soil surveys on the remainder of the private lands within the next few years.

X.1.1.4. Special Interests or Concerns

X.1.1.5. Resource Use Limitations

At the present time, most of the privately owned lands within the Bruneau KGRA (approximately 50% of the area) are under agricultural development (irrigated farm lands). Additional acres could be "broken out" as irrigation expands. Much of the public domain land is utilized as rangeland for livestock. These activities represent conflicting uses with geothermal development, at least on a large scale, and therefore constitute limitations on use of the geothermal re-

source. Terrain limitations would be minimal as most of the area is flat to gently sloping. Fig. 5 shows a land use map of the area (1975 data).

BRUNEAU KGRA

SOILS

APPENDIX A

Annotated Bibliography

- (1) Chugg, J.C., G.A. Monroe, L.L. Lockner, M.A. Fosberg. 1968. Special Soil Survey - Owyhee County, Idaho. Idaho Water Resource Board Report No. 15. USDA Soil Conservation Service/University of Idaho Agricultural Experiment Station. 230 pp, maps.

This report contains information on soil characteristics such as type, composition, depth, permeability, salinity/alkalinity, and irrigability class as well as land types, underlying parent materials, and natural plant communities. The information in this report is based on a survey of a reconnaissance or soil association intensity. This type of soil survey is one of a general nature designed to obtain maximum information about soils important to determining irrigability and for broad county planning. It does not take the place of the detailed soil survey necessary for planning individual parcels of land.

This report is of limited usefulness as, while the soil descriptions are quite detailed, the reference map is very general. However, it is the only publication available which covers the entire KGRA.

- (2) Aerial photographs (1:20,000) of portions of Sections 15, 23 and 26, within the KGRA, showing soil bodies (1978). Handbook containing legend. Soil Conservation Service, Grandview, Idaho.

These photos show detailed, accurate, and up-to-date soil survey data.

Detailed soil descriptions can be obtained from the SCS central office, Room 345, 304 North 8th St., Boise, Idaho. All private lands in Owyhee County, including the KGRA, will be similarly mapped in the next few years by the Owyhee Co. SCS.

- (3) Topographic maps (1:24,000) showing soil mapping units for all public domain lands within the KGRA (1977?). Legend also available. Bureau of Land Management, 5th and Bannock, Boise, Idaho.

These maps constitute reconnaissance soil surveys designed to determine land capability (irrigability) class. Soil series are not identified as they are in SCS surveys but rather a system of symbols is used to denote soil texture, composition, depth, drainage characteristics, alkalinity/salinity, slope, parent materials and land capability class.

These maps were drawn from aerial photos where land types were delineated by photo interpretation and spot checks made on the ground. This is not so detailed a method as the SCS uses but is probably adequate for most geothermal purposes with the exception of crop growing.

This information will be incorporated in Agricultural and Grazing Environmental Statements due for publication in about one year.

(4) Soil Conservation Service. Land use map. Owyhee County (sheet 6). April, 1975.

Blue line map at scale 1:126,720 ($\frac{1}{2}$ inch:mile) available from SCS, Room 345, 304 North 8th St., Boise, Idaho. Denotes the following land uses: urban and built-up land, surface irrigated cropland, sprinkler irrigated cropland, non-irrigated cropland, rangeland, water and wetland, recreation - non-urban land, forest and woodland.



Figure 2. SCS detailed soil survey, NW $\frac{1}{4}$, NW $\frac{1}{4}$, Section 15, T7S, R6E, Bruneau KGRA (legend follows)

(See Figure 2)

DORS SERIES
(DzB, DzC)

The Dors series is a member of a coarse-loamy over sandy or sandy-skeletal, mixed, mesic family of Xerollic Calciorthids. These soils have light-colored sandy loam A horizons, and very strongly calcareous sandy loam Cca horizons over gravel at a depth between 20 and 40 inches.

Typifying Pedon: Dors fine sandy loam (range).

(Colors are for dry soil unless otherwise stated.)

- A11 -- 0-1" -- Light brownish-gray (10YR 6/2) fine sandy loam, dark grayish-brown (10YR 4/2) moist; weak very fine granular to weak coarse platy structure; soft, very friable, nonsticky, nonplastic; few roots; few fine vesicular pores; noncalcareous; moderately alkaline (pH 8.0); abrupt smooth boundary. (0 to 4 inches thick.)
- A12 -- 1-5" -- Pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine platy structure; slightly hard, very friable, nonsticky, nonplastic; few fine roots; few fine pores; few blotches of very pale brown (10YR 8/3) lime; moderately calcareous; moderately alkaline (pH 8.0); abrupt smooth boundary. (3 to 5 inches thick.)
- Clca -- 5-20" -- Pinkish gray (7.5YR 6/2) fine sandy loam, dark grayish-brown (10YR 4/2) moist; massive; hard, very friable, nonsticky, nonplastic; few fine roots; few fine pores; very strongly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary. (8 to 16 inches thick.)

2 - Dors

C2ca -- 20-26" -- Very pale brown (10YR 8/3) fine sandy loam, pale brown (10YR 6/3) moist; massive; hard, very friable, slightly sticky, slightly plastic; few fine roots; few fine pores; very strongly calcareous; strongly alkaline (pH 8.6); abrupt smooth boundary. (3 to 8 inches thick.)

IIC3 -- 26"+ -- Mixed gravels, mainly rhyolite, coated with white or pinkish calcium carbonate mainly on lower side.

Type Location: Elmore County, Idaho; 1,000 feet east of the southwest corner and 20 feet north of the road, in sec. 27, T. 4 S., R. 3 E., about 3½ miles north of Grand View.

Range in Characteristics: The mean annual soil temperature at a depth of 20 inches ranges from 47° to 59° F., and the mean summer temperature ranges from 65° to 72° F. These soils are usually dry. The mineralogy is mixed. The weighted average organic matter content of the A horizons is 0.8 to 1.2 percent. The A horizons range in color value from 5.5 to 7 dry and 3.5 to 5 moist and in chroma from 1.5 to 3 in 10YR hue. The structure ranges from weak fine granular to weak fine or coarse platy. The A horizons are noncalcareous to slightly calcareous and are moderately alkaline. The control section has less than 15 percent clay and 50 to 70 percent coarser than very fine sand. The Cca horizons range in texture from fine sandy loam to gravelly loamy sand and are strongly to very strongly calcareous. The color value ranges from 6 to 7 dry and 4 to 5 moist and in chromas from 2 to 3 in the 7.5YR or 10YR hue. The depth to the Cca horizon ranges from 5 to 12 inches. Depth to mixed sands and gravels ranges from 20 to 40 inches.

Competing Series and Their Differentiae: These include the Cencove and Marsing series, and the tentative Hipwell series which is less than 20 inches to sands or gravels. The Cencove and Marsing series lack calcic horizons.

Setting: The series is on level to moderately sloping broad convex alluvial fans. Slopes range from 0 to 12 percent but are commonly less than 4 percent. The series developed in alluvium from the Payette-Idaho formation. Elevations range from 2,300 to 3,000 feet. The semi-arid climate has an average frost-free period of 140 to 170 days, a mean annual precipitation of 6 to 8 inches, including 1 to 2 feet of snowfall, and dry summers.

Principal Associated Soils: These include the Hipwell, Nannyton and Perjue. The Hipwell series is less than 20 inches deep to sands and gravels. The Nannyton series has a textural B horizon. The Perjue series has a caliche hardpan within 20 inches of the surface.

Drainage and Permeability: Well drained; slow to moderately rapid runoff; moderately rapid permeability.

Use and Vegetation: Mostly winter range with some areas being developed for irrigation. Natural vegetation includes shadscale, budsage, cheatgrass and other annual weeds and grasses.

Distribution and Extent: Southwestern Idaho near the Snake River. A total area of 20,000 to 50,000 acres is estimated.

Series Proposed: Elmore County, Idaho, 1955. (Name from Dorsey Ranch.)

Remarks: The series was classified formerly as a Calcisol.

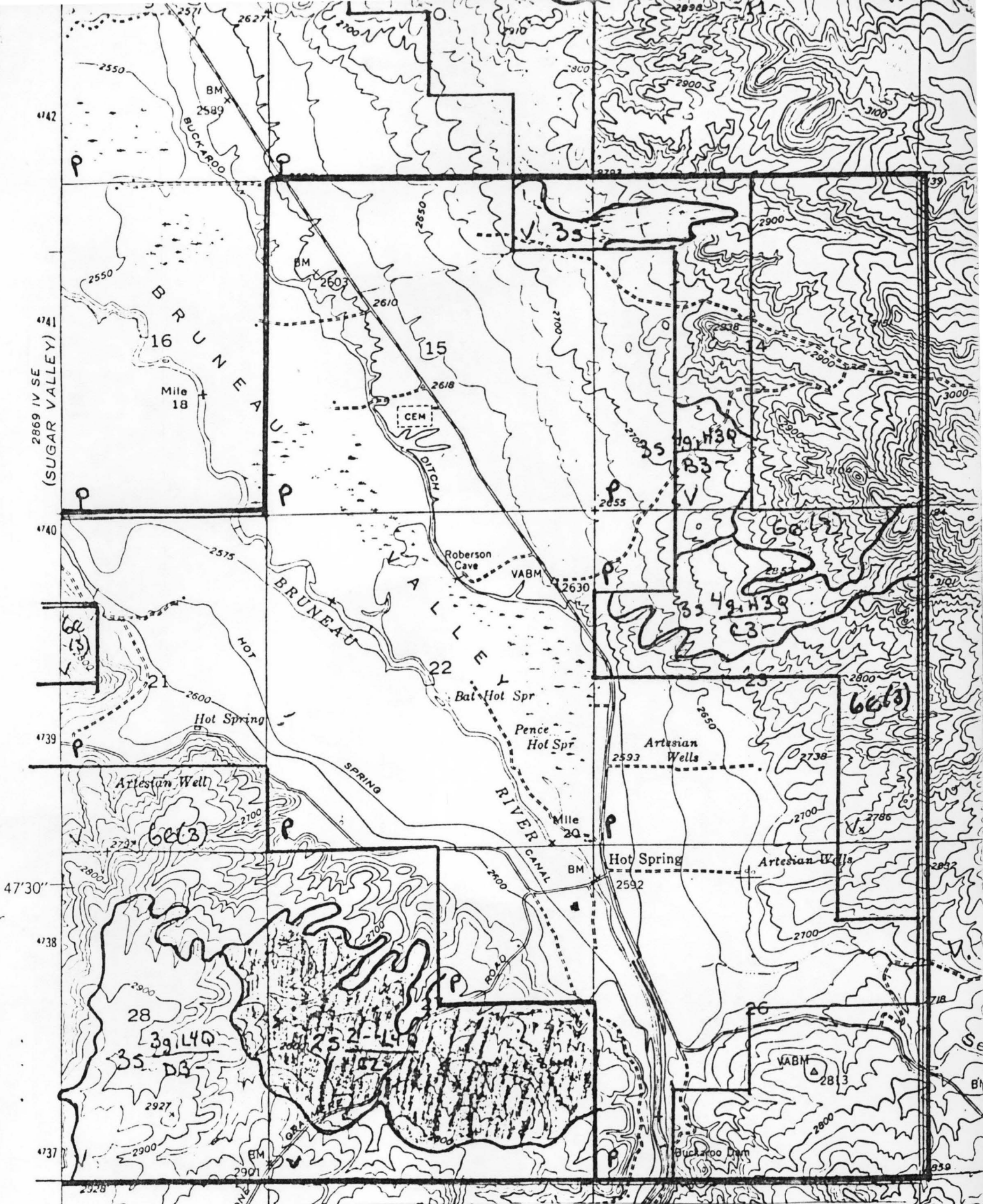
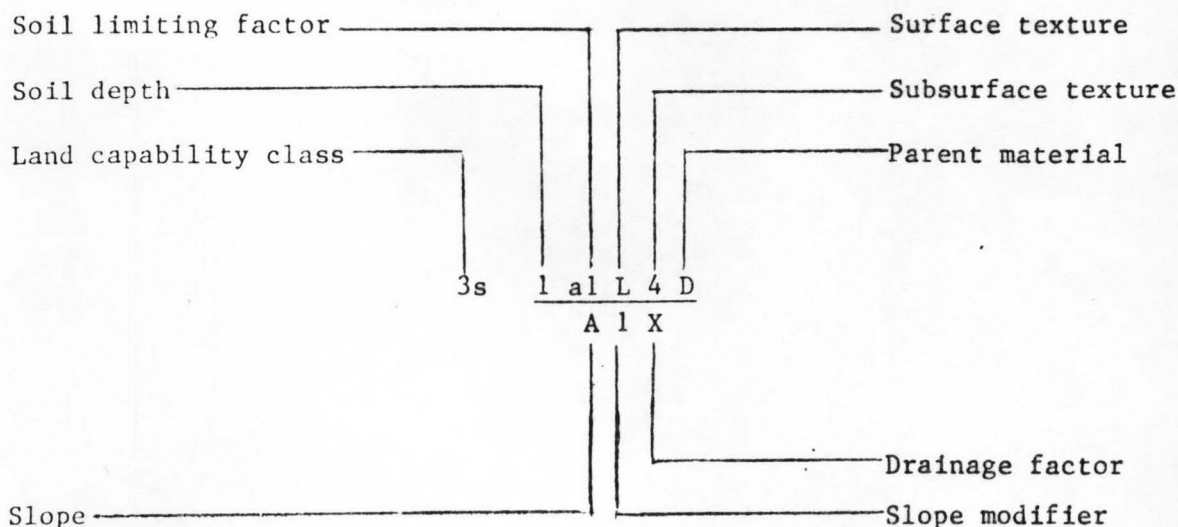


Figure 3. BLM land capability survey, public domain lands, Bruneau KGRA (legend follows)

OWYHEE DESERT AREA - SOIL SURVEY LEGEND
BUREAU OF LAND MANAGEMENT

Explanation of symbols used in mapping (Fig. 3)



Soil Depth

The depth of the soil refers to the depth of the solum or the layers that are readily penetrated by plant roots or the depth to some layer that would restrict root penetration. Five depths are recognized:

<u>Symbol</u>	<u>Descriptive Term</u>	<u>Range</u>
1	Very deep	Over 60 inches
2	Deep	36-60 inches
3	Moderately deep	20-36 inches
4	Shallow	10-20 inches
5	Very Shallow	0-10 inches

Soil Textures

The following textural classes will be recognized, grouped, and coded to reflect surface and subsurface characteristics. Together, these factors will be utilized as a measure of soil permeability. Textural classes grouped in each separation are:

<u>Surface Texture Symbol</u>	<u>Subsurface Texture Symbol</u>	<u>Descriptive Term</u>	<u>Included Textural Classes</u>
F	1	Fine	Clay, silty clay, stony clay, sandy clay
H	2	Moderately fine	Silty clay loam, sandy clay loam, clay loam
M	3	Medium	Silt, silt loam, stony loam, gravelly loam, loam, very fine sandy loam

L	4	Light	Fine sandy loam, sandy loam loamy fine sand
C	5	Coarse	Loamy coarse sand, very fine sand, fine sand, sand, coarse sand, very coarse sand, gravel

Inhibitory Factors (Soil Limiting)

Inhibitory factors are shown by lower case letters following the profile depth code. Combination of factors are made when necessary to express all inhibitory factors. The following are those inhibitory factors to be recognized.

Saline/Alkali - Such soils contain sufficient salts so distributed in the profile that they limit or restrict growth of most crop plants. A saline-alkali soil have either so high a degree of alkalinity (pH 8.6 or higher), or so high a percentage of exchangeable sodium (15 per cent or higher), or both, that the growth of most plants is reduced. These conditions may exist at the soil surface, throughout the profile, at depth within the profile, and occur sporadically as "slick spots" across the landscape or as extensive tracts.

Five occurrences or intensities of saline/alkali conditions will be recognized:

<u>Code</u>	<u>Description</u>
a ₁	Moderate saline/alkaline condition--growth of most crops is moderately affected and less tolerant plants are seriously affected. The pH ranges from 8.6 to 9.0.
a ₂	Severe saline/alkaline condition--growth of only salt and alkali tolerant plants is possible. The pH will exceed 9.0.
a ₃	Saline/alkaline subsoil--soils having the surface layers relatively free of salt or alkali but which have an accumulation of salt and alkali in the subsoil. Such material has been leached to a depth as to not effect crop production unless poorly managed. Accumulations at 20 inches or more.
a ₄	Saline/alkali slick spots--this situation appears on the land as "slick spots" having "pigmy" or thin B horizon development correctable with normal tillage operations. Land surface involved exceeds 15 per cent of total area.
a ₅	Saline/alkali complex--this complex appears on the land as strongly developed B horizons requiring extensive and/or special tillage or other practices to modify profile problems (deep plowing, etc.). Land surface involved exceeds 15 per cent of total area.

Lime--Lime content sufficient to affect plant growth unfavorably.

<u>Code</u>	<u>Description</u>
z ₁	Concentrations in excess of 15 per cent represented by 6 inches or greater depth of nodular and/or cap accumulations within 8 to 20 inches of the soil surface. No apparent restriction of root and/or water penetration.
z ₂	Concentrations in excess of 15 per cent represented by 6 inches or greater nodular and/or cap accumulations within 0 to 8 inches of the soil surface. Or, slight restriction of root and water penetration at 0 to 20 inches as evidenced by inextensive root-matting.

Gravelly and Stony--Fragments of sufficient size and amounts significantly influence plant growth by creating poor soil-air-moisture relationships and/or limits or restricts cultivation, planting, and harvest of crops.

<u>Code</u>	<u>Description</u>
g ₁	Gravelly--20 to 40 per cent of land surface is covered and/or upper soil profile (20 inches) is composed of gravels from 2 mm's to 4 inches in diameter.
g ₂	Very gravelly--40 to 75 per cent of land surface is covered and/or upper soil profile (20 inches) is composed of gravels from 2 mm's to 4 inches in diameter.
s ₁	Stony--Sufficient stones to interfere with tillage but not to make intertilled crops impracticable. (If stones are 1 foot in diameter and about 10 to 30 feet apart, they occupy about 0.1 to 1.5 per cent of the surface, and there are about 1.5 to 25 cubic yards per acre-foot).
s ₂	Very stony--sufficient stones to make tillage of intertilled crops impracticable, but the soil can be worked for hay crops or improved pasture if other soil characteristics are favorable. (If stones are 1 foot in diameter and about 5 to 10 feet apart, they occupy about 0.1 to 3 per cent of the surface, and there are about 1.5 to 50 cubic yards per acre-foot).
r	Extremely gravelly and/or stony condition in excess of foregoing condition.

Overflow--Damaging overflow either as the result of stream action or as over-land flow will be recorded as follows:

<u>Code</u>	<u>Description</u>
f ₁	Damaging oyerflow, occasional and slight. Frequency: 1 to 2 times in 10 year period.
f ₂	Damaging overflow, frequent and severe. Frequency: 3 to 8 times in 10 year period.

Wetness--Additional or excess water in the soil profile of sufficient degree to effect the normal function of the profile in production of crops. These degrees of wetness will be recognized:

<u>Code</u>	<u>Description</u>
w ₁	Choice of crops limited due to delayed drainage and warming of soil in the spring. Evidence (mottling) or water table if found occurs in lower soil profile.
w ₂	Choice of crops is seriously affected due to high water table and delay in drainage and warming of the soil in the spring. Evidence of a water table is found near soil surface with characteristic mottling occurring within major root zone depth.
w ₃	Choice of crops limited to those which can withstand a shallow water table throughout the growing season. The water table is at or near the surface during wetter part of year.

Parent and/or Underlying Materials

A	Acid igneous rock
B	Basic igneous rock
D	Unconsolidated materials
H	Aeolian sand
L	Loess
Q	Sand and gravel
R	Indurated hardpan
S	Semi-consolidated materials
V	Lacustrine material
X	Recent alluvium
Y	Clay

Slope

Steepness or gradient of the land is measured by use of an appropriate hand level and recorded in the denominator of the composite symbol. The dominant slope for each delineated area is recorded in per cent in addition to the appropriate slope class group. Grouping is as follows:

<u>Code</u>	<u>Limits</u>
A	0-2
B	2-4
C	4-7
D	7-12
E	12-20
F	20 per cent plus

Slope modifier--Slope characteristics beyond that of gradient will be known by arabic numeral following slope class code. Three categories will be recognized:

<u>Code</u>	<u>Description</u>
1	Gently undulating land surface requiring a "cut and fill" operation of minimal amount. Surface relief varies from a 4 to 8 inch elevation difference from a level plane (0 to 500 cubic yards excavation per acre required).
2	Moderately undulating land surface requiring greater "cut and fill" operation. Surface relief varies from a 3 to 16 inch elevation from a level plane. (1,000 to 1,465 cubic yards excavation per acre required).

Drainage--Soil depth, structure, topographic features, and underlying strata effect and compound natural drainage patterns. Under "Normal" or natural conditions drainage is satisfactory. However, under an irrigated, agricultural situation, drainage problems may arise. Accordingly, three categories are recognized and will be mapped as:

<u>Code</u>	<u>Description</u>
X	Soil and topographic conditions such that limited drainage requirements are likely to occur. Relatively, simple and inextensive corrective measures will overcome the problem.

Code

Description

Y

Soil and topographic conditions such that significant drainage requirements are likely to occur. Coordinated and extensive corrective measures will be necessary to overcome the problem.

Z

Soil and topographic conditions such that excessive drainage requirements are likely to occur. Subsurface water is evidenced by mottling (mapped under wetness factor); and, although this may have beneficial effects upon irrigated crops and would require extensive measures to correct the problem.

LAND CAPABILITY CLASSIFICATION
IRRIGABLE LANDS
OWYHEE DESERT AREA -

1. Capability classes I and II will be combined and treated as a single class II capability. This is enabled by the simple fact that limited, if any, Class I lands occur within the survey area. Therefore class II criteria will apply.
2. Capability classes II, III, and IV are identified with criterion outlined to enable placement of soils and topographic characteristics into appropriate category. Class(s) II and III are those which permit agricultural development and will sustain such use over time under proper management. Class IV lands are those areas having sever limitations in use and which must be maintained in permanent vegetative cover a majority in the time (approximately 75 per cent) to sustain use over time under proper management.
3. Capability class VI are those lands which are non-irrigable under all but extreme land preparation, water application, and specialty crops. All other lands are included here and, if, an irrigation proposal is made for such lands each case will require specific and detailed evaluation beyond that herein contemplated.
4. Subclass determinations e, s, w, and c (erosion, soils, wetness, and climatic hazards) will be limited to those separations of e and s categories where significant differences in management, crops, water application, etc. are required. This will minimize detail but will give sufficient information to enable determination of economic and engineering considerations. However, where further detail may be required in specific instances the basic field data is available to facilitate such evaluation.

Assuming the foregoing modifications, Table I has been prepared wherein the various characteristic(s) of soil and topography is grouped into appropriate capability class(s). This permits identification and enables definition, with explanation, of each capability class and subclass.

Table 1. Characteristics of Soil and Topography Grouped Into Land Capability Classes (Irrigable)

Capability Class Subclass	II e,s	III e,s	IV e,s	VI All
Solum Depth	36 inches	20-36 inches	10-20 inches	Less than 10 inches
Surface Texture	v ¹ sl-sicl	lfs-sicl	lfs-c	All
AWC-in/profile	5.0	5.0-5.0in.	3.0-2.0 in.	Less than 10 inches
Surface texture (Permanibility- in/hour)	2, 3, 4 (0.2-5.0 in.)	1, 2, 3, 4, 5 (0.05-10.0 in)	1, 2, 3, 4, 5 (0.05-10.0in)	All
Saline/Alkali	a ₃ , a ₄	C ₁ , a ₃	a ₂ , a ₅	All
Lime ^{1/}	None, Z ₁	Z ₂	All	All
Gravel	None, g	g	r	All
Stone	None	s ₁	s ₂	All
Overflow	None, f ₁	f ₂	All	All
Drainage ^{1/}	X	Y	Z	All
Wetness	None, W ₁	W ₂	W ₃	All
Slope Class Slope Modifier	AB 1	ABC 2	ABCDE ^{2/} 3	More than E class All
Erosion	None	2, R	2, R	All
F.F.D. (32 F)	140-110 days & can mature all common crops except common field corn, or less than 110 days & can mature commercial potatoes.	110-80 days or cannot mature commercial potatoes on less than 80 days and can mature 2 cut- tings of al- falfa.	80-60 days or have difficul- ty to mature cuttings of alfalfa or less than 60 days & can mature barley and seed po- tatoes.	Less than 60 days

^{1/} Lime, drainage, slope modifier, and size and shape of field are not so much a criterion of land capability as they are hazards and/or problems associated with production. However, lime, drainage, and slope modifier are included as a guide to land capability consideration.

^{2/} E slope class (12-20%)-applicable to sprinkler irrigation development only.

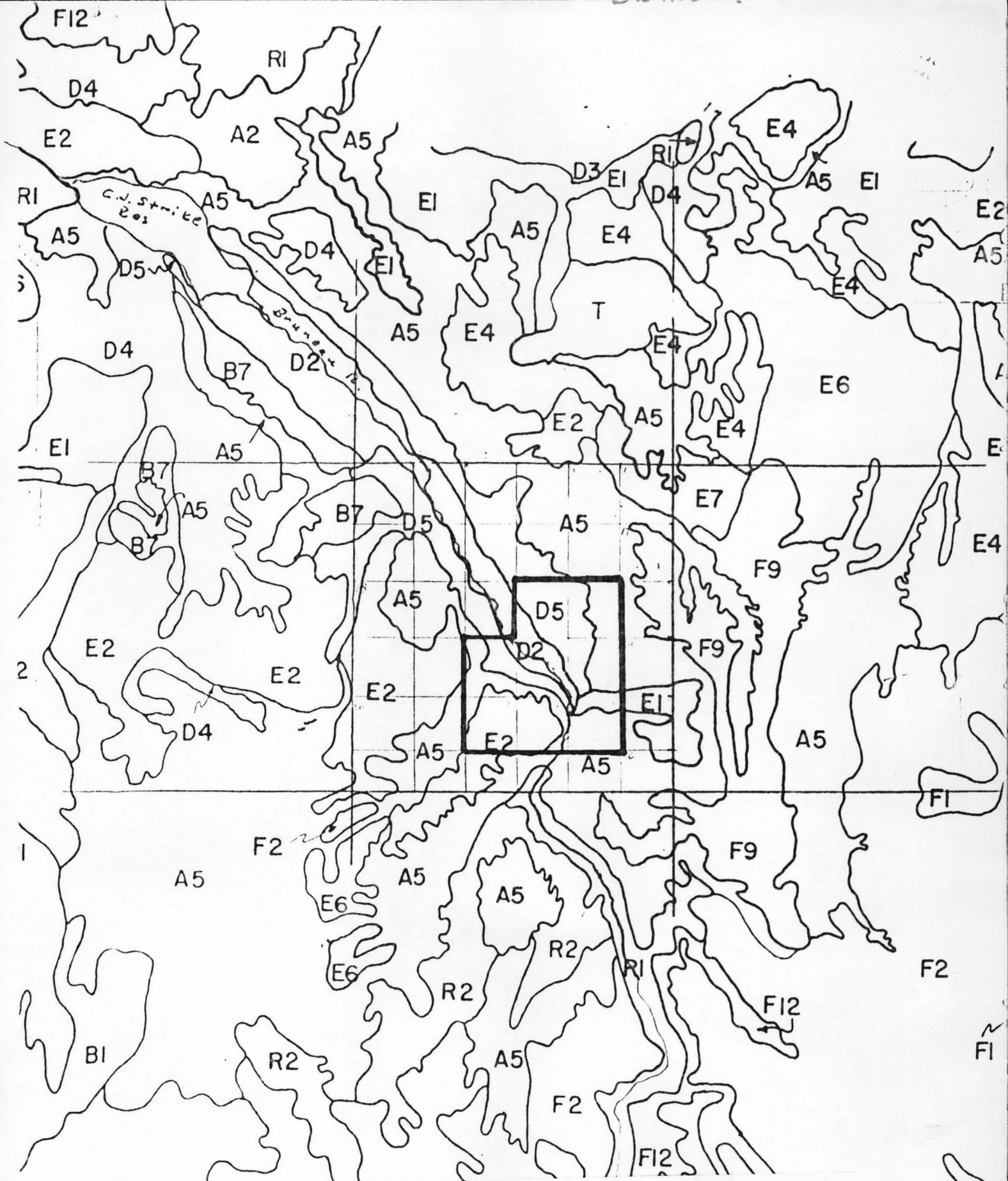


Figure 4. Special soil survey, Bruneau KGRA (Chugg et al, 1968)
(legend follows)



SOIL MAPPING UNITS AND SOIL DESCRIPTIONS 1/

The separations on the general soil map are identified by letters or by a combination of letters and numbers such as A, B1, B2, C1, etc. These symbols represent soil mapping units consisting of a group of identified soils. These maps are of little value unless the soils they represent are described. The following sections on soil mapping units and soil descriptions will discuss the soil characteristics important for interpretation of the individual soil for irrigation.

