DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

HYDROLOGIC INVESTIGATIONS
ATLAS HA-379

INTRODUCTION

Pyramid Lake, about 30 miles northeast of Reno, Nev., is the terminal water body of the Truckee River system. The principal inflow to the lake is from the Truckee River; local drainage around the lake contributes little. There is no outlet stream; therefore the only outflow is by evaporation. Considerable interest in the lake has developed in recent years because it is an important feature in the management of water in the Truckee and Carson River systems, and because of its potential as a recreation area. An important tool in the evaluation of Pyramid Lake from a management and recreation standpoint is an adequate physiographic and hydrologic survey.

This report was prepared under the general direction of G. F. Worts, Jr., district chief of the Geological Survey's Water Resources Division in Nevada.

HISTORY

The earliest written record of Pyramid Lake is the diary of John C. Fremont, who encountered the lake in January 1844. The next record is that by King (1878), who visited the lake in 1867 and 1871. Russell (1885) surveyed the lake in August-September 1882. From records of these early visits and other evidence, the lake at that time, under natural conditions, covered about 140,000 acres (220 square miles), and its stage fluctuated perhaps as much as 20 feet between wet and dry periods (A. M. Piper, U.S. Geol. Survey, oral commun., 1968).

Diversions from the Truckee River for irrigation began about 1860, and they were accelerated considerably following construction of the Truckee Canal in 1905 (fig. 1). The canal diverts water from the Truckee River to Lahontan Reservoir on the Carson River. Although some of this water is used for irrigation in the Fernley area, most is stored in Lahontan Reservoir for use in the Newlands project near Fallon. U.S. Bureau of Reclamation records show that an average of about 250,000 acre-feet per year was diverted into Truckee Canal during the period 1905-68.

Altitudes of the level of Pyramid Lake from 1867 to 1968, taken from the U.S. Geological Survey records, are shown in figure 2. From 1909 to 1968 the lake level declined from an altitude of 3,869 feet to 3,789 feet above sea level, or 80 feet in 59 years.

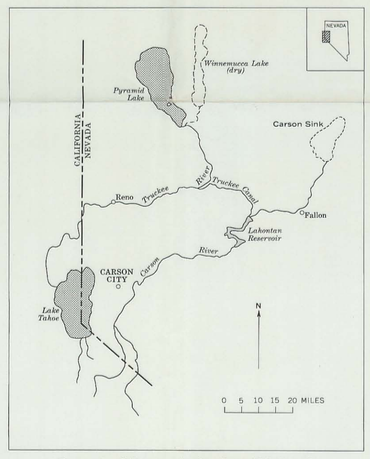

FIGURE 1.—*Index map showing Pyramid Lake and the Truckee and Carson River systems.*

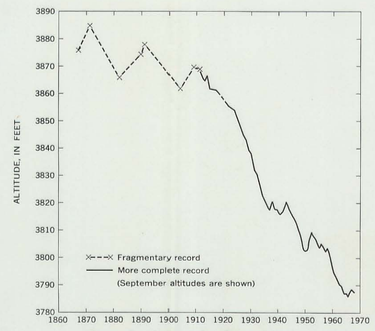

FIGURE 2.—*Water-surface fluctuations of Pyramid Lake, 1867–1968.*

BATHYMETRIC SURVEY

With the exception of a few fathometer surveys made by the Nevada Fish and Game Commission in the 1950's, the only previous systematic survey of Pyramid Lake was made by Russell in 1882 (1885, pl. 9).

For the present survey, section corners and east-west section lines were used to locate accurately the present shoreline and control points for the fathometer survey grid. A boat-mounted recording fathometer was used to obtain cross-sectional profiles of the lake bottom. Twenty-three cross-sectional profiles were run in an east-west direction at one-mile intervals. One long profile was run roughly north-south from The Needle Rocks to Anaho Island. Additional fathometer soundings were made around The Needle Rocks, Anaho Island, The Pyramid, the mouth of the Truckee River, and several beach areas along the west shore. The boat was operated at a constant speed on all profiles, and was kept on line by transit crews on both shores, which were in radio contact with the boat. Hand soundings were made as checks on fathometer readings at 6, 25, 68, 282, and 322 feet.

