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-16

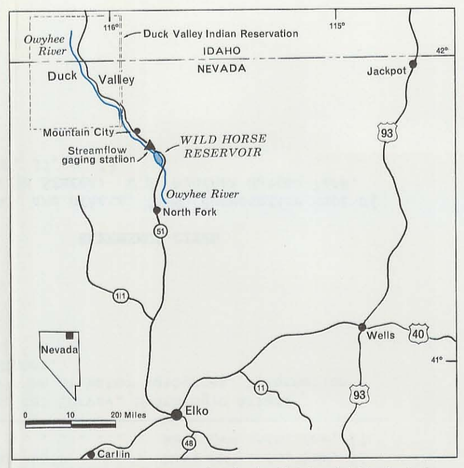

Figure 1.-Index map of the Elko area of northeastern Nevada and vicinity showing location of Wild Horse Reservoir

115°50'

41° 40'

T44N
R54E — R55E
T43N

EXPLANATION

30

Line of equal water depth, in feet; interval variable. Datum is depth below spillway elevation 6205.0 feet above mean sea level

X75
Maximum water depth

②
Vertical water temperature site (Profile shown on fig. 6)

Topographic contour interval variable.

(51)
State route

17°
TRUE NORTH
MAGNETIC NORTH

0 1 2 3 4 5 1 Mile

Base: U.S. Bureau of Reclamation
1:4,800, Wild Horse Reservoir

115°50'

Cartography by Marjorie Thielke

BATHYMETRIC RECONNAISSANCE OF WILD HORSE RESERVOIR, ELKO COUNTY, NEVADA

By
T. L. Katzer and Lynn Harmsen

1973

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INTRODUCTION

Wild Horse Reservoir is in Elko County, on the northeastern flank of the Independence Mountains, about 62 miles north of Elko and 12 miles southeast of Mountain City, on State Route 51 (fig. 1). The drainage area of the Owyhee River, the main tributary to Wild Horse Reservoir, at the gaging station immediately below the reservoir is about 209 square miles. The Owyhee River is one of Nevada's few north-flowing streams and is a tributary to the Snake River (not shown in fig. 1). Wild Horse Reservoir, when full, is at an elevation of 6,205 feet above mean sea level and the surrounding mountains commonly have peaks above an elevation of 7,000 feet.

The need for supplemental irrigation water for Duck Valley on the Western Shoshone Indian Reservation led to the first reservoir site investigation by Halbert T. Johnson in 1916. 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 a dam. Construction started in June 1936, ended in June 1937, and storage began March 18, 1938. According to the Bureau of Indian Affairs, at spillway elevation 6,189.2 feet, the reservoir had a water-surface area of 1,860 acres and a capacity of 33,500 acre-feet.

According to the U.S. Bureau of Reclamation, the aggregate used in the contruction of the first dam proved to be of poor quality. The Bureau of Indian Affairs, therefore, decided to build a new dam to remove a possible safety hazard and allow the reservoir to be enlarged to about double its former capacity. Construction by the U.S. Bureau of Reclamation on the second dam started in September 1967 and was completed in June 1969. This present dam is a double-curvature, thin-arch, concrete structure. The crest is 435 feet long, the spillway is 75 feet wide at elevation 6,205.0 feet. The 1972 survey determined that at spillway elevation 6,205.0 feet, the surface area is 2,830 acres, and the capacity is 73,500 acre-feet.

The reservoir is operated to provide irrigation water for about 21,000 acres of Indian land (W. H. Hoy, Bureau of Indian Affairs, Stewart, Nev., oral commun., 1973). Figure 2 shows the reservoir's annual variation in contents for the water years 1938-71 (a water year is from October 1 to September 30). The original capacity table was used prior to 1969. Table 1 presents the annual releases and spills from the reservoir, as recorded by a downstream gaging station on the Owyhee River (fig. 1). Figure 3 shows the mean monthly flow distribution for the Owyhee River below the reservoir, before and after dam construction.

