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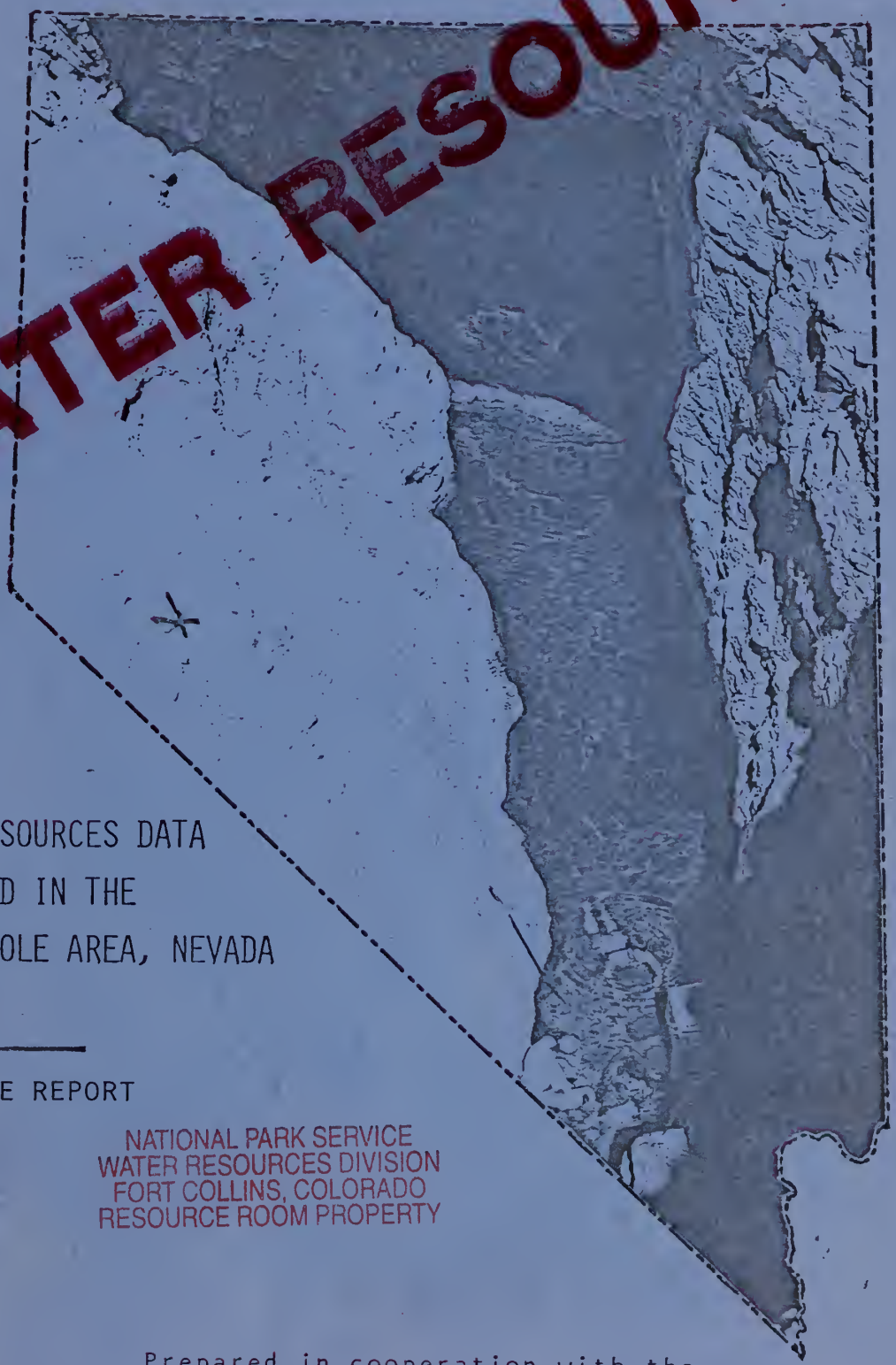

WATER-RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA 1974-75

OPEN-FILE REPORT

Prepared in cooperation with the
NATIONAL PARK SERVICE

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By

J. D. Larson

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Open-File Report

1975

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CONVERSIONS FACTORS

Factors for converting English units to metric units are shown to four significant figures. However, in the text the metric equivalents are shown only to the number of significant figures consistent with the values for the English units.

