DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
STATES OF IDAHO, NEVADA, UTAH, AND WYOMING

UNIVERSITY OF UTAH
RESEARCH INSTITUTE
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HYDROLOGIC INVESTIGATIONS
ATLAS HA-487 (SHEET 3 OF 3)

GS 1975-0022

GROUND WATER

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VALLEY GROUND-WATER RESERVOIRS

Valley ground-water reservoirs, which consist of the saturated valley-fill deposits, are the chief developed source of ground water in the region. The occurrence and movement of water in the consolidated rocks surrounding the valleys are controlled largely by geologic structures such as faults, joints, and folds, and the resulting complex aquifer systems are difficult to delineate or exploit. Water from these aquifer systems discharges in springs and seeps and sustains the base flow of streams, or moves into the valley ground-water reservoirs as subsurface recharge. Most of the water that moves through the consolidated rocks ultimately discharges within the drainage basin in which it originates as precipitation, but some water may travel long distances in interbasin flow systems and discharge in a basin far removed from its place of origin. Development of ground water in some of the valley reservoirs has resulted in overdraft and long-term declines of water levels. Such areas in Nevada and Utah have been designated "critical ground-water areas" and further development is restricted or controlled by the State water administrators.

GROUND-WATER DEVELOPMENT

Most of the valley ground-water reservoirs have undergone some degree of development by wells. At least 23 areas of ground-water development yielded more than 10,000 acre-feet to wells annually, and withdrawal by wells from all developed valley ground-water reservoirs totaled about 1 million acre-feet in 1965. Natural discharge from the valley ground-water reservoirs—exclusive of those in areas of upstream depletion (see runoff map, sheet 2) averages about 2.4 million acre-feet annually. The estimated about 3 million acre-feet) for upstream depletions in the nominal water supply (sheet 1) includes natural ground-water discharge in the areas of upstream depletions.

Estimated natural ground-water discharge, exclusive of areas of upstream depletion, and withdrawal by wells

Subregion	Discharge (Acre-feet per year)	
	Natural discharge (Average)	Withdrawal by wells (1965)
Bear River	40,000	175,000
Great Salt Lake	630,000	300,000
Sevier Lake	329,000	280,000
Humboldt	480,000	140,000
Central Lahontan	205,000	42,000
Tonopah	680,000	98,000
Total (rounded)	2,400,000	1,000,000

GROUND-WATER STORAGE

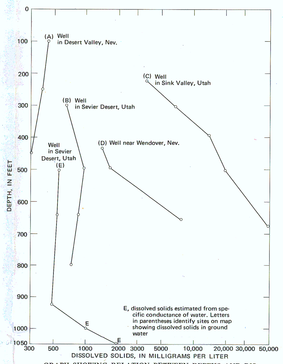
The estimated 190 million acre-feet of water stored in the upper 100 feet of saturated material in the valley ground-water reservoirs represents only a small fraction of the total ground-water storage in the region. The thickness of the saturated fill in most of the valleys exceeds 100 feet, and in some valleys it exceeds 1,000 feet. Moreover, large volumes of water are stored in the consolidated rocks of the region. Therefore, the 190 million acre-feet is the minimum volume of water that is economically recoverable from storage. Not all the ground water in storage is fresh, however; most of the valley reservoirs contain some saline water, especially those reservoirs near the major terminal lakes and sinks. Hence, full development of the valley ground-water reservoirs would require desalinization of some of the water.

