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MAPS SHOWING GROUND-WATER UNITS AND WITHDRAWAL, BASIN AND RANGE PROVINCE, UTAH

by

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INTRODUCTION

This report on ground-water levels, springs, and depth to ground water in the Basin and Range province of Utah (see index map) was prepared as part of a program of the U.S. Geological Survey to identify prospective regions for further study relative to isolation of high-level nuclear waste (Bedinger, Sargent, and Reed, 1984), utilizing program guidelines defined in Sargent and Bedinger (1984). Also included in this report are selected references on pertinent geologic and hydrologic studies of the region. Other map reports in this series contain detailed data on ground-water quality, surface distribution of selected rock types, tectonic conditions, areal geophysics, Pleistocene lakes and marshes, and mineral and energy resources.

GROUND-WATER UNITS

This map shows boundaries of ground-water units, generalized directions of ground-water flow at the water table, areas of natural discharge to streams and lakes, areas of natural discharge by evapotranspiration in areas underlain by ground water at shallow depths, areas of discharge by wells where large withdrawals have caused depressions in the water table, and the distribution of consolidated rock outcrops and areas underlain by basin fill.

Ground-water unit boundaries are based primarily on ground-water divides or surface streams. The water table is used to delineate ground-water units in a manner analogous to the way land-surface topography is used to delineate drainage areas. Where information is available, water-level contour maps were used to define the boundaries. Where water levels were lacking, ground-water boundaries were drawn on topographic drainage divides that were assumed to overlie water-table divides.

Ground-water units shown on the map may contain one or more areas of natural recharge and natural discharge or ground-water withdrawal by wells. Some ground-water units comprise closed flow systems at the water table; that is, no ground-water flow occurs across the ground-water unit boundaries. However, between other units, ground-water flow may occur across some unit boundaries in basin-fill or consolidated-rock aquifers.

In the Basin and Range province, ground water occurs in basin-fill deposits and consolidated rocks. The basin fill consists mostly of unconsolidated to semi-indurated sedimentary deposits. The material ranges from poorly sorted to moderately sorted mixtures of gravel, sand, silt, and clay that were derived from the consolidated rocks in the nearby mountains. Evaporite deposits, limestone, conglomerate, and volcanic rocks are present in places in the unit. Some of the basins may contain as much as 9,000 feet of basin fill, but the most permeable rocks and most of the recoverable ground water is in the upper 1,000 feet of the unit.

The consolidated rocks consist mostly of sedimentary and volcanic rocks, with lesser amounts of metamorphic and intrusive rocks. The consolidated rocks make up the mountain ranges that border the basins and are the principal source of sedimentary material to the basin fill.

Few wells exist in the consolidated rocks compared to the number of wells in the basin fill. The yield of wells tapping many consolidated rock units is due to interception of water in fracture zones. In some areas in the Basin and Range province, carbonate rock is extensive in the subsurface and provides interconnection between alluvial basins through fractures and solution channels. Although the consolidated rock commonly has very low permeability and very low rates of ground-water flow, the entire ground-water system, including basin fill and bedrock, must be treated as one integral system.

Areally extensive ground-water flow systems discharge to the Great Salt Lake and to the Great Salt Lake Desert. The ground-water units in these large discharge areas have been delineated into subunits based on ground-water divides.

Because the ground-water units are drawn largely from water levels in relatively shallow wells, flow in deep, regional flow systems is not reflected in the ground-water units. Interbasin flow is inferred, from hydrologic-budget data, to occur in deep aquifers beneath the water table; such as from Tule Valley to Fish Springs Flat. This interbasin flow is indicated by arrows on the map.

GROUND-WATER WITHDRAWAL

Ground-water withdrawal has been estimated in previous areal ground-water studies in Utah. Estimates of withdrawal are given in the following table. The accompanying map shows the areas for which withdrawal is tabulated and the ground-water unit boundaries.

