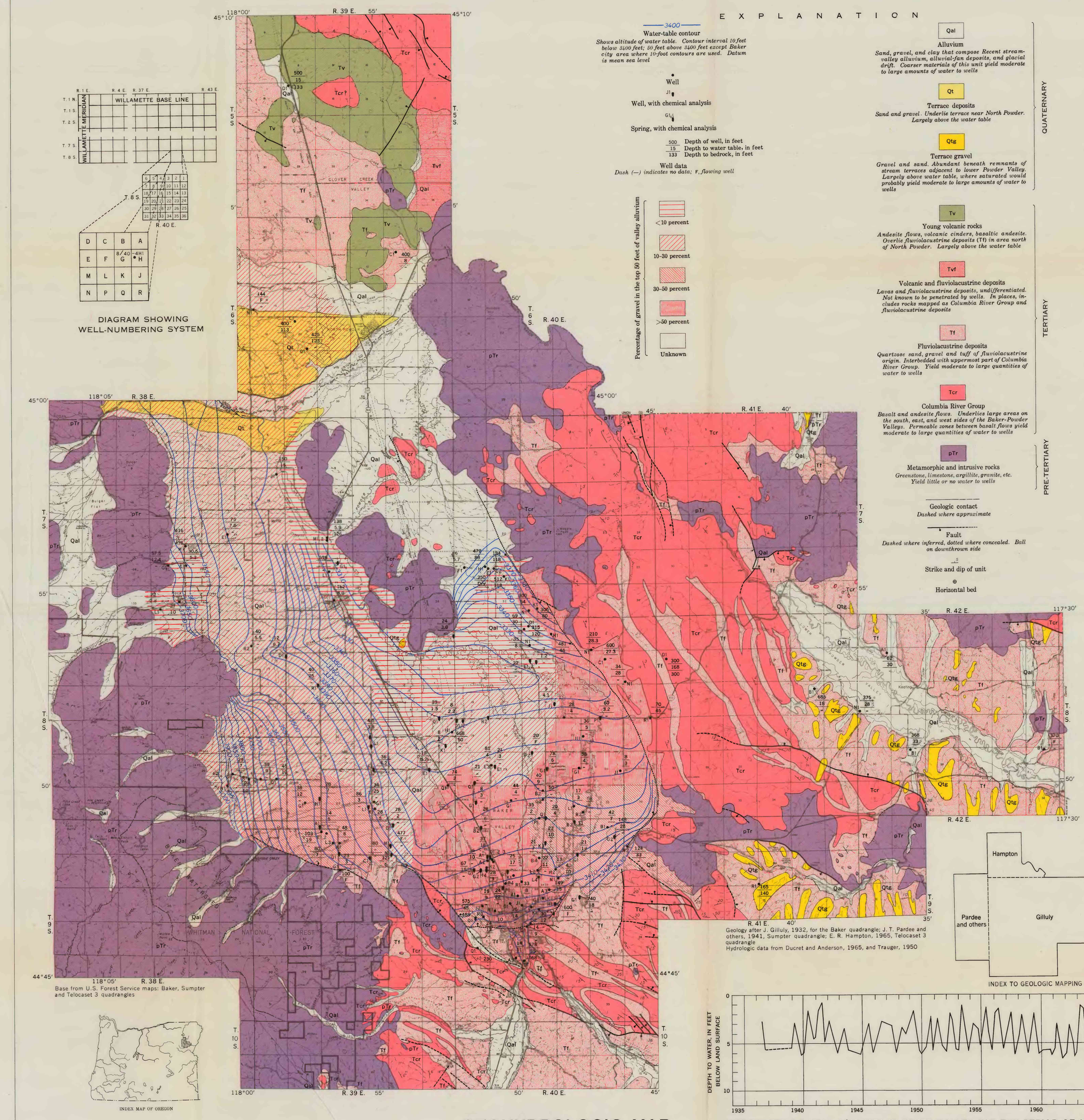
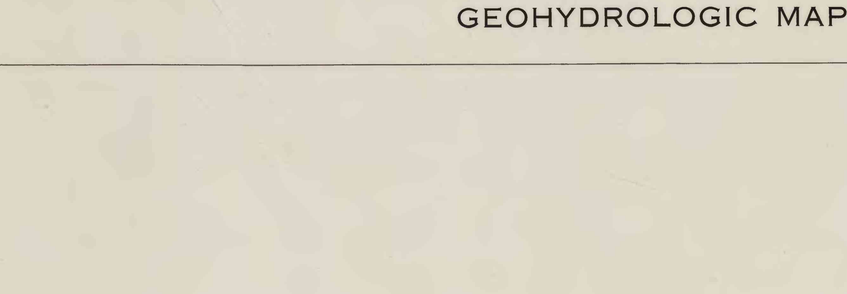
PREPARED IN COOPERATION WITH THE
OREGON STATE ENGINEER