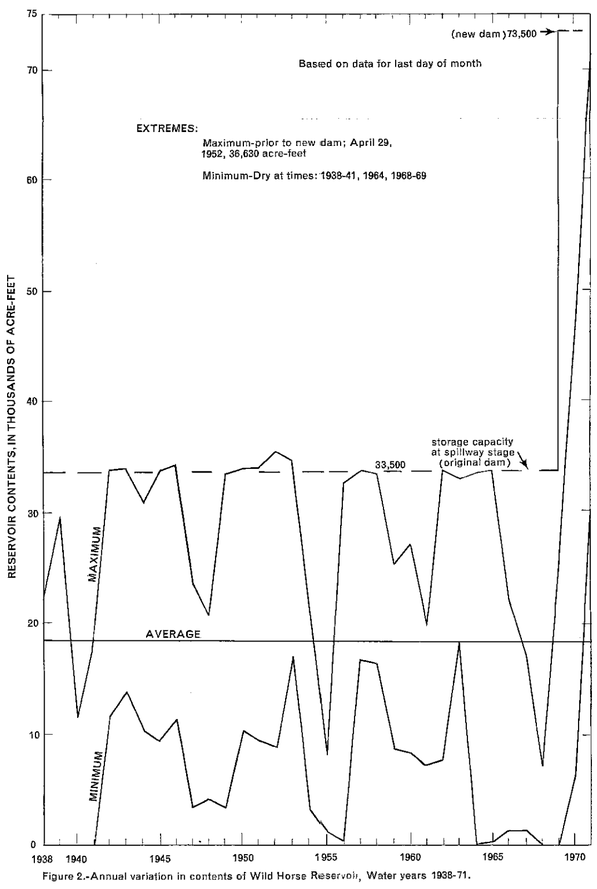

Figure 2.-Annual variation in contents of Wild Horse Reservoir, Water years 1938-71.

Table 1.--*Outflow from Wild Horse Reservoir in the Owyhee River, 1939-72*

(Measured at the gaging station near Gold Creek)

Water year	Streamflow in acre-feet (rounded)	Water year	Streamflow in acre-feet (rounded)
1939	39,700	1957	39,300
1940	15,100	1958	37,200
1941	a 9,000	1959	19,600
1942	33,200	1960	12,600
1943	b 63,700	1961	38,200
1944	27,200	1962	32,900
1945	37,200	1963	14,500
1946	45,800	1964	52,900
1947	22,900	1965	23,000
1948	17,900	1966	25,900
1949	26,800	1967	13,500
1950	33,800	1968	11,000
1951	46,000	1969	40,000
1952	62,100	1970	13,800
1953	30,300	1971	37,600
1954	21,800	1972	54,600
1955	9,800		
1956	15,300	Average	30,100

a. Minimum.
b. Maximum.

Weather Bureau records at North Fork (fig. 1) suggest that the average annual precipitation on the reservoir is about 10 inches. According to Kohler and others (1959, pl. 2), the average annual evaporation from the reservoir is about 3.5 feet (net evaporation, about 2.7 feet). Based on these figures, the construction of the new dam has increased the average inflow from direct precipitation on the reservoir from about 1,500 acre-feet to about 2,300 acre-feet per year at spillway stage, and the water lost by evaporation has also increased from about 6,500 acre-feet to about 10,000 acre-feet at spillway stage.

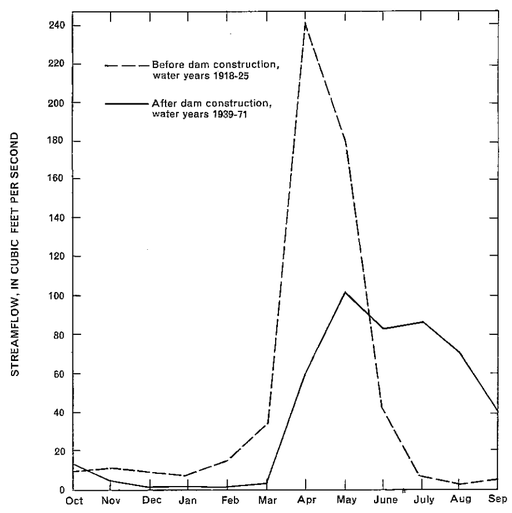

Figure 3.- Mean monthly flow distribution, Owyhee River near Gold Creek, water years 1918-25 and 1939-71.

BATHYMETRY

A continuous recording, electronic fathometer was used to measure the depth of the reservoir on 48 traverses. The Nevada Fish and Game Department provided a boat which was operated by Enforcement Officer Robert Poling. The bathymetric survey was made on May 25-26, 1972, when the reservoir was spilling at stage 6,205.6 feet.

