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Water Resources Division

WATER-RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA, 1972-73

BY

J. D. LARSON

WATER-RESOURCES INVESTIGATIONS 61-73

PREPARED IN COOPERATION WITH THE
U.S. BUREAU OF SPORT FISHERIES AND WILDLIFE

MAY 1974

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Las Vegas, Nevada

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Data report describes the effects of irrigation pumping on the water level in Devils Hole and the flow from springs in Ash Meadows, southern Nevada, in 1972-73. The pool in Devils Hole is the only known native habitat of desert pupfish, Cyprinodon diabolis.

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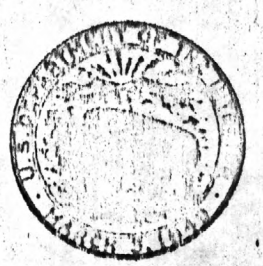

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UNITED STATES DEPARTMENT OF THE INTERIOR

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WATER-RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA, 1972-73

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Introduction

The U.S. Geological Survey collected water-level, spring-flow, and power-consumption data in the Devils Hole area from July 1972 through June 1973. The work was financed by the Geological Survey from June through November, and by the U.S. Bureau of Sport Fisheries and Wildlife from December through June 1973.

Continuous recorders were used to monitor water levels in Devils Hole, three observation wells, and the flow from five springs. Monthly meter readings of six electrically powered irrigation wells provided a record of power consumption, which in turn is a measure of the amount of water pumped.

The purpose of the work is to observe the effects of ground-water withdrawals for irrigation on the level in Devils Hole and the flow from the major springs in the area. The pool in Devils Hole, which is a collapsed fault structure, is the only known native habitat of desert pupfish, Cyprinodon diabolis.

Location of Devils Hole

Devils Hole is a 40-acre tract of Death Valley National Monument, about 65 miles west of Las Vegas, Nevada, 12 miles northeast of Death Valley Junction, Calif., and 30 miles east of the Park Headquarters, Death Valley National Monument (fig. 1). Devils Hole is in the SW¼SE¼ sec. 36, T. 17 S., R. 50 E., in the Amargosa Desert along the east side of the area known as Ash Meadows and is reached from Death Valley Junction by taking a paved road, which trends northeastward, to the California-Nevada boundary, then northward along a dirt road past Ash Meadows Rancho. Devils Hole is at the south end of an unnamed ridge.

The area studied is in the Ash Meadows quadrangle, Nevada-California (scale 1:62,500), of the U.S. Geological Survey (1952). The quadrangle shows the principal highways, the secondary and dirt roads in the vicinity of Devils Hole, the principal springs in Ash Meadows, and the topography (contour interval 40 feet).

Water-Level Fluctuations

Figure 2 shows the locations of Devils Hole and the wells in Ash Meadows. Devils Hole and three wells were measured monthly in addition to the operation of continuous recorders during the 1973 fiscal year.

The water level in Devils Hole is referenced to a copper nail and washer driven into the wall on the south side of the opening. Figure 3 shows the fluctuations in Devils Hole for 1967, prior to pumping, through June 1973. Beginning in 1969, the water level declined from about 1.4 feet below the copper washer to a maximum of 3.87 feet below in September 1972. A net water-level rise of 0.07 foot occurred from July 1972 to June 1973.

Figure 4 shows the detailed water-level fluctuations in Devils Hole during the year ending June 30, 1973. The bar graph below the water-level graph shows total monthly power consumption at six production wells in Ash Meadows. The inverse correlation between kilowatt-hours consumed for pumping and changes in water level in Devils Hole is good.

Observation well 17S/50-36dd is about 900 feet east of Devils Hole (fig. 2). The fluctuations (fig. 5) are similar to those in Devils Hole. The well has been used for artificial recharge, beginning in June 1973. The artificial recharge, supplied from King Spring at a rate of 400 gpm (gallons per minute), was begun as an emergency measure to stop the decline of water level in Devils Hole. Figure 4 shows that the water level in Devils Hole rose near the end of June, which probably was due to a decrease in pumping rather than effects of artificial recharge. Because of the erratic pumping schedule, no direct effects of injection have been identified on the hydrograph of Devils Hole.

Observation well 17S/51-31dd is about 1 mile east of Devils Hole and about 1.5 miles north of the major well field in Ash Meadows. Figure 6 shows fluctuations in response to pumping. In contrast to Devils Hole and well 36dd, the water level in June 1973 was considerably lower than during the summer of 1972. The well seems to be more strongly affected by pumping than Devils Hole and well 36dd.

Observation well 18S/51-7db2 is at the west edge of the major well field in Ash Meadows, near Point of Rocks (fig. 2). As shown in figure 7, the water level responds dramatically to pumping, ranging from flowing (about 2 gpm) during the winter to about 18 feet below land surface during the pumping seasons in 1972 and 1973.