English	Multiply by	Metric
acres	4047	m^2 (square metres)
ft^3/s (cubic feet per second)	0.02832	m^3/s (cubic metres per second)
ft (feet)	0.3048	m (metres)
gpm (gallons per minute)	0.06308	l/s (litres per second)
mi (miles)	1.609	km (kilometres)

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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 1974 through June 1975. The work for this third annual data report was financed by the National Park Service. The work for the first annual report (Larson, 1974) was financed jointly by the U.S. Bureau of Sport Fisheries and Wildlife and the U.S. Geological Survey and the second annual report (Larson, 1974) was financed by the National Park Service.

Continuous recorders were used to monitor water levels in Devils Hole, three observation wells, and the flow from four springs. Also, monthly readings were made on two wells to help define a general trend of ground-water levels. 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 (162,000 m^2) tract of Death Valley National Monument, about 65 miles (105 km) west of Las Vegas, Nevada, 12 miles (19 km) northeast of Death Valley 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, or 12 m).

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

WATER-LEVEL FLUCTUATIONS

Figure 2 shows the locations of Devils Hole and the wells in Ash Meadows. Devils Hole and two wells were measured monthly in addition to the operation of continuous recorders during the 1975 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 1968, prior to pumping, through June 1975. Beginning in 1969, the water level declined from about 1.4 feet (0.4 m) below the copper washer to a maximum of 3.87 feet (1.17 m) below in September 1972. In July 1974, the monthly low water level was 3.51 feet (1.1 m) below the copper washer. In June 1975, the monthly low water level was 3.47 feet (1.06 m) below the copper washer.

Figure 4 shows the detailed water-level fluctuations in Devils Hole during the year ending June 30, 1975. 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 S17/50-36dd is about 900 feet (274 m) east of Devils Hole (fig. 2). The well was used for artificial recharge from June to mid-November 1974; and from mid-April through June 1975. The artificial recharge, supplied from King Spring at a rate of 400 gallons per minute (23 l/s), was begun as an emergency measure to stop the decline of water level in Devils Hole. Because variations in pumpage effect the water level in Devils Hole, no direct effects of injection have been identified on the Devils Hole hydrograph. The water level in this well rose to about 13.5 feet (4.1 m) below land surface near the middle of August 1974 (fig. 5), which may be due to partial plugging of the perforations in the well by algae, air entrainment, or physical change in the well.

Observation well S18/51-6aa (well 12, fig. 2) is about 1 mile (1.6 km) east of Devils Hole and about 1.5 miles (2.4 km) north of the major well field in Ash Meadows. Figure 5 shows the trend of this well in response to nearby pumping, based on monthly water-level measurements. The well was pumped during December 1974 and no water-level measurements were obtained, owing to cascading water in the well.

Observation well S18/51-7bbb (well 5, fig. 2) is about 1 mile southeast of Devils Hole. Monthly water-level measurements were made during the winter months when the well was not pumping (fig. 5) and show little change.

Observation well S18/51-7bdb (well 13, fig. 2) is about 1.5 miles (2.4 km) southeast of Devils Hole, near Point of Rocks (fig. 2). Figure 5 shows the dramatic effect of nearby pumping of well S18/51-7ca (well 4, fig. 2) and well S18/51-7bbb (well 5, fig. 2) on this well.