Aerial photography was obtained to provide details on the present shoreline configuration. Altitudes in this report are expressed in feet above mean sea level (datum of 1929, adjustment of 1956), referenced to U.S. Coast and Geodetic Survey benchmark N-21 at 3,940.29 feet altitude.

The fathometer profiles and aerial photographs were used to contour the lake bottom.

LAKE AREA AND VOLUME

Tables 1 and 2 and figure 3 may be used to obtain the area and volume of the lake at given altitudes. Below altitude 3,789 feet, lake area and volume are based on the bathymetric survey; above altitude 3,802 feet, they are based on planimetry of U.S. Geological Survey topographic maps at scales of 1:24,000 and 1:62,500 by A. M. Piper. Area and volume data have been extended to altitude 3,880 feet, which is approximately the highest recorded lake level.

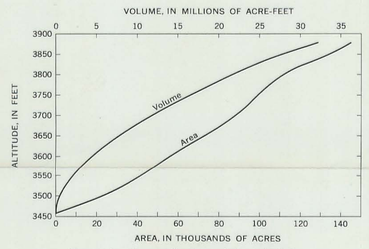

FIGURE 3.—*Area and volume of Pyramid Lake.*

PYRAMID AND ANAHO ISLANDS

As Pyramid Lake recedes, the effect on some of its prominent features is quite noticeable. Pyramid Island, for which the lake is named, is no longer an island but is now connected to the east shore by a narrow neck of land. Anaho Island, which is a National Wildlife Refuge, has been the nesting grounds for much of the bird life in the area. As the lake recedes, Anaho Island grows larger; and if the recession continues, it will soon be connected to the east shore much like Pyramid Island. In May, 1968, the width of the channel between Anaho Island and the east shore was 1,350 feet and its maximum depth was 27 feet.

TABLE 1.—*Area of Pyramid Lake.*
(thousands of acres)