Estimated ground-water storage in the upper 100 feet of saturated valley-fill deposits

State	Assumed average specific yield (percent)	Area (acres)	Storage in upper 100 feet of saturation (1,000 acre-feet)
BEAR RIVER SUBREGION			
Idaho	10	538,000	5,400
Utah	10	537,000	5,400
Wyoming	10	123,000	1,200
Total			12,000
GREAT SALT LAKE SUBREGION			
Idaho	10	108,000	1,100
Nevada	10	404,000	4,000
Utah	10	1,490,000	14,900
	5	5,980,000	29,900
Total			49,900
SEVIER LAKE SUBREGION			
Utah	10	1,670,000	16,700
	5	990,000	5,000
Total			21,700
HUMBOLDT SUBREGION			
Nevada	10	3,910,000	39,100
	5	908,000	4,500
Total			43,600
CENTRAL LAHONTAN SUBREGION			
Nevada	10	1,530,000	15,300
	5	166,000	830
Total			16,130
TONOPAH SUBREGION			
Nevada	10	5,060,000	50,600
GREAT BASIN REGION			
Idaho		646,000	6,500
Nevada		11,980,000	114,300
Utah		10,700,000	71,900
Wyoming		123,000	1,200
Total (rounded)			190,000

QUALITY OF GROUND WATER

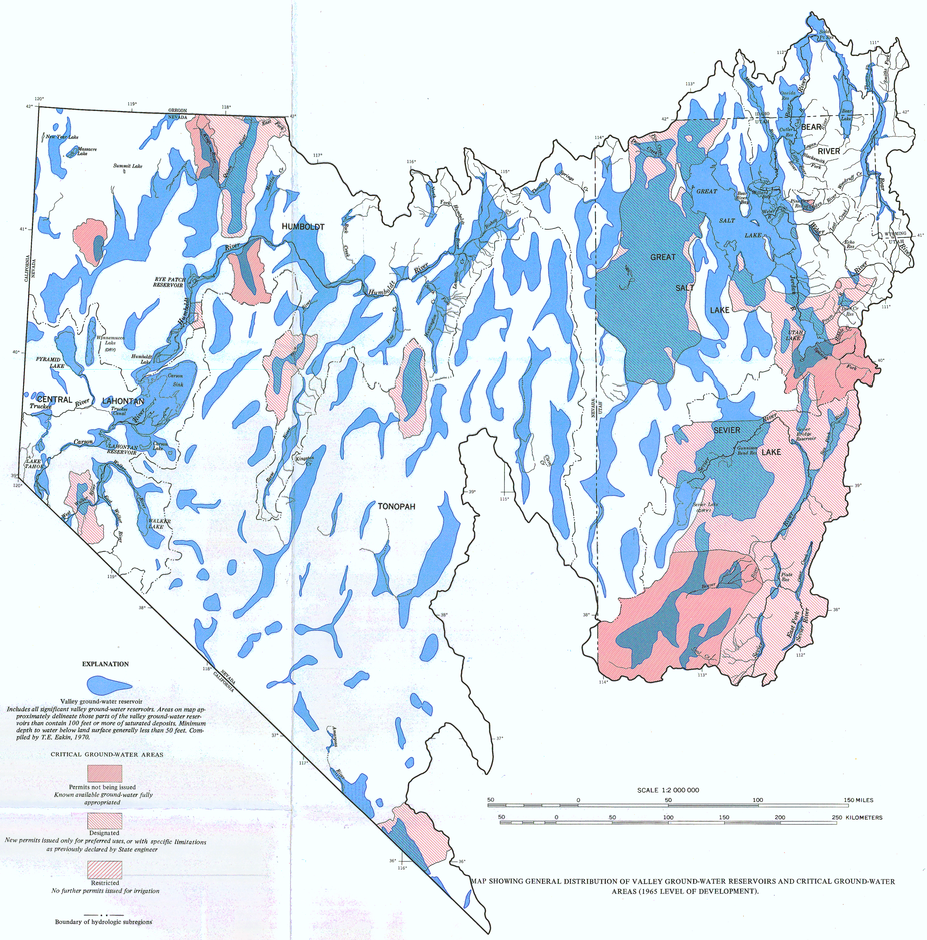
The general suitability of water for most uses is closely related to the dissolved-solids content of the water, although concentrations of individual materials in the water can limit its usefulness for some purposes. For domestic use, the U.S. Public Health Service (1962) recommends water with a maximum dissolved-solids content of 500 mg/l (milligrams per liter), but waters containing up to 1,000 mg/l are generally used for domestic supplies where better water is not available. The combination of dissolved-solids content and SAR (sodium-adsorption ratio) is often used to evaluate the suitability of the water for irrigation use. The larger the dissolved-solids content and SAR of the water, the less suitable the water is likely to be for irrigation. However, these factors must be considered in conjunction with soil types and drainage conditions, as well as the presence of substances, such as boron, that are toxic to certain plants.



