STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
Carson City

Castle Park well, 37/69–9c; Pilot Range in background.

WATER RESOURCES–RECONNAISSANCE SERIES

REPORT 56

WATER-RESOURCES APPRAISAL OF THE PILOT CREEK VALLEY AREA, ELKO AND WHITE PINE COUNTIES, NEVADA

By
J. R. Harrill

Prepared cooperatively by the
Geological Survey, U.S. Department of the Interior

1971

The estimates exclude the flow of Spring Creek and the other drainage systems which drain into Deep Creek. If the spring-fed flow of Spring Creek is included, the total estimated runoff in the Nevada part of Deep Creek Valley would be about 5,000 acre-feet per year. This is in reasonably good agreement with the estimate of 6,000 acre-feet per year derived by Hood and Waddell (1969, p. 17) for the Nevada part of Deep Creek Valley.

The estimated surface flow across the Nevada-Utah State line is about 100 acre-feet per year in the Great Salt Lake Desert and about 3,500 acre-feet per year in Deep Creek Valley.

Recharge from Precipitation

On the valley floors where precipitation is small, little water infiltrates directly to the ground-water reservoir. Much of the precipitation is evaporated before and after infiltration. Some adds to soil moisture and is later transpired. Greater precipitation in the mountains provides most of the recharge. Water reaches the ground-water reservoir by infiltration of runoff in the mountains, on the alluvial apron and the valley floor, and by lateral underflow from the consolidated rocks.

A method described by Eakin and others (1951, p. 79-81) is used to estimate the average annual recharge from precipitation. The method assumes that a percentage of the average annual precipitation becomes ground-water recharge. The estimated average annual recharge for the five valleys listed in table 4 ranges from about 2 to 4 percent of the estimated total precipitation. A range of 3 to 7 percent is typical of the amounts usually calculated by this method for the desert basins of Nevada. Thus, the estimated recharge for Pilot Creek Valley, Great Salt Lake Desert, Antelope Valley, and Deep Creek Valley, which is less than 3 percent of the estimated precipitation, may be slightly low.

Subsurface Inflow from Goshute Valley

A potential hydraulic gradient exists from Goshute Valley to the Great Salt Lake Desert and part of Pilot Creek Valley. Interbasin flow is possible where consolidated rocks in the Toana Range and northern Goshute Mountains, which separate the valleys, are sufficiently permeable. The best agreement between measured and modeled water-level altitudes in Pilot Creek Valley was obtained after assuming that about 1,000 acre-feet per year of subsurface inflow from Goshute Valley occurred. However, these analog results are inconclusive because of other unresolved hydrologic factors. Moreover, there is about 10,000 acre-feet of ground-water discharge in Goshute Valley, and no large imbalance between recharge and discharge was noted by Eakin (1951). Consequently, the amount of subsurface inflow may be small in comparison to the magnitude of leakage from Tippett and Antelope Valleys. Provisional estimates of subsurface inflow of about 1,000 acre-feet per year to the Great Salt Lake Desert and 1,000 acre-feet per year to Pilot Creek Valley are used in this report. These estimates should be revised when additional data are available.

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

Precipitation zone (altitude in feet)	Area (acres)	Estimated annual precipitation			Estimated recharge from precipitation	
		Range (inches)	Average (feet)	Average (acre-feet)	Percentage of precipitation	Acre-feet per year
PILOT CREEK VALLEY						
Above 9,000	778	>20	1.8	1,400	25	350
8,000-9,000	2,270	15-20	1.5	3,400	15	510
7,000-8,000	9,950	12-15	1.1	11,000	7	770
6,000-7,000	29,500	8-12	.8	24,000	3	720
Below 6,000	171,000	<8	.5	86,000	--	--
Total (rounded)	213,000			130,000	2	2,400
GREAT SALT LAKE DESERT						
Above 9,000	1,460	>20	1.8	2,600	25	650
8,000-9,000	5,320	15-20	1.5	8,000	15	1,200
7,000-8,000	20,800	12-15	1.1	23,000	7	1,600
6,000-7,000	55,100	8-12	.8	44,000	3	1,300
Below 6,000	244,000	<8	.5	120,000	--	--
Total (rounded)	327,000			200,000	2	4,800
ANTELOPE VALLEY (Northern part)						
Above 9,000	47	>20	1.8	85	25	21
8,000-9,000	2,190	15-20	1.5	3,300	15	500
7,000-8,000	13,500	12-15	1.1	15,000	7	1,000
6,000-7,000	69,400	8-12	.8	56,000	3	1,700
Below 6,000	85,400	<8	.5	43,000	--	--
Total (rounded)	171,000			120,000	3	3,200
ANTELOPE VALLEY (Southern part)						
8,000-9,000	156	15-20	1.5	230	15	34
7,000-8,000	4,200	12-15	1.1	4,600	7	320
6,000-7,000	47,700	8-12	.8	38,000	3	1,100
Below 6,000	30,000	<8	.5	15,000	--	--
Total (rounded)	82,100			58,000	3	1,500
DEEP CREEK VALLEY (Nevada part)						
Above 9,000	404	>20	1.8	730	25	180
8,000-9,000	1,710	15-20	1.5	2,600	15	390
7,000-8,000	7,620	12-15	1.1	8,400	7	590
6,000-7,000	41,500	8-12	.8	33,000	3	1,000
Below 6,000	82,800	<8	.5	41,000	--	--
Total (rounded)	134,000			86,000	3	2,200