Spring-Flow Fluctuations

The locations of the principal springs in Ash Meadows are shown in figure 2. The springs are generally alined in a northwest-trending direction and are structurally controlled, probably by faulting southwest of the springs. Figure 8 shows the fluctuation in spring flow of five selected springs for the period July 1972-June 1973.

Fairbanks Spring is at the northern edge of Ash Meadows. This spring has not been influenced by nearby pumping as much as many of the other springs. However, the abrupt decrease in flow, starting in late May 1973, followed by a recovery in mid-June, seems related to pumping.

Crystal Pool is the largest spring in the area, and was only slightly affected by pumping during the year. However, in 1971 when the local well 6, 500 feet northeast of the spring, was pumped, spring flow decreased by as much as 2.2 cubic feet per second (1,000 gpm).

Point of Rocks Springs is the combined flow of several orifices, Indian Rock Spring and several others which are collectively called Indian seeps (fig. 2). These springs have been shown to be slightly affected by pumping nearby, but not as much as would be expected considering their close proximity to the main well field.

Jack Rabbit Spring is about 1 mile southwest of the major well field and is materially affected when well 2 is pumped. Pumping from this well affects the flow of Jack Rabbit Spring within a few minutes after the well is turned on. With continued pumping, the flow in Jack Rabbit Spring soon drops to zero, and the spring pool itself has dried up completely by the end of the pumping season. Figure 8 shows zero flow for much of the year.

Big Spring is about 2 miles south of Point of Rocks and the major well field. Thus far, it has shown very little response to nearby pumping. There has been a slight decrease in flow over the past few years and this in part may be the result of nearby pumping.

All the springs tend to show a decrease in flow during the summer season. Some of this decrease in flow is undoubtedly due to increased evapotranspiration during the hot summer growing season.

Power Consumption

Power-consumption data for the irrigation wells in the area are collected monthly at wells 1, 2, 3, 7, 8, and 17 (fig. 2). Electric meters are read each month to obtain total kilowatt hours of electricity used. Table 1 is a summary of the power used at each well, and totals are by wells and by months for the period July 1972-June 1973. No attempt has been made in this monitoring program to convert the kilowatt-hours consumed to acre-feet. Total power used for the year was slightly more than 2 million kilowatt-hours.

Table 1.--Power consumption, in kilowatt-hours, for irrigation wells in Ash Meadows

Date	Well number						Total
	1	2	3	7	8	17	
1972							
July	42,190	38,090	2,115	9,420	7,750	149,320	248,885
Aug.	52,890	38,260	44,880	9,250	—	149,240	294,520
Sept.	42,850	35,230	39,920	8,790	—	128,000	254,790
Oct.	56,970	35,280	41,320	9,200	—	121,760	264,530
Nov.	32,970	32,260	47,680	3,790	—	120,680	237,380
Dec.	24,100	—	20,840	—	—	40	44,980
1973							
Jan.	60	945	0	0	3,390	270	4,665
Feb.	30	0	0	5,840	7,125	0	12,995
Mar.	6,700	5,330	0	0	9,360	0	21,390
Apr.	59,300	33,900	32,600	11,060	0	104,250	231,110
May	41,090	30,470	24,900	9,790	6,110	138,400	250,760
June	24,690	48,160	41,360	9,820	11,200	72,840	208,070
Total	383,840	297,925	295,615	66,960	44,935	984,800	2,074,075