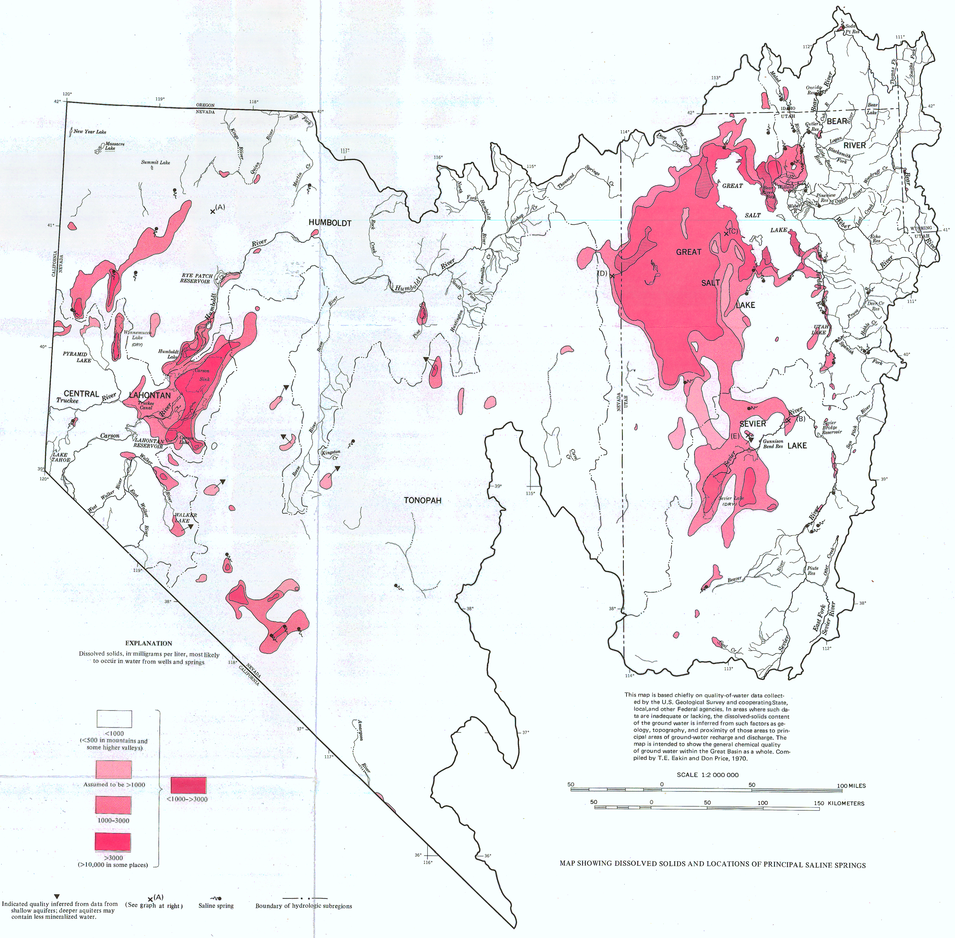
GRAPH SHOWING RELATION BETWEEN DEPTHS AND DISSOLVED SOLIDS IN WATER FROM SELECTED WELLS.