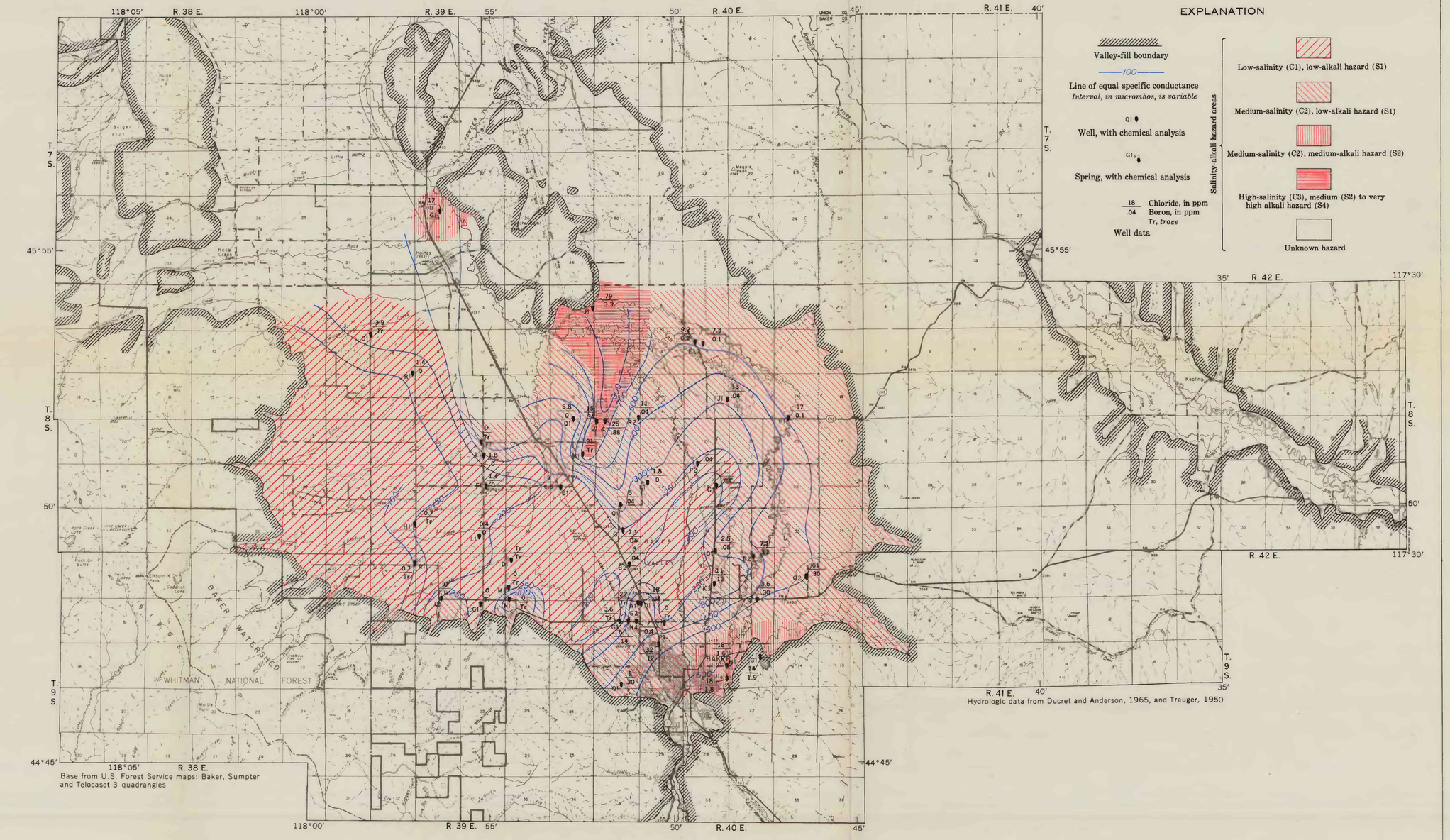


GEOHYDROLOGIC MAP

DIAGRAM SHOWING WELL-NUMBERING SYSTEM



INDEX MAP OF OREGON



WATER-QUALITY MAP

PHYSIOGRAPHY AND CLIMATE

Baker Valley is an intermountain alluviated valley whose altitude ranges from about 3,500 to 3,300 feet. The valley is bounded on the west by peaks as much as 9,100 feet high and on the north, south, and east by lower hills. Many small streams drain the surrounding hills and meander across the valley floor to the Powder River, which flows north through Baker Valley into North Powder Valley and then southeast through the Lower Powder Valley.

The climate of the valley is semiarid, with an average precipitation at the city of Baker, during 58 years of record, of 11.54 inches. During this period of record, the temperature has ranged from -25°F to 104°F. The precipitation in the area is in general proportional to the altitude, so that