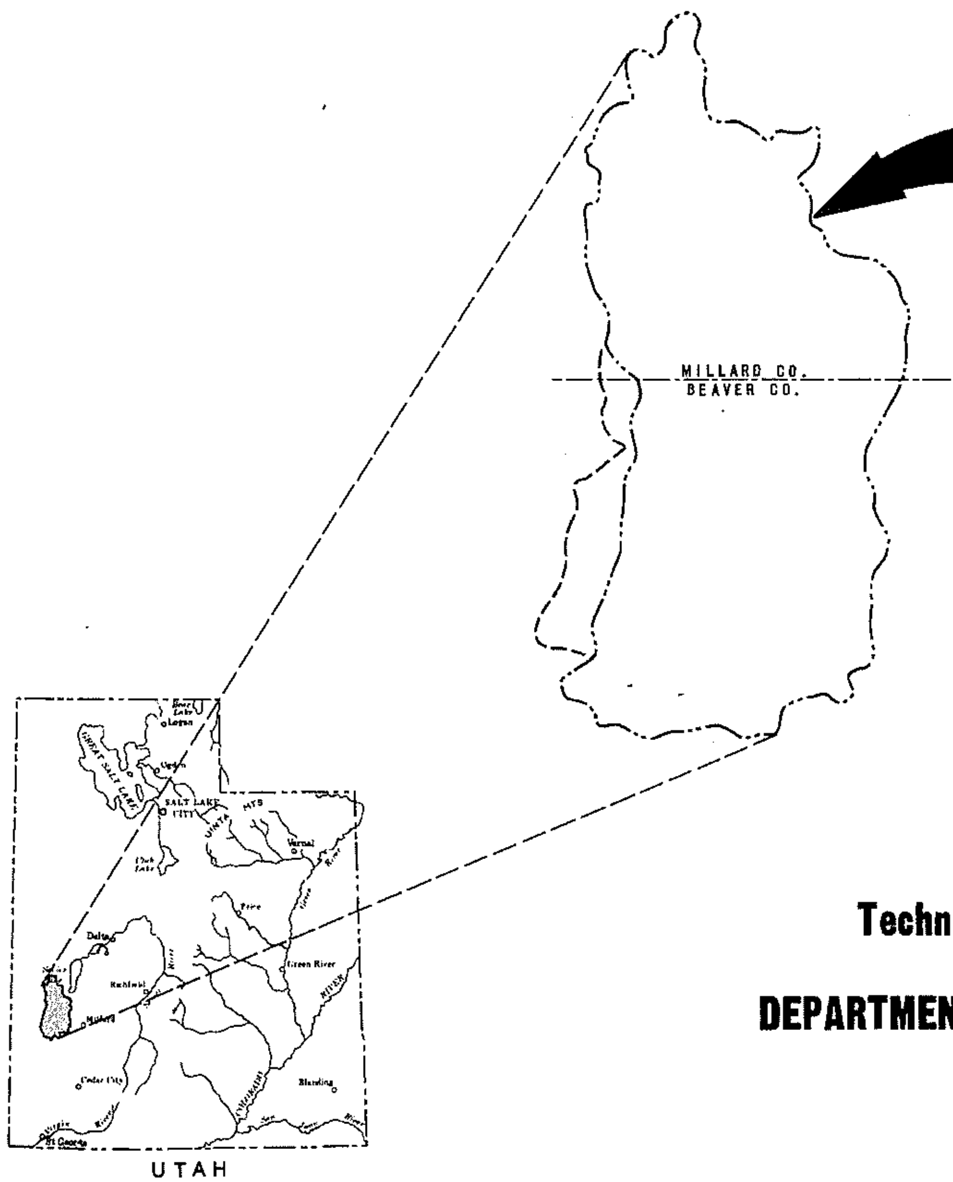
HYDROLOGIC RECONNAISSANCE OF THE WAH WAH VALLEY DRAINAGE BASIN, MILLARD AND BEAVER COUNTIES, UTAH



WAH WAH VALLEY DRAINAGE BASIN

Technical Publication No. 47
State of Utah
DEPARTMENT OF NATURAL RESOURCES
1974

CALVIN L. RAMPTON
Governor

This report was prepared as a part of the Statewide cooperative water-resource investigation program administered jointly by the Utah Department of Natural Resources, Division of Water Rights and the United States Geological Survey. The program is conducted to meet the water administration and water-resource data needs of the State, as well as the water information needs of many units of government and the general public.