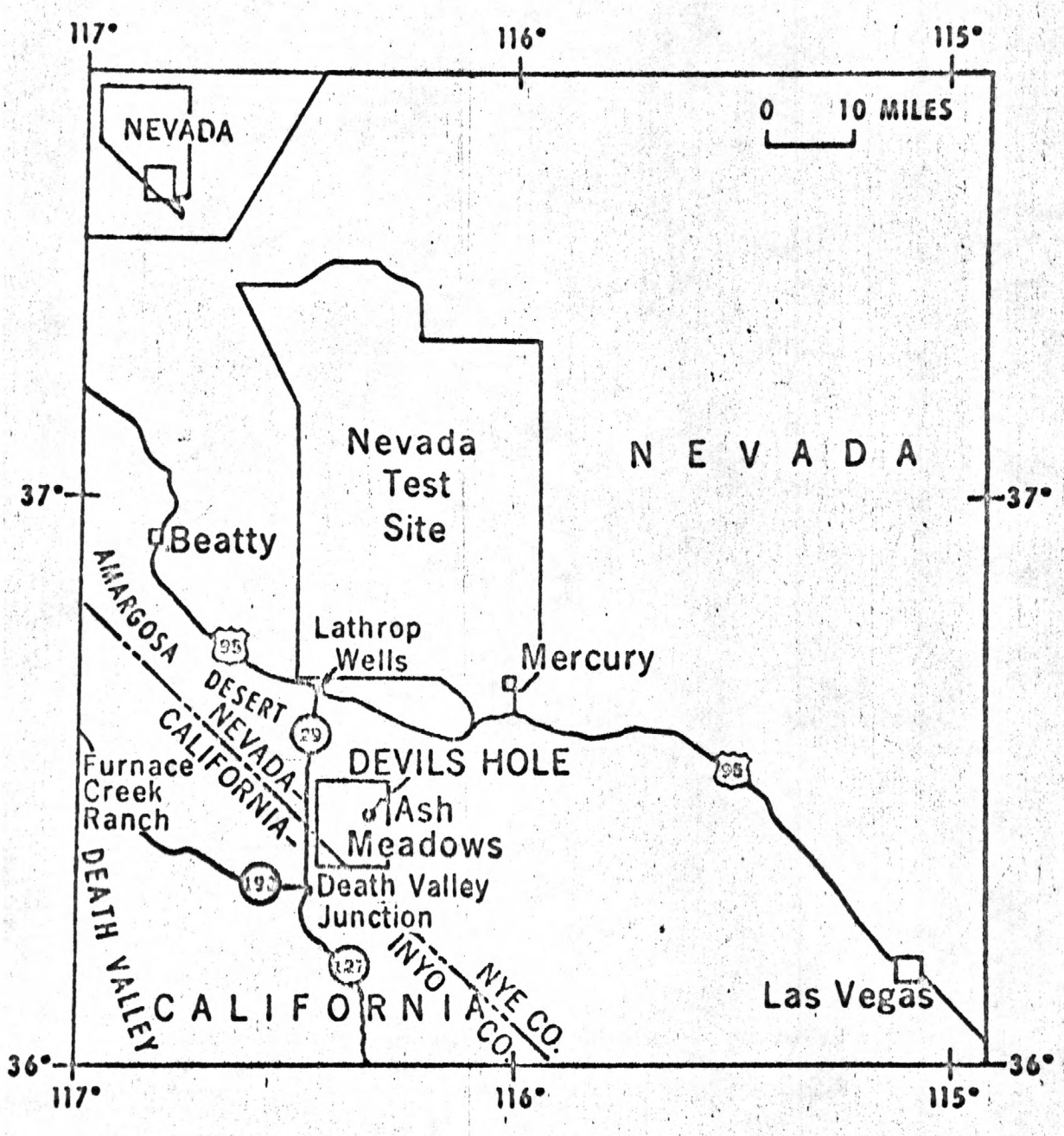

Figure 1.—Index map showing location of Ash Meadows and Devils Hole.