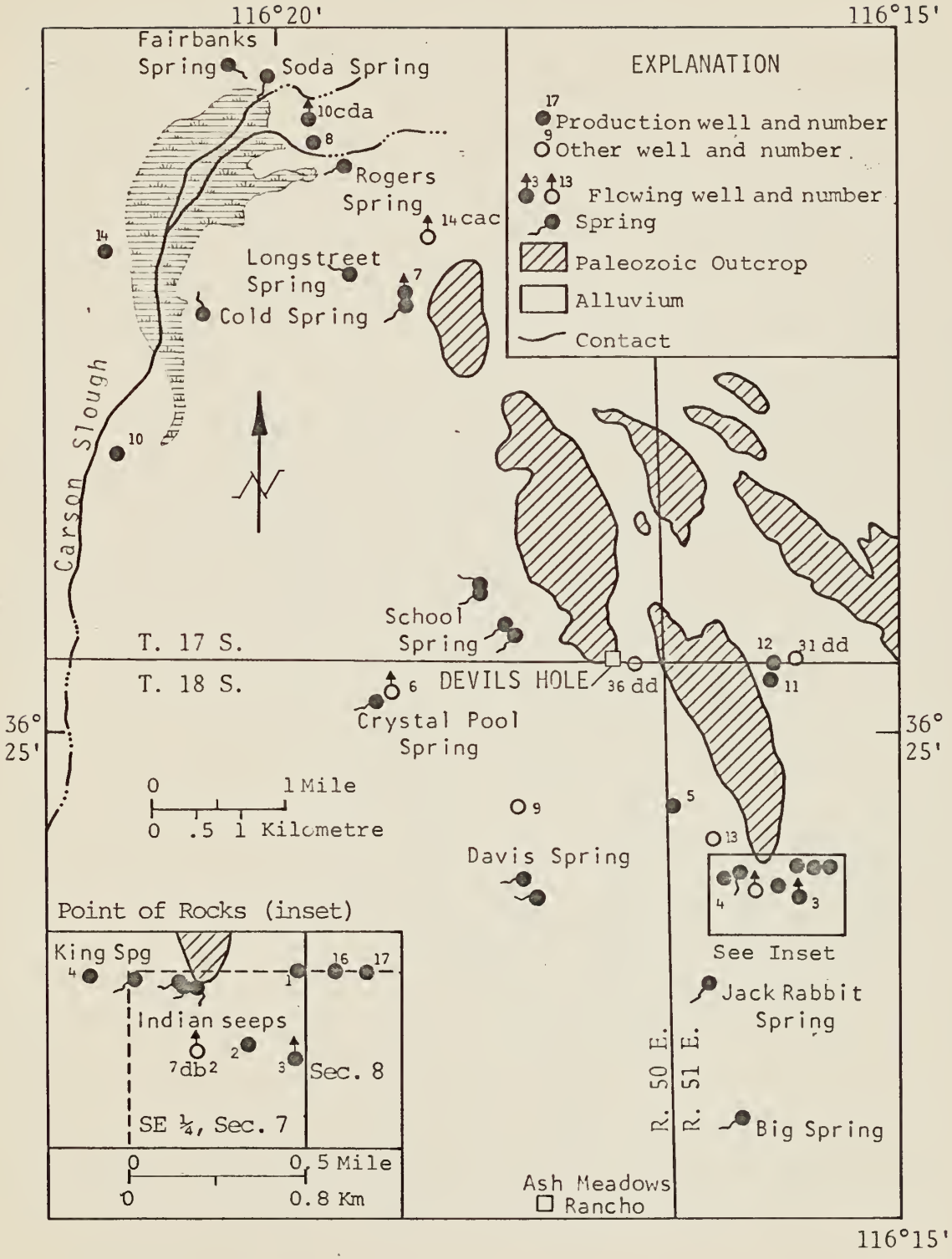

Figure 2.—Locations of Devils Hole, wells, and springs in Ash Meadows, Nye County.