the higher ridges or areas receive more precipitation than the valley plain. Most of the precipitation occurs as snowfall during December, January, and February and does not usually accumulate to any appreciable depth. There is a secondary wet season in May and June, which is accompanied by electrical storms.

WELL-NUMBERING SYSTEM

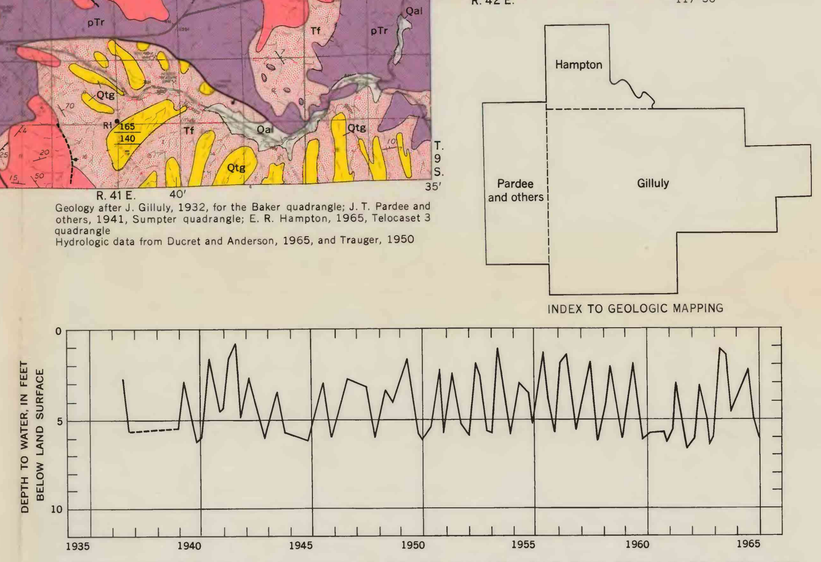
The wells are designated by symbols that indicate their locations according to the official rectangular subdivision of public lands. For example, in well 8/40-4H1, 8/40 indicates respectively the township and range (T. 8 S., R. 40 E.) south and east of the Willamette base line and meridian. The number after the hyphen indicates the section (sec.4), and the letter H indicates the 40-acre subdivision of that section. (See well-numbering system diagram.) The final digit is the serial number of the particular well in the 40-acre tract.