SOIL MAPPING UNITS OF A

- A1 621-281a-281b-909d Mapping Unit: Deep, well-drained soils on nearly level to sloping lacustrine sediments on lake terraces, terrace escarpments and mixed alluvium on alluvial fans.
- A2 281a-909b-909a Mapping Unit: Deep, well-drained soils on nearly level to sloping lacustrine sediments on dissected lake terraces and mixed alluvium on alluvial fans.
- A3 034-281a Mapping Unit: Very shallow and deep, well-drained soils on nearly level to very steep lacustrine sediments in Badlands and mixed alluvium on alluvial fans.
- A4 909d-909b Mapping Unit: Moderately deep, well-drained soils on steep and very steep lacustrine sediments on dissected lake terraces, terrace escarpments and mixed alluvium on alluvial fans.
- A5 034-909d Mapping Unit: Very shallow and moderately deep, well-drained soils on very steep dissected lacustrine sediments in Badlands and on terrace escarpments.
- A6 909b-909d-599b Mapping Unit: Moderately deep and deep, well-drained soils on gently sloping to very steep lacustrine sediments on dissected lake terraces and terrace escarpments.
- A7 909d-752 Mapping Unit: Moderately deep and very shallow soils on very steep lacustrine sediments on terrace escarpments and in Canyon Rockland.

The major soils in these mapping units are developing in lacustrine sediments on lake terraces, terrace escarpments and in mixed alluvium on alluvial fans interspersed with Badlands and some Rockland. They occur on nearly level to very steep

slopes. Soil Mapping Unit A1 is located on sheet 1 of the soils map, A2 on sheet 4, A3 on sheet 3; A4 on sheets 1, 2 and 3, A5 on sheets 1, 2, 3, 4 and 5, A6 on sheets 1, 3 and 4, A7 on sheets 1, 2 and 3.

The major soils occur in 7 different combinations of mapping units based on kinds of soils and percent composition. These soils are developing in essentially the same kind of parent materials derived from/or in the Payette formation and related strata.

The mean annual precipitation is estimated to be about 6 to 9 inches. The mean annual soil temperature is about 49 to 51 degrees F. The frost-free period is more than 120 days. The elevations range from about 2,200 to 4,500 feet.

The soils are deep, moderately deep, shallow, very shallow and are well-drained. The surface textures among the sub-units of these mapping units are dominated by silt loam and gravelly loam with miscellaneous land type Badlands that are also silty. Some minor areas include fine sand loam and Rockland. These soils are generally calcareous at or near the surface. The underlying materials are stratified lacustrine sediments ranging from gravelly materials to loamy and silty sediments with some strata high in sodium salts and high concentrations of calcium carbonate. The slopes are variable, ranging from long, uniform nearly level alluvial fans and lake terraces to short, complex, very steep slopes of the terrace escarpments and highly dissected lacustrine sediments of the Badlands.

The major soils and miscellaneous land types in the various mapping units are 034, 281a, 281b, 599b, 621, 752, 909a, 909b and 909d. The minor soils, each representing less than 15 percent of the area in their respective mapping units, are 037, 350a, 564a, 599a, 632a, 704b, 890a, 890b, 909c and 1000.

A more detailed description of each of these soils can be found in the Soil Descriptions section of this report.

SOIL MAPPING UNITS OF D

- D1 040 Mapping Unit: Deep, somewhat poorly drained soils on nearly level to very gently sloping mixed alluvium on stream bottoms.
- D2 083a-083b-281a Mapping Unit: Deep, somewhat poorly and poorly drained soils on nearly level to very gently sloping mixed alluvium on stream bottoms and alluvial fans.
- D3 082-083b Mapping Unit: Deep, very poorly and somewhat poorly drained alkaline soils on nearly level to very gently sloping mixed alluvium on stream bottoms.

D4 281a Mapping Unit: Deep, somewhat poorly drained soils on nearly level to very gently sloping mixed alluvium on alluvial fans.

D5 281a-281b-909d Mapping Unit: Deep and moderately deep, somewhat poorly drained and well-drained soils on nearly level to very steep mixed alluvium on alluvial fans and on terrace escarpments.

The major soil in these mapping units are developing in mixed alluvium and lacustrine sediments on stream bottoms, alluvial fans and terrace escarpments. They generally occur on nearly level to very gently sloping landforms with some very steep areas. Soil Mapping Unit D1 is located on sheet 1 of the soils map, D2 and D3 on sheet 4, D4 on sheets 3 and 4, D5 on sheets 1, 3, 4 and 5.

The major soils occur in 5 different combinations of mapping units based on kinds of soils and percent of composition. These soils are developing in alluvium essentially from the same kind of parent material derived from or in the Payette formation and related strata.

The mean annual precipitation is estimated to be about 6 to 9 inches. The mean annual soil temperature is about 49 to 51 degrees F. The frost-free period is more than 120 days. The elevations range from about 2,200 to 3,000 feet.

The soils are generally deep with few areas that are moderately deep or shallow. The surface textures are dominated by silt loam and loam. There are minor areas among the sub-units that include fine sandy loam, cobbly sandy loam and silty clay loam. These soils are generally calcareous at or near the surface except for some of the sandy soils with drainage problems that may be noncalcareous. The underlying materials are generally stratified sandy or loamy that may or may not be gravelly or cobbly. Alkaline or saline-alkaline areas are associated with somewhat poorly and poorly drained conditions where natural or induced water tables prevail. The soils are generally nearly level to very gently sloping with few areas that are sloping to very steep.

The major soils are 040, 082, 083a, 083b, 281a, 281b and 909d. The minor soils and miscellaneous land types, each representing less than 15 percent of the area, are 034, 040, 254, 281b, 306a, 306b, 306c, 323, 332, 350c, 521, 583, 616 and 890.

A more detailed description of each of these soils can be found in the Soil Descriptions section of this report.

SOIL MAPPING UNITS OF E

- E1 890a Mapping Unit: Deep, well-drained soils on nearly level to very gently sloping mixed sandy alluvium on stream terraces.
- E2 890a-890b-257a Mapping Unit: Deep, well-drained and excessively drained soils on nearly level to sloping mixed sandy alluvium on stream terraces.
- E3 890a-281a Mapping Unit: Deep, well-drained soils on nearly level to very gently sloping mixed sandy alluvium on stream terraces and alluvial fans.
- E4 704a-134b Mapping Unit: Deep and moderately deep, excessively drained and well-drained soils on nearly level to steep sand dunes and mixed sandy alluvium on stream terraces and alluvial fans.
- E5 704a-890a-257b Mapping Unit: Deep, excessively drained and well-drained soils on nearly level to steep sand dunes and mixed sandy alluvium on stream terraces.
- E6 257c-890a Mapping Unit: Deep, excessively drained and well-drained soils on nearly level to very steep mixed sandy alluvium on stream terraces.
- E7 886-389-704a Mapping Unit: Moderately deep and deep, well-drained and excessively drained soils on nearly level to steep eolian sand on stream and lake terraces and in sand dunes.

The major soils in these mapping units are developing in mixed sandy alluvium or in sand dunes on stream terraces, lake terraces and alluvial fans. They occur on nearly level to very steep landforms. Soil Mapping Unit E1 is located on sheets 3, 4 and 5 of the soils map, E2 on sheets 1, 4 and 5, E3 on sheets 2 and 3, E4 on sheets 4 and 5, E5 on sheet 3, E6 on sheets 1, 3 and 4 and E7 on sheet 4.

The major soils occur in 7 different combinations of mapping units. These soils are developing in alluvial deposits of essentially the same kind of parent materials derived from or in the Payette formation and related strata.

The mean annual precipitation is estimated to be about 6 to 9 inches. The mean annual soil temperature is about 49 to 51 degrees F. The frost-free period is more than 120 days. The elevations range from about 2,200 to 3,000 feet.

The soils are generally deep and excessively drained to well-drained. Some areas are deep to hardpan. The surface textures are dominated by fine sandy loam, loamy fine sand, sandy loam, loamy sand and sand. Only minor areas include silt loam. Most of these soils are calcareous at or near the surface. Others are strongly calcareous in the subsoil and may have a lime-silica hardpan. The underlying materials are either eolian sand or stratified sand and gravel. The slopes vary from short and narrow to broad and long, nearly level stream terraces and alluvial fans to sand hummocks and sand dunes.

The major soils are 134b, 257a, 257b, 257c, 281a, 389, 704a, 886, 890a and 890b. The minor soils, each representing less than 15 percent of the area, are 037, 040, 134a, 174, 564a, 704a and 704b.

A more detailed description of each of these soils can be found in the Soil Descriptions section of this report.

SOIL DESCRIPTIONS

Soil 034 (A5)

This is a miscellaneous land type (Badlands). It occupies about 60 percent of Soil Mapping Unit A3 located on sheet 3 of the soils map, 35 percent of A5 on sheets 1, 2, 3, 4 and 5, 5 percent of A6 on sheets 1, 3 and 4 and 5 percent of D5 on sheets 1, 3, 4 and 5.

It occurs on very steep highly dissected lacustrine sediments with little or no soil mantle over the exposed underlying materials. They consist mostly of stratified sand, silts and gravel with thin layers of volcanic ash, shale, fresh water limestone, sandstone and clay. Some intrusions of volcanic rocks occur in some places.

The soil material is deep (over 40 inches) and well-drained. Permeability is variable but generally moderate (0.8 to 2.5 inches per hour). Available water-holding capacity is high (over 6 inches). The strata are variable saline, and water intake is somewhat restricted. The silty and loamy surface materials puddle easily and are highly susceptible to water erosion.

The very severe limitation of this miscellaneous land type is extremely rough topography; therefore, it is placed in non-irrigable class 6.

Soil 083a (D2)

This soil occupies about 10 percent of Soil Mapping Unit D1 located on sheet 1 of the soils map and 30 percent of D2 on sheet 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium on stream bottoms.

Typical Profile:

- A1 0-8 inches. Light brownish-gray silt loam, granular structure, very friable and strongly calcareous.
- B2 8-17 inches. Very pale brown silt loam, blocky structure, very friable and strongly calcareous.
- Clca 17-32 inches. Light gray loam or silt loam, massive, very friable, very strongly calcareous.
- C2 32-52 inches. Very pale brown silt loam or loam, massive, very friable, strongly calcareous.
- IIC3 52-96 inches. Light colored stratified medium and coarse-textured materials, slightly calcareous.

This soil is deep (over 40 inches) and moderately well-drained. Permeability is moderately slow (0.2 to 0.8 inches per hour). Available water-holding capacity from 0 to 48 inches is high (over 6 inches). The soil profile is moderately alkaline. The water table is generally below 3 to 6 feet during the growing season.

The moderate limitations of this soil for irrigation are a combination of water table, moderately alkaline condition and moderately slow permeability; therefore, it is placed in irrigable class 2.

Soil 083b (D2)

This soil occupies about 25 percent of Soil Mapping Unit D2 located on sheet 4 of the soils map, 60 percent of D3 on sheet 4 and 3 percent of D4 on sheets 3 and 4.

This soil is similar to soil 083a except it is moderately to severely saline-alkali and the water table is about 18 to 36 inches below the surface.

The severe limitations of this soil for irrigation are a combination of high water table and a moderately to severely saline-alkali condition; therefore, it is placed in irrigable class 3.

Soil 257a (E2)

This soil occupies about 15 percent of Soil Mapping Unit E2 located on sheets 1, 4 and 5 of the soils map, 10 percent of E3 on sheets 2 and 3, 10 percent of E4 on sheets 4 and 5, 10 percent of E6 on sheets 1, 3 and 4 and 5 percent of E7 on sheet 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium on stream terraces.

Typical Profile:

- A1 0-6 inches. Grayish-brown loamy fine sand, granular structure, very friable and calcareous.
- C1 6-32 inches. Light brownish-gray loamy fine sand, massive, very friable and calcareous.
- 11C2Ca 32-96 inches. Stratified medium and moderately coarse-textured materials, moderately calcareous.

This soil is deep (over 40 inches) and somewhat excessively drained. Permeability is rapid (over 10 inches per hour). Available water-holding capacity from 0 to 48 inches is low (3 to 4.5 inches). Erosion hazard is severe.

The severe limitations of this soil for irrigation are sandy texture and a low available water-holding capacity; therefore, it is placed in irrigable class 3.

Soil 281a (D2, D5)

This soil occupies about 20 percent of Soil Mapping Unit A1 located on sheet 1 of the soils map, 20 percent of A2 on sheet 4, 20 percent of A3 on sheet 3, 2 percent of A6 on sheets 1, 3 and 4, 15 percent of D2 on sheet 4, 77 percent of D4 on sheets 3 and 4, 50 percent of D5 on sheets 1, 3, 4 and 5, 5 percent of E2 on sheets 1, 4 and 5 and 30 percent of E3 on sheets 2 and 3.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed silty alluvium on alluvial fans.

Typical Profile:

- A1 0-3 inches. Light brownish-gray silt loam, granular structure, very friable and slightly calcareous.
- C1 3-22 inches. Light brownish-gray to light gray stratified silt loam, prismatic structure, very friable and moderately calcareous.
- C2ca 22-40 inches. Light gray silt loam, massive, very friable and moderately calcareous.
- IIC3 40-96 inches. Light brownish-gray to light gray, stratified fine gravelly loam and silt loam, very friable and moderately calcareous.

This soil is deep (over 40 inches) and well-drained. Permeability is moderate (0.8 to 2.5 inches per hour). Available water-holding capacity from 0 to 48 inches is high (over 6 inches). The soil profile is moderately alkaline.

The moderate limitation of this soil for irrigation is a moderately alkaline condition; therefore, it is placed in irrigable class 2.

Soil 281b (D2)

This soil occupies about 15 percent of Soil Mapping Unit A1 located on sheet 1 of the soils map, 4 percent of A5 on sheets 1, 2, 3, 4 and 5, 5 percent of D4 on sheets 3 and 4 and 20 percent of D5 on sheets 1, 3, 4 and 5.

It is similar to soil 281a except it occurs on gently sloping to sloping (4 to 12 percent) mixed alluvium on alluvial fans.

The severe limitations of this soil for irrigation are a combination of a moderately alkaline condition and a gently sloping to sloping landform; therefore, it is placed in irrigable class 3.

Soil 890a 67 Ida 37251 (E2)

This soil occupies about 5 percent of Soil Mapping Unit A1 on sheet 1 of the soils map, 5 percent of A3 on sheet 3, 4 percent of A5 on sheets 1, 2, 3, 4 and 5, 3 percent of B6 on sheets 2 and 3, 86 percent of E1 on sheets 3, 4 and 5, 60 percent of E2 on sheets 1, 4 and 5, 40 percent of E3 on sheets 2 and 3, 5 percent of E4 on sheets 4 and 5, 5 percent of E5 on sheet 3, 15 percent of E6 on sheets 1, 3 and 4 and 10 percent of E7 on sheet 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium on stream terraces.

Typical Profile:

- A1 0-4 inches. Light brownish-gray fine sandy loam or sandy loam, platy to granular structure, very friable and noncalcareous.
- C1 4-13 inches. Light brownish-gray fine sandy loam, massive, very friable and strongly calcareous.
-
- C2ca 13-60 inches. Light gray fine sandy loam, massive, very friable and very strongly calcareous.
- C3 60-96 inches. Light gray fine sandy loam, massive, very friable and strongly calcareous.

This soil is deep (over 40 inches) and well-drained. Permeability is moderately rapid (2.5 to 5.0 inches per hour). Available water-holding capacity from 0 to 48 inches is moderate (4.5 to 6 inches). The soil profile is moderately to strongly alkaline in the lower part.

The moderate limitation of this soil for irrigation is a moderate available water-holding capacity; therefore, it is placed in irrigable class 2.

Soil 890b (E2)

This soil occupies about 4 percent of Soil Mapping Unit A5 located on sheets 1, 2, 3, 4 and 5 of the soils map, 10 percent of B7 on sheets 1, 2, 3 and 4, 15 percent of E2 on sheets 1, 4 and 5, 5 percent of E5 on sheet 3 and 5 percent of E6 on sheets 1, 3 and 4.

It is similar to soil 890a except it occurs on gently sloping (4 to 12 percent) mixed alluvium on stream terraces.

The severe limitations of this soil for irrigation are a combination of moderate available water-holding capacity, sandy texture and a gently sloping to sloping landform; therefore, it is placed in irrigable class 3.

Soil 909a

This soil occupies about 25 percent of Soil Mapping Unit A2 located on sheet 4 of the soils map, 4 percent of A5 on sheets 1, 2, 3, 4 and 5 and 10 percent of A6 on sheets 1, 3 and 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) silty lacustrine sediments on lake terraces.

Typical Profile:

- A1 0-5 inches. Light gray silt loam, platy to granular structure (vesicular), friable and slightly calcareous.
- B 5-12 inches. Light gray silt loam, blocky structure, friable and slightly calcareous.
- C 12-23 inches. Light gray silt loam, laminated, firm and slightly calcareous.
- R 23-96 inches. White laminated silt stone, very hard and slightly calcareous.

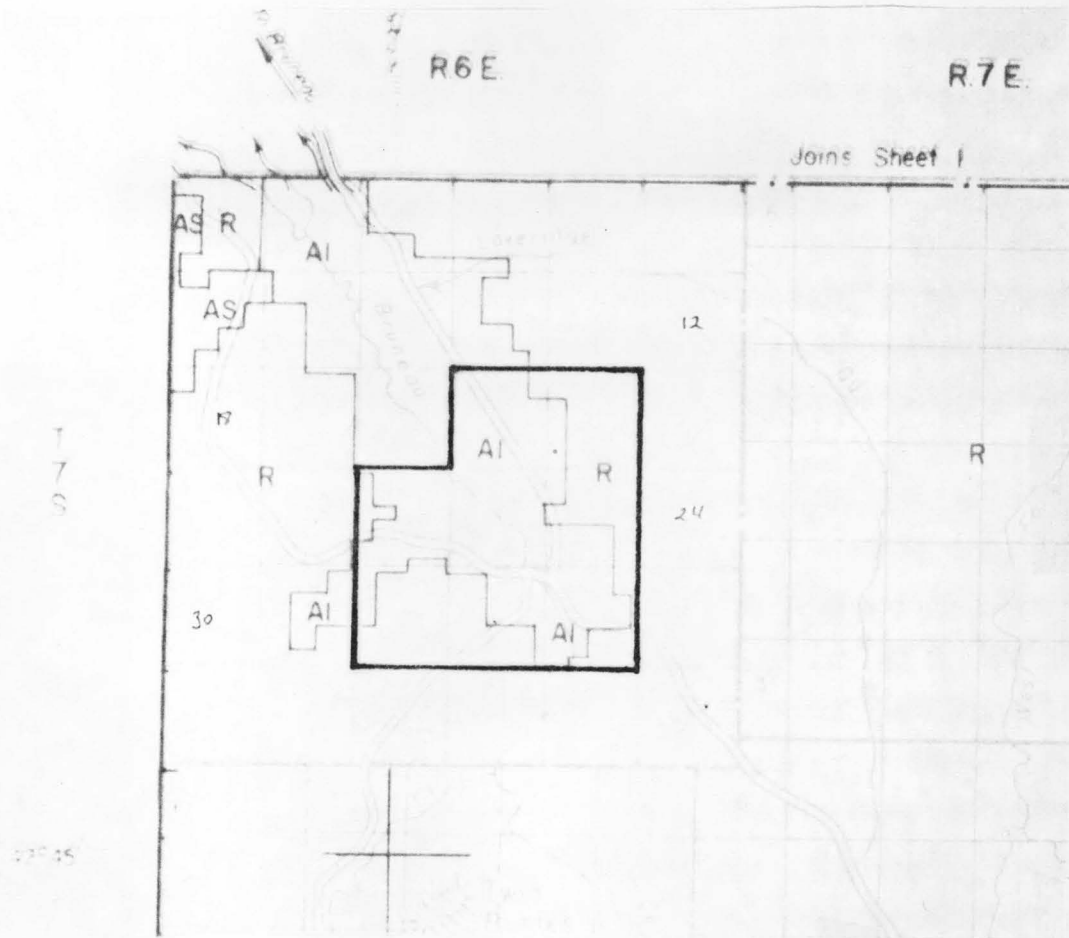
This soil is moderately deep (20 to 40 inches) and well-drained. Permeability is moderate (0.8 to 2.5 inches per hour) in the upper part but slow (0.05 to 0.2 inches per hour) in the laminated substratum. The soil profile is moderately alkaline above 23 inches. Available water-holding capacity from 0 to 24 inches is moderate (4.5 to 5 inches).

Soil 909d (A5, D5)

This soil occupies about 15 percent of Soil Mapping Unit A1 located on sheet 1 of the soils map, 80 percent of A4 on sheets 1, 2 and 3, 30 percent of A5 on sheets 1, 2, 3, 4 and 5, 15 percent of A6 on sheets 1, 3 and 4, 65 percent of A7 on sheets 1, 2 and 3, 5 percent of B1 on sheets 1 and 4, 5 percent of B3 on sheet 1, 7 percent of B4 on sheet 1, 25 percent of D5 on sheets 1, 3, 4 and 5 and 10 percent of F10 on sheet 5.

This soil is similar to soil 909a except it occurs on very steep (over 20 percent) silty lacustrine sediments on lake terrace escarpments.

The very severe limitation of this soil for irrigation is very steep slopes; therefore, it is placed in non-irrigable class 6.



- U Urban and built-up land
- AI Surface irrigated cropland
- AS Sprinkler irrigated cropland
- AL Non-irrigated cropland
- R Rangeland
- W Water and wetland
- OR Recreation - non-urban

Figure 5. Bruneau KGRA. SCS land use map, 1975.

CASTLE CREEK KGRA

SOILS

X.1.1.1. Description of Existing Data

(1) The Owyhee County Soil Conservation Service (Grandview Office) has made detailed soil surveys on three parcels of private land in the Owyhee Co. portion of the Castle Creek KGRA. One parcel is south of and adjacent to the Snake River, one is a quarter section on Henderson Flats while the other is in the Castle Creek valley near the southwest corner of the KGRA (Fig. 1). These areas were mapped 10-20 years ago. The soil maps of these parcels are on open file aerial photographs (1:20,000) in the Grandview office.

The Ada Co. SCS (Meridian office) has completed mapping the entire portion of the KGRA which lies in Ada Co. Fig. 2 shows the soil map of this area traced from aerial photos (1:20,000) and transposed onto a 7½ minute topographic map.

The SCS central office in Boise (Room 345, 304 North 8th Street) has on file detailed descriptions of each soil series which include the following data:

Soil taxonomic class	Drainage
Typical pedon (soil profile)	Permeability (in/hr)
Depth	Available water capacity (in/in)
Color	Soil reaction (pH)
Texture	Salinity
Composition	Use and vegetation potentials
pH	Sanitary facilities
Range in characteristics	Community development
Mean annual soil temperature	Source materials
Mean summer soil temperature	Water management
Relative moisture content	Wildlife habitat
Depth to bedrock	Native vegetation
Organic content	Crop use and potential
Structure	
Geographic setting	
Elevation	
Slope	
Parent materials	
Climate	

(2) The Boise District Office of the Bureau of Land Management has completed a land capability class survey on all or part of 28 sections within the KGRA (Figs. 1 and 3). This ongoing survey is designed to determine irrigability and is less detailed than the SCS method. A system of map symbols is used such as $2 \frac{2a_1m3v}{A1Y}$ to describe a soil body. Each letter or number refers to the following soil characteristics which are contained in a map legend:

Land capability class (irrigability class)
Soil depth
Soil limiting factor
Surface and subsurface texture
Parent material
Slope and slope modifier
Drainage factor

(3) Chugg et al (1968) conducted a special soil survey in Owyhee Co. which included all of the Castle Creek KGRA. This reconnaissance survey was intended for determination of irrigability class and for broad county planning (Fig. 4). The mapping units used in this survey reveal general information on relative soil depth, drainage characteristics, slope, underlying materials, and geomorphic features and refer to the soils found in the mapping unit by number. Detailed descriptions of each of these soils are given; however, these cannot be pinpointed on the map.

X.1.1.2. Evaluation of Existing Data

(1) The Soil Conservation Service detailed soil surveys on private lands in Owyhee Co. and in the entire Ada Co. portion of the Castle Creek KGRA are the most detailed surveys available. The remaining privately owned lands within the Owyhee Co. portion will be mapped within the next 3-5 years as the Owyhee Co. soil survey is completed.

(2) The Bureau of Land Management land capability class survey on the public domain lands within the KGRA was conducted primarily to determine irrigability of the lands in question. Mapping was accomplished by de-

lineating discrete land types on an aerial photograph and then spot checking them on the ground for soil characteristics. This is not as detailed a survey method as that employed by the SCS. However, the soil data documented is probably quite adequate for most geothermal resource development projects. Additional public domain lands within the KGRA will be surveyed in the coming year and incorporated in the Agricultural and Grazing Environmental Statement now being prepared.