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

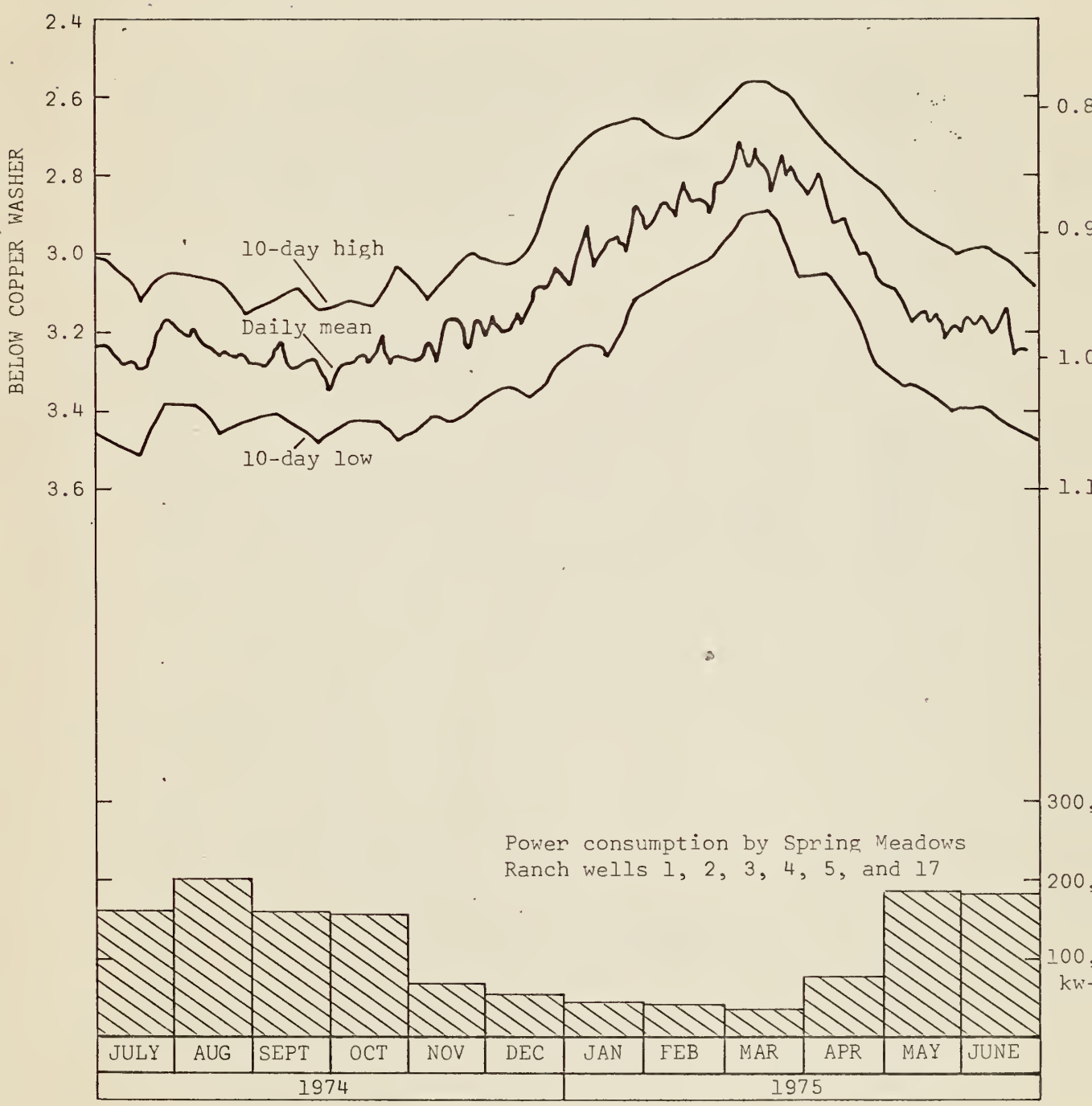

Figure 4.--Water-level fluctuations in Devils Hole and power consumption by irrigation wells.

