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HYDROLOGIC RECONNAISSANCE OF THE FISH SPRINGS FLAT AREA, TOOELE, JUAB, AND MILLARD COUNTIES, UTAH

by

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Table 3.--Estimated average annual volumes of precipitation and ground-water recharge

(Areas of precipitation zones calculated from pl. 1; all estimates are rounded.)

Precipitation zone (inches)	Area (acres)	Precipitation (acre-feet)	Recharge	
			Percentage of precipitation	Acre-ft
Consolidated and unconsolidated rocks				
6- 8	326,000	190,000	1	1,900
Unconsolidated rocks				
8-10	16,000	12,000	1	120
Consolidated rocks				
8-10	30,000	22,000	3	660
10-12	4,000	3,700	8	300
12-16	2,400	2,800	10	280
16-20	800	1,200	25	300
Subtotal	37,200	29,700		1,540
Totals (rounded)	379,000	232,000		4,000

Surface runoff in the Fish Springs Flat area was estimated using information from previous reports in this series. Stephens (1974, 1976, 1977) estimated runoff for Wah Wah, Pine, and Tule Valleys, and Stephens and Sumsion (1978) estimated runoff in the Dugway Valley-Government Creek area. The estimates of runoff in these previous studies were based on channel-geometry measurements. In all the areas except the Dugway Valley-Government Creek area, where runoff was negligible, estimated runoff was about 1 percent of the total precipitation. Using that percentage, therefore, the runoff for the Fish Springs Flat area would be about 2,000 acre-ft (2.5 hm^3) annually. Some additional water leaves the area as runoff, but this is the result of overflow water from the spring ponds at the wildlife refuge and is classified as ground-water discharge. The amount of overflow is unknown, but it is probably small and occurs during periods of low evaporation. The overflow eventually drains northward into the Great Salt Lake Desert.

Some runoff is periodically stored in reservoirs for livestock. These reservoirs are few in number and are dry most of the time, so that their importance as dependable water sources is minimal.

Ground water

Recharge

The amount of recharge from infiltration of precipitation was estimated using a method developed by Eakin and others (1951, p. 79-81) and modified by Hood and Waddell (1968, p. 22-23). Using this method, the average annual amount of recharge derived from infiltration of precipitation for the Fish Springs Flat area was estimated to be about 4,000 acre-ft (5 hm^3) (table 3).

Another source of water to the Fish Springs Flat area may be interbasin flow through fault zones, fractures, and solution channels in the rocks of the mountain masses that otherwise are considered boundaries of the ground-water reservoir in the unconsolidated deposits in Fish Springs Flat. Also, some subsurface inflow may occur through unconsolidated deposits that underlie passes, such as Sand Pass near the southwestern part of the area. Total inflow from outside the drainage area is unknown but significant, as indicated by the ground-water balance discussed later in this report.

Occurrence and movement

The data available for the Fish Springs Flat area, although scant, indicate that ground water occurs under both artesian and water-table conditions. The springs that comprise the Fish Springs group and most of the other springs in the area rise under artesian pressure (supported in some cases by hydrothermal convection, such as at Wilson Hot Springs) along fracture zones associated with concealed faults. Water-level data for wells (C-11-12)15bba-1 and (C-14-12)4cbc-1 (table 5) and lithologic information from drillers' logs for these wells (table 6) indicate that ground water occurs under artesian conditions on the higher valley slopes. The water-bearing material in these areas is principally coarse sand and gravel (QTu in table 2); and when penetrated by wells, the water rises above the bed in which it was encountered. In the lowland areas, particularly the salty mudflats in the northern part of Fish Springs Flat, shallow auger holes show that the potentiometric surface is within a few feet of the land surface. Locally, such as in recharge areas on alluvial fans or sand dunes, ground water occurs under water-table conditions or sometimes as perched water.

Ground water moves generally from areas of recharge toward the unconsolidated valley fill and then along the axis of the valley northward toward the Great Salt Lake Desert (pl. 1). The water moves at a relatively slow rate through the ground-water system primarily due to the small amount of recharge and probably also due to the low permeability of the unconsolidated materials in the central part of the valley. The amount of water leaving the study area as subsurface flow is estimated to be less than 100 acre-ft (0.12 hm^3) per year.

Some ground water may move into the Fish Springs Flat area from other basins such as Tule Valley (Stephens, 1977, p. 16 and 21) through pathways provided by fractures and solution channels in the consolidated rocks forming the boundaries of the area. This water either moves into the unconsolidated fill or into fractures which give rise to springs that discharge at the land surface. These fractures have a higher permeability than the adjacent or overlying valley fill. Some of the springs along fracture zones, such as the Fish Springs group, discharge large quantities of water. Additionally, some ground water may enter the area through the unconsolidated material that comprises low divides, such as Sand Pass.

Storage

Because of the scant data available, the amount of water in storage can only be estimated. The quantity of water recoverable from the upper 100 ft (30 m) of the saturated valley fill (unconsolidated alluvial and lacustrine deposits) is the product of the volume of saturated fill and the specific yield of that material.[1] In the Fish Springs Flat area, the volume of the upper 100 ft (30 m) of saturated valley fill is about 22 million acre-ft (27,000 hm^3). Because of the abundance of fine-grained sediment in the fill, the specific yield is estimated to range from less than 1 to about 5 percent. Assuming the average specific yield of the fill to be about 2.5 percent, the total recoverable storage in the upper 100 ft (30 m) of saturated valley fill is about 550,000 acre-ft (680 hm^3). Most of this water is slightly to moderately saline.

[1] Specific yield of a rock or soil is the ratio of the volume of water it will yield by gravity after being saturated to the volume of the rock or soil.