Figure 4 is a graph of the stage-area-volume relations. The results of this survey indicate that at spillway elevation 6,205 feet, the water-surface area is 2,830 acres and the storage capacity is 73,500 acre-feet. A comparison of these results and data furnished by the Bureau of Indian Affairs, Stewart, Nev., shows that at spillway stage the water-surface area computed in this survey to be 7 percent less and the capacity to be 3 percent greater than those previously used. The differences are within the accuracy limits of this reconnaissance. The stage-area-volume tables of the Bureau of Indian Affairs show that the original reservoir, at spillway stage 6,189.2 feet, had a water-surface area of 1,860 acres and a capacity of 33,500 acre-feet. The 1972 survey shows that at the original reservoir spillway stage the surface area was 1,870 acres and the capacity was 36,700 acre-feet. The differences in capacity are again considered to be within the accuracy limits of the two surveys. Bathymetric data were used to develop the stage-area-volume relations below elevation 6,185 feet, and existing topographic maps were used above elevation 6,185 feet.

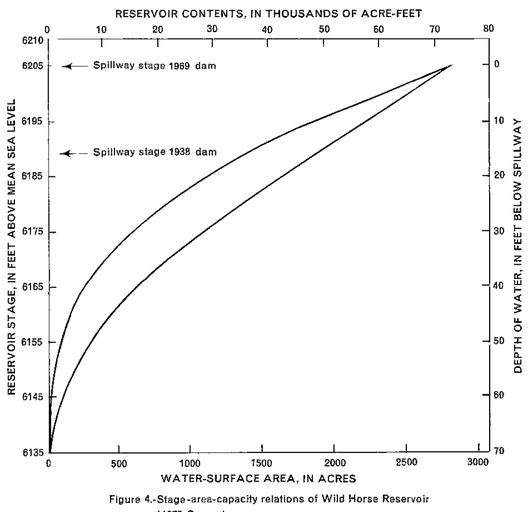

Figure 4.-Stage-area-capacity relations of Wild Horse Reservoir (1972 Survey)

SEDIMENTATION AND WATER QUALITY

Sediment movement and deposition data are lacking for Wild Horse Reservoir. The results of this survey, however, indicate that there has been no identifiable loss of storage due to sedimentation, and therefore sediment transport into Wild Horse Reservoir is assumed to have been minor. The lack of identifiable sedimentation in the reservoir is mainly due to the relatively stabilized soils, small size of the drainage area above the reservoir, and small runoff.

Table 2 presents the results of the Nevada State Health Department water sampling and analyses of the Owyhee River during 1971. The sampling site was about 10 miles downstream from the reservoir.

Table 2.--*Water-quality data for sampling site downstream from Wild Horse Reservoir*

[Data for Owyhee River immediately upstream from Mountain City (fig. 1), furnished by the Nevada State Health Department]

	Concentration in milligrams per liter unless otherwise specified 1971	
	May 24	August 30
Approximate flow, cubic feet per second	250	80
Temperature	12.5°C (54.5°F)	18.5°C (65.3°F)
pH (units)	7.9	8.3
Dissolved oxygen	8.9	8.3
Chloride (Cl)	1	4
Orthophosphate (PO_4)	.16	.40
Nitrate (NO_3)	.2	0
Dissolved solids	121	137
Alkalinity	74	94
Bicarbonate	90	115
Carbonate	0	0

Figure 5 shows vertical temperature profiles at four sites in the reservoir.

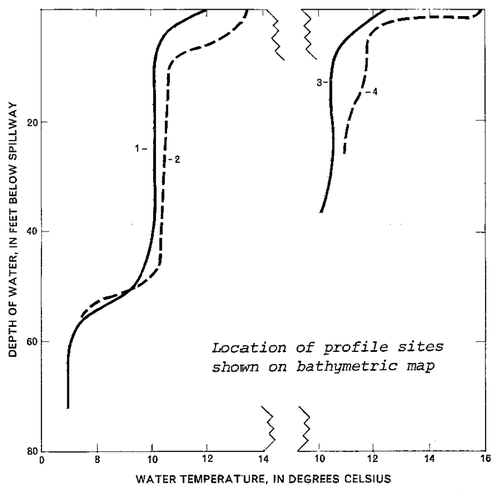

Figure 5.-Vertical water-temperature profiles for Wild Horse Reservoir, May 26, 1972

OTHER BATHYMETRIC SURVEYS

Reconnaissance bathymetric surveys of this series are listed below:

Lake or Reservoir	*Publication*
Pyramid Lake	USGS HA-379[1]
Walker Lake	USGS HA-415[2]
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
Marlette and Spooner 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.

REFERENCE CITED

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