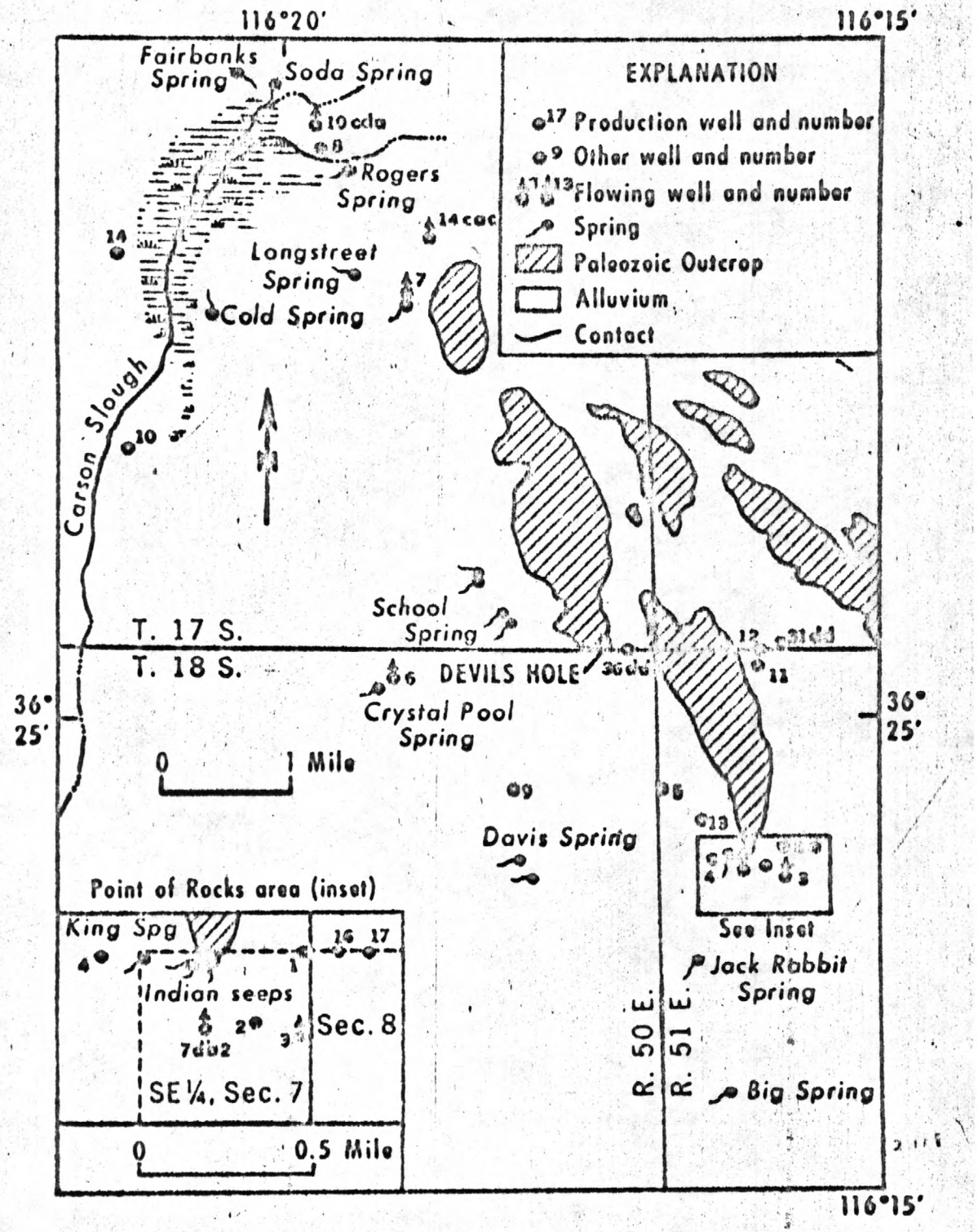

Figure 2.—Locations of Devils Hole, wells, and springs in Ash Meadows, Nye County.