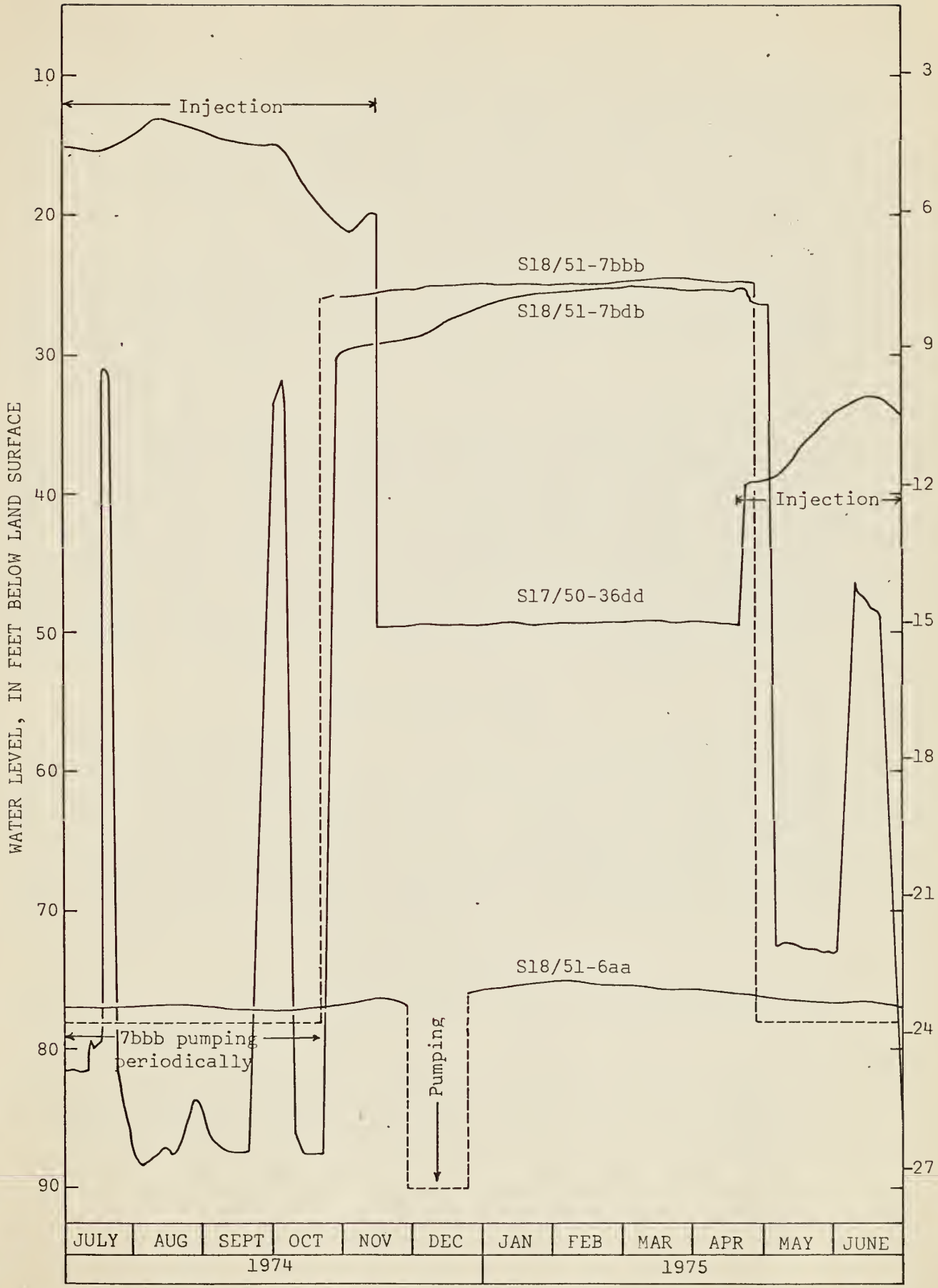

Figure 5.--Water-level fluctuations in observation wells. (Dashed lines are estimated water levels.)

Observation well S18/51-7db2 is at the west edge of the major well field in Ash Meadows, near Point of Rocks (fig. 2). As shown in figure 6, the water level responds dramatically to pumping, ranging from about 0.75 foot (0.15 m) below land surface during the winter to nearly 18 feet (5.5 m) below during the pumping season in 1974.

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 7 shows the fluctuation in spring flow of four selected springs from July 1974 to June 1975.

Fairbanks Spring and Big Spring, which are in the extreme northern and the extreme southern parts of Ash Meadows, respectively, show little effect of pumping. There is a general increase in flow during the winter months, which is attributed mainly to a decrease in evapotranspiration rates. Point of Rocks Spring shows a similar pattern with larger increases of fluctuation due to diversion. Jack Rabbit Spring, which is about 1 mile (1.6 km) southwest of the major pumping field, is affected strongly by pumping of well 2. The effects can be seen in a matter of minutes after well 2 begins pumping. Jack Rabbit Spring showed only a little flow during late summer and fall of 1974 but had a good recovery of flow during the winter. In most of May and June 1975, the flow decreased to zero.

POWER CONSUMPTION

Power-consumption data for the irrigation wells in the area are collected monthly at wells 1, 2, 3, 4, 5, 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 from July 1974 to June 1975. 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 nearly 1.4 million kilowatt-hours--about equal to the amount used during the previous year (Larson, 1974, p. 5).