(3) The special soil survey of Chugg et al (1968) was also intended for determination of irrigability class and for broad county planning and includes all lands within the county. While the soils descriptions are quite detailed and complete, there is no way to locate soil bodies on the soil mapping units displayed on the small scale maps.

X.1.1.3. Recommendations for Further Study

The existing Soil Conservation Service and Bureau of Land Management soil surveys on the Castle Creek KGRA are probably adequate for most geothermal resource development projects. However, only 25% of the area has been mapped in adequate detail. Both agencies are in the process of mapping additional lands within their domain and these data should be available within the next three years. While the BLM surveys are adequate for most uses, any development involving use of the soil for growing of crops will require a more detailed SCS soil analysis.

X.1.1.4. Special Interests or Concerns

X.1.1.5. Resource Use Limitations

At the present time, most of the privately owned lands within the Castle Creek KGRA are under agricultural development as irrigated farm lands. Additional acres could be "broken out" as irrigation expands. Much of the public

domain land is utilized as rangeland for livestock. These activities, where they occur, might impose limitations on geothermal development. The terrain ranges from flat and gently sloping to steep-sided hills and buttes. Terrain limitations would probably be minimal. Fig. 5 shows a land use map for the area (1975 data).

CASTLE CREEK KGRA

SOILS

APPENDIX A

Annotated Bibliography

- (1) Chugg, J.C., G.A. Monroe, L.L. Lockner, M.A. Fosber. 1968. Special Soil Survey - Owyhee County, Idaho. Idaho Water Resource Board Report No. 15. USDA Soil Conservation Service/University of Idaho Agricultural Experimental Station. 230 pp, maps.

This report contains information on soil characteristics such as type, composition, depth, permeability, salinity/alkalinity, and irrigability class as well as land types, underlying parent materials, and natural plant communities. The information in this report is based on a survey of a reconnaissance or soil association intensity. This type of soil survey is one of a general nature designed to obtain maximum information about soils important to determining irrigability and for broad county planning. It does not take the place of the detailed soil survey necessary for planning individual parcels of land.

This report is of limited usefulness as, while the soil descriptions are quite detailed, the reference map is very general. However, it is the only publication available which covers the entire KGRA.

- (2) Aerial photographs (1:20,000) of three parcels of private land within the Castle Creek KGRA showing soil bodies (1958-1976). Handbook containing legend. Owyhee Co. Soil Conservation Service, Grandview, Idaho.

These photos show detailed, accurate soil survey data. Detailed soil descriptions can be obtained from the SCS central office, Room 345, 304 North 8th St., Boise, Idaho. All private lands within Owyhee Co., including those in the KGRA, will be similarly mapped in the next 3-5 years.

- (3) Aerial photographs (1:20,000) of Ada Co. within the Castle Creek KGRA showing soil bodies. Draft of completed final report of the Ada County Soil Survey including soil descriptions. Ada Co. Soil Conservation Service, Meridian, Idaho.

These photos show detailed, accurate, up-to-date soil survey data.

The completed published report which will include detailed maps and soil descriptions is presently being printed.

- (4) Topographic maps (1:24,000) showing soil mapping units for all or parts of 28 sections of public domain lands within the KGRA. Legend also available. Bureau of Land Management, 5th and Bannock, Boise, Idaho.

These maps constitute reconnaissance soil surveys designed to determine land capability (irrigability) class. Soil series are not identified as they are in SCS surveys but rather a system of symbols is used to denote soil texture, composition, depth, drainage characteristics, alkalinity/salinity, slope, parent materials and land capability class.

These maps were drawn from aerial photos where land types were delineated by photo interpretation and spot checks made on the ground. This is not so detailed a method as the SCS uses but is probably adequate for most geothermal development purposes with the exception of crop growing.

This information will be incorporated in Agricultural and Grazing Environmental Statements due for publication in about one year.

- (5) Soil Conservation Service. Land use map. Owyhee County (sheet 1 and 3). April, 1975.

Blue line map at scale 1:126,720 ($\frac{1}{2}$ inch:mile) available from SCS, Room 345, 304 North 8th St., Boise, Idaho. Denotes the following land uses: urban and built-up land, surface irrigated cropland, sprinkler irrigated cropland, non-irrigated cropland, rangeland, water and wetland, recreation - non-urban land, forest and woodland.

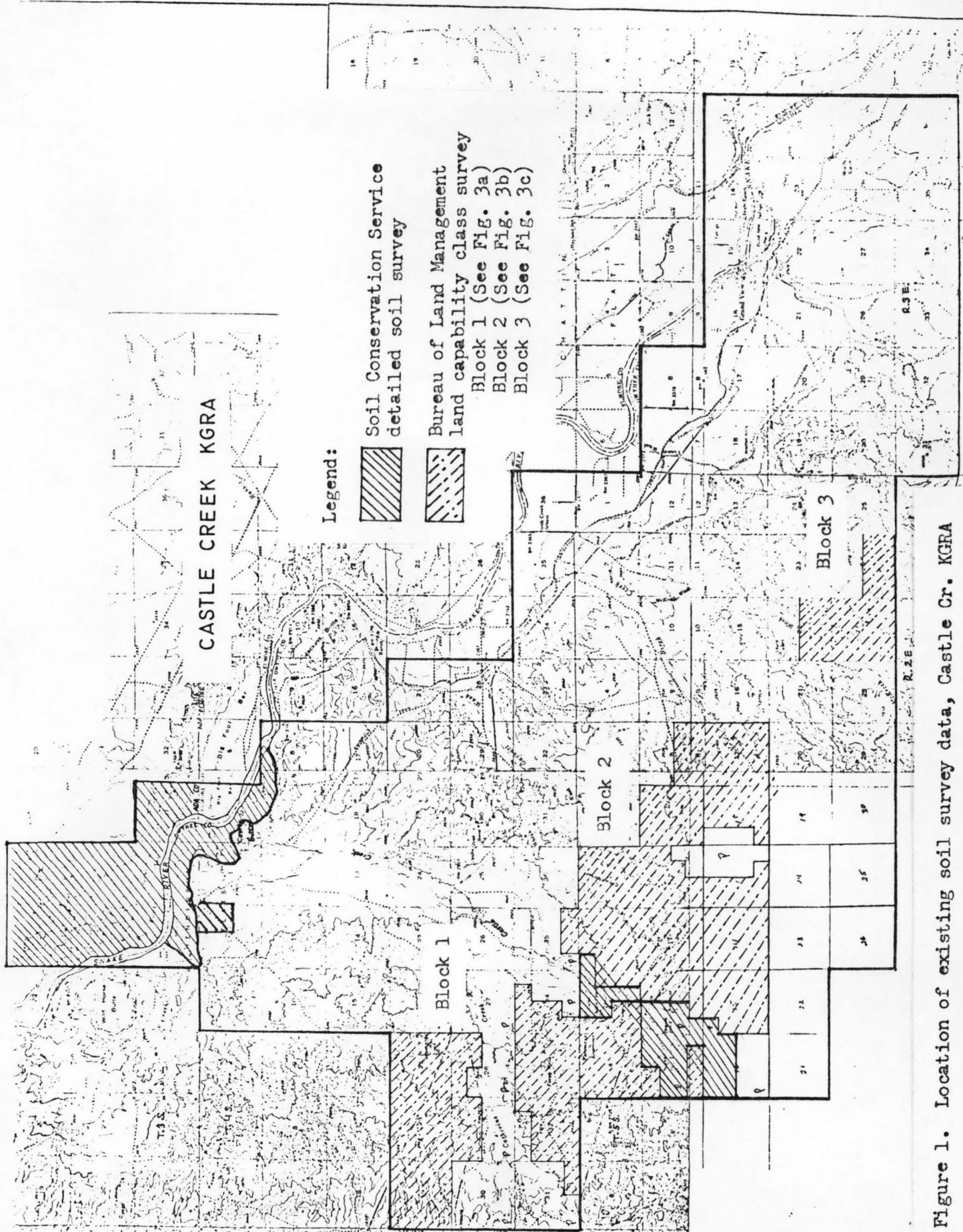


Figure 1. Location of existing soil survey data, Castle Cr. KGRA

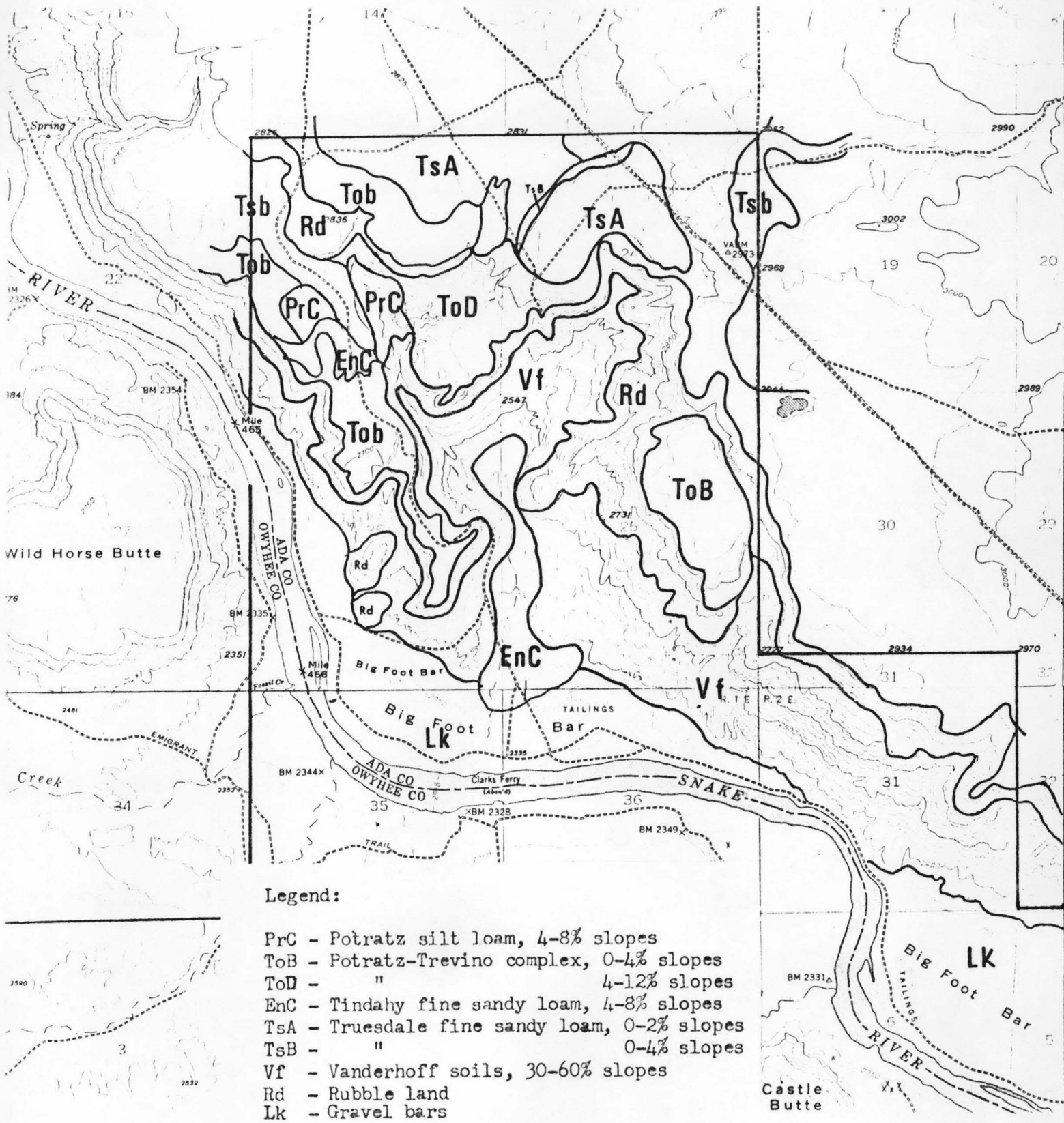


Figure 2. Soil map of Ada Co. portion of Castle Cr. KGRA (soil descriptions follow)

Soil Descriptions and Capabilities in Ada County Portion of Castle Creek KGRA

(See Fig. 2)

(PrC) Potratz silt loam, 4 to 8 percent slopes. This moderately deep, well drained soil is on basalt plans and terraces. It formed in loess underlain by basalt bedrock. Elevation is 2,600 to 3,100 feet. The mean annual precipitation is about 9 inches, the mean annual air temperature is about 51 degrees F, and the frost-free period is about 150 days.

Typically, the surface layer is light brownish gray and pale brown silt loam about 10 inches thick. The subsoil is yellowish brown silt loam about 9 inches thick. The substream is light gray and white silt loam and loam to about 38 inches over basalt.

Included with this soil in mapping are small areas of Garbutt silt loam, 4 to 8 percent slopes, McCain silt loam, 4 to 8 percent slopes, Power silt loam, 4 to 8 percent slopes, Rock outcrops, 50 to 20 percent slopes, and Trevino extremely stony, silt loam, 15 to 20 percent slopes. These inclusions occupy about 15 percent of this unit.

Permeability of this Potratz soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is high or very high. Runoff is medium and the hazard of erosion is moderate.

Most areas of this soil are used as range and for wildlife habitat. It has potential for irrigated farming and residential development.

The native vegetation on this soil is dominated by Thurber needlegrass, bluebunch wheatgrass and big sagebrush. In the drier areas of this soil, winterfat and shadscale occur commonly. As range condition declines, Thurber needlegrass and bluebunch wheatgrass decrease and are replaced by annuals such as cheatgrass. Big sagebrush increases as range deteriorates.

This soil is best suited to winter grazing. Range seeding is an alternative if the range is in poor condition. Some of the suitable grasses for seeding are Siberian wheatgrass, and crested wheatgrass. Seedings are most successful in late fall. Due to low rainfall on this site there is a high chance of seeding failure.

Crops grown on this soil are alfalfa, field corn, sweetcorn, wheat, barley, potatoes, sugarbeets, and pasture.

Rooting depth and the hazard of erosion are the major limitations for agricultural uses of this soil. Bedrock at depths of 20 to 40 inches hinders the productivity of some deep rooted crops. It also limits the available water capacity of this soil. The hazard of erosion hinders the use of border, furrow, and corrugation methods of irrigating this soil. The

hazard of erosion hinders the use of border, furrow, and corrugation methods of irrigating this soil.

The use of this soil for residential development is limited by depth to rock and potential frost action. Capability subclass IIIe, irrigated; VIe, nonirrigated.

(ToB) Potratz-Trevino complex, 0 to 4 percent slopes.

(ToD) Potratz-Trevino complex, 4 to 12 percent slopes. This complex consists of sloping soils on basalt plains. Elevation is 2,600 to 3,100 feet. The mean annual precipitation is about 9 inches, the mean annual air temperature is about 51 degrees F, and the frost-free period is about 150 days.

About 50 percent of the complex is Potratz silt loam and 35 percent is Trevino extremely stony silt loam. The remaining 15 percent is Scism silt loam, bedrock substratum, 4 to 12 percent slopes and Trio very fine sandy loam, 4 to 8 percent slopes.

The Potratz soil is moderately deep and well drained. It formed in loess underlain by basalt. Typically, the surface layer is light brownish gray and pale brown silt loam about 10 inches thick. The subsoil is yellowish brown, brown silt loam about 9 inches thick. The substratum is light gray and white loam and silt loam to about 38 inches over basalt.

Permeability of this Potratz soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is high or very high. Runoff is medium and the hazard of erosion is moderate.

The Trevino soil is shallow over bedrock and well drained. It formed in loess over basalt. Typically, the surface layer is light brownish gray extremely stony silt loam about 4 inches thick. The subsoil is pale brown stony silt loam about 6 inches thick. The substratum is very pale brown and white silt loam, and loam to about 19 inches over highly fractured basalt.

Permeability of this Trevino soil is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Runoff is medium and the hazard of erosion is moderate.

This complex is used mainly as range and for wildlife habitat. These soils have limited potential for irrigated farming and residential development.

The native vegetation on this complex is dominated by Thurber needlegrass, bluebunch wheatgrass and big sagebrush. Winterfat and shadscale occur commonly in the drier areas of this soil. As range condition declines, Thurber needlegrass and bluebunch wheatgrass decrease and are replaced by

annuals such as cheatgrass. Big sagebrush increases as range deteriorates.

These soils are best suited to winter grazing. Range seeding is an alternative if the range is in poor condition. Some of the suitable grasses for seeding are Siberian wheatgrass and crested wheatgrass.

Seedings are most successful in late fall. Due to the low rainfall on this site there is a high chance of seeding failure.

Rooting depth is the major limitation for agricultural uses of these soils. The bedrock, which occurs at a depth of 20 to 40 inches in the Potratz soil and 10 to 20 inches in the Trevino soil hinders the productivity of deep rooted crops.

The use of these soils for residential development is limited by slope, depth to rock and potential frost action. Capability subclass IVe; irrigated, VIe nonirrigated.

(Rd) Rubble land. This Rubble land mapping unit is areas of stones and boulders, virtually free of vegetation except for lichens. The areas are commonly at the base of mountain slopes, but some are deposits of cobbles, stones, and boulders left in drainageways.

In Ada County these areas are at the base of the Snake River canyon wall and in drainageways throughout the county. Capability subclass VIIIs.

(EnC) Tindahay fine sandy loam, 4 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans and very low alluvial terraces adjacent to intermittent drainages. It formed in recent alluvium of acid igneous origin. Elevation is 2,500 to 3,300 feet. The mean annual precipitation is about 12 inches, the mean annual air temperature is about 50 degrees F, and the frost-free period is about 145 days.

Typically, the surface layer is light brownish gray fine sandy loam about 8 inches thick. The underlying layer is light brownish gray, pale brown, light gray, and variegated fine sandy loam, sandy loam, loamy coarse sand, and fine gravelly loamy coarse sand to about 60 inches.

Included with this soil in mapping are small areas of Jenness fine sandy loam, 4 to 8 percent slopes and Quincy sand, 4 to 8 percent slopes. These inclusions occupy about 10 percent of the unit.

Permeability is moderately rapid, Effective rooting depth is 60 inches or more. Available water capacity is high. Runoff is medium and the hazard of erosion is moderate.

Most areas of this soil are used as range and for wildlife habitat. It has potential for irrigated farming and residential development.

The native vegetation on this soil is dominated by bluebunch wheatgrass, Thurber needlegrass and big sagebrush. As range condition declines, bluebunch wheatgrass and Thurber needlegrass are gradually replaced by red threeawn and cheatgrass. Big sagebrush increases as range condition deteriorates.

This soil is best suited to spring and late fall grazing by livestock. Range seeding is an alternative, if the range is in poor condition. Some of the grasses suitable for seeding are Indian ricegrass, crested wheatgrass or Siberian wheatgrass. Seedings are most successful in the late fall. Due to low rainfall and droughtiness there is a high chance of seeding failure on this soil.

This soil is highly erodable when vegetation is removed. Proper grazing uses and a planned grazing system are essential to protect the soil when grazed by livestock.

Erosion hazard and moderately rapid permeability is the major limitation of this soil for farming. Returning crop residues to the soil and turning under green manure crops help increase and maintain the organic matter content. Applications of soil amendments, such as gypsum, improves soil structure which aids seedling emergence and water penetration.

The use of this soil for residential development is limited mainly by unstable cutbanks.

Septic tank absorption fields can be expected to work well in this soil. If effluent is discharged into the coarse textured underlying layer of this soil there is a hazard of contaminating nearby water supplies.

Trenches for utilities and other shallow excavations are hampered by unstable cutbanks. Cutbanks could collapse as excavations extend into coarse textured alluvium.

This soil is well suited to homes with and without basements. If finer textured soil is used as top soil it will be more conducive to the growth of lawns and gardens.

Capability subclass IV, irrigated; VIc, nonirrigated.

(ToB) Trevino-Potratz complex, 0 to 4 percent slopes. This complex consists of level to gently sloping soils on basalt plains. Elevation is 2,600 to 3,100 feet. The mean annual precipitation is about 9 inches, the mean annual air temperature is about 51 degrees F, and the frost-free period is about 150 days.

About 50 percent of the complex is Trevino extremely stony silt loam and 30 percent is Potratz silt loam. The remaining 20 percent is Minidoka

silt loam, bedrock substratum, 2 to 4 percent slopes, Scism silt loam, bedrock substratum, 0 to 4 percent slopes, Trio very fine sandy loam, 0 to 4 percent slopes and Truesdale fine sandy loam, bedrock substratum, 0 to 4 percent slopes.

The Trevino soil is shallow over bedrock and well drained. It formed in loess over basalt. Typically, the surface layer is light brownish gray extremely stony silt loam about 4 inches thick. The subsoil is pale brown stony silt loam about 6 inches thick. The substratum is very pale brown and white silt loam, and loam to about 19 inches over highly fractured basalt.

Permeability of this Trevino soil is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Runoff is slow to medium and the hazard of erosion is slight to moderate.

The Potratz soil is moderately deep and well drained. It formed in loess underlain by basalt. Typically, the surface layer is light brownish gray and pale brown silt loam about 10 inches thick. The subsoil is yellowish brown, brown silt loam about 9 inches thick. The substratum is light gray and white loam and silt loam to about 38 inches over basalt.

Permeability of this Potratz soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is high or very high. Runoff is medium and the hazard of erosion is slight to moderate.

This complex is used mainly as range and for wildlife habitat. These soils have limited potential for irrigated farming and residential development.

The native vegetation on this complex is dominated by Thurber needlegrass, bluebunch wheatgrass and big sagebrush. Winterfat and shadscale occur commonly in the drier areas of this soil. As range condition declines, Thurber needlegrass and bluebunch wheatgrass decrease and are replaced by annuals such as cheatgrass. Big sagebrush increases as range deteriorates.

These soils are best suited to winter grazing. Range seeding is an alternative if the range is in poor condition. Some of the suitable grasses for seeding are Siberian wheatgrass or crested wheatgrass. Seedings are most successful in late fall. Due to the low rainfall on this site there is a high chance of seeding failure.

Hazard of erosion and rooting depth is the major limitations for agricultural uses of these soils. The bedrock, which occurs at a depth of 20 to 40 inches in the Potratz soil and 10 to 20 inches in the Trevino soil

hinders the productivity of deep rooted crops.

The use of these soils for residential development is limited mainly by depth to rock and potential frost action. Capability subclass IVE irrigated; VIs, nonirrigated.

(TsA) Truesdale fine sandy loam, 0 to 2 percent slopes.

(TsB) Truesdale fine sandy loam, 0 to 4 percent slopes. This moderately deep, well drained soil is on basalt plains. It formed in wind modified alluvium and loess. Elevation is 2,700 to 3,100 feet. The mean annual precipitation is about 8 inches, the mean annual air temperature is about 54 degrees F, and the frost-free period is about 150 days.

Typically, the surface layer is pale brown fine sandy loam about 8 inches thick. The substratum includes a pale brown fine sandy loam, weakly cemented hardpan about 9 inches thick, over very pale brown fine sandy loam to about 60 inches.

Included with this soil in mapping are small areas of Feltham loamy sand, 0 to 3 percent slopes, Scism silt loam, 0 to 2 percent slopes, Shabliss very fine sandy loam, 0 to 2 percent slopes, and Turbyfill fine sandy loam, 0 to 2 percent slopes. These inclusions occupy about 15 percent of this unit.

Permeability of this Truesdale soil is moderately rapid above the hardpan and very slow through fractures in the hardpan. Effective rooting depth is 20 to 40 inches. Available water capacity is low. Runoff is slow and the hazard of erosion is slight.

Most areas of this soil are used as range and for wildlife habitat. A significant acreage is used for irrigated farming. Crops commonly grown on this soil are sugarbeets, potatoes and wheat.

The native vegetation on this soil is dominated by Thurber needlegrass, bluebunch wheatgrass and big sagebrush. In the drier areas of this soil, winterfat and shadscale occur commonly. As range condition declines, Thurber needlegrass and bluebunch wheatgrass decrease and are replaced by annuals such as cheatgrass. Big sagebrush increases as range deteriorates.

This soil is best suited to winter grazing. Range seeding is an alternative if the range is in poor condition. Some of the suitable grasses for seeding are Siberian wheatgrass or crested wheatgrass. Seedings are most successful in late fall. Due to the low rainfall on this site there is a high chance of seeding failure.

Rooting depth is the major limitation for agricultural uses of this soil. The hardpan, which occurs at a depth of 20 to 40 inches, hinders the productivity of some deep rooted crops. It also limits the available

water capacity of this soil. Proper crop selection and irrigation water management are important in dealing with this limitation. The weakly cemented hardpan maybe ripped with heavy equipment to increase rooting depth and available water capacity.

Irrigation methods suitable for this soil are furrows, borders, corrugates, and sprinkling, depending on the crop. Corrugates are well suited to alfalfa, small grains and pasture. The furrow and corrugation methods are well suited to row crops. Sprinkler irrigation is well suited to most crops.

The use of this soil for residential development is limited by depth to hardpan and potential frost action. Capability subclass IIs, irrigated; VIc, nonirrigated.

(Vf) Vanderhoff soils, 30 to 60 percent slopes. This moderately deep, well drained soil is on the exposed sediments adjacent to the Snake river. It formed in residuum and colluvium from well consolidated, weakly cemented mudstone and lacustrine tuff deposits. Elevation is 2,400 to 2,900 feet. The mean annual precipitation is about 8 inches, the mean annual air temperature is about 54 degrees F, and the frost-free period is about 150 days.

This undifferentiated mapping unit consists mainly of Vanderhoff extremely stony loam, 30 to 60 percent slopes, and very gravelly loam, 30 to 60 percent slopes, with inclusions of Vanderhoff silt loam, 30 to 60 percent slopes, and Vanderhoff very cobbly silt loam, 30 to 60 percent slopes. The mapped areas consist of one or all of these types.

In a representative profile the surface layer is light gray extremely stony loam about 5 inches thick. The underlying material is light gray and white gravelly loam and fine sandy loam to about 22 inches over white mudstone.

