DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

STATE OF NEVADA
DEPARTMENT OF FISH AND GAME AND
DIVISION OF WATER RESOURCES

WATER RESOURCES INFORMATION SERIES
REPORT-15

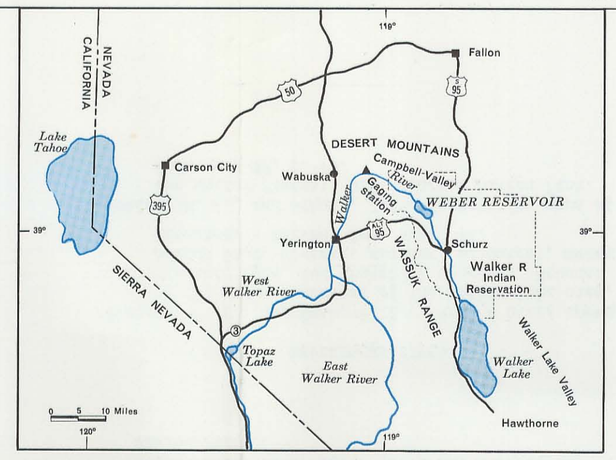

Figure 1.-Index map showing Weber Reservoir and the Nevada part of the Walker River system

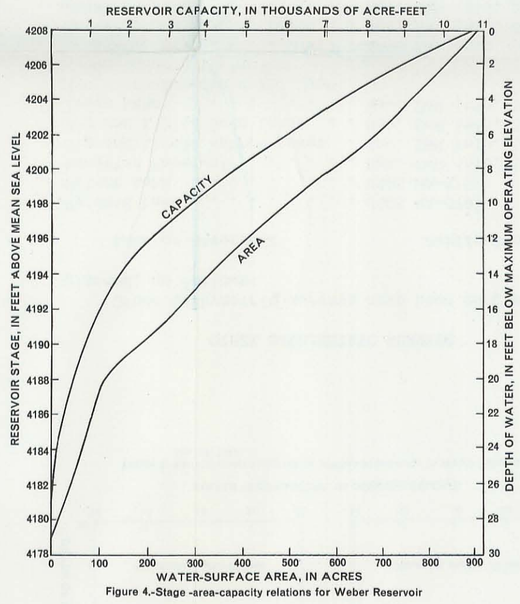

Figure 4.-Stage -area-capacity relations for Weber Reservoir

EXPLANATION

20
Line of equal water depth, 5-foot interval. Datum is depth below maximum operating level of 4208 feet above mean sea level.

① Sediment sampling and vertical water temperature profile site (table 2 and fig. 5)

X 29 Maximum water depth

0 1 2 3 4 5 1 MILE

Topographic contour interval 40 feet with supplemental 20-foot interval. Datum is mean sea level.

17° TRUE NORTH MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 1971

Base: U.S.G.S. 1:62,500, Weber Reservoir, Nev.

Cartography by Charles A. Bosch and Marjorie Thielke

BATHYMETRIC RECONNAISSANCE OF WEBER RESERVOIR, MINERAL COUNTY, NEVADA

By
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BATHYMETRIC RECONNAISSANCE OF WEBER RESERVOIR, MINERAL COUNTY, NEVADA

INTRODUCTION

Weber Reservoir is in Campbell Valley (northern end of Walker Lake Valley) on the Walker River about 7 road miles northwest of Schurz and about 16 miles east of Yerington in Mineral County, Nevada (fig. 1). Weber Reservoir is totally within the Walker River Indian Reservation and is at an elevation of about 4,200 feet. The Desert Mountains that form the northern boundary of Campbell Valley have a maximum elevation of 6,404 feet. The northern end of the Wassuk Range, that forms the southern boundary of Campbell Valley, has a maximum elevation of 8,159 feet (fig. 1).

Shortages of Walker River irrigation water on the Walker River Indian Reservation created an interest in upstream storage, and in 1915, Frank Weber, an engineer, made the first reservoir site investigation. The National Industrial Recovery Act of 1933 allocated funds to the U.S. Indian Service (now the Bureau of Indian Affairs) for the building of the reservoir. On Sept. 21, 1933, construction started, and 10 months later on July 27, 1934, storage began, although it was more than a year later before the dam was completely finished. The reservoir is operated by the Bureau of Indian Affairs to provide summer irrigation water to the Walker River Indian Reservation.