REFERENCES CITED

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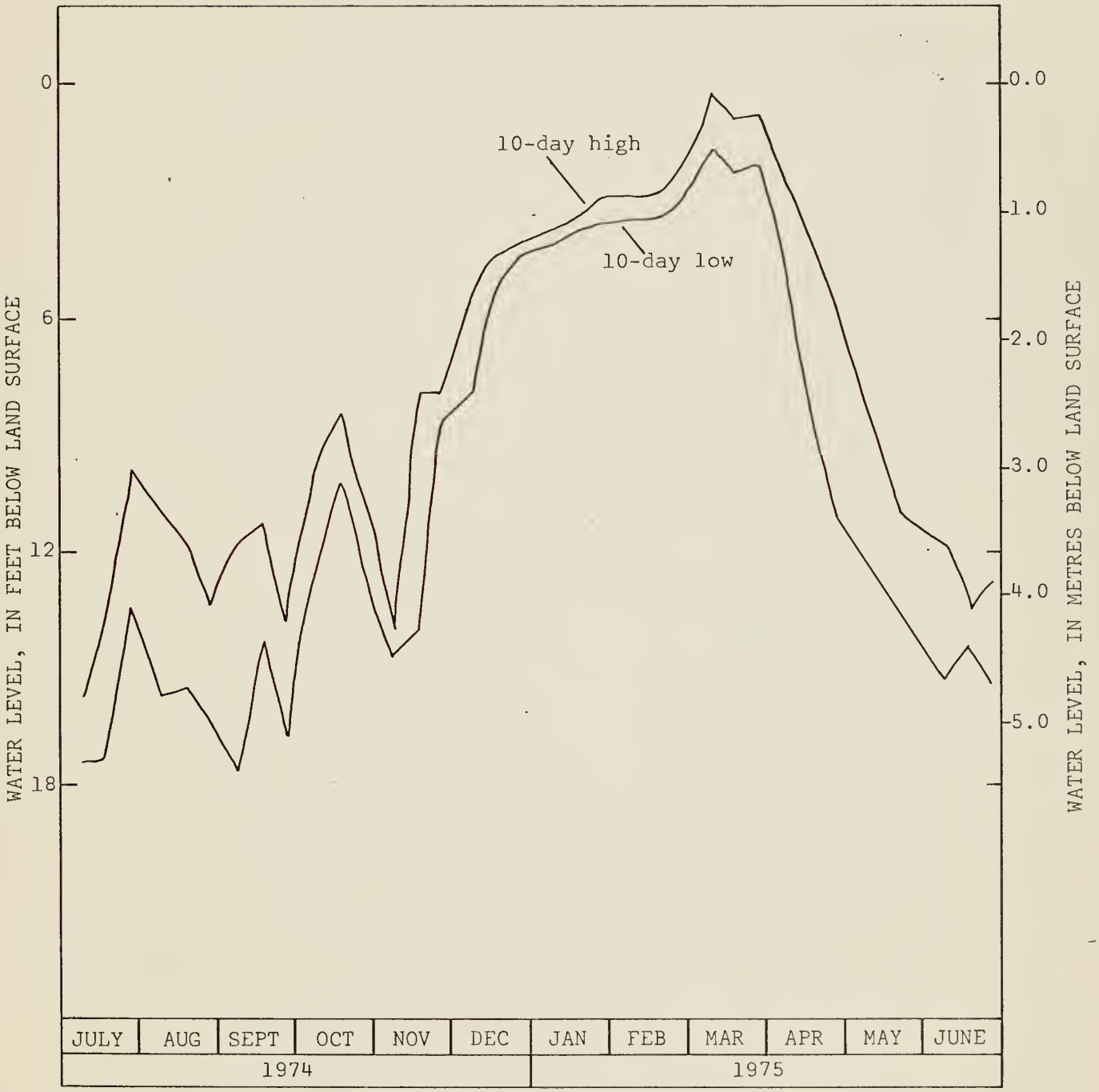

Figure 6.--Water-level fluctuations in well S18/51-7db2.