Altitude (feet)	0	1	2	3	4	5	6	7	8	9
3,880	144.3									
3,870	142.4	142.6	142.8	143.0	143.2	143.4	143.6	143.8	144.0	144.2
3,860	139.0	139.4	139.8	140.2	140.5	140.9	141.2	141.5	141.8	142.1
3,850	134.3	134.8	135.3	135.8	136.3	136.8	137.2	137.7	138.1	138.6
3,840	129.1	129.6	130.1	130.7	131.2	131.7	132.2	132.8	133.3	133.8
3,830	123.8	124.3	124.9	125.4	125.9	126.4	127.0	127.5	128.0	128.6
3,820	118.6	119.1	119.6	120.1	120.7	121.2	121.7	122.2	122.8	123.3
3,810	114.7	115.1	115.4	115.8	116.2	116.6	117.0	117.4	117.8	118.2
3,800	111.3	111.6	112.0	112.3	112.6	113.0	113.3	113.6	114.0	114.4
3,790	108.2	108.5	108.8	109.1	109.4	109.7	110.0	110.3	110.7	111.0
3,780	105.9	106.1	106.3	106.6	106.8	107.0	107.2	107.4	107.7	108.0
3,770	103.7	103.9	104.1	104.4	104.6	104.8	105.0	105.2	105.5	105.7
3,760	101.5	101.7	101.9	102.2	102.4	102.6	102.8	103.0	103.3	103.5
3,750	99.3	99.5	99.7	100.0	100.2	100.4	100.6	100.8	101.1	101.3
3,740	97.1	97.3	97.5	97.8	98.0	98.2	98.4	98.6	98.9	99.1
3,730	94.9	95.1	95.3	95.6	95.8	96.0	96.2	96.4	96.7	96.9
3,720	92.6	92.8	93.1	93.3	93.5	93.8	94.0	94.2	94.4	94.7
3,710	90.3	90.5	90.8	91.0	91.2	91.4	91.7	91.9	92.1	92.4
3,700	87.8	88.0	88.3	88.6	88.8	89.0	89.3	89.6	89.8	90.0
3,690	85.2	85.5	85.7	86.0	86.2	86.5	86.8	87.0	87.3	87.5
3,680	82.6	82.9	83.1	83.4	83.6	83.9	84.2	84.4	84.7	84.9
3,670	79.9	80.2	80.4	80.7	81.0	81.2	81.5	81.8	82.1	82.3
3,660	76.6	76.9	77.3	77.6	77.9	78.2	78.6	78.9	79.2	79.6
3,650	73.1	73.4	73.8	74.2	74.5	74.8	75.2	75.6	75.9	76.2
3,640	69.4	69.8	70.1	70.5	70.9	71.2	71.6	72.0	72.4	72.7
3,630	65.7	66.1	66.4	66.8	67.2	67.6	67.9	68.3	68.7	69.0
3,620	62.1	62.5	62.8	63.2	63.5	63.9	64.3	64.6	65.0	65.3
3,610	58.9	59.2	59.5	59.9	60.2	60.5	60.8	61.1	61.5	61.8
3,600	55.7	56.0	56.3	56.7	57.0	57.3	57.6	57.9	58.3	58.6
3,590	52.5	52.8	53.1	53.5	53.8	54.1	54.4	54.7	55.1	55.4
3,580	49.7	50.0	50.3	50.5	50.8	51.1	51.4	51.7	51.9	52.2
3,570	47.0	47.3	47.5	47.8	48.1	48.4	48.6	48.9	49.2	49.4
3,560	44.2	44.5	44.8	45.0	45.3	45.6	45.9	46.2	46.4	46.7
3,550	41.4	41.7	42.0	42.2	42.5	42.8	43.1	43.4	43.6	43.9
3,540	38.4	38.7	39.0	39.3	39.6	39.9	40.2	40.5	40.8	41.1
3,530	35.1	35.4	35.8	36.1	36.4	36.8	37.1	37.4	37.7	38.1
3,520	31.5	31.9	32.2	32.6	32.9	33.3	33.7	34.0	34.4	34.7
3,510	27.6	28.0	28.4	28.8	29.2	29.6	29.9	30.3	30.7	31.1
3,500	23.0	23.5	23.9	24.4	24.8	25.3	25.8	26.2	26.7	27.1
3,490	17.5	18.0	18.6	19.2	19.7	20.2	20.8	21.4	21.9	22.4
3,480	11.8	12.4	12.9	13.5	14.1	14.6	15.2	15.8	16.4	16.9
3,470	5.9	6.5	7.1	7.7	8.3	8.8	9.4	10.0	10.6	11.2
3,460	.5	1.0	1.6	2.1	2.7	3.2	3.7	4.3	4.8	5.4
3,450										.0

TABLE 2.—*Volume of Pyramid Lake.*
(thousands of acre-feet)