Gordon Harmston
Executive Director
Department of Natural Resources

Dee C. Hansen
State Engineer
Division of Water Rights

Copies available at
Utah Department of Natural Resources
Division of Water Rights
442 State Capitol
Salt Lake City, Utah

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES

Technical Publication No. 47

HYDROLOGIC RECONNAISSANCE OF THE WAH WAH VALLEY DRAINAGE BASIN, MILLARD AND BEAVER COUNTIES, UTAH

by

Jerry C. Stephens, Hydrologist
U.S. Geological Survey

Prepared by
the United States Geological Survey
in cooperation with
the Utah Department of Natural Resources
Division of Water Rights

1974

CONTENTS

of the total precipitation falls there. The corresponding annual rate of runoff would average about 0.02 inch (0.5 mm), which is comparable to the rate calculated for the total drainage area above site 1 (table 3).

Several small reservoirs have been constructed in Wah Wah Valley to intercept local runoff. These reservoirs store small quantities of water for livestock at times during the fall and spring, but during much of the summer they are dry. A reservoir at Wah Wah Ranch, which reportedly has a surface area of about 60 acres (24 hm^2) and storage capacity of about 200 acre-feet (0.247 hm^3), stores water diverted by pipeline from Wah Wah Springs. Both Dutchman and Newhouse Reservoirs (pl. 1) also store some water diverted from the springs.

There is no surface outflow from the Wah Wah Valley drainage basin; thus, the long-term average consumptive use of surface water by evaporation and transpiration must equal the difference between total precipitation and ground-water recharge within the basin (table 4). The estimated consumptive use of surface water (excluding springflow), therefore, averages more than 97 percent of the total precipitation.

Ground water

Ground water is present in most of the rock units in the Wah Wah Valley drainage basin. At only a few locations are these rocks known to yield water to wells or springs, however, because the top of the saturated zone generally is well below the land surface.

Meinzer (1911, p. 119) concluded that "Conditions are not favorable for finding ground water in this [Wah Wah Valley] region. Beneath the broad slopes that flank the valley water is almost certainly at a great depth, and may be entirely absent. Even along the axis of the valley the gradient is in most places so steep and the altitude so much higher than that of Sevier Lake that it is not likely that water would be found near the surface."

Meinzer's assessment of the ground-water potential of Wah Wah Valley has been verified by exploratory drilling and attempted well developments since 1911. The well records (table 6) indicate the general lack of success of efforts to develop ground-water supplies from shallow wells in the valley.

Figure 3 and table 1 show, respectively, the areal variations in annual precipitation and the average monthly precipitation in Wah Wah Valley. Estimated average annual precipitation over the entire basin is about 9 inches (229 mm), or 290,000 acre-feet (358 hm^3). An estimated 7,000 acre-feet (8.63 hm^3), or about 2½ percent of the total precipitation, recharges the ground-water reservoir. Table 4 gives the derivation of these estimates, based on a method described by Eakin and others (1951, p. 79-81) and modified for use in western Utah by Hood and Waddell (1968, p. 22-23).