(Continued)

Table 4.--Estimated precipitation and recharge--Continued

Precipitation zone (altitude in feet)	Area (acres)	Estimated annual precipitation			Estimated recharge from precipitation	
		Range (inches)	Average (feet)	Average (acre-feet)	Percentage of precipitation	Acre-feet per year
			TIPPETT VALLEY			
Above 9,000	280	>20	1.8	500	25	120
8,000-9,000	11,300	15-20	1.5	17,000	15	2,600
7,000-8,000	28,200	12-15	1.1	31,000	7	2,200
6,000-7,000	81,300	8-12	.8	65,000	3	2,000
Below 6,000	102,000	<8	.5	51,000	--	--
Total (rounded)	223,000			160,000	4	6,900

OUTFLOW FROM THE VALLEY-FILL RESERVOIR

Evapotranspiration

Natural evapotranspiration of ground water occurs where the saturated part of the valley fill is at shallow depth. Discharge occurs principally in three ways: (1) by evapotranspiration in areas of phreatophytes; (2) by direct evaporation from bare soil where the capillary fringe extends to within a short distance of the land surface; and (3) by evapotranspiration in areas of spring discharge where ground water intersects the land surface.

The principal phreatophyte in the areas shown on plate 1 is greasewood. Some shadscale and rabbitbrush are included in the area along Pilot Creek, and saltbush is present along the margins of playas in the Great Salt Lake Desert. Local patches of greasewood are present on the valley floor of northern Antelope Valley and are not shown on plate 1. The estimated depth to water beneath these areas is 80 to 100 feet. Field observations indicated that this occurrence of greasewood is most commonly associated with stabilized sand dunes of low relief or local surficial depressions, and the plants probably receive most of their moisture from local precipitation that falls on the valley floor and not ground-water inflow from the surrounding mountains.

Phreatophytes, mainly greasewood, are established on areas at the south end of Pilot Creek Valley and in parts of the Great Salt Lake Desert north of Wendover, which in the early 1950's were primarily bare-soil playas. This recent growth was noticed when areal photographs taken in 1954 were compared with the 1969 distribution of vegetation and was confirmed by residents of Wendover, who reported that they had formerly driven across these areas at high speed but could no longer do so because of the vegetation. Determination of the cause for this growth of phreatophytes was beyond the scope of this report.

Estimates of the natural evapotranspiration of ground water are given in table 5. The estimates are based on rates of consumption of ground water as described by Lee (1912), White (1932), Young and Blaney (1943), Houston (1950), and Robinson (1962). Little information is available concerning the rate at which ground water is evaporated from bare soil on playas. Depth to water below playas on the Great Salt Lake Desert is probably less than 10 feet. An estimated ground-water evaporation rate of 0.1 foot per year is used in these areas.

Water levels beneath the southern part of Antelope Valley and Tippett Valley are greater than 50 feet. Hence, evapotranspiration losses from ground water in these areas are considered negligible.

DEVELOPMENT

Irrigation in 1969 was limited to about 100 acres of alfalfa and about 60 acres of hay in Pilot Creek Valley, about 800 acres of meadow along Spring Creek in Deep Creek Valley, and about 40 acres of hay and pasture in Tippett Valley. Areas in Pilot Creek and Tippett Valleys are irrigated by streamflow (in part spring-fed) piped or diverted in ditches from nearby mountains. The area in Deep Creek Valley is irrigated by diversions from Spring Creek and from shallow ground water. Two irrigation wells had been drilled in Pilot Creek Valley, but in 1969, no crops had been irrigated by pumping ground water.

Springs and spring-fed streams have been developed for stock and domestic purposes in all of the valleys. About 20 acre-feet per year of spring discharge is piped from Pilot Creek Valley to Montello, Nevada, for use as a public supply, and about 260 acre-feet per year of discharge from Cottonwood, Cedars, and Miners Canyon Springs is piped into the Wendover public-supply system and used mostly in Utah. Additional stock-water supplies have been developed by drilling stock wells (see table 10 at the back of report) and in parts of Antelope, Tippett, and Deep Creek Valleys by constructing retaining reservoirs along ephemeral stream channels.

In 1969, pumpage for stock and domestic purposes probably did not exceed 10 acre-feet in any of the valleys. Streamflow diversions for irrigation were about 400 acre-feet in Pilot Creek Valley, and about 1,000 acre-feet in Deep Creek Valley.