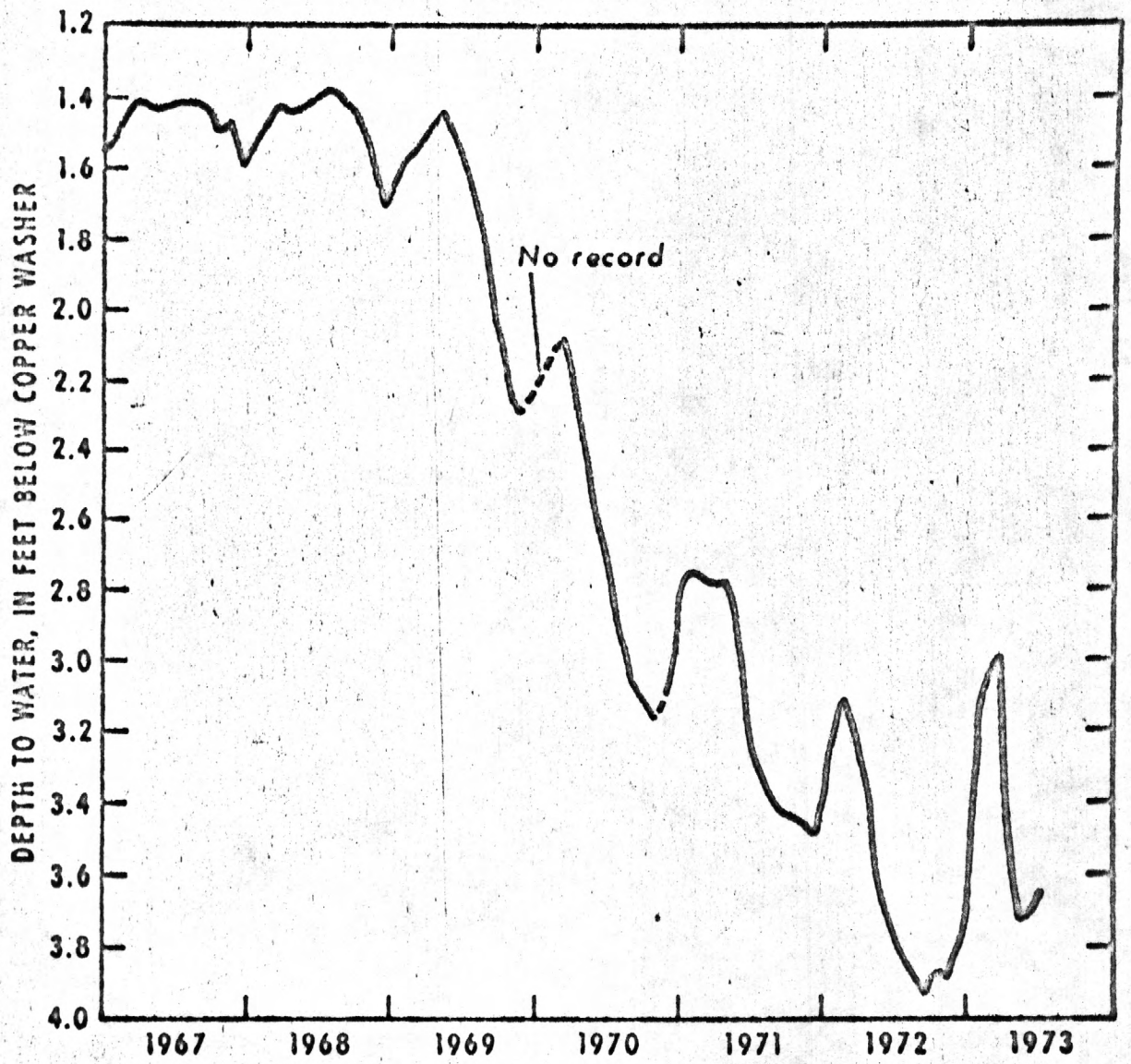

Figure 3.--Monthly low water levels in Devils Hole.

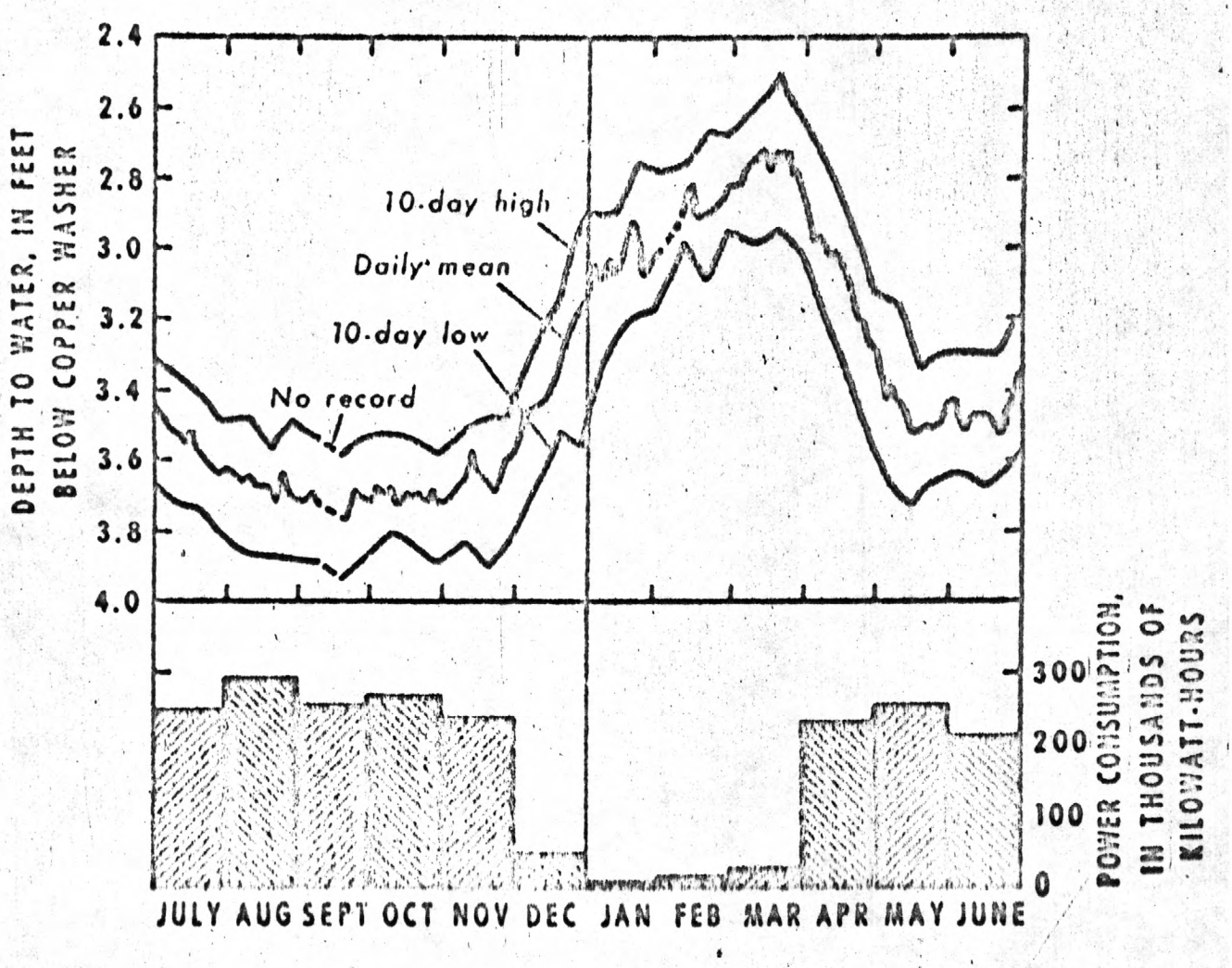

Figure 4.--Water-level fluctuations in Devils Hole and power consumption by Spring Meadows Ranch wells 1, 2, 3, 7, 8, and 17.