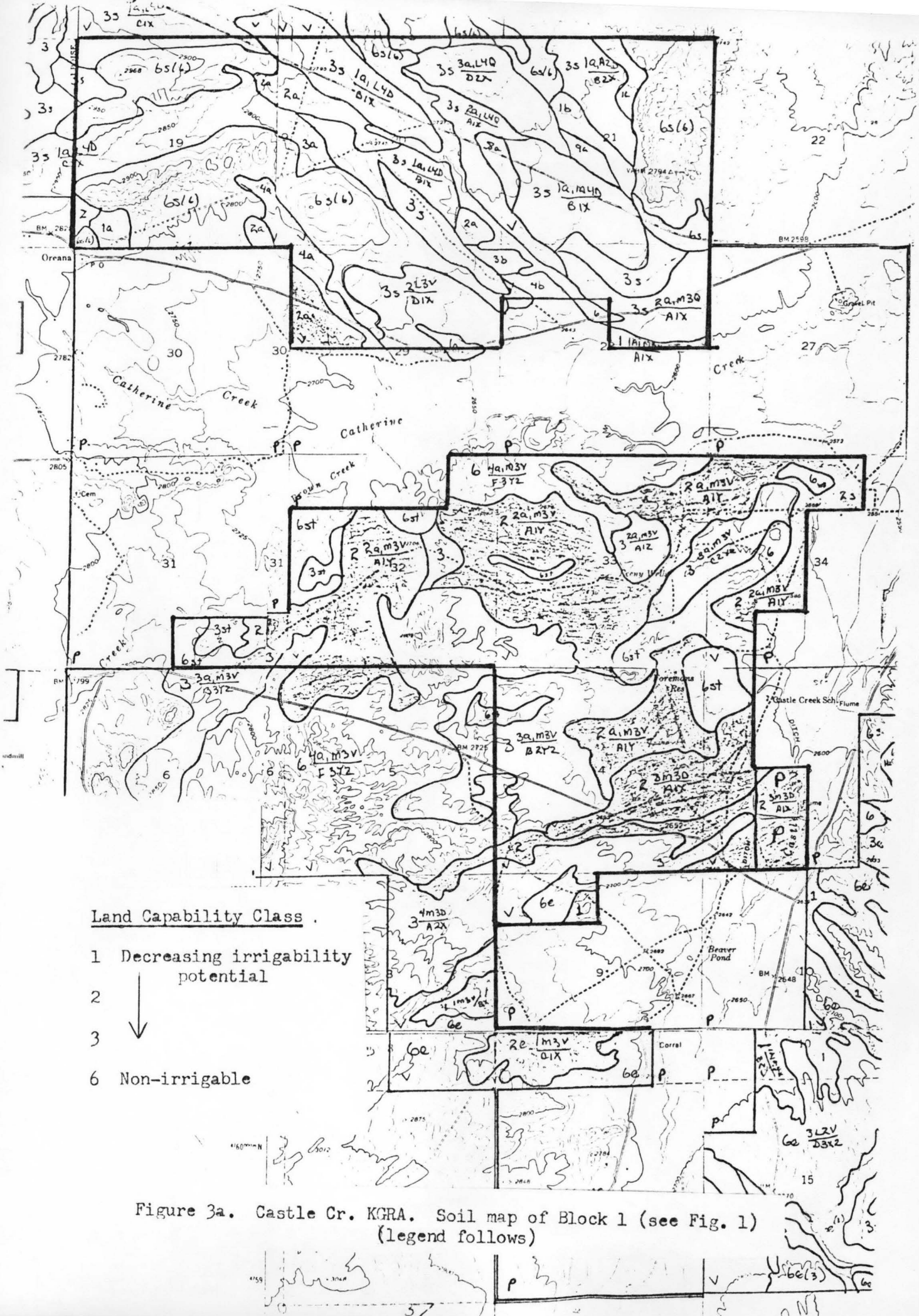
Also included with this soil in mapping are small areas of Rubble land and Trevino extremely stony silt loam, 5 to 20 percent slopes. These inclusions occupy about 15 percent of this unit.

Permeability of this Vanderhoff soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is low or moderate. Runoff is very rapid and the hazard of erosion is very high.

Most areas of this soil are used for wildlife habitat and as range.

The native vegetation on this soil is dominated by big sagebrush, shadscale, sparc grass and forbs. This mapping unit consists mostly of bare ground which has undergone extensive natural geologic erosion due to

the low organic matter content and low water intake rate of the soil. It has very limited potential for forage production. Capability subclass VIIe, nonirrigated.



Land Capability Class

- 1 Decreasing irrigability potential
- 2 ↓
- 3 ↓
- 6 Non-irrigable

Figure 3a. Castle Cr. KGRA. Soil map of Block 1 (see Fig. 1) (legend follows)

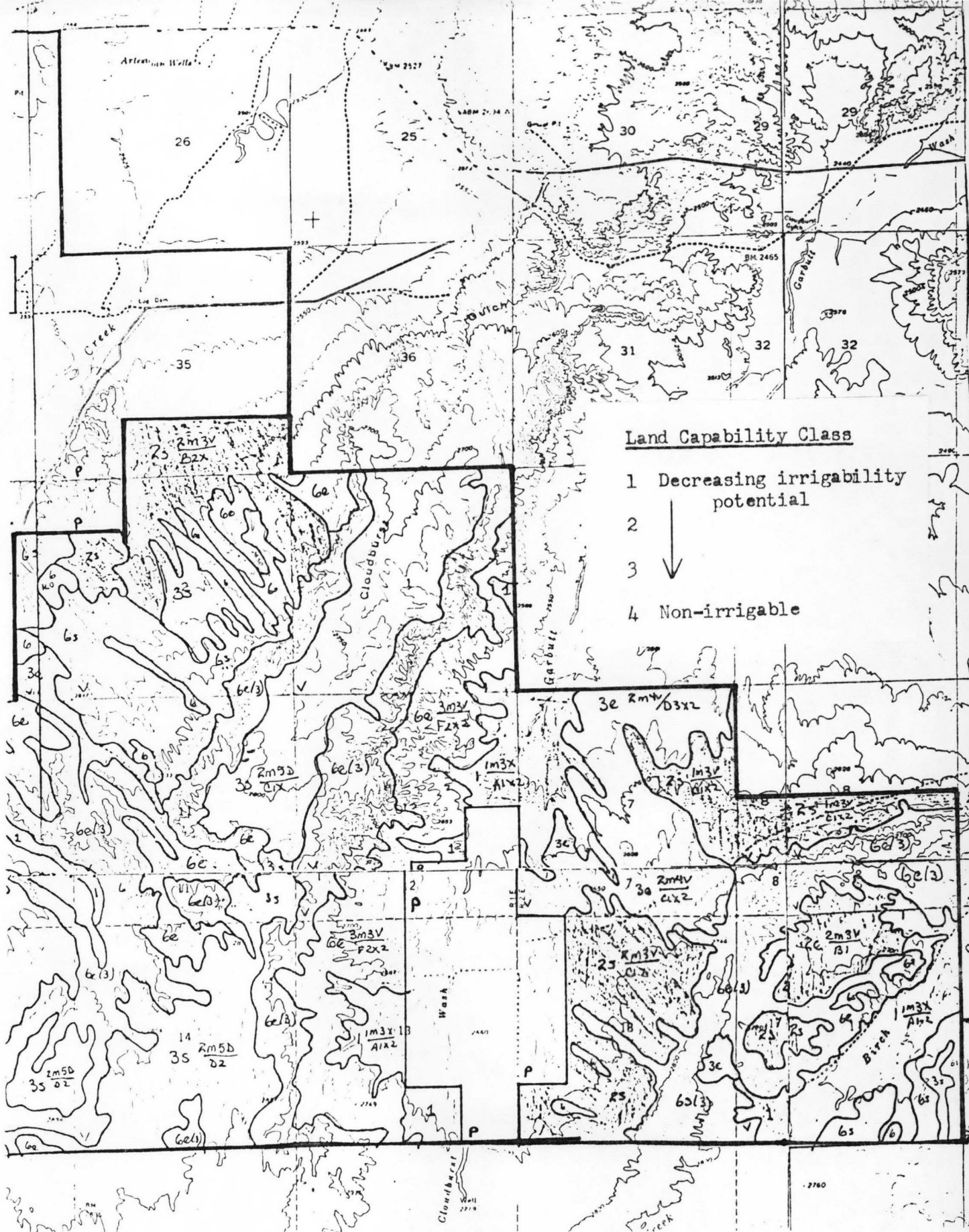


Figure 3b. Castle Cr. KGRA. Soil map of Block 2 (see Fig. 1)
(legend follows)

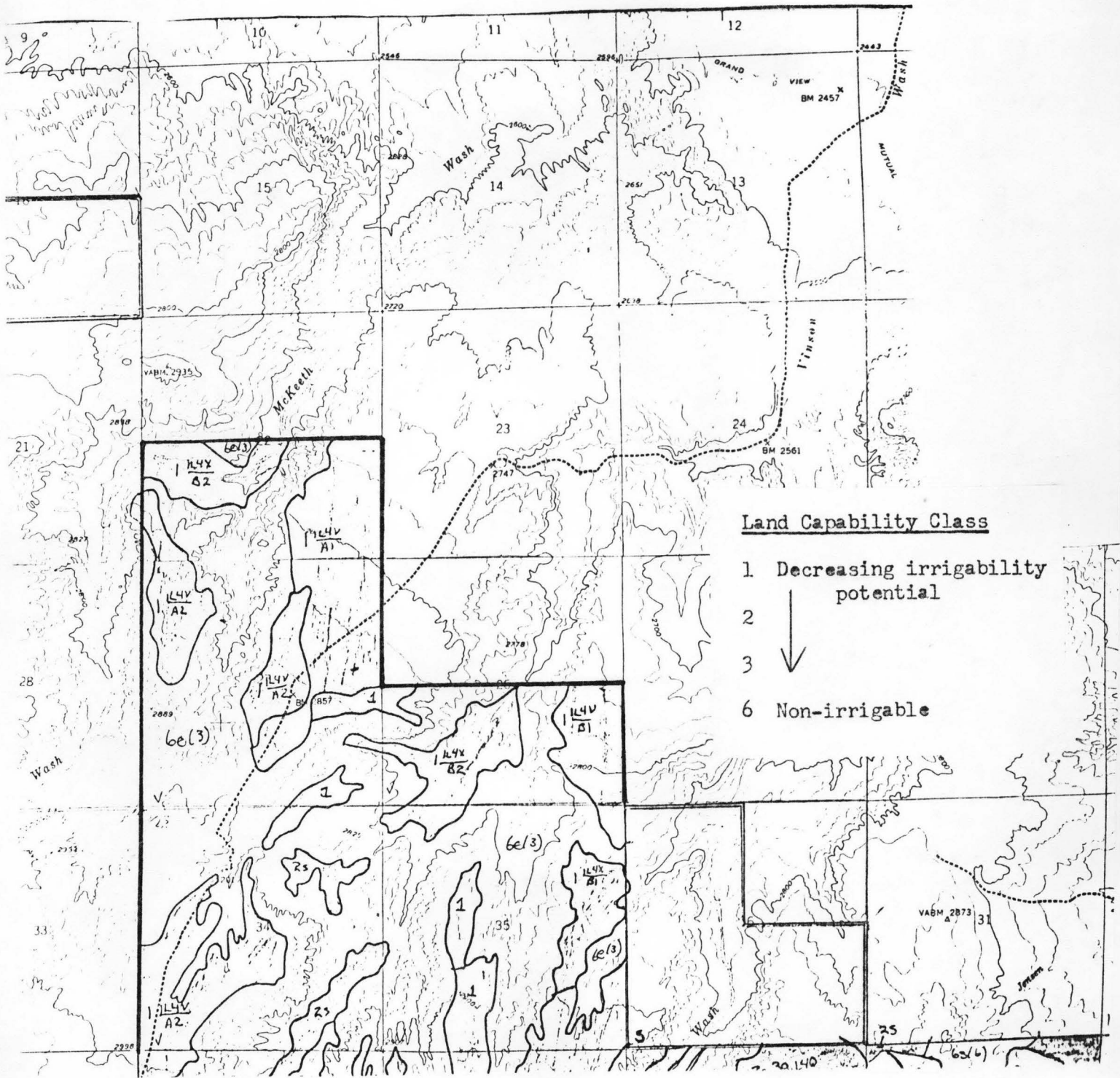


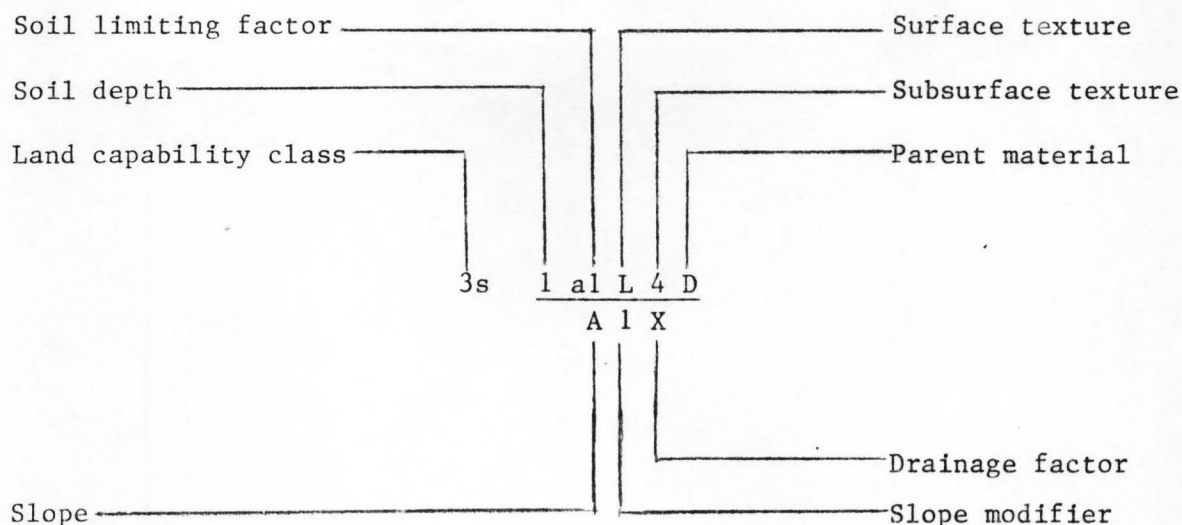
Figure 3c. Castle Cr. KGRA. Soil map of Block 3 (see Fig. 1)
(legend follows)

OWYHEE DESERT AREA - SOIL SURVEY LEGEND

BUREAU OF LAND MANAGEMENT

(Figs. 3a, 3b, 3c)

Explanation of symbols used in mapping



Soil Depth

The depth of the soil refers to the depth of the solum or the layers that are readily penetrated by plant roots or the depth to some layer that would restrict root penetration. Five depths are recognized:

<u>Symbol</u>	<u>Descriptive Term</u>	<u>Range</u>
1	Very deep	Over 60 inches
2	Deep	36-60 inches
3	Moderately deep	20-36 inches
4	Shallow	10-20 inches
5	Very Shallow	0-10 inches

Soil Textures

The following textural classes will be recognized, grouped, and coded to reflect surface and subsurface characteristics. Together, these factors will be utilized as a measure of soil permeability. Textural classes grouped in each separation are:

<u>Surface Texture Symbol</u>	<u>Subsurface Texture Symbol</u>	<u>Descriptive Term</u>	<u>Included Textural Classes</u>
F	1	Fine	Clay, silty clay, stony clay, sandy clay
H	2	Moderately fine	Silty clay loam, sandy clay loam, clay loam
M	3	Medium	Silt, silt loam, stony loam, gravelly loam, loam, very fine sandy loam

L	4	Light	Fine sandy loam, sandy loam loamy fine sand
C	5	Coarse	Loamy coarse sand, very fine sand, fine sand, sand, coarse sand, very coarse sand, gravel

Inhibitory Factors (Soil Limiting)

Inhibitory factors are shown by lower case letters following the profile depth code. Combination of factors are made when necessary to express all inhibitory factors. The following are those inhibitory factors to be recognized.

Saline/Alkali - Such soils contain sufficient salts so distributed in the profile that they limit or restrict growth of most crop plants. A saline-alkali soil have either so high a degree of alkalinity (pH 8.6 or higher), or so high a percentage of exchangeable sodium (15 per cent or higher), or both, that the growth of most plants is reduced. These conditions may exist at the soil surface, throughout the profile, at depth within the profile, and occur sporadically as "slick spots" across the landscape or as extensive tracts.

Five occurrences or intensities of saline/alkali conditions will be recognized:

<u>Code</u>	<u>Description</u>
a ₁	Moderate saline/alkaline condition--growth of most crops is moderately affected and less tolerant plants are seriously affected. The pH ranges from 8.6 to 9.0.
a ₂	Severe saline/alkaline condition--growth of only salt and alkali tolerant plants is possible. The pH will exceed 9.0.
a ₃	Saline/alkaline subsoil--soils having the surface layers relatively free of salt or alkali but which have an accumulation of salt and alkali in the subsoil. Such material has been leached to a depth as to not effect crop production unless poorly managed. Accumulations at 20 inches or more.
a ₄	Saline/alkali slick spots--this situation appears on the land as "slick spots" having "pigmy" or thin B horizon development correctable with normal tillage operations. Land surface involved exceeds 15 per cent of total area.
a ₅	Saline/alkali complex--this complex appears on the land as strongly developed B horizons requiring extensive and/or special tillage or other practices to modify profile problems (deep plowing, etc.). Land surface involved exceeds 15 per cent of total area.

Lime--Lime content sufficient to affect plant growth unfavorably.

<u>Code</u>	<u>Description</u>
z ₁	Concentrations in excess of 15 per cent represented by 6 inches or greater depth of nodular and/or cap accumulations within 8 to 20 inches of the soil surface. No apparent restriction of root and/or water penetration.
z ₂	Concentrations in excess of 15 per cent represented by 6 inches or greater nodular and/or cap accumulations within 0 to 8 inches of the soil surface. Or, slight restriction of root and water penetration at 0 to 20 inches as evidenced by inextensive root-matting.

Gravelly and Stony--Fragments of sufficient size and amounts significantly influence plant growth by creating poor soil-air-moisture relationships and/or limits or restricts cultivation, planting, and harvest of crops.

<u>Code</u>	<u>Description</u>
g ₁	Gravelly--20 to 40 per cent of land surface is covered and/or upper soil profile (20 inches) is composed of gravels from 2 mm's to 4 inches in diameter.
g ₂	Very gravelly--40 to 75 per cent of land surface is covered and/or upper soil profile (20 inches) is composed of gravels from 2 mm's to 4 inches in diameter.
s ₁	Stony--Sufficient stones to interfere with tillage but not to make intertilled crops impracticable. (If stones are 1 foot in diameter and about 10 to 30 feet apart, they occupy about 0.1 to 1.5 per cent of the surface, and there are about 1.5 to 25 cubic yards per acre-foot).
s ₂	Very stony--sufficient stones to make tillage of intertilled crops impracticable, but the soil can be worked for hay crops or improved pasture if other soil characteristics are favorable. (If stones are 1 foot in diameter and about 5 to 10 feet apart, they occupy about 0.1 to 3 per cent of the surface, and there are about 1.5 to 50 cubic yards per acre-foot).
r	Extremely gravelly and/or stony condition in excess of foregoing condition.

Overflow--Damaging overflow either as the result of stream action or as overland flow will be recorded as follows:

<u>Code</u>	<u>Description</u>
f ₁	Damaging overflow, occasional and slight. Frequency: 1 to 2 times in 10 year period.
f ₂	Damaging overflow, frequent and severe. Frequency: 3 to 8 times in 10 year period.

Wetness--Additional or excess water in the soil profile of sufficient degree to effect the normal function of the profile in production of crops. These degrees of wetness will be recognized:

<u>Code</u>	<u>Description</u>
w ₁	Choice of crops limited due to delayed drainage and warming of soil in the spring. Evidence (mottling) or water table if found occurs in lower soil profile.
w ₂	Choice of crops is seriously affected due to high water table and delay in drainage and warming of the soil in the spring. Evidence of a water table is found near soil surface with characteristic mottling occurring within major root zone depth.
w ₃	Choice of crops limited to those which can withstand a shallow water table throughout the growing season. The water table is at or near the surface during wetter part of year.

Parent and/or Underlying Materials

A	Acid igneous rock
B	Basic igneous rock
D	Unconsolidated materials
H	Aeolian sand
L	Loess
Q	Sand and gravel
R	Indurated hardpan
S	Semi-consolidated materials
V	Lacustrine material
X	Recent alluvium
Y	Clay

Slope

Steepness or gradient of the land is measured by use of an appropriate hand level and recorded in the denominator of the composite symbol. The dominant slope for each delineated area is recorded in per cent in addition to the appropriate slope class group. Grouping is as follows:

<u>Code</u>	<u>Limits</u>
A	0-2
B	2-4
C	4-7
D	7-12
E	12-20
F	20 per cent plus

Slope modifier--Slope characteristics beyond that of gradient will be known by arabic numeral following slope class code. Three categories will be recognized:

<u>Code</u>	<u>Description</u>
1	Gently undulating land surface requiring a "cut and fill" operation of minimal amount. Surface relief varies from a 4 to 8 inch elevation difference from a level plane (0 to 500 cubic yards excavation per acre required).
2	Moderately undulating land surface requiring greater "cut and fill" operation. Surface relief varies from a 3 to 16 inch elevation from a level plane. (1,000 to 1,465 cubic yards excavation per acre required).

Drainage--Soil depth, structure, topographic features, and underlying strata effect and compound natural drainage patterns. Under "Normal" or natural conditions drainage is satisfactory. However, under an irrigated, agricultural situation, drainage problems may arise. Accordingly, three categories are recognized and will be mapped as:

<u>Code</u>	<u>Description</u>
X	Soil and topographic conditions such that limited drainage requirements are likely to occur. Relatively, simple and inextensive corrective measures will overcome the problem.

Code

Description

Y

Soil and topographic conditions such that significant drainage requirements are likely to occur. Coordinated and extensive corrective measures will be necessary to overcome the problem.

Z

Soil and topographic conditions such that excessive drainage requirements are likely to occur. Subsurface water is evidenced by mottling (mapped under wetness factor); and, although this may have beneficial effects upon irrigated crops and would require extensive measures to correct the problem.

LAND CAPABILITY CLASSIFICATION
IRRIGABLE LANDS
OWYHEE DESERT AREA

1. Capability classes I and II will be combined and treated as a single class II capability. This is enabled by the simple fact that limited, if any, Class I lands occur within the survey area. Therefore class II criteria will apply.
2. Capability classes II, III, and IV are identified with criterion outlined to enable placement of soils and topographic characteristics into appropriate category. Class(s) II and III are those which permit agricultural development and will sustain such use over time under proper management. Class IV lands are those areas having sever limitations in use and which must be maintained in permanent vegetative cover a majority in the time (approximately 75 per cent) to sustain use over time under proper management.
3. Capability class VI are those lands which are non-irrigable under all but extreme land preparation, water application, and specialty crops. All other lands are included here and, if, an irrigation proposal is made for such lands each case will require specific and detailed evaluation beyond that herein contemplated.
4. Subclass determinations e, s, w, and c (erosion, soils, wetness, and climatic hazards) will be limited to those separations of e and s categories where significant differences in management, crops, water application, etc. are required. This will minimize detail but will give sufficient information to enable determination of economic and engineering considerations. However, where further detail may be required in specific instances the basic field data is available to facilitate such evaluation.

Assuming the foregoing modifications, Table I has been prepared wherein the various characteristic(s) of soil and topography is grouped into appropriate capability class(s). This permits identification and enables definition, with explanation, of each capability class and subclass.

Table 1. Characteristics of Soil and Topography Grouped Into Land Capability Classes (Irrigable)

Capability Class Subclass	II e,s	III e,s	IV e,s	VI All
Solum Depth	36 inches	20-36 inches	10-20 inches	Less than 10 inches
Surface Texture	v ¹ sl-sicl	lfs-sicl	lfs-c	All
AWC-in/profile	5.0	5.0-5.0in.	3.0-2.0 in.	Less than 10 inches
Surface texture (Permanibility- in/hour)	2, 3, 4 (0.2-5.0 in.)	1, 2, 3, 4, 5 (0.05-10.0 in)	1, 2, 3, 4, 5 (0.05-10.0in)	All
Saline/Alkali	a ₃ , a ₄	C ₁ , a ₃	a ₂ , a ₅	All
Lime ^{1/}	None, Z ₁	Z ₂	All	All
Gravel	None, g	g	r	All
Stone	None	s ₁	s ₂	All
Overflow	None, f ₁	f ₂	All	All
Drainage ^{1/}	X	Y	Z	All
Wetness	None, W ₁	W ₂	W ₃	All
Slope Class Slope Modifier	AB 1	ABC 2	ABCDE ^{2/} 3	More than E class All
Erosion	None	2, R	2, R	All
F.F.D. (32 F)	140-110 days & can mature all common crops except common field corn, or less than 110 days & can mature commercial potatoes.	110-80 days or cannot mature commercial potatoes on less than 80 days and can mature 2 cut- tings of al- falfa.	80-60 days or have difficul- ty to mature cuttings of alfalfa or less than 60 days & can mature barley and seed po- tatoes.	Less than 60 days

^{1/} Lime, drainage, slope modifier, and size and shape of field are not so much a criterion of land capability as they are hazards and/or problems associated with production. However, lime, drainage, and slope modifier are included as a guide to land capability consideration.

^{2/} E slope class (12-20%)-applicable to sprinkler irrigation development only.

Castle Creek

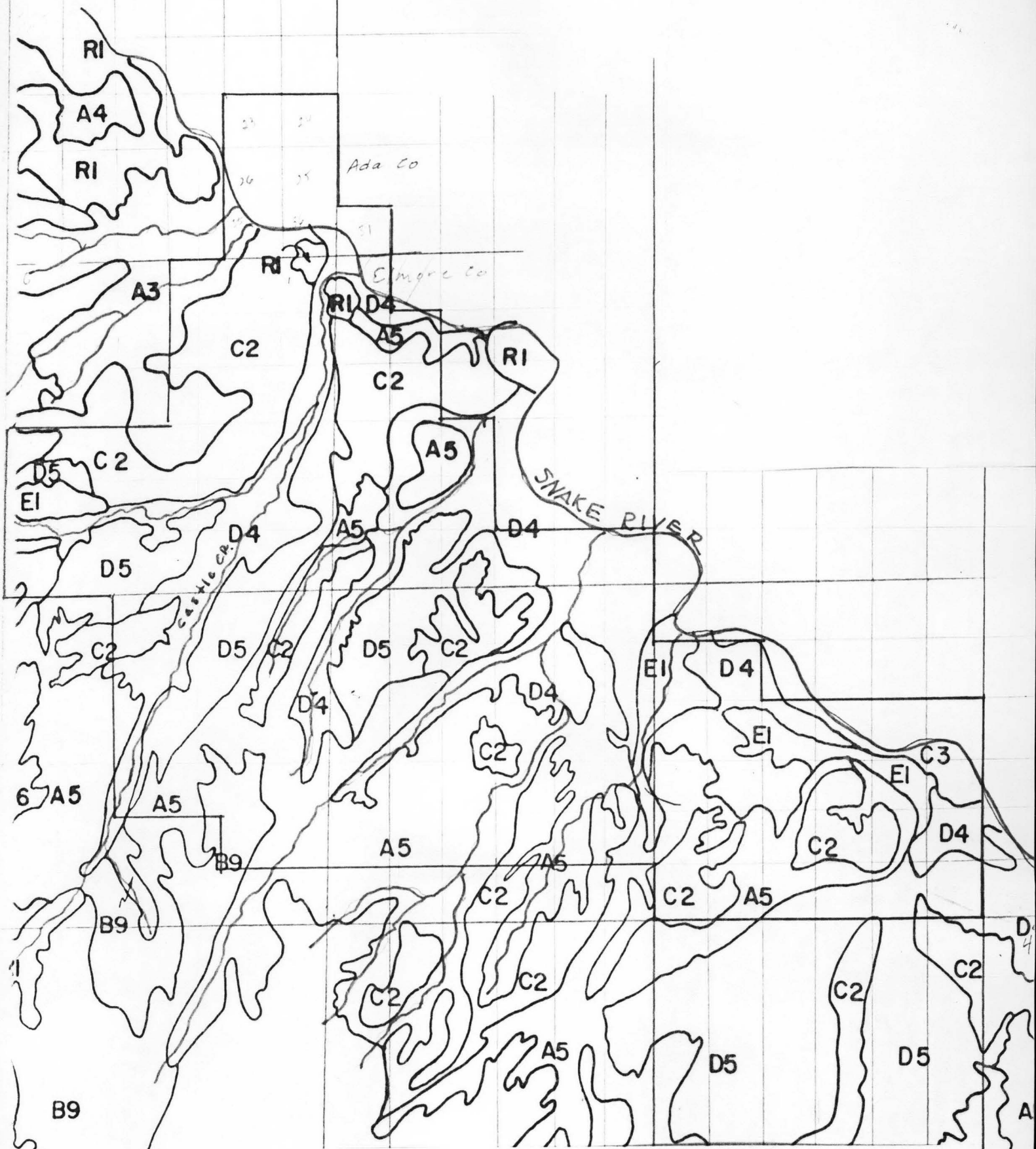
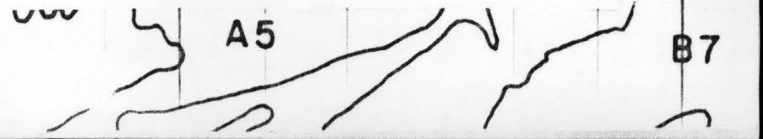
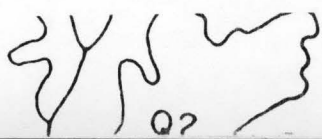


Figure 4. Special soil survey, Castle Creek KGRA (Chugg et al, 1968)
(legend follows)



SOIL MAPPING UNITS AND SOIL DESCRIPTIONS 1/

The separations on the general soil map are identified by letters or by a combination of letters and numbers such as A, B1, B2, C1, etc. These symbols represent soil mapping units consisting of a group of identified soils. These maps are of little value unless the soils they represent are described. The following sections on soil mapping units and soil descriptions will discuss the soil characteristics important for interpretation of the individual soil for irrigation.