QUALITY VARIATION WITH DEPTH

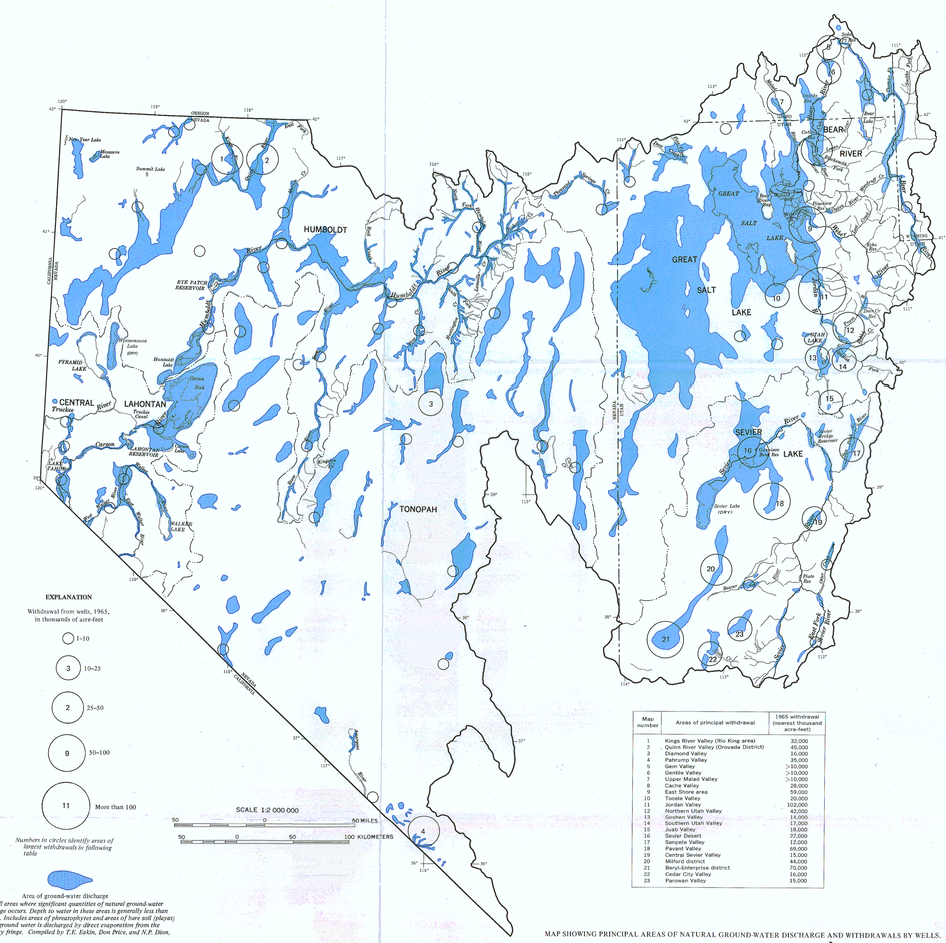
In most places, there is an increase in dissolved solids in ground water with increasing depth. In some parts of the region, however, shallow ground water is more highly mineralized than deeper ground water. This condition commonly occurs in and near terminal sinks of topographically closed valleys where deep, relatively fresh water moves upward under artesian pressure into shallower aquifers and dissolves minerals along its upward course. In these terminal areas, the mineral content of shallow ground water is concentrated by evapotranspiration.



MAP SHOWING GENERAL DISTRIBUTION OF VALLEY GROUND-WATER RESERVOIRS AND CRITICAL GROUND-WATER AREAS (1965 LEVEL OF DEVELOPMENT).