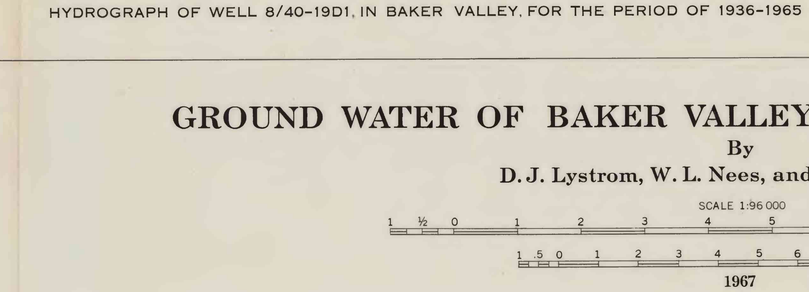
GROUND-WATER RESOURCES

The geohydrologic map shows the geology of the area, the water-table contours, and the location of the wells and springs. The depth of well, depth to water, and depth to bedrock is given for each well for which information is available. The hatched patterns show the percentage of gravel in the upper 50 feet of the alluvium, the major aquifer in the valley. This aquifer supplies water to most of the wells in the valley. A hydrograph for the period 1936-65 for a typical well in Baker Valley is shown below.

Because of the nature of this information, some of the values given (such as specific conductance, depth to water, and chloride concentration) will vary with time, season, and precipitation. The user should exercise judgment in interpolating or extrapolating the point data given on the sheets.

Most of the wells in the valley are drilled in sedimentary sand and gravel units designated on the map as fluviolacustrine deposits, terrace gravel, terrace deposits, and alluvium. These units underlie the valley floor and yield moderate to large quantities of water to wells. Surrounding and underlying the valley at depth are the volcanic, intrusive, and metamorphic rocks. The igneous and metamorphic rocks are poorly permeable and are not known to yield quantities of water adequate for domestic or stock supplies.





HYDROGRAPH OF WELL 8/40-19D1, IN BAKER VALLEY, FOR THE PERIOD OF 1936-1965

The volcanic rocks, especially the Columbia River Group, at places yield moderate to large quantities of water to wells where penetrated below the water table.

GENERAL CHEMICAL QUALITY

The water-quality map shows contours of the specific conductance of shallow ground water of the valley, the valley-fill boundary, and the locations of the wells for which chemical analyses are available. The chloride and boron content, in parts per million, are shown for the water from each well. The hatched overprint shows areas of the valley fill that have waters of various degrees of salinity-alkali hazard.

Chemical quality of water is, in general, represented by dissolved solids expressed in parts per million. Because dissolved-solids analyses were available for waters from only a few scattered locations in the project area, specific conductance (micromhos at 25°C) is used to indicate overall chemical quality in this atlas.

The ratios of dissolved solids to specific conductance, determined from available dissolved-solids analyses, were found to range from 0.65 to 0.85 for the waters (which are highly siliceous) in the Baker Valley area.

The distribution of dissolved-solids concentrations are approximated by the specific-conductance contours. The zone of highest concentrations is found in the central part of the valley fill, or "sump," area. By superimposing the water-table contours on the specific-conductance contours, it is apparent that during the summer ground water flows into the sump area.

Evapotranspiration consumes a large portion of the ground water that flows into the sump, so that the water remaining beneath this area contains higher concentrations of dissolved solids than that in surrounding areas.

Owing to the complexities of ground-water movement and recharge, the chemical quality of shallow ground water is subject to notable change with season or period. The chemical-quality data in this atlas are based on samples collected over a period of years; therefore, the chemical-quality illustrations show general patterns, but are not necessarily specific for a particular well at a particular time.

SUITABILITY OF WATER FOR IRRIGATION

The characteristics most important in determining the quality of irrigation water have been stated by the U.S. Department of Agriculture (U.S. Salinity Laboratory Staff, 1954). They are (a) the total concentration of soluble salts, (b) the relative proportion of sodium among the principal cations, and (c) the concentrations of elements possibly toxic to plants. Approximate concentrations of soluble salts can be determined by measuring the electrical conductivity of the water. Conductivity, usually expressed in micromhos, is a partial measure of the suitability of water for irrigation. The conductivity is an indicator of the amount of dissolved salts in a water, and the condition indicated by excessive conductivity values is normally called the salinity hazard.