The primary source of water for Weber Reservoir is the Walker River, which heads in the high Sierra Nevada (fig. 1). Flow of the Walker River is somewhat depleted by extensive irrigation upstream from Weber Reservoir. A continuous-record streamflow gaging station is at the head of Campbell Valley on the Walker River near Wabuska (fig. 1), about 16 miles upstream from Weber Dam. This station is the furthest downstream gage on the Walker River. Table 1 lists the annual flows at this site for water years 1924-71 (a water year is the 12-month period, October 1 to September 30). There are streamflow records prior to 1924; however, the years 1924-71 represent the period of manmade modifications of the hydrologic system that exist today. Streamflow at this site for the 48-year period 1924-71 has averaged about 118,000 acre-feet per year, and this value agrees closely with the runoff of 120,000 acre-feet per year of average wetness for the base period 1919-69. Streamflow measurements made about 2 miles upstream from Weber Reservoir suggest that the flows into the reservoir may be on the order of 5 to 15 percent less than the flows measured at the Wabuska gaging station. The loss is due largely to evapotranspiration in excess of local runoff along the river.

Table 1.--*Streamflow of the Walker River at the Wabuska gaging station for water years 1924-71*

Water year	Streamflow (acre-feet)	Water year	Streamflow (acre-feet)
1924	52,600	1948	31,070
1925	*a* 20,000	1949	36,520
1926	29,200	1950	30,330
1927	100,000	1951	158,600
1928	46,900	1952	379,000
1929	18,300	1953	121,800
1930	14,500	1954	43,340
1931	9,340	1955	34,620
1932	59,800	1956	277,000
1933	35,900	1957	88,350
1934	21,000	1958	227,300
1935	46,410	1959	70,590
1936	*a* 110,000	1960	26,260
1937	*a* 114,000	1961	23,780
1938	*a* 470,000	1962	37,260
1939	*a* 80,000	1963	169,200
1940	62,960	1964	51,460
1941	179,900	1965	123,200
1942	*a* 280,000	1966	107,600
1943	240,100	1967	237,100
1944	*a* 70,000	1968	90,710
1945	331,900	1969	403,200
1946	170,900	1970	134,900
1947	84,410	1971	93,720
Average annual streamflow (rounded)			118,000 acre-feet

a. Estimated streamflow based on streamflow records on the East Walker River near Mason and the West Walker River near Hudson.

Figure 2 shows the monthly flow distribution at the streamflow gaging station near Wabuska for the water years 1940-71. In general, this flow distribution is also applicable to the monthly inflow to Weber Reservoir.

Weather Bureau records at Schurz and Yerington suggest that the average precipitation on the reservoir is about 5 inches per year. The full reservoir has a surface area of 900 acres (1972 survey); thus, the estimated inflow from precipitation is nearly 380 acre-feet per year (rounded). Using an average evaporation rate of 4 feet per year (Kohler and others, 1959, p. 13), annual evaporation loss is estimated to be about 3,600 acre-feet per year for a full reservoir, which is nine times the average annual precipitation inflow. Everett and Rush (1967) used a precipitation inflow rate of 400 acre-feet per year and an evaporation loss rate of 4,000 acre-feet per year. These figures were based on an average reservoir surface area of 1,000 acres.

Lack of storage prevents the reservoir from being fully effective in the control of downstream flooding, although minor flooding can be reduced. Figure 3 shows the annual variation in contents of Weber Reservoir for the period of continuous record, water years 1956-72.

BATHYMETRY

A continuously recording, electronic fathometer was used to measure the depth of the reservoir on 38 traverses. The reservoir was at maximum operating stage, 4,208.0 feet (considered full with 2 feet of freeboard left on radial spillway gates) during the survey on May 22-23, 1972. Figure 4 shows the stage-area-capacity relations. The new stage-area-capacity figures indicate a water-surface area of 900 acres and a storage capacity of 10,700 acre-feet at stage 4,208 feet, or about 2,400 acre-feet less storage than the original area-capacity figures. This represents an 18 percent loss of computed storage capacity. The maximum reservoir depth found was 29 feet.