SOIL MAPPING UNITS OF A

- A1 621-281a-281b-909d Mapping Unit: Deep, well-drained soils on nearly level to sloping lacustrine sediments on lake terraces, terrace escarpments and mixed alluvium on alluvial fans.
- A2 281a-909b-909a Mapping Unit: Deep, well-drained soils on nearly level to sloping lacustrine sediments on dissected lake terraces and mixed alluvium on alluvial fans.
- A3 034-281a Mapping Unit: Very shallow and deep, well-drained soils on nearly level to very steep lacustrine sediments in Badlands and mixed alluvium on alluvial fans.
- A4 909d-909b Mapping Unit: Moderately deep, well-drained soils on steep and very steep lacustrine sediments on dissected lake terraces, terrace escarpments and mixed alluvium on alluvial fans.
- A5 034-909d Mapping Unit: Very shallow and moderately deep, well-drained soils on very steep dissected lacustrine sediments in Badlands and on terrace escarpments.
- A6 909b-909d-599b Mapping Unit: Moderately deep and deep, well-drained soils on gently sloping to very steep lacustrine sediments on dissected lake terraces and terrace escarpments.
- A7 909d-752 Mapping Unit: Moderately deep and very shallow soils on very steep lacustrine sediments on terrace escarpments and in Canyon Rockland.

The major soils in these mapping units are developing in lacustrine sediments on lake terraces, terrace escarpments and in mixed alluvium on alluvial fans interspersed with Badlands and some Rockland. They occur on nearly level to very steep

1/ Chugg et al, 1968

slopes. Soil Mapping Unit A1 is located on sheet 1 of the soils map, A2 on sheet 4, A3 on sheet 3, A4 on sheets 1, 2 and 3, A5 on sheets 1, 2, 3, 4 and 5, A6 on sheets 1, 3 and 4, A7 on sheets 1, 2 and 3.

The major soils occur in 7 different combinations of mapping units based on kinds of soils and percent composition. These soils are developing in essentially the same kind of parent materials derived from/or in the Payette formation and related strata.

The mean annual precipitation is estimated to be about 6 to 9 inches. The mean annual soil temperature is about 49 to 51 degrees F. The frost-free period is more than 120 days. The elevations range from about 2,200 to 4,500 feet.

The soils are deep, moderately deep, shallow, very shallow and are well-drained. The surface textures among the sub-units of these mapping units are dominated by silt loam and gravelly loam with miscellaneous land type Badlands that are also silty. Some minor areas include fine sand loam and Rockland. These soils are generally calcareous at or near the surface. The underlying materials are stratified lacustrine sediments ranging from gravelly materials to loamy and silty sediments with some strata high in sodium salts and high concentrations of calcium carbonate. The slopes are variable, ranging from long, uniform nearly level alluvial fans and lake terraces to short, complex, very steep slopes of the terrace escarpments and highly dissected lacustrine sediments of the Badlands.

The major soils and miscellaneous land types in the various mapping units are 034, 281a, 281b, 599b, 621, 752, 909a, 909b and 909d. The minor soils, each representing less than 15 percent of the area in their respective mapping units, are 037, 350a, 564a, 599a, 632a, 704b, 890a, 890b, 909c and 1000.

A more detailed description of each of these soils can be found in the Soil Descriptions section of this report.

SOIL MAPPING UNITS OF B

- B1 599a Mapping Unit: Deep, well-drained soils on nearly level to very gently sloping mixed alluvium on alluvial fans, pediments and stream terraces.
- B2 599a-529a-599b Mapping Unit: Deep and moderately deep, well-drained soils, on nearly level to sloping mixed alluvium on alluvial fans, lake terraces, pediments and stream bottoms.

- B3 599a-1001 Mapping Unit: Deep, well-drained soils on nearly level mixed alluvium on alluvial fans and stream terraces.
- B4 296-599c-599d Mapping Unit: Moderately deep and deep, well-drained soils on gently sloping to steep, mixed alluvium on hills, alluvial fans, pediments and stream terraces.
- B5 599b-357-752 Mapping Unit: Deep, shallow and very shallow, well-drained soils on gently sloping to very steep residuum on rhyolitic hills and mixed alluvium on alluvial fans.
- B6 699a-599a-599b Mapping Unit: Shallow and deep well-drained soils on nearly level to sloping mixed alluvium on pediments and alluvial fans on lake terraces.
- B7 599b-699a Mapping Unit: Deep and shallow, well-drained soils on nearly level to sloping mixed alluvium on alluvial fans and pediments on stream terraces.
- B8 599a-002-040 Mapping Unit: Deep, well-drained soils on nearly level to very gently sloping mixed alluvium on stream bottoms and alluvial fans.
- B9 476-599f-599e Mapping Unit: Deep, well-drained soils on nearly level to sloping mixed alluvium on alluvial fans and pediments on lake terraces.

The major soils in these mapping units are developing in mixed alluvium on alluvial fans and pediments on lake and stream terraces and on stream bottoms. They occur on nearly level to sloping landforms. Soil Mapping Unit B1 is located on sheets 1 and 4 of the soils map, B2 on sheets 1, 2, and 3, B3, B4 and B5 on sheet 1, B6 on sheets 2 and 3, B7 on sheets 1, 2, 3, and 4, B8 on sheet 1, and B9 on sheet 3.

The major soils occur in 9 different combinations of mapping units based on kinds of soils and percent composition. These soils are developing in essentially the same kind of parent material derived from the Payette formation and related strata mixed with basaltic and rhyolitic alluvial materials from the adjacent hills and mountains. Some of the sediments have scattered areas of Rockland and residuum in rhyolitic mountains.

Annual precipitation is estimated to be about 6 to 9 inches. Annual temperature is about 49 to 51 degrees F. The frost-free period is more than 120 days. The elevations range from about 2,300 to 4,500 feet.

The soils are deep, moderately deep, shallow, very shallow and well-drained. The surface textures are dominated by gravelly loam, loam, fine sandy loam and channery loam. Minor areas among the subunits include loamy sand, silt loam, very stony loam and sandy loam. These soils are generally calcareous at or near the surface and one soil has a lime-silica hardpan. The underlying materials are stratified stream alluvium, lacustrine sediments or rhyolitic bedrock in some areas. The slopes are variable with the largest portion being rather broad, long and nearly level to very gently sloping; the remaining areas are rather narrow, short to long and sloping to steep terraces and terrace escarpments.

The major soils and miscellaneous land types in the various mapping units are 002, 040, 296, 357, 476, 529, 599a, 599b, 599c, 599d, 599e, 599f, 699a, 752 and 1001. The minor soils, each representing less than 15 percent of the area in their respective mapping units, are 350a, 481a, 481b, 529b, 699b, 704b, 890a, 890b, 909c and 909d.

A more detailed description of each of these soils can be found in the Soil Descriptions section of this report.

SOIL MAPPING UNITS OF C

- C1 1002a-1002b Mapping Unit: Moderately deep, well-drained soils on nearly level to sloping lacustrine sediments on lake terraces.
- C2 350c-529a Mapping Unit: Moderately deep, well-drained soils on nearly level to very gently sloping mixed alluvium on stream terraces.
- C3 350c-350b Mapping Unit: Moderately deep, well-drained soils on nearly level to sloping mixed alluvium on stream terraces.
- C4 281a-350c Mapping Unit: Deep and moderately deep, well-drained soils on nearly level to sloping mixed alluvium on alluvial fans and stream terraces.

The major soils in these mapping units are developing in mixed sandy or silty alluvium on stream terraces and alluvial fans. They occur on nearly level to sloping landforms. Soil Mapping Unit C1 is located on sheet 1 of the soils map, C2 on sheets 2 and 3, C3 and C4 on sheet 3.

The major soils occur in 4 different combinations of mapping units based on kinds of soils and percent of composition. These soils are developing in essentially the same kind of parent material derived from the Payette formation and related strata.

The mean annual precipitation is estimated to be about 7 to 9 inches. The mean annual soil temperature is estimated to be about 49 to 51 degrees F. The elevations range from about 2,400 to 3,500 feet.

The soils are moderately deep, deep and well-drained. The surface textures are dominated by gravelly sandy loam, loam and silt loam. Minor areas within the subunits include sand and sandy loam. These soils are calcareous at or near the surface. The underlying materials are stratified sand and gravel, loamy material and lacustrine sediments. The slopes are narrow and long.

The major soils are 281a, 350c, 350b, 529a, 1002a and 1002b. The minor soils, each representing less than 15 percent of the area in their respective mapping units, are 529a, 529b, 704a, 890a, 1002c and 1003.

A more detailed description of each of these soils can be found in the Soil Descriptions section of this report.

SOIL MAPPING UNITS OF D

- D1 040 Mapping Unit: Deep, somewhat poorly drained soils on nearly level to very gently sloping mixed alluvium on stream bottoms.
- D2 083a-083b-281a Mapping Unit: Deep, somewhat poorly and poorly drained soils on nearly level to very gently sloping mixed alluvium on stream bottoms and alluvial fans.
- D3 082-083b Mapping Unit: Deep, very poorly and somewhat poorly drained alkaline soils on nearly level to very gently sloping mixed alluvium on stream bottoms.
- D4 281a Mapping Unit: Deep, somewhat poorly drained soils on nearly level to very gently sloping mixed alluvium on alluvial fans.
- D5 281a-281b-909d Mapping Unit: Deep and moderately deep, somewhat poorly drained and well-drained soils on nearly level to very steep mixed alluvium on alluvial fans and on terrace escarpments.

The major soil in these mapping units are developing in mixed alluvium and lacustrine sediments on stream bottoms, alluvial fans and terrace escarpments. They generally occur on nearly level to very gently sloping landforms with some very steep areas. Soil Mapping Unit D1 is located on sheet 1 of the soils map, D2 and D3 on sheet 4, D4 on sheets 3 and 4, D5 on sheets 1, 3, 4 and 5.

The major soils occur in 5 different combinations of mapping units based on kinds of soils and percent of composition. These soils are developing in alluvium essentially from the same kind of parent material derived from or in the Payette formation and related strata.

The mean annual precipitation is estimated to be about 6 to 9 inches. The mean annual soil temperature is about 49 to 51 degrees F. The frost-free period is more than 120 days. The elevations range from about 2,200 to 3,000 feet.

The soils are generally deep with few areas that are moderately deep or shallow. The surface textures are dominated by silt loam and loam. There are minor areas among the subunits that include fine sandy loam, cobbly sandy loam and silty clay loam. These soils are generally calcareous at or near the surface except for some of the sandy soils with drainage problems that may be noncalcareous. The underlying materials are generally stratified sandy or loamy that may or may not be gravelly or cobbly. Alkaline or saline-alkaline areas are associated with somewhat poorly and poorly drained conditions where natural or induced water tables prevail. The soils are generally nearly level to very gently sloping with few areas that are sloping to very steep.

The major soils are 040, 082, 083a, 083b, 281a, 281b and 909d. The minor soils and miscellaneous land types, each representing less than 15 percent of the area, are 034, 040, 254, 281b, 306a, 306b, 306c, 323, 332, 350c, 521, 583, 616 and 890.

A more detailed description of each of these soils can be found in the Soil Descriptions section of this report.

SOIL MAPPING UNITS OF E

- E1 890a Mapping Unit: Deep, well-drained soils on nearly level to very gently sloping mixed sandy alluvium on stream terraces.
- E2 890a-890b-257a Mapping Unit: Deep, well-drained and excessively drained soils on nearly level to sloping mixed sandy alluvium on stream terraces.

- E3 890a-281a Mapping Unit: Deep, well-drained soils on nearly level to very gently sloping mixed sandy alluvium on stream terraces and alluvial fans.
- E4 704a-134b Mapping Unit: Deep and moderately deep, excessively drained and well-drained soils on nearly level to steep sand dunes and mixed sandy alluvium on stream terraces and alluvial fans.
- E5 704a-890a-257b Mapping Unit: Deep, excessively drained and well-drained soils on nearly level to steep sand dunes and mixed sandy alluvium on stream terraces.
- E6 257c-890a Mapping Unit: Deep, excessively drained and well-drained soils on nearly level to very steep mixed sandy alluvium on stream terraces.
- E7 886-389-704a Mapping Unit: Moderately deep and deep, well-drained and excessively drained soils on nearly level to steep eolian sand on stream and lake terraces and in sand dunes.

The major soils in these mapping units are developing in mixed sandy alluvium or in sand dunes on stream terraces, lake terraces and alluvial fans. They occur on nearly level to very steep landforms. Soil Mapping Unit E1 is located on sheets 3, 4 and 5 of the soils map, E2 on sheets 1, 4 and 5, E3 on sheets 2 and 3, E4 on sheets 4 and 5, E5 on sheet 3, E6 on sheets 1, 3 and 4 and E7 on sheet 4.

The major soils occur in 7 different combinations of mapping units. These soils are developing in alluvial deposits of essentially the same kind of parent materials derived from or in the Payette formation and related strata.

The mean annual precipitation is estimated to be about 6 to 9 inches. The mean annual soil temperature is about 49 to 51 degrees F. The frost-free period is more than 120 days. The elevations range from about 2,200 to 3,000 feet.

The soils are generally deep and excessively drained to well-drained. Some areas are deep to hardpan. The surface textures are dominated by fine sandy loam, loamy fine sand, sandy loam, loamy sand and sand. Only minor areas include silt loam. Most of these soils are calcareous at or near the surface. Others are strongly calcareous in the subsoil and may have a lime-silica hardpan. The underlying materials are either eolian sand or stratified sand and gravel. The slopes vary from short and narrow to broad and long, nearly level stream terraces and alluvial fans to sands hummocks and sand dunes.

The major soils are 134b, 257a, 257b, 257c, 281a, 389, 704a, 886, 890a and 890b. The minor soils, each representing less than 15 percent of the area, are 037, 040, 134a, 174, 564a, 704a and 704b.

A more detailed description of each of these soils can be found in the Soil Descriptions section of this report.

SOIL MAPPING UNITS OF R

- R1 752-1026 Mapping Unit: Rockland, rough broken and stony canyon land and escarpments.
- R2 752-357 Mapping Unit: Rockland and shallow, well-drained soils on very steep rhyolitic mountains and canyons.
- R3 752-127 Mapping Unit: Rockland and shallow, well-drained soils on very steep granitic mountains and canyons.

These miscellaneous land types and soils consist of Rockland (basaltic and rhyolitic), rough broken and stony canyon land and escarpments of the rhyolitic and granitic mountains and canyons. These landforms are generally very steep and are scattered throughout the county. Soil Mapping Unit R1 is located on all the sheets of the soils map, R2 on sheets 1 and 4 and R3 on sheet 1.

The miscellaneous land types and soils occur in 3 different combinations of kinds of landforms, parent materials and soils. They are mixed geologically with granitic materials at the highest elevations, and with basaltic and rhyolitic materials in the bottoms of canyons of the basalt areas. Many of these canyons represent fault lines and degradation by stream action.

The climatic conditions in these landforms are widely variable, ranging from 8 inches precipitation in canyons at about 3,000 feet to over 20 inches on rock escarpments at 7,000 feet. Air temperatures are also widely variable depending on depth of canyon and elevation, but are estimated to range from 40 to 50 degrees F. Frost-free period is estimated to range from 85 to over 120 days. These canyons range from 50 to 800 feet deep and effectively isolate many areas across the southern part of the county.

The major miscellaneous land types and soils are 127, 357, 752 and 1026. The only minor soil recognized, representing less than 15 percent of the area, is 599c.

A more detailed description of each soil and miscellaneous land type can be found in the Soil Descriptions section of this report.

Soil 034

This is a miscellaneous land type (Badlands). It occupies about 60 percent of Soil Mapping Unit A3 located on sheet 3 of the soils map, 35 percent of A5 on sheets 1, 2, 3, 4 and 5, 5 percent of A6 on sheets 1, 3 and 4 and 5 percent of D5 on sheets 1, 3, 4 and 5.

It occurs on very steep highly dissected lacustrine sediments with little or no soil mantle over the exposed underlying materials. They consist mostly of stratified sand, silts and gravel with thin layers of volcanic ash, shale, fresh water limestone, sandstone and clay. Some intrusions of volcanic rocks occur in some places.

The soil material is deep (over 40 inches) and well-drained. Permeability is variable but generally moderate (0.8 to 2.5 inches per hour). Available water-holding capacity is high (over 6 inches). The strata are variable saline, and water intake is somewhat restricted. The silty and loamy surface materials puddle easily and are highly susceptible to water erosion.

The very severe limitation of this miscellaneous land type is extremely rough topography; therefore, it is placed in non-irrigable class 6.

Soil 083a

This soil occupies about 10 percent of Soil Mapping Unit D1 located on sheet 1 of the soils map and 30 percent of D2 on sheet 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium on stream bottoms.

Typical Profile:

- A1 0-8 inches. Light brownish-gray silt loam, granular structure, very friable and strongly calcareous.
- B2 8-17 inches. Very pale brown silt loam, blocky structure, very friable and strongly calcareous.
- Clca 17-32 inches. Light gray loam or silt loam, massive, very friable, very strongly calcareous.
- C2 32-52 inches. Very pale brown silt loam or loam, massive, very friable, strongly calcareous.
- IIC3 52-96 inches. Light colored stratified medium and coarse-textured materials, slightly calcareous.

This soil is deep (over 40 inches) and moderately well-drained. Permeability is moderately slow (0.2 to 0.8 inches per hour). Available water-holding capacity from 0 to 48 inches is high (over 6 inches). The soil profile is moderately alkaline. The water table is generally below 3 to 6 feet during the growing season.

The moderate limitations of this soil for irrigation are a combination of water table, moderately alkaline condition and moderately slow permeability; therefore, it is placed in irrigable class 2.

Soil 083b

This soil occupies about 25 percent of Soil Mapping Unit D2 located on sheet 4 of the soils map, 60 percent of D3 on sheet 4 and 3 percent of D4 on sheets 3 and 4.

This soil is similar to soil 083a except it is moderately to severely saline-alkali and the water table is about 18 to 36 inches below the surface.

The severe limitations of this soil for irrigation are a combination of high water table and a moderately to severely saline-alkali condition; therefore, it is placed in irrigable class 3.

Soil 257a

This soil occupies about 15 percent of Soil Mapping Unit E2 located on sheets 1, 4 and 5 of the soils map, 10 percent of E3 on sheets 2 and 3, 10 percent of E4 on sheets 4 and 5, 10 percent of E6 on sheets 1, 3 and 4 and 5 percent of E7 on sheet 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium on stream terraces.

Typical Profile:

- A1 0-6 inches. Grayish-brown loamy fine sand, granular structure, very friable and calcareous.
- C1 6-32 inches. Light brownish-gray loamy fine sand, massive, very friable and calcareous.
- 11C2Ca 32-96 inches. Stratified medium and moderately coarse-textured materials, moderately calcareous.

This soil is deep (over 40 inches) and somewhat excessively drained. Permeability is rapid (over 10 inches per hour). Available water-holding capacity from 0 to 48 inches is low (3 to 4.5 inches). Erosion hazard is severe.

The severe limitations of this soil for irrigation are sandy texture and a low available water-holding capacity; therefore, it is placed in irrigable class 3.

Soil 281a

This soil occupies about 20 percent of Soil Mapping Unit A1 located on sheet 1 of the soils map, 20 percent of A2 on sheet 4, 20 percent of A3 on sheet 3, 2 percent of A6 on sheets 1, 3 and 4, 15 percent of D2 on sheet 4, 77 percent of D4 on sheets 3 and 4, 50 percent of D5 on sheets 1, 3, 4 and 5, 5 percent of E2 on sheets 1, 4 and 5 and 30 percent of E3 on sheets 2 and 3.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed silty alluvium on alluvial fans.

Typical Profile:

- A1 0-3 inches. Light brownish-gray silt loam, granular structure, very friable and slightly calcareous.
- C1 3-22 inches. Light brownish-gray to light gray stratified silt loam, prismatic structure, very friable and moderately calcareous.
- C2ca 22-40 inches. Light gray silt loam, massive, very friable and moderately calcareous.
- IIC3 40-96 inches. Light brownish-gray to light gray, stratified fine gravelly loam and silt loam, very friable and moderately calcareous.

This soil is deep (over 40 inches) and well-drained. Permeability is moderate (0.8 to 2.5 inches per hour). Available water-holding capacity from 0 to 48 inches is high (over 6 inches). The soil profile is moderately alkaline.

The moderate limitation of this soil for irrigation is a moderately alkaline condition; therefore, it is placed in irrigable class 2.

Soil 281b

This soil occupies about 15 percent of Soil Mapping Unit A1 located on sheet 1 of the soils map, 4 percent of A5 on sheets 1, 2, 3, 4 and 5, 5 percent of D4 on sheets 3 and 4 and 20 percent of D5 on sheets 1, 3, 4 and 5.

It is similar to soil 281a except it occurs on gently sloping to sloping (4 to 12 percent) mixed alluvium on alluvial fans.

The severe limitations of this soil for irrigation are a combination of a moderately alkaline condition and a gently sloping to sloping landform; therefore, it is placed in irrigable class 3.

Soil 350a 67 Ida 37253

This soil occupies about 5 percent of Soil Mapping Unit A5 located on sheets 1, 2, 3, 4 and 5 of the soils map and B2 located on sheets 1 and 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium on stream terraces.

Typical Profile:

- A1 0-7 inches. Light brownish-gray gravelly sandy loam, platy to granular structure, very friable and non to slightly calcareous.
- Cca 7-19 inches. Light gray gravelly sandy loam, massive, very friable and strongly calcareous.
- IIC 90-96 inches. Mixed sand and gravel.

This soil is shallow (10 to 20 inches) and well-drained. Permeability is moderately rapid (2.5 to 5.0 inches per hour). The available water-holding capacity from 0 to 15 inches is very low (less than 3 inches).

The very severe limitations of this soil for irrigation are a very low available water-holding capacity as reflected by texture and depth; therefore, it is placed in non-irrigable class 6.

Soil 350c

This soil occupies about 60 percent of Soil Mapping Unit C2, 55 percent of C3, 70 percent of C4 and 4 percent of D4, located on sheets 2, 3 and 4 of the soils map.

It is similar to soil 350a except it is moderately deep (20 to 40 inches) and slightly gravelly. The available water-holding capacity from 0 to 30 inches is low (3 to 4.5 inches).

The severe limitations of this soil for irrigation are a low available water-holding capacity as reflected by texture and depth; therefore, it is placed in irrigable class 3.

Soil 476

This soil occupies about 3 percent of Soil Mapping Unit B9 located on sheet 3 of the soils map.

This soil occurs on nearly level to sloping (0 to 12 percent) mixed alluvium on alluvial fans and pediments on lake terraces.

Typical Profile:

- A1 0-2 inches. Light brownish-gray sandy loam, granular structure, very friable and noncalcareous.

A2 2-14 inches. Light brownish-gray sandy loam, platy structure, very friable and noncalcareous.

B2t 14-50 inches. Grayish-brown to pale brown clay loam, prismatic to blocky structure with some clay films, firm and noncalcareous.

IIC1 50-96 inches. Stratified sandy materials and non-calcareous to calcareous.

This soil is deep (over 40 inches) and well-drained. Permeability is moderately slow (0.2 to 0.8 inches per hour). Available water-holding capacity from 0 to 48 inches is high (over 6 inches). Some areas may be gravelly or loamy fine sand. Erosion hazard is severe.

The severe limitations of this soil for irrigation are a combination of short slopes and sandy surface textures; therefore, it is placed in irrigable class 3.

Soil 529a

This soil occupies about 20 percent of Soil Mapping Unit B2 located on sheets 1, 2 and 3 of the soils map, 10 percent of C3 on sheet 3 and 10 percent of C4 on sheet 3.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium on stream terraces, alluvial fans and stream bottoms.

Typical Profile:

AP 0-9 inches. Light brownish-gray loam, granular structure, very friable and slightly calcareous.

Clca 9-23 inches. Light gray loam, massive to blocky structure, very friable and strongly calcareous.

IIC2 23-96 inches. Stratified light-colored mixed sandy or gravelly materials.

This soil is moderately deep (20 to 40 inches) and well-drained. Permeability is moderate (0.8 to 2.5 inches per hour). Available water-holding capacity is moderate (4.5 to 6 inches). The soil profile is slightly gravelly (less than 15 percent).

The moderate limitation of this soil for irrigation is a moderate available water-holding capacity; therefore, it is placed in irrigable class 2.

This soil occupies about 10 percent of Soil Mapping Unit A3 on sheet 3 of the soils map, 13 percent of A6 on sheets 1, 3 and 4, 70 percent of B1 on sheets 1 and 4, 35 percent of B2 on sheets 1, 2 and 3, 40 percent of B3 on sheet 1, 9 percent of B4 on sheet 1, 20 percent of B6 on sheets 2 and 3 and 40 percent of B8 on sheet 1.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium from rhyolitic formations on alluvial fans, pediments and stream terraces.