Table 4.--Estimated average annual volumes of precipitation and ground-water recharge

(Areas of precipitation zones measured from pl. 1 and fig. 3)

Precipitation zone (inches)	Area in zone (acres)	Estimated annual precipitation		Estimated annual recharge	
		Feet	Acre-feet	Percent of precipitation	Acre-feet
Area where Quaternary and Tertiary sedimentary rocks are exposed					
Less than 8	134,800	0.54	72,800	0	0
8-10	55,200	.75	41,400	0	0
10-12	27,800	.92	25,600	3	770
12-16	2,200	1.17	2,600	6	160
More than 16	100	1.38	140	20	30
Subtotal	220,100		142,540		960
Area where Tertiary igneous rocks, Paleozoic sedimentary rocks, and Precambrian metamorphic rocks are exposed					
Less than 8	19,300	0.54	10,400	0	0
8-10	27,700	.75	20,800	0	0
10-12	71,900	.92	66,100	3	1,980
12-16	36,900	1.17	43,200	6	2,590
More than 16	6,900	1.38	9,500	20	1,900
Subtotal	162,700		150,000		6,470
Total (rounded)	380,000		290,000		7,000

In addition to recharge from precipitation in the drainage basin, the ground-water reservoir in Wah Wah Valley probably receives recharge by subsurface flow from the Pine Valley drainage basin, which is on the west side of the Wah Wah Mountains. The quartzite and carbonate rock strata underlying the central and southern Wah Wah Mountains, except near the intrusive rocks in T. 26 S., are inclined toward Wah Wah Valley, and recharge on the outcrops west of the surface-drainage divide presumably moves downdip toward the east under the divide. The inferred location of the ground-water divide in this area is shown on plate 1. The Wah Wah Valley ground-water basin thus encompasses about 28,000 acres (113 km^2) of Pine Valley; estimated recharge from west of the surface divide is about 3,000 acre-feet (3.70 hm^3) annually. Thus, the total ground-water recharge to Wah Wah Valley is estimated to average about 10,000 acre-feet (12.3 hm^3) annually.

The following sections describe briefly the significant features of the hydrogeologic units that yield water in the drainage basin and assess the present and potential ground-water development in each.

Quaternary and Tertiary sedimentary rocks

Stream-channel alluvium

Thin deposits of alluvium in and along the channels of Quartz and Willow Creeks and Wah Wah and Grover Washes (Qay, pl. 1) contain ground water. These unconsolidated deposits probably are less than 20 feet (6 m) thick. They are at least partly saturated much of the time, however, because infiltration of runoff from upslope areas supplies intermittent recharge, and locally seepage from adjacent volcanic rocks may supply relatively constant recharge.

The flows of Quartz and Willow Creeks on June 21, 1973, were observed to disappear entirely into the stream-channel deposits within a short distance after leaving the volcanic rocks. Channel losses were calculated as follows:

	Discharge	
Quartz Creek at (C-28-15)36bba	0.71 ft^3/s	(0.020 m^3/s)
Quartz Creek at (C-28-14)19ddb	0	
Loss	.71 ft^3/s	(0.020 m^3/s)
Approximate length of reach	2.1 mi	(3.4 km)
Average loss	.34 $ft^3/s/mi$	(0.0059 $m^3/s/km$)
Willow Creek at (C-28-14)21bbc	1.26 ft^3/s	(0.036 m^3/s)
Willow Creek at (C-28-14)16acc	0	
Loss	1.26 ft^3/s	(0.036 m^3/s)
Approximate length of reach	1.0 mi	(1.6 km)
Average loss	1.26 $ft^3/s/mi$	(0.0225 $m^3/s/km$)

At the time of these observations, the flow of both creeks consisted primarily of discharge from the Tertiary igneous rocks of water temporarily stored during the melting of the abnormally large snowpack of the preceding winter.

Much of the ground water moving downgradient through the stream-channel alluvium is consumed by evapotranspiration before it reaches the valley floor. Seveys Well, (C-28-13)28ddc-1, and Willow Spring, (C-29-15)2dad-S1, are the only known sources yielding ground water from stream-channel alluvium in the drainage basin; together they discharge an estimated 40 acre-feet (0.049 hm^3) of water annually. (See tables 6 and 8.) Both of these sources are developed in areas of natural discharge. The structures installed at the two sites capture a part of the discharge that would otherwise be consumed by evapotranspiration and divert it elsewhere for livestock use. Evapotranspiration probably accounts for an additional 30-50 acre-feet (0.037-0.061 hm^3) of ground water annually from the channel deposits. Ground water moving through