SEDIMENTATION

The difference between the two capacities is probably the result of sedimentation and errors in the estimates of storage. The original figures (from the files of the Bureau of Indian Affairs, Stewart, Nev.) show that the minimum elevation on the reservoir floor was at elevation 4,176 feet, which was 3 feet lower than that found by this study. The thickness of fill probably is not uniform but may average somewhere between 2 to 3 feet, or on the order of 2,000 to 2,500 acre-feet. This computes to be an average sedimentation rate in the reservoir for the 38 years of operation of about 60 acre-feet per year. Because of upstream storage reservoirs and natural sediment traps, and because much of the area contributes little sediment, no meaningful erosion rate for the entire watershed could be computed.

Sedimentation data for the reservoir are virtually nonexistent, except for a few samples taken for this study, the results of which are listed in table 2. The data for May 23, 1972 show (1) an increase of sediment concentration with depth of water, and (2) that more sediment was moving into the reservoir (236 mg/l) than was moving out (82 mg/l).

Table 2.--*Suspended sediment quantities at selected sites*

Location	Date	Concentration (milligrams per liter)	Streamflow at time of sample (cubic feet per second)	Tons of sediment per day during time of sampling
Walker River 2 miles upstream from Weber Reservoir	April 27, 1972	65	80	14
	May 23, 1972	80	90	67
Walker River at outlet of Weber Reservoir	do.	82	85	19
Weber Reservoir point sampling:				
Site 1 (bathymetric map)				
12 feet below water surface	do.	47	--	--
20 feet below water surface	do.	57	--	--
Site 2 (bathymetric map)				
3 feet below water surface	do.	29	--	--
13 feet below water surface	do.	54	--	--
26 feet below water surface	do.	164	--	--

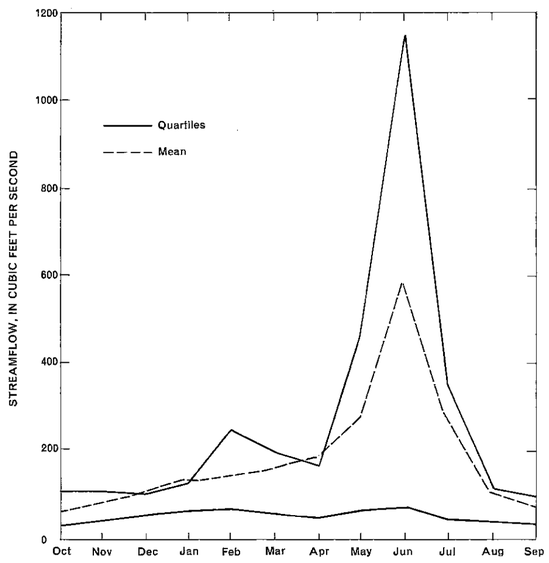

Figure 2.-Mean monthly flow distribution, Walker River near Wabuska, water years 1940-71 (Quartiles show 25 percent of the monthly flows were higher and lower than indicated)

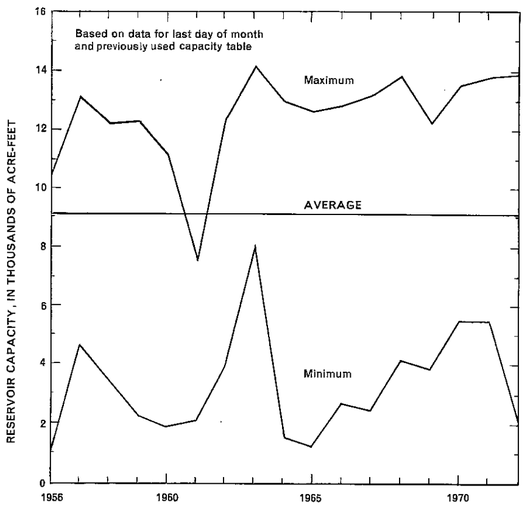

Figure 3.-Annual variation in contents of Weber Reservoir, Water years 1956-1972, (furnished by Bureau of Indian Affairs, Stewart, Nev.)