Typical Profile:

- A2 0-7 inches. Light brownish-gray gravelly loam, platy structure, very friable and noncalcareous.
- A3 7-9 inches. Pale brown gravelly loam, blocky structure, very friable and noncalcareous.
- B2t 9-13 inches. Pale brown gravelly clay loam, blocky structure with clay film, friable and noncalcareous.
- B3t 13-15 inches. Pale brown gravelly clay loam, blocky structure with clay films, friable and noncalcareous.
- Clca 15-28 inches. Light gray slightly gravelly loam to sandy loam, massive, strongly to very strongly calcareous.
- IIC2ca 28-96 inches. Stratified gravelly and sandy materials that are light-colored and strongly calcareous.

Soil 599e

This soil occupies about 20 percent of Soil Mapping Unit B9 located on sheets 1 and 3 of the soils map.

It is similar to soil 599a except it is non to slightly gravelly and occurs on the upper parts of the alluvial fans.

The slight limitation of this soil for irrigation places it in irrigable class 1.

Soil 599f

This soil occupies about 50 percent of Soil Mapping Unit B9 located on sheets 1 and 3 of the general soil map.

It is similar to soil 599a except it is non to slightly gravelly and occurs on gently sloping to sloping (4 to 12 percent) sides of the alluvial fans and stream terraces.

The moderate limitation of this soil for irrigation is a gently sloping to sloping landform; therefore, it is placed in irrigable class 2.

Soil 752

This is a miscellaneous land type (Rockland). It occupies about 5 percent of Soil Mapping Unit A6 located on sheets 1, 3 and 4 of the soils map, 30 percent of A7 on sheets 1, 2 and 3, 25 percent of B5 on sheet 1, 40 percent of F11 on sheets 1, 3, 4, 8 and 9, 60 percent of H4 on sheets 2 and 3, 5 percent of H10 on sheets 7 and 8, 5 percent of H11 on sheets 4, 7 and 8, 10 percent of J1 on sheet 1, 20 percent of J2 on sheets 1 and 2, 25 percent of J3 on sheet 1, 30 percent of L2 on sheets 1, 2 and 3, 5 percent of P3 on sheets 2, 3, 4, 6, 7, 8 and 9, 5 percent of P4 on sheets 7 and 8, 5 percent of Q4 on sheet 8, 20 percent of Q5 on sheet 8, 60 percent of R1 on all the sheets, 75 percent of R2 on sheets 1 and 4, 60 percent of R3 on sheet 1, 5 percent of S1 on sheets 4, 6 and 8, 5 percent of S2 on sheets 4, 6 and 8, 5 percent of U2 on sheet 8, 25 percent of V on sheets 7 and 8 and 10 percent of X on sheets 6 and 7.

It occurs on nearly level to very steep (0 to over 20 percent) mixed geological materials consisting mostly of basaltic, granitic and rhyolitic rocks. The landforms are mostly canyons of the major streams. Other areas are represented by hills, mountains and escarpments with little or no soil materials covering the surface. A thin colluvial cover and talus are prevalent throughout these areas. Most of these landforms are inaccessible due to steepness of slope and stones.

The very severe limitations of this miscellaneous land-type for irrigation are rockiness, very shallow depth or very steep slopes; therefore, it is placed in non-irrigable class 6.

Soil 890a 67 Ida 37251

This soil occupies about 5 percent of Soil Mapping Unit A1 on sheet 1 of the soils map, 5 percent of A3 on sheet 3, 4 percent of A5 on sheets 1, 2, 3, 4 and 5, 3 percent of B6 on sheets 2 and 3, 86 percent of E1 on sheets 3, 4 and 5, 60 percent of E2 on sheets 1, 4 and 5, 40 percent of E3 on sheets 2 and 3, 5 percent of E4 on sheets 4 and 5, 5 percent of E5 on sheet 3, 15 percent of E6 on sheets 1, 3 and 4 and 10 percent of E7 on sheet 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) mixed alluvium on stream terraces.

Typical Profile:

- A1 0-4 inches. Light brownish-gray fine sandy loam or sandy loam, platy to granular structure, very friable and noncalcareous.
- C1 4-13 inches. Light brownish-gray fine sandy loam, massive, very friable and strongly calcareous.

C2ca 13-60 inches. Light gray fine sandy loam, massive, very friable and very strongly calcareous.

C3 60-96 inches. Light gray fine sandy loam, massive, very friable and strongly calcareous.

This soil is deep (over 40 inches) and well-drained. Permeability is moderately rapid (2.5 to 5.0 inches per hour). Available water-holding capacity from 0 to 48 inches is moderate (4.5 to 6 inches). The soil profile is moderately to strongly alkaline in the lower part.

The moderate limitation of this soil for irrigation is a moderate available water-holding capacity; therefore, it is placed in irrigable class 2.

Soil 890b

This soil occupies about 4 percent of Soil Mapping Unit A5 located on sheets 1, 2, 3, 4 and 5 of the soils map, 10 percent of B7 on sheets 1, 2, 3 and 4, 15 percent of E2 on sheets 1, 4 and 5, 5 percent of E5 on sheet 3 and 5 percent of E6 on sheets 1, 3 and 4.

It is similar to soil 890a except it occurs on gently sloping to sloping (4 to 12 percent) mixed alluvium on stream terraces.

The severe limitations of this soil for irrigation are a combination of moderate available water-holding capacity, sandy texture and a gently sloping to sloping landform; therefore, it is placed in irrigable class 3.

Soil 909a

This soil occupies about 25 percent of Soil Mapping Unit A2 located on sheet 4 of the soils map, 4 percent of A5 on sheets 1, 2, 3, 4 and 5 and 10 percent of A6 on sheets 1, 3 and 4.

It occurs on nearly level to very gently sloping (0 to 4 percent) silty lacustrine sediments on lake terraces.

Typical Profile:

A1 0-5 inches. Light gray silt loam, platy to granular structure (vesicular), friable and slightly calcareous.

B 5-12 inches. Light gray silt loam, blocky structure, friable and slightly calcareous.

C 12-23 inches. Light gray silt loam, laminated, firm and slightly calcareous.

R 23-96 inches. White laminated silt stone, very hard and slightly calcareous.

This soil is moderately deep (20 to 40 inches) and well-drained. Permeability is moderate (0.8 to 2.5 inches per hour) in the upper part but slow (0.05 to 0.2 inches per hour) in the laminated substratum. The soil profile is moderately alkaline above 23 inches. Available water-holding capacity from 0 to 24 inches is moderate (4.5 to 5 inches).

Soil 909d

This soil occupies about 15 percent of Soil Mapping Unit A1 located on sheet 1 of the soils map, 80 percent of A4 on sheets 1, 2 and 3, 30 percent of A5 on sheets 1, 2, 3, 4 and 5, 15 percent of A6 on sheets 1, 3 and 4, 65 percent of A7 on sheets 1, 2 and 3, 5 percent of B1 on sheets 1 and 4, 5 percent of B3 on sheet 1, 7 percent of B4 on sheet 1, 25 percent of D5 on sheets 1, 3, 4 and 5 and 10 percent of F10 on sheet 5.

This soil is similar to soil 909a except it occurs on very steep (over 20 percent) silty lacustrine sediments on lake terrace escarpments.

The very severe limitation of this soil for irrigation is very steep slopes; therefore, it is placed in non-irrigable class 6.

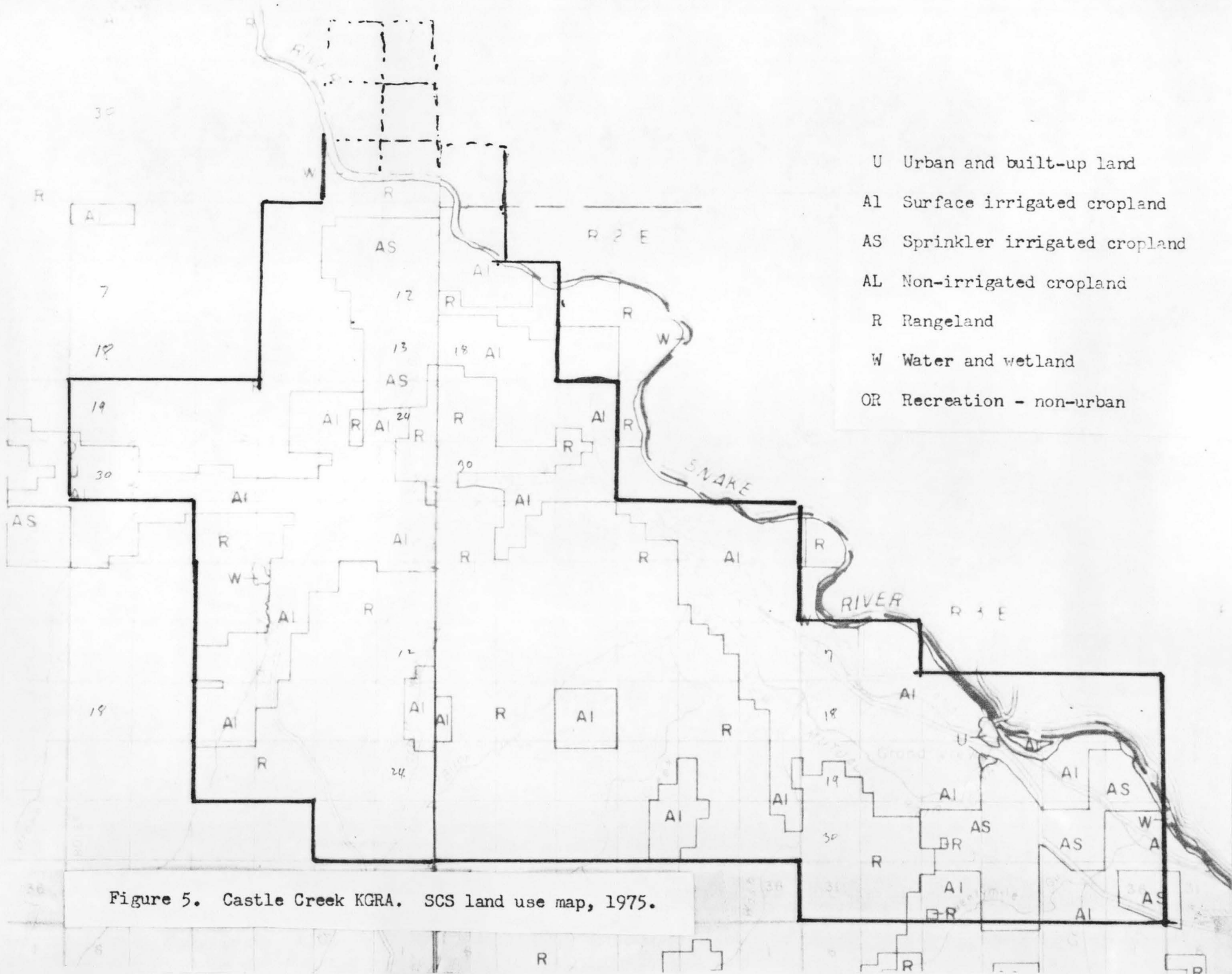
Soil 1026

This is a miscellaneous land type (rough broken and stony canyon lands). It occupies about 40 percent of Soil Mapping Unit R1 located on sheets 1, 2, 3, 4, 5, 6, 7, 8 and 9 of the soils map.

It occurs on the steep and very steep (12 to over 20 percent) colluvial slopes in the canyons of the major and minor streams.

The soil materials are generally very stony or rocky consisting of basaltic rhyolitic or granitic materials. The canyons are generally narrow and deep ranging from 1/8 to 1 mile wide and 50 to 800 feet deep.

The very severe limitations of this soil material for irrigation are a combination of stoniness, rockiness, steep and very steep slopes and inaccessibility; therefore, it is placed in non-irrigable class 6.



- U Urban and built-up land
- AI Surface irrigated cropland
- AS Sprinkler irrigated cropland
- AL Non-irrigated cropland
- R Rangeland
- W Water and wetland
- OR Recreation - non-urban

Figure 5. Castle Creek KGRA. SCS land use map, 1975.

84a

CRANE CREEK KGRA

SOILS

X.1.1.1. Description of Existing Data

The Crane Cr. KGRA contains both public domain lands administered by the Bureau of Land Management and privately owned lands. The Washington County Soil Conservation Service has completed a detailed soil survey on 220 acres of private lands as indicated in Fig. 1. Of these, 40 acres are irrigated, 30 acres are dry cropland, and the remainder are rangeland. Additional lands within the KGRA may be mapped during the summer of 1979.

The soils have been mapped on aerial photographs (1:20,000) and are available on open file at the Weiser office, Washington Co. SCS. The SCS central office in Boise (Room 345, 304 North 8th Street) has on file detailed descriptions of each soil series which include the following data:

Soil taxonomic class	Drainage
Typical pedon (soil profile)	Permeability (in/hr)
Depth	Available water capacity (in/in)
Color	Soil reaction (pH)
Texture	Salinity
Composition	Use and vegetation potentials
pH	Sanitary facilities
Range in characteristics	Community development
Mean annual soil temperature	Source materials
Mean summer soil temperature	Water management
Relative moisture content	Wildlife habitat
Depth to bedrock	Native vegetation
Organic content	Crop use and potential
Structure	
Geographic setting	
Elevation	
Slope	
Parent materials	
Climate	

In 1976, the Boise District, Bureau of Land Management completed an environmental assessment of the Crane Cr. KGRA. Fig. 2 shows a reconnaissance soil association map of the KGRA and adjacent lands from this assessment. The map legend describes the soil types and general land uses within the area. Soil data includes general information on composition, depth, parent materials, landtypes, and slope gradient.

X.1.1.2. Evaluation of Existing Data

The Soil Conservation Service detailed soil surveys are the most complete compilation of soil data available. The Washington Co. SCS has mapped most of the private lands within the Crane Cr. KGRA and will probably complete the survey during the summer of 1979.

The Bureau of Land Management reconnaissance survey was conducted at the soil association level of intensity and is very general in nature. This type of survey gives some indication of land capability potential.

X.1.1.3. Recommendations for Further Study

The Washington Co. SCS will complete a detailed soil survey of the county by 1983. The remaining private lands within the Crane Cr. KGRA may be mapped during the summer of 1979. Soils on specific sites chosen for geothermal development should probably be mapped at the level of detail prescribed by the SCS.

X.1.1.4. Special Interests of Concerns

X.1.1.5. Resource Use Limitations

Approximately 75% of the Crane Cr. KGRA is underlain by shallow, stony soils on steep slopes indicating both topographic and drainage limitations to geothermal development. (Fig. 2, A and B). Developed farmlands comprise

most of the flat bottomlands and dissected terrace lands (Fig. 2, C and D) representing possible land use conflicts with geothermal development.

CRANE CREEK KGRA

SOILS

APPENDIX A

Annotated Bibliography

- (1) Aerial photographs (1:20,000) of portions of sections 17 and 18, T11N, R3W and section 12, T11N, R4W, within the KGRA, showing soil bodies. Handbook containing legend. Soil Conservation Service, Weiser, Idaho.

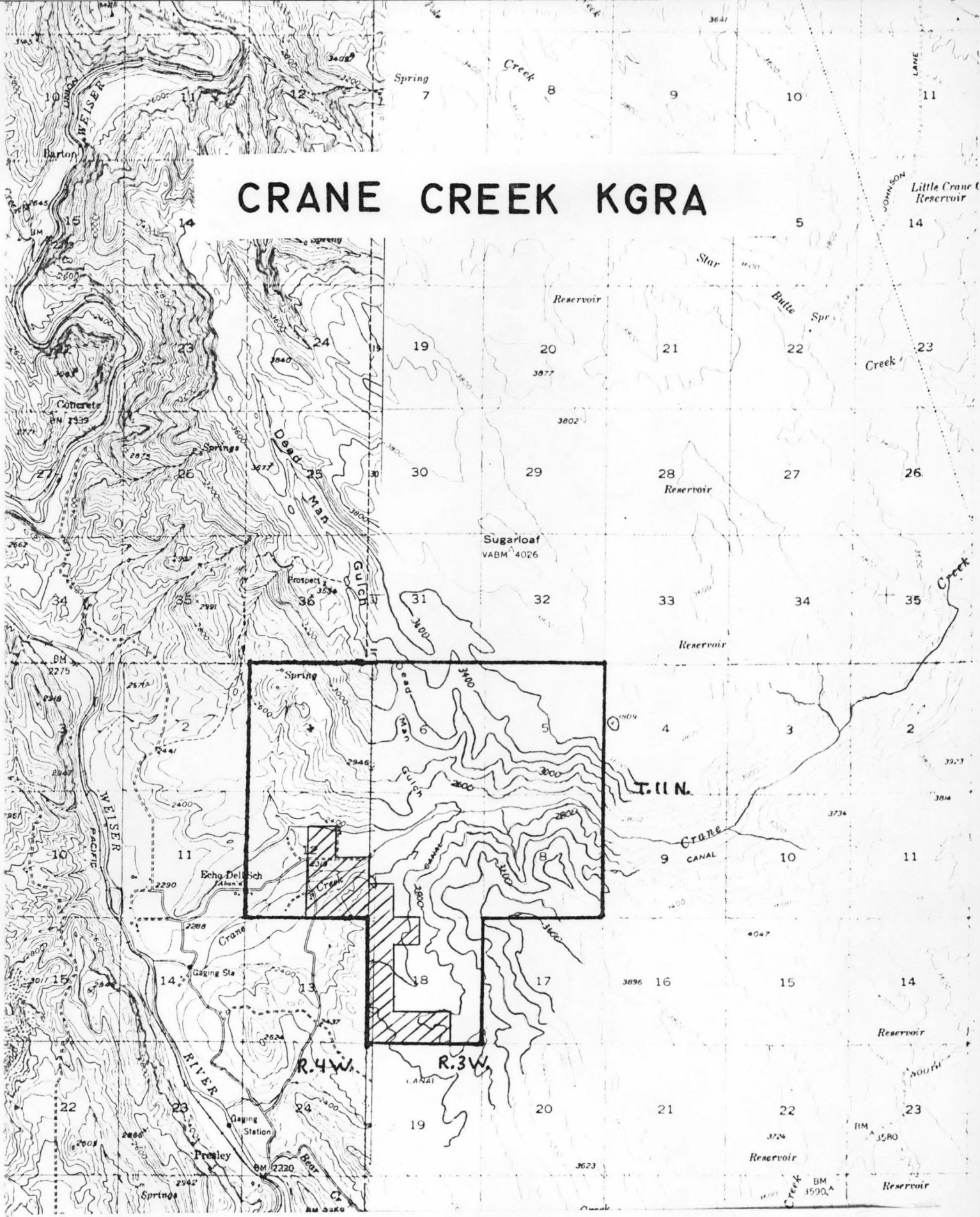
These photos show detailed, accurate, and up-to-date soil survey data.

Detailed soil descriptions can be obtained from the SCS central office, Room 345, 304 North 8th St., Boise, Idaho. The remaining private lands in the KGRA will be mapped during the next one to four years by the Washington Co. SCS.

- (2) Boise District, Bureau of Land Management, 1976. Environmental Analysis (1976) and a Management Framework Plan (1978) for the KGRA.

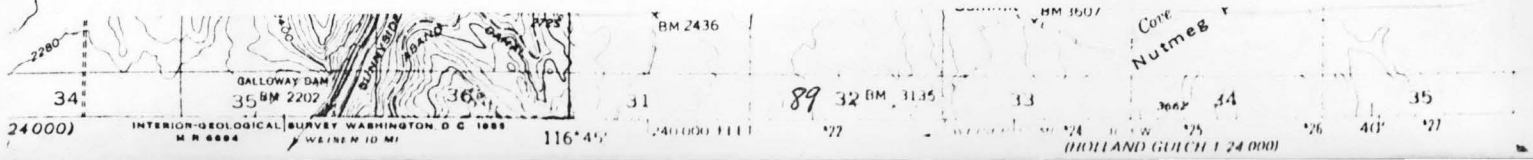
- (3) Soil Conservation Service. Land use map. Washington County (sheet 1). April, 1975.

Blue line map at scale 1:126,720 ($\frac{1}{2}$ inch:mile) available from SCS, Room 345, 304 North 8th St., Boise, Idaho. Denotes the following land uses: urban and built-up land, surface irrigated cropland, sprinkler irrigated cropland, non-irrigated cropland, rangeland, water and wetland, recreation - non-urban land, forest and woodland.



CRANE CREEK KGRA

Figure 1. Location of Soil Conservation Service soil survey (Washington Co., SCS)



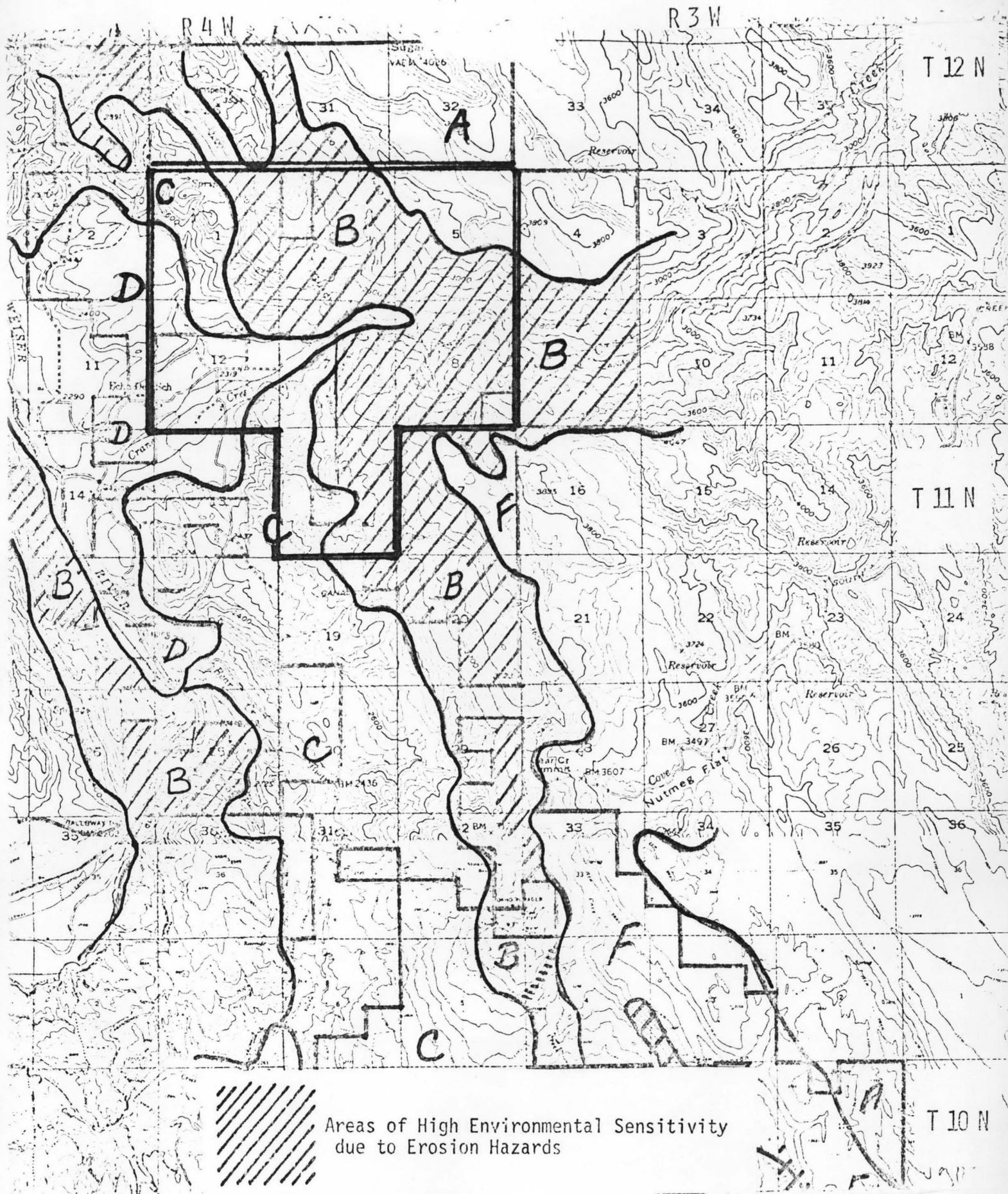


Figure 2. Crane Cr. KGRA. BLM soil survey, 1976 (legend follows)

Legend for Fig. 2, BLM soil survey, 1976:

Soils

There are six soil associations found in the area. They consist of the following types:

- A. Very shallow (0-10 inches) and shallow (10-20") very stony loams to clays overlying basalt bedrock. Slopes range generally from 0 to 30 per cent.
- B. Very shallow and shallow, very stony loams and clay loams overlying basalt with numerous outcroppings of bedrock. Slopes are generally more than 30 per cent.
- C. Shallow to deep loams to clays (may or may not be stony) developed on dissected terraces and hills overlying basalt bedrock. Slopes generally range from 10 to 30 per cent.
- D. These are moderately deep to deep well drained to poorly drained, nearly level to moderately sloping soils on stream bottoms and terraces. Slopes generally less than 15 per cent.
- E. These are primarily moderately deep loamy soils developing on dissected terraces and hills overlying basalt bedrock. Slopes range from 10 to 30 per cent.
- F. These are generally deep, loam and silt loam soils that are developed on dissected terraces and hills overlying basalt bedrock. Slopes range from about 15 to 50 per cent.

Areas of high soil erosion hazard are shown on Fig. 2. Shaded portions of the map indicates area of high environmental sensitivity due to soil composition and erosion factors.

Land Use

BLM is currently developing a Unit Resource Analysis for the area due to be completed by May 1, 1976. The Management Framework Plan (MFP) is not scheduled for completion until the end of FY '77.

The land base supports a number of compatible land uses. The most widespread uses are livestock grazing and wildlife habitat. Other uses include many types of recreation, agriculture on private lands adjacent to lease area, and very sparse man made improvements. Recreation uses include rock hounding, big game and upland game hunting, fishing and sightseeing. The major man made improvement is the main gravel road which provides access throughout the area. However, access to the KGRA site and much of the leasing area is mainly by four-wheel drive vehicle. Dwellings are scattered throughout the area. No major powerlines or other such structures exist in the area.