Altitude (feet)	0	1	2	3	4	5	6	7	8	9
3,880	32,020									
3,870	30,580	30,730	30,870	31,010	31,160	31,300	31,440	31,590	31,730	31,870
3,860	29,180	29,320	29,460	29,600	29,740	29,880	30,020	30,160	30,300	30,440
3,850	27,810	27,940	28,080	28,210	28,350	28,490	28,620	28,760	28,900	29,040
3,840	26,490	26,620	26,750	26,880	27,010	27,140	27,290	27,410	27,540	27,680
3,830	25,230	25,350	25,480	25,600	25,730	25,850	25,980	26,110	26,240	26,360
3,820	24,020	24,130	24,250	24,370	24,490	24,620	24,740	24,860	24,980	25,100
3,810	22,850	22,960	23,080	23,200	23,310	23,430	23,540	23,660	23,780	23,900
3,800	21,720	21,830	21,940	22,060	22,170	22,280	22,390	22,510	22,620	22,740
3,790	20,620	20,730	20,840	20,950	21,060	21,170	21,280	21,390	21,500	21,610
3,780	19,550	19,660	19,760	19,870	19,980	20,080	20,190	20,300	20,410	20,510
3,770	18,500	18,610	18,710	18,820	18,920	19,030	19,130	19,240	19,340	19,450
3,760	17,480	17,580	17,680	17,780	17,890	17,990	18,090	18,190	18,300	18,400
3,750	16,470	16,570	16,670	16,770	16,870	16,970	17,070	17,180	17,280	17,380
3,740	15,490	15,590	15,690	15,790	15,880	15,980	16,080	16,180	16,280	16,380
3,730	14,530	14,630	14,720	14,820	14,910	15,010	15,110	15,200	15,300	15,400
3,720	13,600	13,690	13,780	13,870	13,970	14,060	14,150	14,250	14,340	14,440
3,710	12,680	12,770	12,860	12,950	13,040	13,130	13,230	13,320	13,410	13,500
3,700	11,790	11,880	11,970	12,050	12,140	12,230	12,320	12,410	12,500	12,590
3,690	10,930	11,010	11,100	11,180	11,270	11,350	11,440	11,530	11,620	11,700
3,680	10,090	10,170	10,250	10,340	10,420	10,500	10,590	10,670	10,760	10,840
3,670	9,270	9,350	9,430	9,510	9,600	9,680	9,760	9,840	9,920	10,000
3,660	8,490	8,570	8,650	8,720	8,800	8,880	8,960	9,040	9,110	9,190
3,650	7,740	7,820	7,890	7,960	8,040	8,110	8,190	8,260	8,340	8,410
3,640	7,030	7,100	7,170	7,240	7,310	7,380	7,450	7,530	7,600	7,670
3,630	6,350	6,420	6,490	6,550	6,620	6,690	6,760	6,820	6,890	6,960
3,620	5,720	5,780	5,840	5,900	5,970	6,030	6,090	6,160	6,200	6,290
3,610	5,110	5,170	5,230	5,290	5,350	5,410	5,470	5,530	5,590	5,650
3,600	4,540	4,590	4,650	4,710	4,760	4,820	4,880	4,940	4,990	5,050
3,590	4,000	4,050	4,100	4,160	4,210	4,260	4,320	4,370	4,430	4,480
3,580	3,490	3,540	3,590	3,640	3,690	3,740	3,790	3,840	3,890	3,940
3,570	3,000	3,050	3,100	3,140	3,190	3,240	3,290	3,340	3,390	3,440
3,560	2,550	2,590	2,640	2,680	2,730	2,770	2,820	2,860	2,910	2,960
3,550	2,120	2,160	2,200	2,240	2,290	2,330	2,370	2,410	2,460	2,500
3,540	1,720	1,760	1,800	1,840	1,880	1,920	1,960	2,000	2,040	2,080
3,530	1,350	1,390	1,420	1,460	1,490	1,530	1,570	1,610	1,640	1,680
3,520	1,020	1,050	1,080	1,110	1,150	1,180	1,210	1,250	1,280	1,320
3,510	723	750	779	807	836	866	895	926	956	987
3,500	470	493	517	541	565	590	616	642	668	695
3,490	267	285	303	322	342	362	382	403	425	447
3,480	121	133	145	159	172	187	202	217	233	250
3,470	32.2	38.4	45.2	52.6	60.6	69.2	78.3	88.0	89.3	109
3,460	.2	2.3	1.0	4.2	6.6	9.5	13.0	17.0	21.5	26.6
3,450										.0

REFERENCES CITED

King, Clarence, 1878, United States geological explorations of the fortieth parallel, v. 1, Systematic geology: Washington, D. C., Govt. Printing Office, 803 p.

Russell, I. C., 1885, Geological history of Lake Lahontan, a Quaternary lake of northwestern Nevada: U.S. Geol. Survey monograph 11, 288 p.

EXPLANATION

40
20
Lines of equal water depth
Interval 40 feet. Supplemental lines (dashed) at 10 and 20 feet

x242
Deepest point, in feet, on east-west profiles along projected section lines

Altitude 3789 feet above mean sea level, May 1968

Base from U.S. Geological Survey, 1:24,000

SCALE 1:62 500

Hydrography mapped in May 1968

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