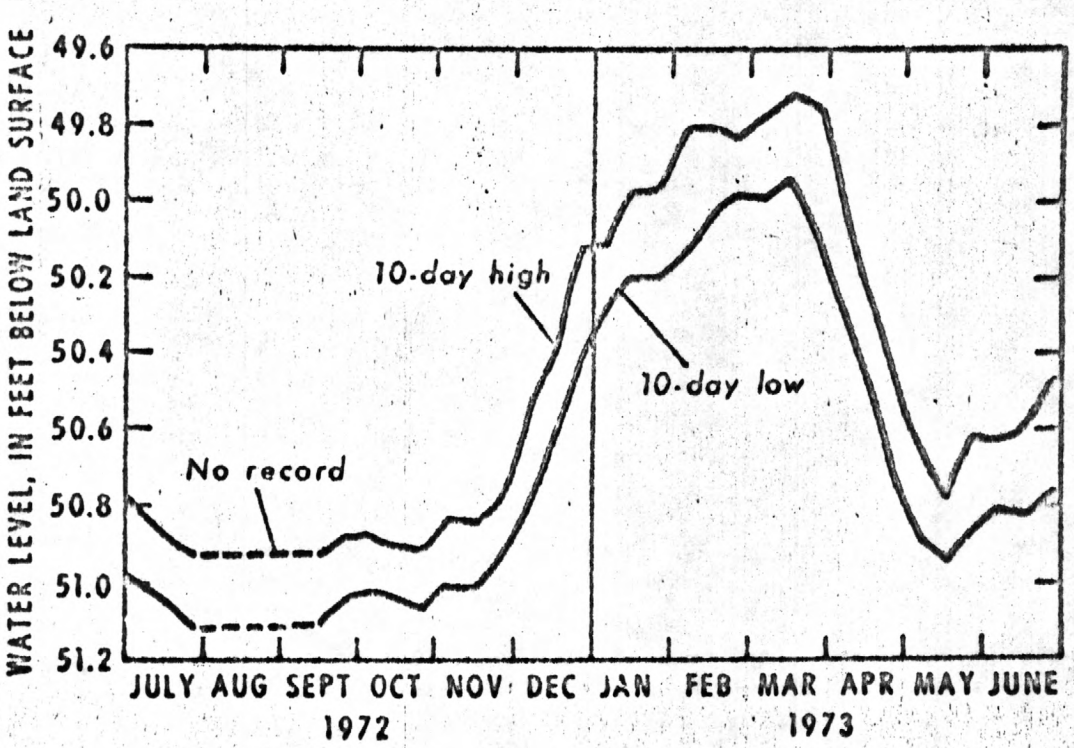

Figure 5.--Water-level fluctuations in well 17S/50-36dd.