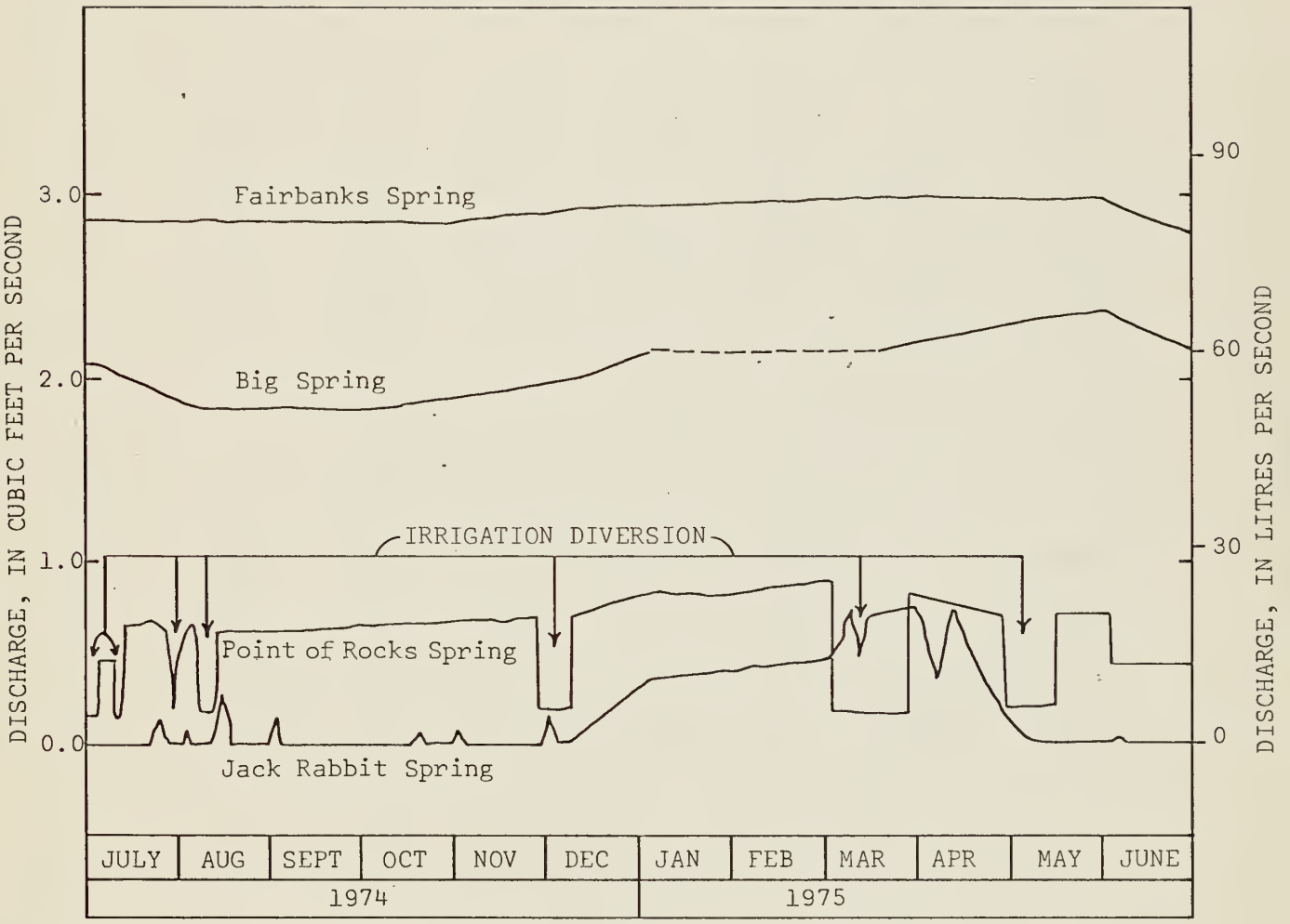

Figure 7.--Spring-flow in the Ash Meadows area, 1974-75.

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

Date	Well number 1	2	3	4	5	17	Total
1974							
July	10,500	41,000	20,000	48,000	44,000	0	163,500
Aug.	58,000	27,000	22,000	48,000	48,000	0	203,000
Sept.	30,000	32,000	18,000	16,000	24,000	41,000	161,000
Oct.	37,000	45,000	24,000	24,000	28,000	0	158,000
Nov.	27,000	37,000	4,000	0	0	0	68,000
Dec.	8,000	47,000	0	0	0	0	55,000
1975							
Jan.	0	45,000	0	0	0	0	45,000
Feb.	0	41,000	0	0	0	0	41,000
Mar.	0	15,000	20,000	0	0	0	35,000
Apr.	22,000	21,000	20,000	12,000	2,000	0	77,000
May	6,000	47,000	26,000	52,000	56,000	0	187,000
June	46,400	40,300	22,400	35,600	37,700	0	182,400
Total	244,900	438,300	176,400	235,600	239,700	41,000	1,375,900