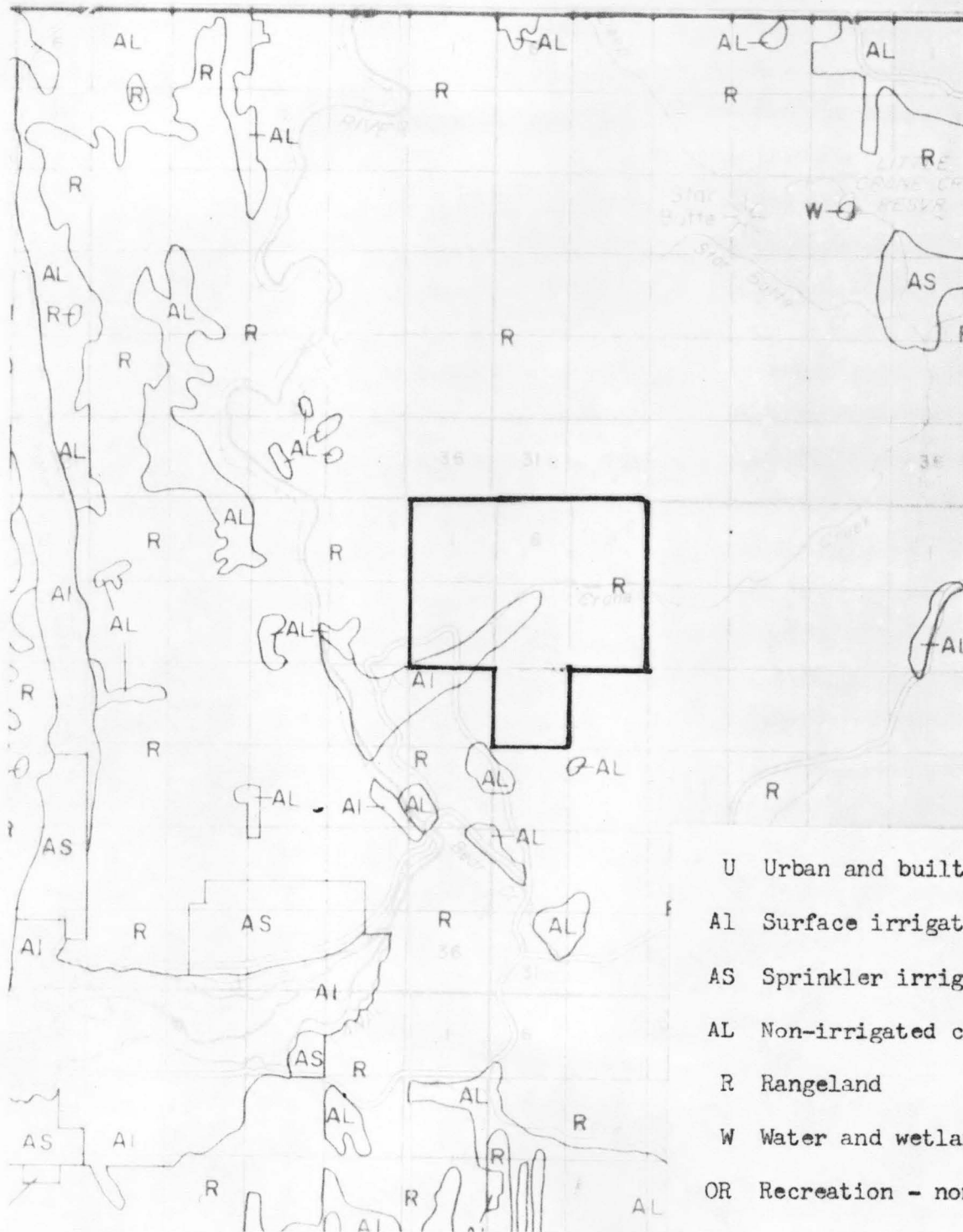
The only evidence of previous mining activity is at the Idaho Almaden Mine which was at one time a leading producer of mercury (quicksilver) in the U.S. The mine was reactivated in 1968 by El Paso Natural Gas Company, but was shut down in 1972 due to economic reasons.

R.4 W.

116°4

R.3 W.

Joins Sheet 2



- U Urban and built-up land
- AI Surface irrigated cropland
- AS Sprinkler irrigated cropland
- AL Non-irrigated cropland
- R Rangeland
- W Water and wetland
- OR Recreation - non-urban

Figure 3. Crane Creek KGRA. SCS land use map, 1975.

VULCAN KGRA

SOILS

X.1.1.1. Description of Existing Data

The Vulcan KGRA is entirely on National Forest land (Fig. 1). The only existing data on soils is that contained in the USFS Soil Hydrological Reconnaissance (1969) which is based on soil and hydrology survey conducted by Arnold and Lundeen (1968). All landtypes within the KGRA have been identified and described in these reports (Fig. 2, Table 1).

The soil descriptions are limited to texture, composition, color and acidity of surface and subsoil layers and depth of soil profile. The landtype descriptions (following Fig. 2) contain additional useful information on topography, geomorphic features, bedrock characteristics, vegetation, and management qualities.

The soils in this area have developed over granitic rock of the Idaho batholith and are generally highly erodable (USDA, Forest Service, South Fork Plan).

X.1.1.2. Evaluation of Existing Data

The USFS soil survey is probably incomplete for geothermal development purposes as there is no data on drainage characteristics such as permeability rate or water holding capacity. General drainage characteristics (i.e. well-drained, poorly-drained) can only be inferred from soil composition characteristics (gravelly, sandy, etc.).

X.1.1.3. Recommendations for Further Study

A detailed soil survey such as that conducted by the Soil Conservation Service should be completed on the area subject to geothermal development. At the least, additional data on drainage characteristics should be deter-

mined by USFS soil scientists.

X.1.1.4. Special Interests or Concerns

X.1.1.5. Resource Use Limitations

Topography in the Vulcan KGRA ranges from 0-60% slope gradient with most of the area on landtypes with greater than 20% slope and heavily forested. The soils, developed over granitic rocks of the Idaho batholith, are highly erodible. Both of these factors would impose limitations on geothermal development.

APPENDIX A

Annotated Bibliography

1. Arnold, John F. and Lloyd J. Lundeen. 1968. South Fork of the Salmon River Special Survey, Soils and Hydrology. U.S. Forest Service R-4 (Unpublished report).

This survey was the basic source of information on soil and landtype characteristics within the Vulcan KGRA. Any information in the following reports was drawn from this survey. It is available on open file in the Boise National Forest Supervisors Office in Boise.

2. USDA, Forest Service, Intermountain Region. 1969. Soil Hydrological Reconnaissance, Boise National Forest, Cascade Ranger District.

This is the working document describing soil and landtype characteristics within the KGRA. Landtype descriptions include subsections on: location, management zone, extent, topography, geomorphic features, bedrock characteristics, vegetation, soils, management qualities, and management evaluation. The soils subsection gives abbreviated information on texture, composition, and depth and refers to the soil by number. These soil numbers are contained in a table giving classification of the soil and more detailed information on texture, composition and depth.

This document is available on open file in the Boise National Forest Supervisors Office in Boise or the Cascade Ranger District Office in Cascade.

3. USDA, Forest Service. June 1977. South Fork Salmon River Planning Unit. Final Environmental Statement and Land Management Plan. Boise and Payette National Forests.

Very general information on all aspects of the South Fork Planning Unit. General statements on soils but no specific information on the Vulcan KGRA. Copies available upon request at Boise and Payette National Forest Supervisors Offices (Boise and McCall) and at the Cascade Ranger District Office.

4. USDA, Forest Service. 1977. Environmental Analysis Report (Review Draft). Geothermal Installation (Vulcan Hot Springs). Boise National Forest, Cascade Ranger District.

This EAR attempts to address all aspects of the environment as they would be affected by geothermal development. A landtype map is included but the reader is referred to the Soil Hydrological Reconnaissance report for additional information on soils and landtypes. A xerox copy was obtained from the Boise National Forest Supervisors Office.

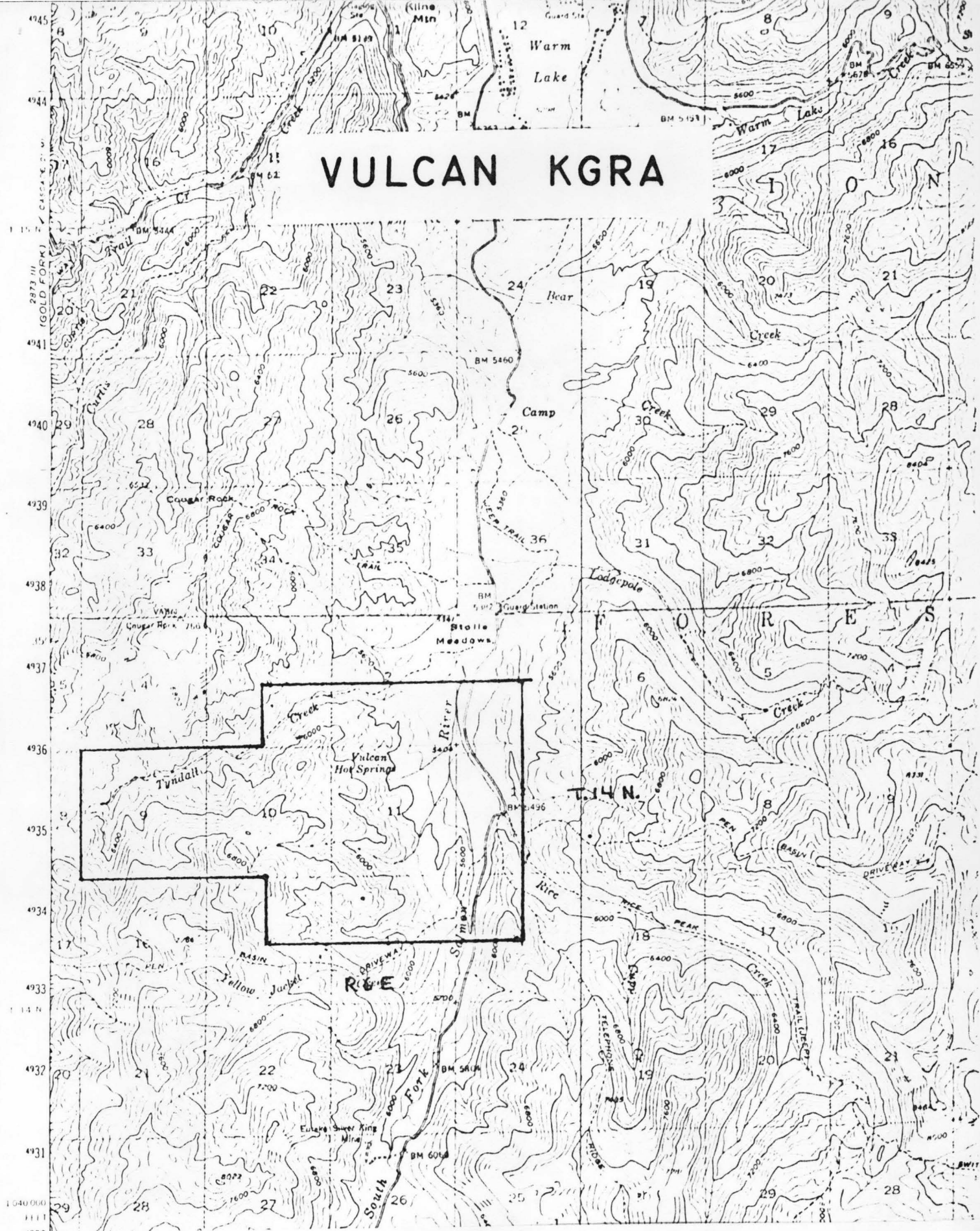


Figure 1. Location map, Vulcan KGRA, Cascade Ranger District, Boise National Forest

LANDTYPE LEGEND:

- 101 Alluvial Land
- 105 Alluvial Fan Land
- 106a Lateral Moraine Land
- 108 Glacial Plastered Mountain Slope Land
- 109 Weakly Glaciated Upland
- 110 Cirque Basin Land
- 120a Weakly Dissected Mountain Slope Land
- 120b Moderately Dissected Mountain Slope Land
- 120d Steep Rocky Head Land
- 123 Faulted Bench Land

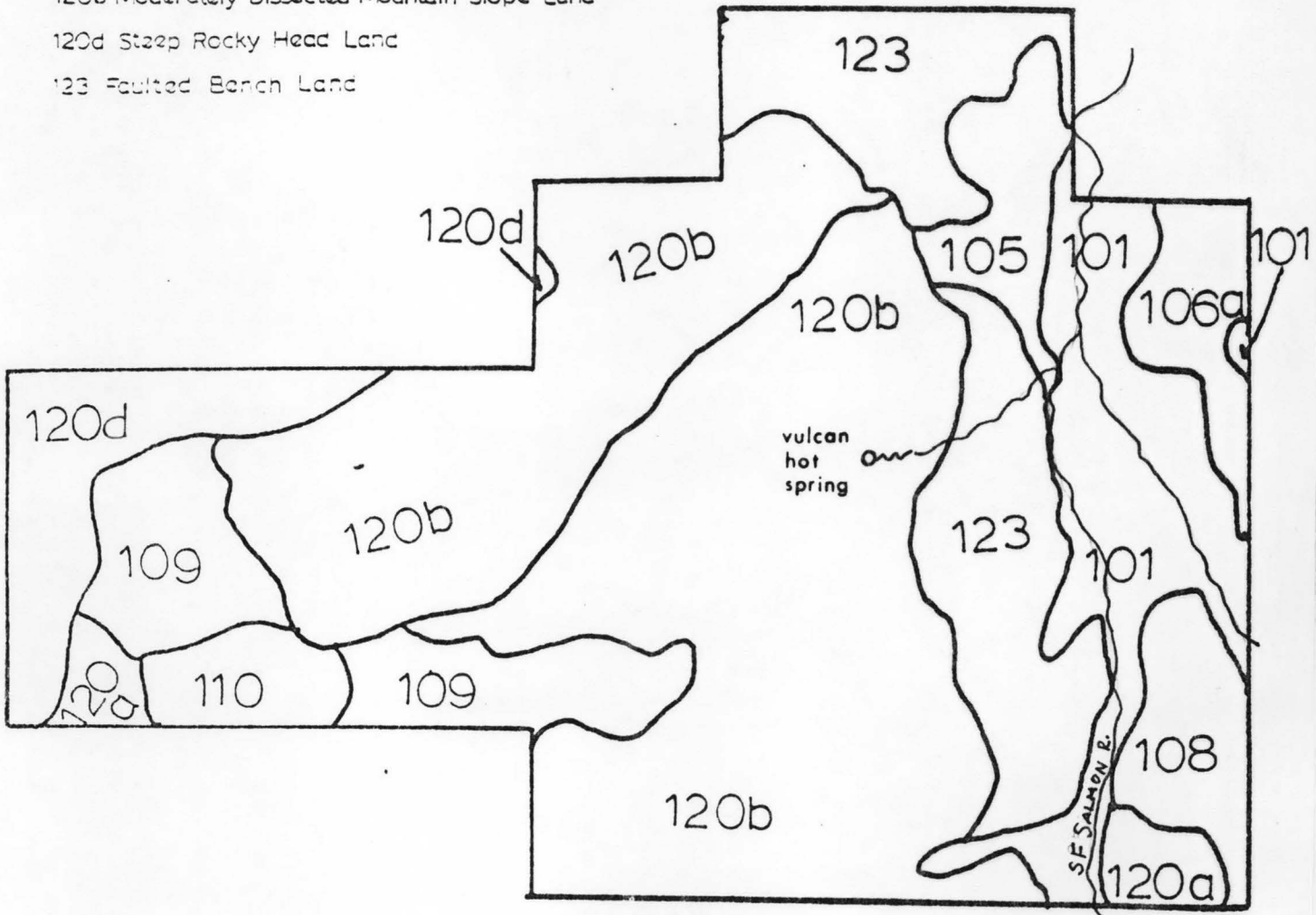
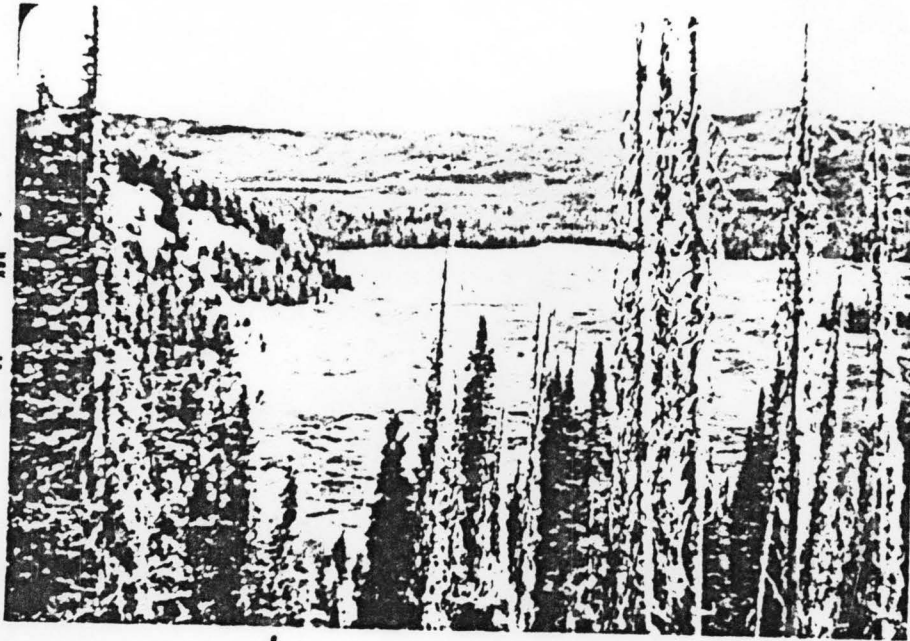


Figure 2. Landtype map of Vulcan KGRA (USFS Soil Hydrologic Reconnaissance)
(Landtype descriptions follow)

LANDTYPE DESCRIPTIONS 1/

ALLUVIAL LAND
Map Symbol 101



Location - The low lands adjacent to the South Fork of the Salmon River

Management Zone - Mostly Travel or Water Influence

Extent - Acres: 3,942
Percent of Area: 1.6

Topography - Slope Gradient: 0 - 5%
Aspect: All
Elevation: Dominantly 3000 - 4000'

Geomorphic Features - Alluvial lands are those lands immediately adjacent to streams and include river wash, bottom lands, and first terrace land positions. The alluvial lands are also mapped in the high mountain meadows and generally have a high water table at least in the spring of the year.

Bedrock Characteristics - This is a depositional land type and generally it is quite deep to bedrock. Normally these land types are at least 10 feet to bedrock and may be as deep as 100 feet or more.

Vegetation - The vegetation on this unit, because of the wide elevational range, is quite variable. The vegetation at the lower elevation consists mostly of ponderosa

1/ From USDA, Forest Service, Intermountain Region. 1969. Soil Hydro-
logical Reconnaissance. Boise National Forest, Cascade Ranger District.

pine with some areas having Douglas-fir. The understories are generally pine grass and some of the warmer brush species. The ground covers at the lower elevations range from 30 - 60 percent. The crown cover densities range from 15 - 30 percent for the overstory, 20 - 50 percent for the understory. The vegetation at the higher elevation consists of lodgepole pine and spruce overstories with understories of sedges and other meadow-like vegetation. The ground cover on these meadows generally is near 100 percent.

Soils*-

Because of the depositional nature of this land type soils are quite variable. The dominant soils at the lower elevations are 12 (70 percent), 12a (30%). The soils in the high mountain meadows were not identified because of the very small extent of these lands. Generally speaking, the soils in the meadow lands have thick dark sandy loam to loam surface horizons over lighter colored sandy loam and loam subsurface horizons. The 12 soil has loamy sand textures throughout and the 12a soil has loamy sand textures throughout, however, is stony throughout the profile. These soils are 6 feet or more to bedrock.

Management
Qualities -

Engineering problems in this unit are mainly involved with stream encroachment in the bearing capacity of road prisms. Some of these lands will require considerable ballast to provide the bearing strength necessary for expected wheel loads during the wet season. These lands also provide an effective buffer from the sediment from the above slopes. The soils in these land types have a moderate to high productivity potential for timber and herbaceous vegetation.

Management -
Evaluation

* Refer to Table 1

ALLUVIAL FAN LAND
Map Symbol 105



- Location - Area near Stolle Meadows
- Management Zone - Travel and Water Influence
- Extent - Acres: 1,043
Percent of Area: .4
- Topography - Slope Gradient: 5 - 20%
Aspect: All
Elevation: 3500 - 4000'
- Geomorphic Features - Alluvial Fan Land is relatively uncommon on the District. This land type was mapped only where it could be delineated consistently at the limiting scale of the aerial photos used. Alluvial Fans are cone-shaped deposits of alluvium made by streams when they flow out onto a level plane or meet a slower stream.
- Bedrock Characteristics - The granitic bedrock is generally from 4 to 6 feet or more beneath the soil mantle and generally is slightly to moderately well fractured, hard and unweathered.

Vegetation -

Timber species on these units are ponderosa pine and Douglas-fir. Understories are ceanothus, snowberry, willow, prunis and huckleberry and pine grass. Ground cover densities range in percent from 70 to 100. Crown cover densities for the overstory range from 20 to 30 percent and 30 to 50 percent for the understory.

Soils -

The dominant soils on this unit are 11a (40%), 1 (30%), and 7 (30%). The 11a soil has loamy sand surfaces and subsurfaces. It is stony throughout the profile. The 1 soil has loamy sand surfaces and subsoils and are non-stony. The 7 soil has sandy loam surface horizons over sandy loam and loam subsurface horizons. Depth to bedrock for these soils is 6 feet or more.

Management -
Qualities

This land type, because of its favorable topography adjacent to main access routes, provides favorable administrative sites for campgrounds and recreation areas. These lands provide little hazard to road construction except for cut slopes which will have a moderately high erosion hazard on the steeper slopes. The inherent erosion hazard for this unit is moderately low. These lands have moderate to moderately high productivity potentials for timber and herbaceous vegetation.

Management -
Evaluation

LATERAL MORaine LAND
Map Symbol 106a



Location - Warm Lake Area

Management Zone- Crest and Intermediate

Extent - Acres: 1,298
Percent of Area: .5

Topography - Slope Gradient: 10 - 35%
Aspect: Dominantly Northerly
Elevation: 6000 - 7500'

Geomorphic Features - Lateral moraines are associated with the major alpine glaciated valleys. These lands were deposited above and on the lateral margins of the valley glaciers. Most of these lands have a total relief approaching 150 feet and slope gradients ranging dominantly from 10 to 35 percent. Where mapped on the side of glacial troughs, the slope gradients may be as high as 40 - 45 percent.

Bedrock Characteristics - Depth to bedrock is generally 10 feet or more.

Vegetation - These lands produce dominantly lodgepole pine, sub-alpine fir and some Douglas-fir. They have understories of low huckleberry, elk sedge and pine grass. Ground cover densities range from 60 to 80 percent. The crown cover density ranges from 15 to 30 percent for the over-story and 15 to 20 percent for the understory.

Soils -

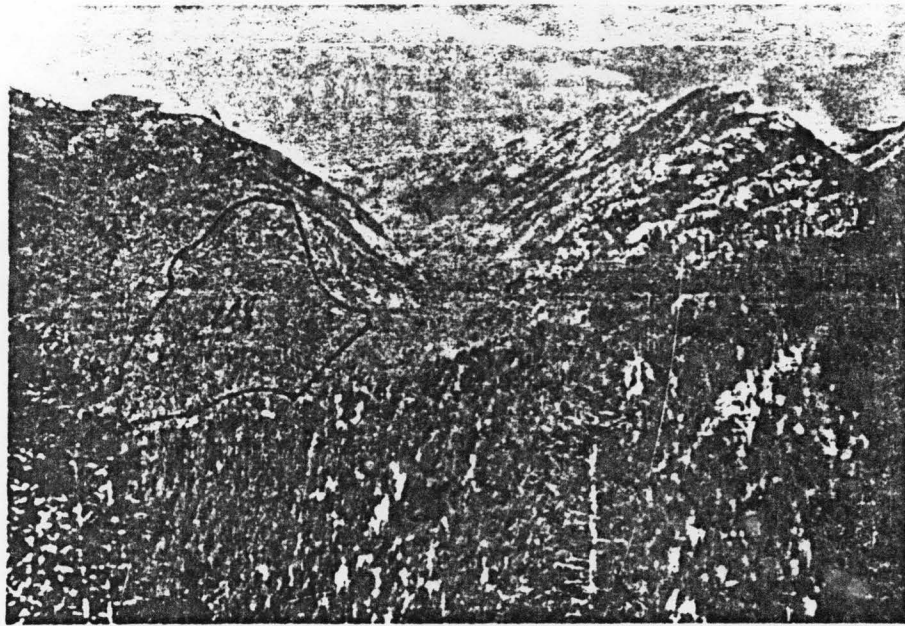
The dominant soils on this land type are 9b (50%), and 8b (50%). The 9b soil has a bright colored sandy loam surface over sandy loam and loamy sand subsurfaces. The 8b soil has dark colored surface horizons with sandy loam surface textures over sandy loam and loamy sand subsurface textures. Both the 9b and 8b soils are cobbly throughout the profile and on the surface. These soils are more than 6 feet to bedrock.

Management -
Qualities

The inherent erosion hazard of the soils in this unit is moderate. The management qualities of this unit are similar to that of Moraine Land Undifferentiated (106), except that the surface erosion hazard for cut and fill slopes is somewhat higher because of the steeper topography.

Management -
Evaluation

GLACIAL PLASTERED MOUNTAIN SLOPE LAND
Map Symbol 108



- Location - Rice Creek, Lodgepole Creek, Bear Creek
- Management Zone - Crest and Intermediate
- Extent - Acres: 12,978
Percent of Area: 5.3
- Topography - Slope Gradient: 35-45%
Aspect: Dominantly North and East
Elevation: 5,500' - 7500'
- Geomorphic Features - These land types are the glacially modified slopes which have had glacial material deposited on them rather than stripped away by the scouring of the glacier. These lands are generally benchy and have fairly thick soil mantles on them. Some of these lands are in the glacial troughs. These lands contain considerable lateral moraine materials with typically sub-rounded glacial worked rock fragments.
- Bedrock Characteristics - The granitic bedrock is generally moderately fractured and ranges from somewhat weathered to soft, well weathered.
- Vegetation - Vegetation on southerly and westerly slopes consists of moderately dense stands of Douglas-fir, lodgepole pine, and some ponderosa pine, with understories of

pine grass and elk sedge. Northerly slopes have lodgepole pine and Douglas-fir with an elk sedge, pine grass and tall huckleberry ground cover. The ground cover density ranges from 60 to 90 percent. The crown cover density for the overstory ranges from 25 to 35 percent and 20 to 30 percent for the understory.

Soils -

The dominant soils on this land type are 9b (40%) 11a (25%) and 15 (25%). The 9b and 15 soils have sandy loam surfaces and subsurfaces and are generally stony throughout. The 11a soil has stony surfaces and subsurfaces and has loamy sandy textures throughout the profile. The 9b and 15 soils are generally on the northerly aspects and produce moderately dense stands of Douglas-fir and lodgepole pine. The 11a soil is generally on the more southerly aspects and produces moderate stands of Douglas-fir and ponderosa pine. Soil erodibility for these soils ranges from low to moderate.

Soils on this unit generally average from 4 to 6 feet to bedrock.

Management -
Qualities

These lands, because of the favorable gradation of soil materials and benchy slopes under 55 percent present favorable road location chances. Wet spots are fairly common and they should be recognized as increasing the chances for mass failures of the cutslope. Road fills on these lands are fairly stable. On steep slopes the fill slope erosion hazard is moderate to moderately high. The inherent erosion hazard is moderately low to moderate. Timber productivity is medium and herbaceous vegetation productivity is moderately low under conifer vegetation.