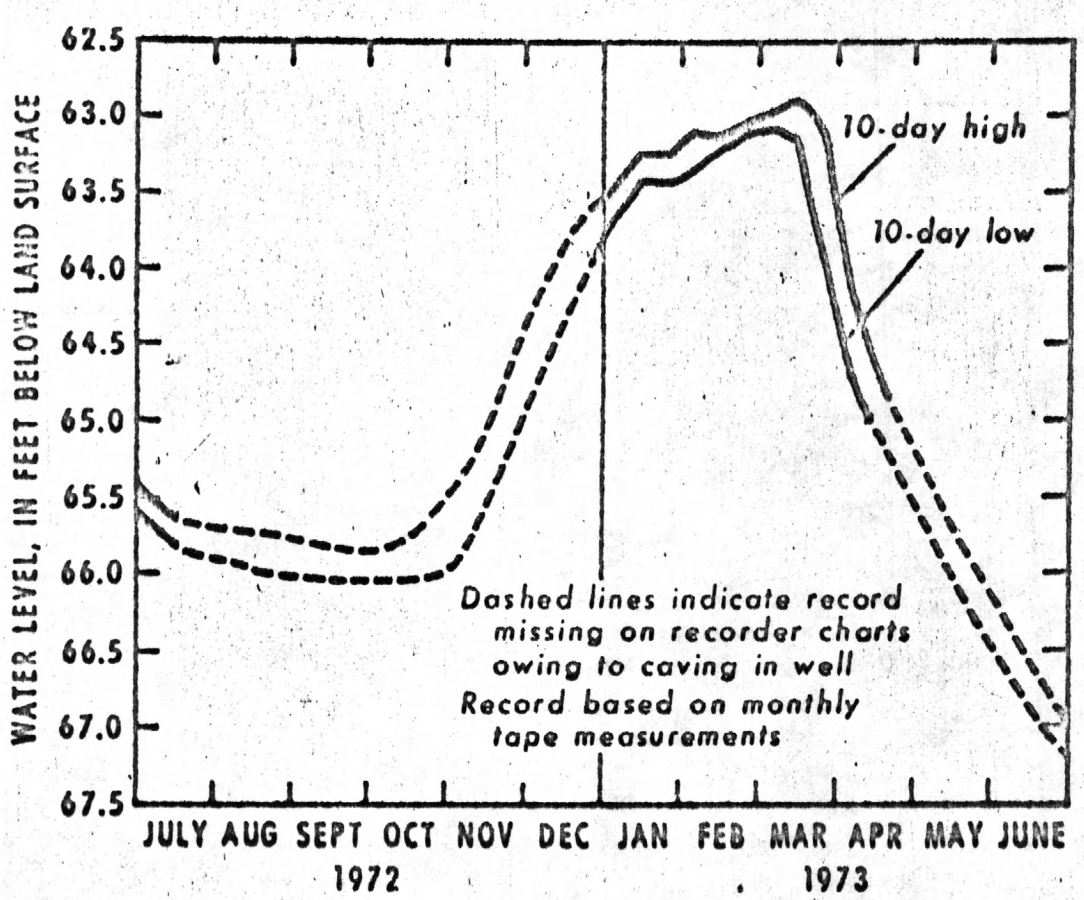

Figure 6.—Water-level fluctuations in well 17S/51-31dd.