The sodium (alkali) hazard of an irrigation water is determined by the relative proportion of sodium to magnesium and calcium. If the relative proportion of sodium is high, the hazard is high; if the relative proportion is low, the hazard is low. The significance and interpretation of the class ratings of irrigation waters, quoted from the U.S. Salinity Laboratory Staff (1954) are summarized below.

CONDUCTIVITY

Low-salinity water (C1) can be used for irrigation of most crops on most soils with little likelihood that soil salinity will develop. Some leaching is required, but this occurs under normal irrigation practices except in soils of extremely low permeability.

Medium-salinity water (C2) can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown, in most cases, without special practices for salinity control.

High-salinity water (C3) cannot be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required, and plants with good salt tolerance should be selected.

Very high salinity water (C4) is not suitable for irrigation under ordinary conditions, but may be used occasionally under special circumstances. The soils must be permeable, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching, and salt-tolerant crops should be selected.

SODIUM

The classification of irrigation waters with respect to SAR (sodium-adsorption-ratio) is based primarily on the physical condition of the soil. Sodium-sensitive plants may, however, suffer damage as a result of sodium accumulation in plant tissues when exchangeable sodium values are lower than those effective in causing deterioration of the physical condition of the soil.

Low-sodium water (S1) can be used for irrigation on almost all soils with little danger of development of harmful levels of exchangeable sodium. However, sodium-sensitive crops, such as stone-fruits and avocados, may accumulate injurious concentrations of sodium.

Medium-sodium water (S2) will present an appreciable sodium hazard in fine-textured soils having high cation-exchange capacity, especially under low leaching conditions, unless gypsum is present in the soil. This water may be used on coarse-textured or organic soils with good permeability.

High-sodium water (S3) may produce harmful levels of exchangeable sodium in most soils and will require special soil management—good drainage, high leaching, and organic matter additions. Gypsiferous soils may not develop harmful levels of exchangeable sodium from such waters. Chemical amendments may be required for replacement of exchangeable sodium, except that amendments may not be feasible with waters of very high salinity.

Very high sodium water (S4) is generally unsatisfactory for irrigation purposes except at low and perhaps medium salinity, where the solution of calcium from the soil or use of gypsum or other amendments may make the use of these waters feasible.

BORON

Boron is essential to normal growth of most plants, though the quantity required is usually very small. A deficiency of boron produces striking effects on many plant species. A given concentration of boron in irrigation water may be toxic to certain plant species, whereas the same concentration of boron is approximately that required for normal growth of very tolerant plants.

Concentrations of less than 1 ppm (part per million) are nontoxic to most plants. Water samples from only four wells in the project area had boron concentrations of more than 1 ppm. The concentrations of boron (1.6, 1.8, and 1.9 ppm) in three of these, collected in and near Baker, would be detrimental to certain citrus crops and fruit trees, none of which, however, are grown in the area. Analysis of water from well 8/39-1J1, however, indicated a boron content of 3.27 ppm, which exceeds the limits for successful growth of most crops, with the exception of alfalfa and other very tolerant plants (Wilcox, 1948).

CHLORIDE

The chloride content of the tested waters is not high enough to be objectionable. The highest chloride content was 91 ppm in water sampled from a well in the sump area of the valley. The upper limit of chloride in drinking water recommended by the U.S. Public Health Service (1962) for use on interstate carriers is 250 ppm. The range of chloride for waters sampled from the valley wells was from 0 to 91 ppm.

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GROUND WATER OF BAKER VALLEY, BAKER COUNTY, OREGON

By
D. J. Lystrom, W. L. Nees, and E. R. Hampton

SCALE 1:96 000

1 ½ 0 1 2 3 4 5 6 7 8 9 10 MILES

1 .5 0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

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