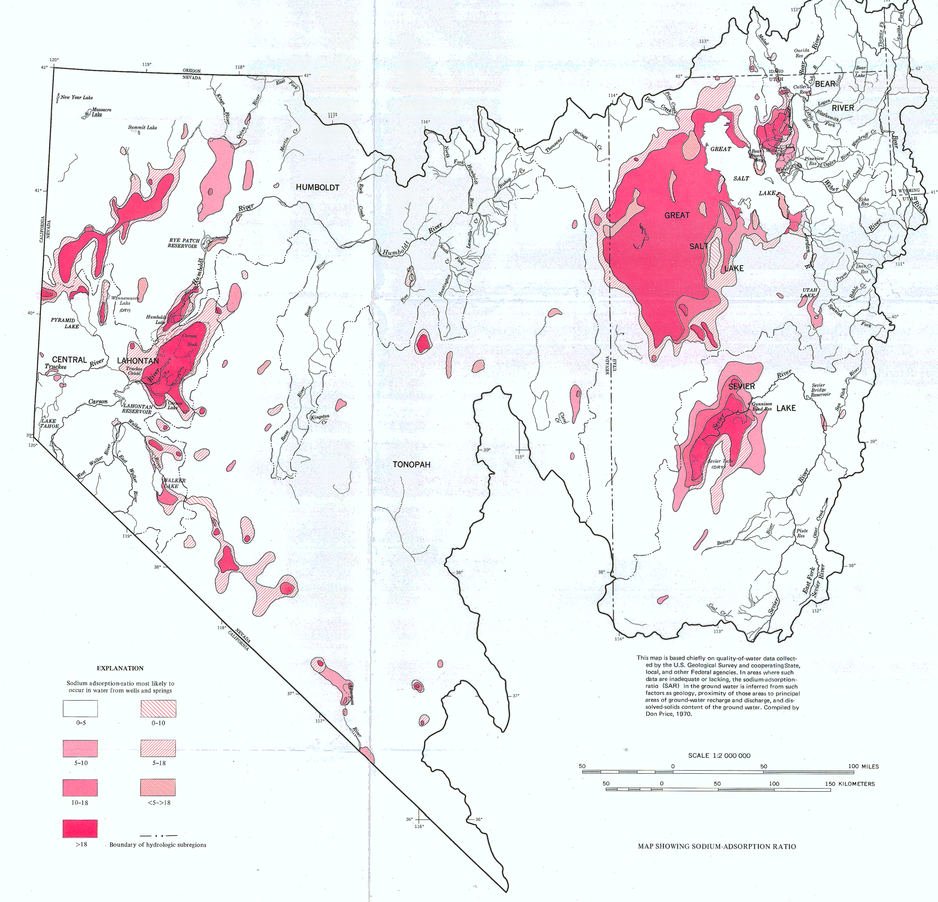


MAP SHOWING DISSOLVED SOLIDS AND LOCATIONS OF PRINCIPAL SALINE SPRINGS



Map number	Areas of principal withdrawal	1965 withdrawal (nearest thousand acre-feet)
1	Kings River Valley (Ohio-King area)	32,000
2	Quinn River Valley (Orovada District)	45,000
3	Diamond Valley	16,000
4	Pahrump Valley	35,000
5	Gem Valley	>10,000
6	Grass Valley	>10,000
7	Upper Reese River Valley	28,000
8	Cache Valley	38,000
9	East Shore area	59,000
10	Tooele Valley	20,000
11	Jordan Valley	102,000
12	Northern Utah Valley	42,000
13	Southern Utah Valley	17,000
14	Southern Utah Valley	17,000
15	Juab Valley	18,000
16	Sevier Desert	27,000
17	Sanpete Valley	12,000
18	Pavant Valley	69,000
19	Central Sevier Valley	15,000
20	Milford district	44,000
21	Beryl-Enterprise district	16,000
22	Escalante Valley	28,000
23	Parowan Valley	15,000

MAP SHOWING PRINCIPAL AREAS OF NATURAL GROUND-WATER DISCHARGE AND WITHDRAWALS BY WELLS.



MAP SHOWING SODIUM-ADSORPTION RATIO

WATER IN THE GREAT BASIN REGION; IDAHO, NEVADA, UTAH, AND WYOMING

By
Don Price, T. E. Eakin, and others

1974

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1974