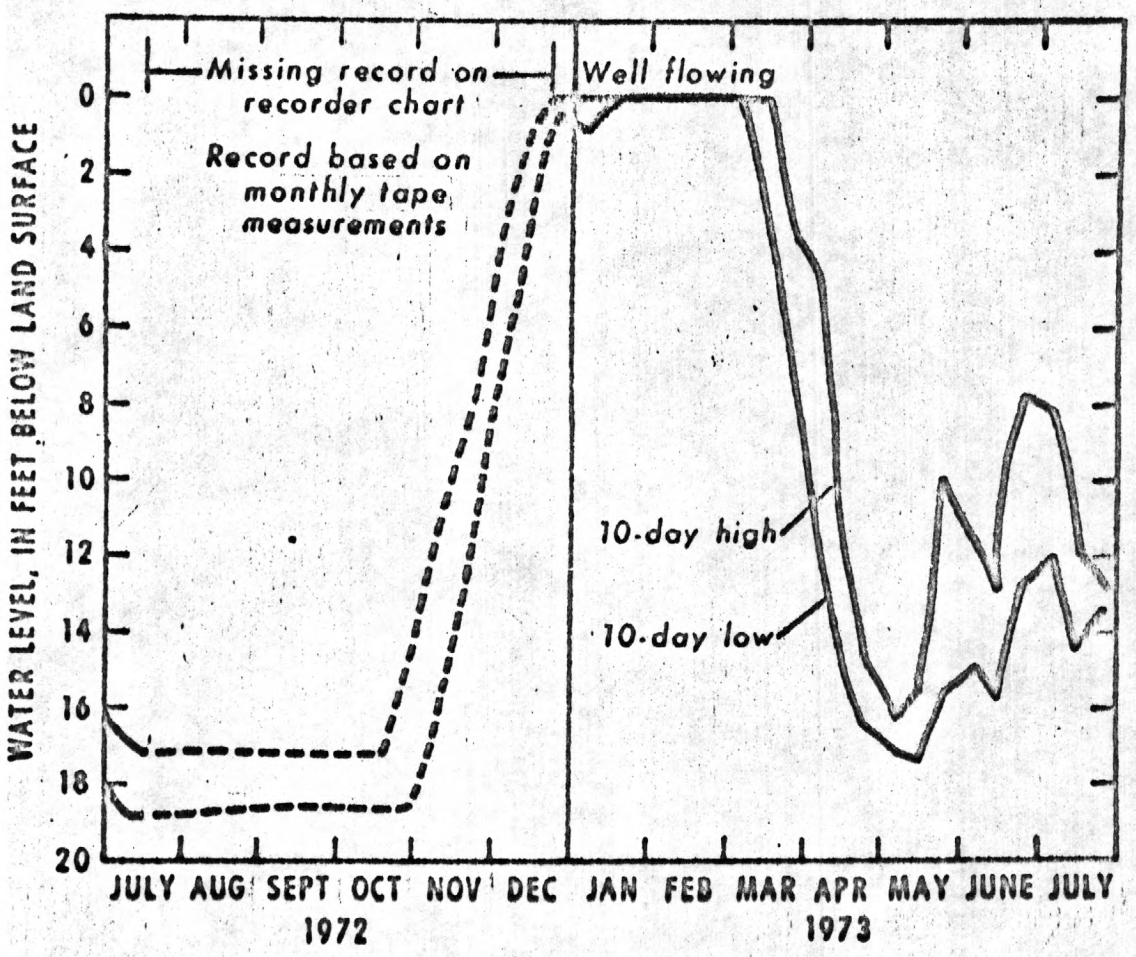

Figure 7.—Water-level fluctuations in well 18S/51-7db2.

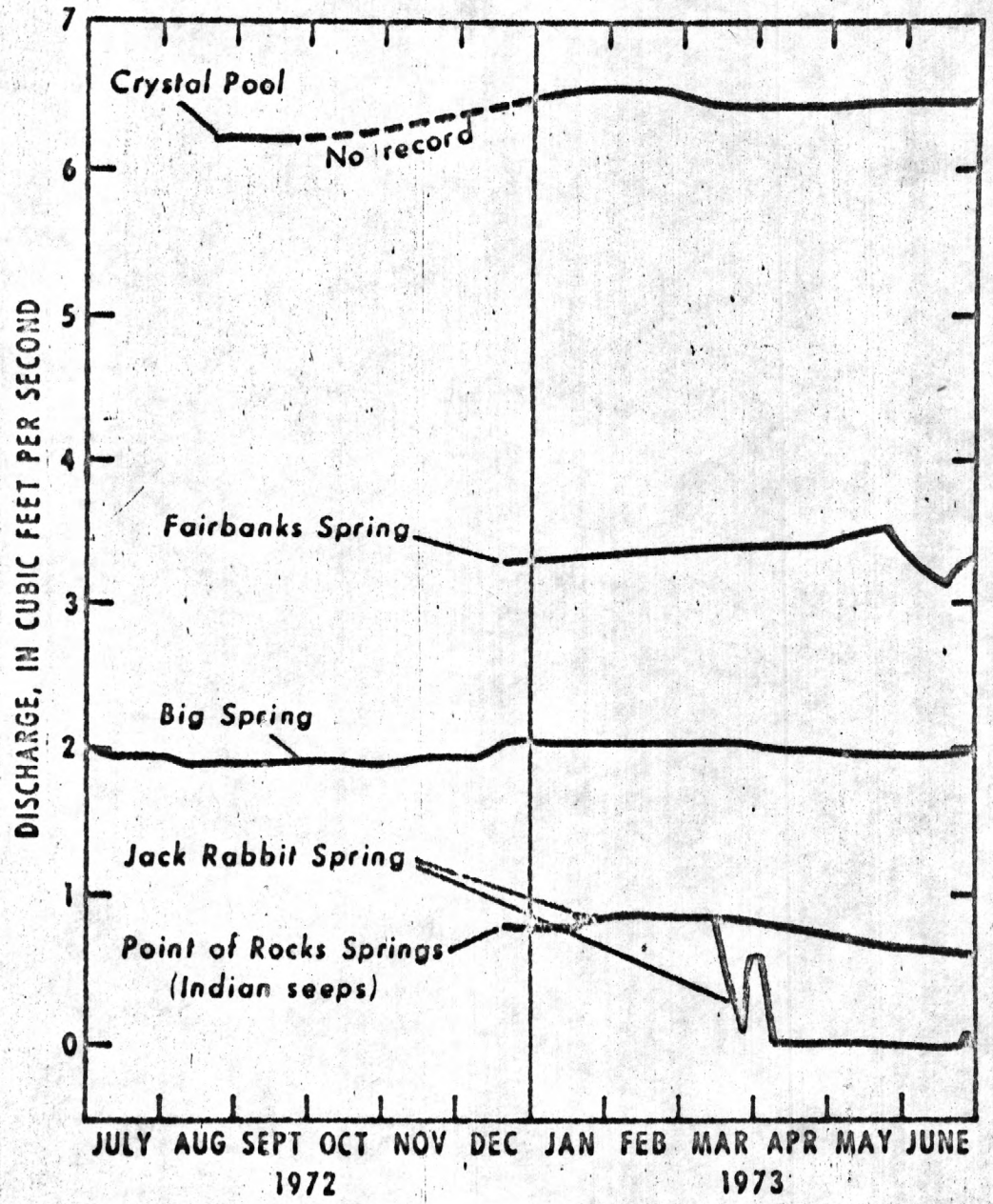

Figure 8.—Spring flow in the Ash Meadows area, 1972-73.