WATER QUALITY

Table 3 lists the results of U.S. Geological Survey chemical analyses of water samples collected during the 1971 water year at the Walker River gaging station near Wabuska. Although this sampling site is several miles above the reservoir, it should be generally representative of the water quality entering the reservoir. Figure 5 shows vertical temperature profiles at two sites in the reservoir taken on May 23, 1972. The water-inflow temperature at the head of the reservoir at that time was 21°C; the outflow temperature, taken as water was being released from the bottom of the reservoir, was 14.5°C.

Table 3.--*Summary of water-quality data for river*

(Data for Walker River gaging station near Wabuska, 16 miles upstream from reservoir, fig. 1)

Constituent	Concentration range[1] (in milligrams per liter unless otherwise specified)
Water year 1971 (11 samples)	
Temperature	0.5 - 21.5°C
Calcium	19 - 49
Magnesium	4.6 - 13
Sodium	19 - 80
Bicarbonate	101 - 267
Chloride	6.1 - 32
Nitrate (as N)	0.0 - 1.1
Orthophosphate (as P)	0.09 - 0.40
Dissolved solids	194 - 437
Hardness (as $CaCO_3$)	66 - 176
Specific conductance	222 - 677 micromhos

1 *Range in flow at time of sampling, 29 to 1,010 cubic feet per second.*

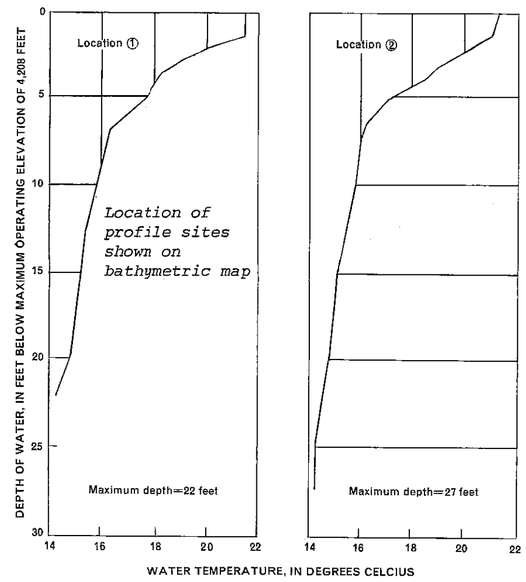

Figure 5.-Vertical water-temperature profiles at two sites in Weber Reservoir, May 23, 1972

OTHER BATHYMETRIC SURVEYS

Other bathymetric surveys have been completed or planned, as follows:

Lake or Reservoir	*Publication*
Pyramid Lake	USGS HA-379[1]
Walker Lake	USGS HA-415
Lahontan Reservoir	Nev. DWR Info. Ser. 9[2]
Big and Little Washoe Lakes	Nev. DWR Info. Ser. 10
Big and Little Soda Lakes	Nev. DWR Info. Ser. 11
Topaz Lake	Nev. DWR Info. Ser. 12
Rye Patch Reservoir and Upper and Lower Pitt-Taylor Reservoirs	Nev. DWR Info. Ser. 13
Mariette and Sooner Lakes	Nev. DWR Info. Ser. 14
Weber Reservoir	Nev. DWR Info. Ser. 15
Wild Horse Reservoir	Nev. DWR Info. Ser. 16
Lake Tahoe	Nev. DWR Info. Ser. 17

1 *U.S. Geological Survey Hydrologic Atlas.*
2 *Nevada Division of Water Resources Information Series Report.*

REFERENCES CITED

Everett, D. E., and Rush, F. E., 1967, A brief appraisal of the water resources of the Walker Lake area, Mineral, Lyon, and Churchill Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources - Reconn. Ser. Rept. 40.

Kohler, M. A., and others, 1959, Evaporation maps of the United States: U.S. Weather Bureau Tech. Paper no. 37, p. 13.

MAP L-12
WEBER RESERVOIR