Area	Withdrawal (acre feet per year)	Period of or year of estimate	Source of information
1. Grouse Creek Valley (Utah and Nevada)	2,000	1967	Hood and Price, 1970.
	3,000	1979	Herbert and others, 1980.
2. Park Valley	500	1968	Hood, 1971a.
	2,600	1979	Herbert and others, 1980.
3. Curlew Valley (Utah and Idaho)	27,200-33,500	1969-1972	Baker, 1974.
	33,500		
(Utah only)	25,700	1979	Herbert and others, 1980.
4. Hansel Valley	Negligible	1969	Hood, 1971b.
5. Blue Creek Valley	500	1969-1970	Bolke and Price, 1972.
6. Promontory Mountains	2,000	1970	Stephens, 1974a.
7. Lower Bear River	4,000	1970-1971	Bjorklund and McGreevey, 1974.
8. Cache Valley	28,600	1967	Bjorklund and McGreevey, 1971.
	26,700	1968	Do.
	32,000	1969	Do.
	28,000	1979	Herbert and others, 1980.
9. Pilot Valley (Utah and Nevada)	200	1971	Stephens and Hood, 1973.
10. Northern Great Salt Lake Desert	(1)4,700	1971	Stephens, 1974a.
11. West Shore	(2)100	1970	Stephens, 1974a.
12. East Shore	51,000	1960	Bolke and Waddell, 1972.
	28,000	1969	Do.
	46,000	1979	Holmes and others, 1982.

13. Southern Great Salt Lake Desert	1,500	1978	Gates and Kruer, 1981.
14. Sink Valley	40	1970	Price and Bolke, 1970; Stephens, 1974a.
15. Skull Valley	5,000	1965	Hood and Waddell, 1968.
16. Tooele Valley	28,000	1977	Razem and Steiger, 1981.
	30,000	1979	Herbert and others, 1980.
17. Salt Lake (Jordan) Valley	107,000	1964-1968	Hely, Mower, and Harr, 1971b.
	136,000	1979	Herbert and others, 1980.
18. Deep Creek Valley (Nevada and Utah)	600	1966-1967	Hood and Waddell, 1969.
19. Dugway Valley-Government Creek area	300	1967-1975	Stephens and Sumsion, 1978.
20. Rush Valley	4,800	1966	Hood and others, 1966.
21. Cedar Valley	1,700	1965	Feltis, 1967.
	4,400	1979	Herbert and others, 1980.
22. Northern Utah Valley	50,000	1963	Cordova and Subitzky, 1965.
	73,600	1979	Clark, D.W., and Appel, C.L., USGS, written commun., 1983; Herbert and others, 1980.
23. Southern Utah and Goshen Valleys	43,000	1966	Cordova, 1969.
	33,700	1979	Clark, D.W., and Appel, C.L., USGS, written commun., 1983; Herbert and others, 1980.
24. Fish Springs Flat	Negligible	1976-1977	Bolke and Sumsion, 1978.
25. Sevier Desert	30,000	1964	Mower and Feltis, 1968.
	45,000	1979	Herbert and others, 1980.

26. Northern Juab Valley	14,900	1965	Bjorklund, 1967.
27. Yuba Dam-Leamington Canyon area (Southern Juab, Sage, Little, Scipio, and Round Valleys)	6,600	1963	Bjorklund and Robinson, 1968.
28. Snake Valley	7,000	1964	Hood and Rush, 1965.
	18,000	1977	Gates and Kruer, 1981.
	15,700	1979	Herbert and others, 1980.
29. Tule Valley	35	1973-1974	Stephens, 1977.
30. Pavant Valley	60,000	1959	Mower, 1965.
	86,000	1979	Herbert and others, 1980.
31. Pine Valley	5	1972	Stephens, 1976.
32. Wah Wah Valley	Negligible	1972-1973	Stephens, 1974b.
33. Milford	57,000	1970-1971	Mower and Cordova, 1974.
	49,000	1979	Herbert and others, 1980.
34. Beaver Valley	9,900	1974	Mower, 1978.
	11,400	1979	Herbert and others, 1980.
35. Beryl-Enterprise	80,000-100,000	1977	Mower, 1982.
36. Parwan-Cedar City Valleys	73,000	1973-1975	Bjorklund and Sandberg, 1978.
	62,000	1979	Herbert and others, 1980.
37. Central Virgin River Basin	6,600	1968-1970	Cordova, Sandberg, and McConkie, 1972.
	19,900	1979	Herbert and others, 1980.

[1] Includes withdrawal by wells and discharge to springs and drains.

[2] Includes withdrawal by wells and discharge to springs.

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