Management -
Evaluation

WEAKLY GLACIATED UPLAND
Map Symbol 109



Location - Cupp Corral and East Mountain Lookout Areas

Management Zone - Mostly Crest, Some Intermediate

Extent - Acres: 18,478
Percent of Area: 7.6

Topography - Slope Gradient: 25 - 40%
Aspect: All
Elevation: 5500' - 7500'

Geomorphic Features - Weakly Glaciated Uplands have not been subjected to the scouring action of the Strongly Glaciated Lands. These lands are near areas of land which have been strongly glaciated and are the result of the climatic change brought about by the glaciers. These lands have been formed by the processes and effects of permanent snow and ice field action and any movement of materials was only locally. Soil and rock materials were not carried by major ice currents nor was the bedrock deeply stripped. These lands generally have not been dissected to any great degree by fluvial processes. This is due partially to the localized transportation of materials in snow and ice fields and partially to the dominant kinds of slope forming

processes presently active on these slopes. The Weakly Glaciated (periglaciated) Landscapes are mainly at elevations where nivation, freezing and thawing, wetting and drying make mass wasting the chief process by which materials are moved down slope. This process keeps replacing materials which may have been removed by overland flow.

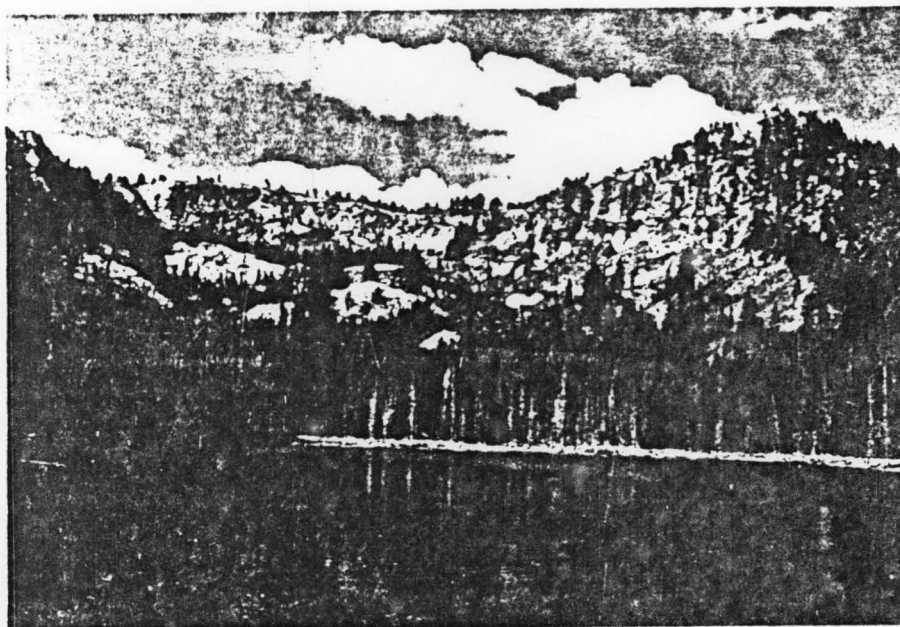
Bedrock Characteristics - The granitic bedrock is slightly to moderately fractured and moderately soft, moderately weathered.

Vegetation - This land type supports mixed stands of subalpine fir, lodgepole pine and Engelmann spruce with understories of low and tall huckleberry, elk sedge, and pine grass. The ground cover density ranges from 50 to 80 percent. The crown cover for the overstory ranges from 5 to 30 percent and from 0 to 20 percent for the understory.

Soils - The dominant soils on this unit are 9b (40%), 8b (20%), and 9d (20%). The 9b and 8b soils are generally stony throughout and have sandy loam surfaces over loamy sand subsurfaces. The 9d soil is non-stony on the surface and throughout the profile and has fine sandy loam textures over sandy loam and loamy sand subsurface textures. This soil is less than 20 inches deep to highly weathered bedrock. Depth to bedrock for the other soils averages 3 to 5 feet with some areas being up to 10 feet. The 9b soil generally supports timber stands and the 8b soils generally have sparser stands of timber and more grass vegetation on them.

Management Qualities - Engineering-wise these lands should provide few problems except for moderate to moderately high surface erosion hazards on cut and fill slopes and a moderate to moderately high mass failure hazard for the cut slope in areas of seeps and wet spots. The structures such as trenches or below standard roads on these lands provide less impact than most other lands of comparable slope gradient in the Fluvial Lands. The main reasons for this are generally the stony nature of the soil mantle and the deeper subsurface flow line. Shallow cuts, therefore, are less apt to intercept the subsurface flow line. The inherent erosion hazard for this unit is moderately low to moderate. Productivity for timber and herbaceous vegetation on this land type will range from moderately low to moderate. These lands are good regulators of sustained stream flow as they take in and percolate water readily.

CIRQUE BASIN LAND
Map Symbol 110



Location - The head of Warm Lake Creek, Roaring Creek

Management Zone - Crest

Extent - Acres: 3,949
Percent of Area: 1.6

Topography - Slope Gradient: 10 - 30%
Aspect: Dominantly North
Elevation: 7,000' - 8,500'

Geomorphic Features - This land type consists of amphitheater-like basins that are found at the heads of most of the glaciated valleys on the District. Some of the cirque basins have small lakes in them. Common inclusions in this land type are narrow strips of Valley Train Land and Toe Slope Land. In the larger cirques there usually are small areas of wet Alluvial Lands near the lakes.

Bedrock Characteristics - The granitic bedrock is generally hard, unweathered, nonspalling and slightly to moderately fractured.

Vegetation - Dominantly lodgepole pine, subalpine fir and some Engelmann spruce in the low areas. Ground cover is mostly low huckleberry and elk sedge. Ground cover density including litter ranges from 30 to 60 percent.

Soils -

Dominant soils on this land type are 11a (30%), 9b (30%), 8b (20%), 9c (20%). Soils are generally stony with subangular coarse fragments from 4 inches to one foot in diameter. These soils have loamy sand and sandy loam surfaces over bright colored loamy sands and sandy loam subsurfaces. Depth to bedrock averages 20-40 inches. The 9b and 9c soils are found on the lower north slopes and in the depressional areas and may support a good stand of Engelmann spruce over low huckleberry and elk sedge. The other soils support open to dense stands of lodgepole pine and subalpine fir with elk sedge and low huckleberry the dominant ground cover.

Management -
Qualities

These lands are one of the chief regulators for sustained stream flow. The depressional nature of the landscape allows for deep percolation and the return of water as subsurface flow and ground water. Because of the short growing season, productivity for timber is generally low except for small stands of spruce which may be medium. Potential for forage production is also low. The engineering characteristics of these lands are favorable in most respects, except for some of the Wet Alluvial Lands and wet meadows. These lands contain many lakes which have been stocked and provide excellent fishing. These areas also provide some favorable big game summer range. These lands, because they are easily traversed by foot or horseback, are an important part of the high value dispersed recreational area associated with the rest of the land type in the Strongly Glaciated Lands.

Management -
Evaluation

WEAKLY DISSECTED MOUNTAIN SLOPE LAND
Map Symbol 120a



Location - Big Creek

Management Zone - Intermediate

Extent - Acres: 10,297
Percent of Area: 4.2

Topography - Slope Gradient: 40 - 55%
Aspect: North and East
Elevation: 4000 - 6000'

Geomorphic Features - These lands consist of mountain slopes that are incised by drainages greater than 1500 feet apart and entrenched in the slope at depths ranging from 10 to 30 feet deep. Drainages spaced closer than 1500 feet are generally less than 10 feet deep, drainages spaced at distances greater than 3000 feet may be greater than 30 feet deep. The fluvial process is the dominant slope forming process on these lands. This land type occasionally has evidence of weak glacial (periglacial) activities at the higher elevations.

Bedrock Characteristics - The granitic bedrock is moderately well fractured, moderately hard, somewhat weathered to moderately soft, moderately weathered and spalling.

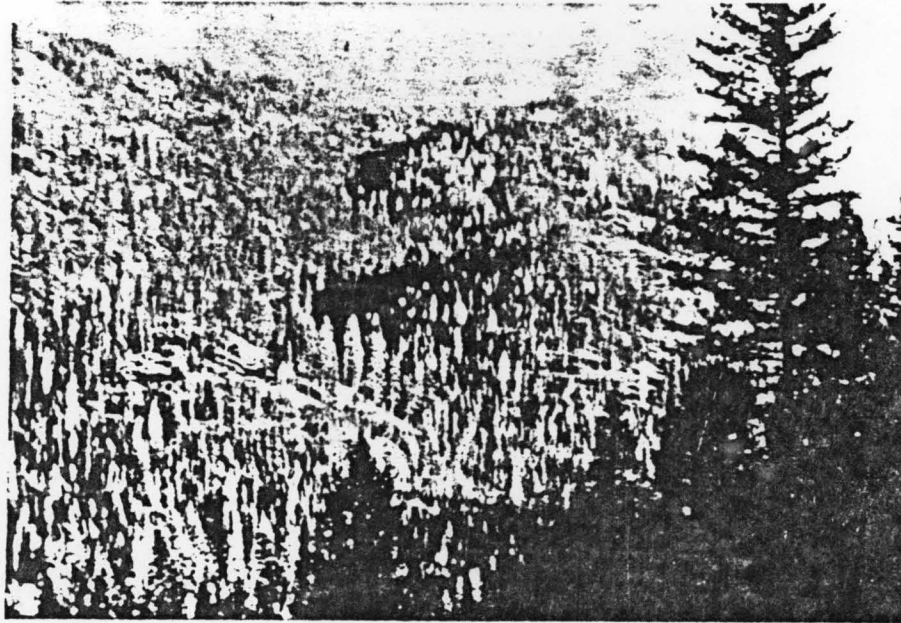
Vegetation - Most of the timber species on the District occur on this land type. The dominant ones are Douglas-fir, and ponderosa pine, larch and white fir also are common. The understory consists of brush and elk sedge and pine grass. The ground cover density for this unit ranges from 60 to 90 percent; the crown cover for the overstory ranges from 15 to 35; for the understory 15 to 30 percent.

Soils - The dominant soils on this land type are 17 (30%), 1 (35%), 15 (20%) and 9 (15%). The 11 and 9 soils generally occur at the higher elevations, with the 9 soils on the northerly exposed slopes and the 17 soils on the south aspects. The 17 soil has sandy loam surfaces over loamy sand subsurfaces and is non-stony throughout. The 9 soil has sandy loam surfaces over sandy loam and loamy sand subsurfaces. It may be stony or non-stony throughout. The 1 and 15 soils are found at the lower elevations. The 1 soils have sandy loam and loamy sand surface textures over loamy sand subsurface textures. The 15 soils have sandy loam surface textures over sandy loam subsurface textures. The average depth to bedrock in this unit is 36 to 60 inches. The 1 and 15 soils support the ponderosa pine timber species and the 17 and 9 soils support stands of Douglas-fir, white fir and larch.

Management Qualities - The inherent erosion hazard of this unit is moderate. These lands are not as hazardous for road construction as are some of the more dissected lands because the slopes are not as steep and there are fewer drainages to cross with fills. However, there is a moderate to moderately high surface erosion hazard for cut and fill slopes. On the steeper portion of this land type the mass stability hazard for cut and fill slopes ranges from moderate to moderately high. This land type has a moderate to moderately high productivity potential for timber and herbaceous vegetation.

Management Evaluation

MODERATELY DISSECTED MOUNTAIN SLOPE LAND
Map Symbol 120b



- Location - Dollar and Six-Bit Creeks
- Management Zone - Intermediate
- Extent - Acres: 36,413
Percent of Area: 14.9
- Topography - Slope Gradient: 45-60%
Aspect: Dominantly North and East
Elevation: 3500 - 6000'
- Geomorphic Features - These lands are dissected mountain slopes which are incised by drainages spaced generally between 500 and 1500 feet apart and entrenched in the slopes at depths ranging from 10 to 30 feet. Drainages spaced at distances greater than 1500 feet may be deeper than 30 feet and drainages spaced closer than 500 may be less than 20 feet deep.
- Bedrock Characteristics - The granitic bedrock is moderately fractured and the weathering ranges from moderately hard somewhat weathered to moderately soft moderately weathered. Much of the bedrock is the spalling variety.

Vegetation -

Most of the timber species in the District occur on this particular land type, however, the dominant ones are Douglas-fir, ponderosa pine, over a shrub and grass ground cover. Larch and white fir are common at the higher elevations. The ground cover density ranges from 50 to 80 percent. The crown cover for the overstory ranges between 15 and 35, and 15 and 30 for the understory.

Soils -

The dominant soils in this unit are 2 (40%), 3 (30%), 7 (15%) and 17 (15%). These soils are generally non-stony on the surface and throughout the profile. Average soil depth is 3 to 5 feet to bedrock. The number 2 soil has a dark colored loamy sand surface over a loamy sand subsurface. The number 3 soil has light colored loamy sand surfaces over loamy sand subsurfaces. The 7 soils have sandy loam to loam surfaces over sandy loam or loam subsurfaces.

Management Qualities -

This land type supports a large percentage of merchantable timber on the District and much of these lands have already been logged. These lands with deep soils and slopes over 60 percent have exhibited a moderate to moderately high hazard for road fill failures. The surface erosion hazard for road cuts and fills on this unit is moderate to moderately high and mass stability hazard for cuts and fills is moderate to moderately high. The inherent erosion hazard for this land type ranges from low to moderate. This land type has a moderate to moderately high productivity potential for timber and herbaceous vegetation.

Management Evaluation -

FAULTED BENCH LAND

Map Symbol 123



Location - Area between Cougar Rock and Stolle Meadows

Management Zone - Intermediate

Extent - Acres: 4,261
Percent of Area: 1.7

Topography - Slope Gradient: 30 - 50%
Aspect: Mostly North and East
Elevation: 4500 - 6500'

Geomorphic Features - These lands comprise a special group of lands which are remnants of block faulting activity on the District. The block faulting activity results in low bench-like ridge systems which in many cases have been modified by glacial outwash deposits and have been moderately to weakly dissected.

Bedrock Characteristics - The fracturing of the granitic bedrock ranges from slightly to moderate well fractured and the weathering ranges from moderately soft moderately weathered to soft and well weathered.

Vegetation - The dominant tree species are Douglas-fir, white fir, and ponderosa pine. The understory is generally brush, tall huckleberry and elk sedge and pine grass. The ground cover densities range from 50 - 80 percent. The crown cover for the overstory range from 15 - 35

percent and 15 - 30 percent for the understory.

Soils -

The soils on this unit are 1 (30%), 9 (25%), 15 (25%) and 14 (20%). The 1 soil is 36 inches to 48 inches to bedrock and has loamy sand textures throughout. The 9 soil has sandy loam and loam surfaces over sandy loam and loamy sand subsurfaces and is generally 36 inches or more to well weathered bedrock. The 9 soil is found at the higher elevations. The 15 soil has sandy loam textures throughout and it is 36 to 48 inches to bedrock. The 14 soil has sandy loam or loam surface textures and sandy loam to sandy clay loam subsurface textures and is 30 to 40 inches to well weathered bedrock.

Management
Qualities -

Timber productivity and herbage productivity for this unit is moderately high. The inherent erosion hazard is moderate and the surface erosion hazard for road cuts, fills and road surfaces range from moderate to moderately high. The fill slope mass stability hazard ranges from moderate to moderately high also. Because of the well weathered nature of the bedrock road construction on the steeper slopes in this unit would result in moderately high amounts of sediment to the drainages.

Management
Evaluation -

TABLE 1
SOIL PROFILE CHARACTERISTICS ^{1/}

Soil No.	Soil Family	Depth of Profile	Surface Layers	Subsoil Layers	Bedrock Characteristics
1	Alfic Cryopsamments, mixed	40"-60"+	Coarse sandy loam to loamy coarse sand, one to 7 inches thick, brown to dark brown; slightly to medium acid.	Loamy sand to sand, 25 to 70 thick, light gray to yellowish brown; medium acid	Moderately hard, somewhat weathered to soft well weathered. Moderately fractured.
2	Typic Cryoborolls, sandy mixed	40"-60"	Loamy sand or sandy loam, 10 to 16 inches thick, dark grayish brown to brown; slightly acid.	Loamy sand to fine gravelly loamy coarse sand, 24 to 50" thick, light gray to very pale brown; slightly to medium acid.	Moderately hard somewhat weathered, slightly to well fractured.
3	Lithic Hapludolls, sandy mixed frigid.	Less than 20"	Sandy loam or loamy sand, 5 to 16 thick, brown to grayish brown; slightly to medium acid.	Sandy loam or loamy sand, 2 to 10 inches thick, light gray to pale brown; slightly to medium acid.	Moderately hard, somewhat weathered, spalling, and slightly to moderately fractured.
4	Typic Cryoborolls, sandy mixed shallow	Less than 20"	Sandy loam to loamy sand, 4 to 12 inches thick, brown to dark grayish brown; slightly acid.	Loamy coarse sand to sandy loam, 4 to 12 inches thick, brown to very pale brown, slightly acid.	Soft, well weathered, and Moderately to well fractured.
5,6	Argic Cryoborolls, coarse loamy mixed	40"-60"	Sandy loam to gravelly loam, 10 to 15 inches thick, brown to dark grayish brown, neutral to slightly acid.	Sandy loam to heavy loam, 10 to 35 inches thick, pale brown to light yellowish brown; slightly acid.	Moderately hard, somewhat weathered to moderately soft, moderately weathered, and moderately fractured.
7	Typic Cryoborolls, coarse loamy mixed.	40"-60"	Sandy loam to loam, 8 to 10 inches thick, grayish brown to brown, slightly acid.	Loam to coarse sandy loam, 5 to 20 inches thick, slightly to strongly acid, over gravelly loamy sands, sands, or cobbly loamy sands.	Moderately hard, somewhat weathered, and moderately to well fractured.
7e	Typic Cryoborolls, loamy skeletal mixed.	40"-60"+	Sandy loam to loam, 8 to 10 inches thick, grayish brown to brown, slightly acid.	Loam to coarse sandy loam, 5 to 20 inches thick, slightly to strongly acid, over gravelly loamy sands, sands or cobbly loamy sands. Has more than 35% by volume of cobble.	Moderately hard, somewhat weathered, and moderately to well fractured.

^{1/} From USDA, Forest Service, Intermountain Region. 1969. Soil Hydrological Reconnaissance, Boise National Forest, Cascade Ranger District.

TABLE 1
SOIL PROFILE CHARACTERISTICS (cont'd)

Soil No.	Soil Family	Depth of Profile	Surface Layers	Subsoil Layers	Bedrock Characteristics
8	Typic Cryochrepts, coarse loamy mixed	25"-45"	Loam or sandy loam, 10 to 15 inches, dark grayish brown to brown, medium to strongly acid.	Light loam or fine gravelly sandy loam, 7 to 30 inches thick, brown to yellowish brown, medium acid.	Moderately hard, somewhat weathered, and well to extremely well fractured.
8a	Typic Cryumbrepts, sandy skeletal mixed	25"-35"	Cobbly sandy loam to cobbly loamy sand, 10 to 15 inches thick, dark grayish brown to brown, medium to strongly acid.	Cobbly gravelly loamy sand, 7 to 20 inches thick, brown to yellowish brown medium acid more than 35% by volume of angular cobble.	Moderately hard, somewhat weathered, and well to extremely well fractured.
8b	Typic Cryumbrepts, loamy skeletal mixed	30"-50"	Loam or sandy loam, 10 to 15 inches, dark grayish brown to brown, medium to strongly acid.	Light loam or fine gravelly sandy loam, 7 to 30 inches thick, brown to yellowish brown, medium acid, has 35% or more by volume of subangular cobble.	Moderately hard, somewhat weathered, and well to extremely well fractured.
9	Typic Cryochrepts, coarse loamy	30"-50"	Fine gravelly loam, 1 to 10 inches thick, grayish-brown to pale brown, medium to strongly acid	Sandy loam or fine gravelly loam, 7 to 40 inches thick, light gray to light yellowish brown, medium to strongly acid loamy sands, 10 to 20" thick.	Moderately soft, moderately weathered and well fractured.
9b	Typic Cryochrepts, loamy skeletal	40"-60"+	Cobbly fine gravelly loam, 1 to 10 inches thick, grayish-brown to pale brown, medium to strongly acid.	Sandy loam or fine gravelly loam, 7 to 40 inches thick, light gray to light yellowish brown, medium to strongly acid loamy sands, 10 to 20" thick, 35% by volume of subangular cobble.	Moderately soft, moderately weathered and well fractured.
9d	Typic Cryochrepts, ^{CO-l or sandy} loamy mixed, shallow	Less than 20"	Fine sandy loam and gravelly sandy loam. 6 to 12 inches thick, brown to dark brown, medium acid.	Gravelly loamy sand, 8 to 14 inches thick. Yellowish brown, medium acid.	Soft, well weathered and moderately fractured.

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TABLE 1
SOIL PROFILE CHARACTERISTICS (cont'd)

Soil No.	Soil Family	Depth of Profile	Surface Layers	Subsoil Layers	Bedrock Characteristics
9c	Lithic Cryochrepts, coarse loamy mixed	Less than 20"	Fine gravelly loam, 1 to 10 inches thick, grayish-brown to pale brown medium to strongly acid.	Sandy loam or fine gravelly loam 6 to 14 inches thick, light gray to light yellowish brown, medium to strongly acid.	Moderately soft, moderately weathered and well fractured.
10	Lithic Cryumbrepts, sandy mixed	Less than 20"	Loamy coarse sand, 4 to 8 inches thick, brown medium to strongly acid.	Gravelly sands, 2 to 10 inches thick, light gray or very pale brown, strongly to medium acid.	Moderately hard, somewhat weathered, spalling, and slightly fractured.
10a	Lithic Cryumbrepts, sandy skeletal mixed.	Less than 20"	¹⁵ Loam or sandy loam, 10 to 15 inches, dark grayish brown to brown, medium to strongly acid, has more than 35% by volume of angular cobble.	¹⁵ Light loam or fine gravelly sandy loam, 7 to 30 inches thick, brown to yellowish brown, medium acid, has more than 35% by volume of angular cobble.	Moderately hard, somewhat weathered, and well fractured.
10b	Lithic Cryumbrepts, loamy skeletal mixed	Less than 20"	Sandy loam or loamy coarse sand, 4 to 8 inches thick, brown medium to strongly acid, has more than 35% by volume of angular cobble.	Gravelly and cobbly loam or sandy loam, light gray or very pale brown, strongly to medium acid, has more than 35% by volume of angular cobble.	Moderately hard, somewhat weathered, and well fractured.
11	Typic Cryopsammets mixed	30"-50"	¹⁵ Fine gravelly loam, sandy loam, loam, 1 to 10 inches thick, grayish brown to pale brown, medium to strongly acid.	¹⁵ Sandy loam or fine gravelly loam 7 to 40 inches, light gray to light yellowish brown, medium to very strongly acid.	Moderately hard, somewhat weathered, and well fractured.
11a	Typic Cryorthents, sandy skeletal mixed.	30"-50"	¹⁵ Fine gravelly loam, sandy loam, loam, 1 to 10 inches thick, grayish brown to pale brown, medium to strongly acid, has more than 35% by volume of angular cobble	¹⁵ Sandy loam or fine gravelly loam 7 to 40 inches, light gray to light yellowish brown, medium to very strongly acid, has more than 35% by volume of cobble.	Moderately hard, somewhat weathered, and well fractured.
12	Entic Ultic Haploxerolls, sandy mixed (mesic)	40"-60"+	Loamy coarse sand to light sandy loam, 10 to 35 inches thick, light gray to brown.	Loamy sand, 15 to 40 inches thick light grayish brown to brown, slightly acid.	Moderately hard somewhat weathered and slightly fractured.

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TABLE 1
SOIL PROFILE CHARACTERISTICS (cont'd)

Soil No.	Soil Family	Depth of Profile	Surface Layers	Subsoil Layers	Bedrock Characteristics
12a	Entic Ultic Haploxerolls, sandy skeletal, mixed mesic	80"+	Loamy coarse sand to light sandy loam, 10 to 35 inches thick, light gray to brown.	Loamy sand, 15 to 40 inches thick, light grayish brown to brown, slightly acid, has more than 35% by volume sub-angular cobble.	Moderately hard somewhat weathered and slightly fractured.
13	Typic Cryoboralfs, coarse loamy mixed	30"-40"+	Sandy loam, 5 to 10 inches thick pale brown medium to strongly acid.	Sandy loam to sandy clay loam 10 to 30 inches thick, pale brown to brownish yellow, medium acid.	Soft well weathered and slightly fractured.
14	<i>Entic Glossoboralf</i> Typic Hapludalfs , coarse loamy mixed	40"+	Sandy loam to fine sandy loam, 3 to 10 inches thick, pale brown to grayish brown, medium acid.	Gravelly coarse sandy loam to sandy clay loam, 30 to 40 inches thick, very pale brown to light yellowish brown, medium acid.	Soft well weathered and slightly to moderately fractured.
15	Dystric Cryochrepts, coarse loamy mixed	40"-60"+	Gravelly sandy loam, 6 to 12 inches thick, pale brown, medium acid.	Gravelly sandy loam, 20 to 40 inches thick, pale brown medium acid.	Moderately hard somewhat weathered, and well fractured.
16	Lithic Xerochrepts, mixed, frigid	Less than 20"	Sandy loam or loamy coarse sand 3 to 14 inches thick, pale brown, slightly acid	Loamy coarse sand, 4 to 8 inches thick, light gray to pale brown.	Moderately hard, somewhat weathered, spalling, slightly fractured.
17	Entic Cryobrepts, sandy, mixed	40"-80"	Loam or sandy loam, 10 to 15 inches thick, dark grayish brown to brown, slightly acid.	Loamy sand, 18 to 40 inches thick, brown to light yellowish brown, slightly acid.	Soft, well weathered and moderately fractured.
18	Typic Cryochrepts, coarse loamy over sandy skeletal, mixed	80"+	Sandy loam or loam, 6 to 12 inches thick, grayish brown to brown, medium acid.	Fine gravelly sandy loam to very gravelly loamy sand, 20 to 40 inches thick, strongly acid. 35% by volume of sub-angular cobble.	Deep to bedrock, not examined.

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REMINDER TO ALL FACULTY AND STAFF

The most recent revision (11/16/78) of the draft personnel policies-- reduction in force, etc.--that was prepared by the board's legal counsel and the staff in the Office of the State Board of Education and distributed with the *University Register* of November 22 will be considered at faculty and staff meetings in the Agricultural Science Auditorium as follows:

STAFF: 4 p.m., Monday, November 27

FACULTY: 3:10 p.m., Tuesday, November 28

Please bring your copy of the draft to the appropriate meeting and plan to take part in the discussion.

L. E. O'Keefe, Chairman, Faculty Council

E. L. Enochs, Chairman, Staff Affairs Committee