MANN CREEK RESERVOIR
1992 SEDIMENTATION SURVEY

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16. ABSTRACT

Mann Creek Reservoir was surveyed in June 1992 to compile field data for developing a reservoir topographic map and computing a present storage-elevation relationship. The data were also used to calculate the volume of sediment that has accumulated in the reservoir since dam closure on March 27, 1967. The 1992 bathymetric survey utilized sonic depth recording equipment interfaced with an automated microwave positioning system that gave continuous depth and sounding positions throughout the reservoir. The above-water reservoir area was calculated from close interval cross sections measured from aerial photography. A new reservoir contour map was developed by the computer graphics program Surface II using the collected data.

As of June 1992, at reservoir spillway crest elevation (feet) 2889.0, the surface area was 283 acres with a total capacity of 12,536 acre-feet and an active capacity of 10,917 acre-feet. Since the reservoir's initial filling in March 1967, 555 acre-feet of sediment have been trapped in Mann Creek Reservoir resulting in 4.4 percent loss in reservoir capacity. The average annual rate of sediment accumulation since 1967 is 22.0 acre-feet.

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MANN CREEK RESERVOIR

1992 SEDIMENTATION SURVEY

by

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U.S. Department of the Interior
Mission Statement

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally-owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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INTRODUCTION

Mann Creek Dam and Reservoir, major features of the Mann Creek Project, are located on Mann Creek in the Weiser River Basin. The dam, located in Washington County, Idaho, is about 13 miles northeast of Weiser, Idaho. The dam was designed and constructed as Spangler Dam, but its name was officially changed to Mann Creek Dam prior to completion (fig. 1).

In 1938, Reclamation (Bureau of Reclamation), investigated the Spangler Reservoir site on Mann Creek for developing an irrigation water supply. The project was approved for construction in July 1941 under the terms of the Water Conservation and Utilization Act. The landowners of the Mann Creek area failed to approve the proposed repayment contract and the project was not constructed. A new study was prepared on an alternative Spangler Reservoir site in 1958, followed by authorization and development of a definite plan. The Mann Creek Project was authorized for construction under the provisions of Public Law 87-589, approved August 16, 1962.

Construction of Mann Creek Dam and Reservoir began in 1965, and was completed in 1967. Initial water storage began on March 27, 1967. The dam was constructed as a zoned earth and rockfill structure. The reservoir was designed to provide water for supplemental irrigation in the Mann Creek and Monroe Creek areas. Actual operation showed flood control, recreation, and fish and wildlife benefits. Mann Creek Dam and Reservoir and all other project facilities are operated by the Mann Creek Irrigation District.

At dam crest elevation 2903.0, Mann Creek Dam (fig. 2) has:

- a structural height* of 148 feet
- a hydraulic height of 132 feet
- a top crest width of 30 feet
- a crest length of 1,176 feet

The spillway, located along the right abutment, consists of a morning-glory-type inlet structure with an uncontrolled ogee crest at elevation 2889.0, a 24-inch air inlet pipe, and a circular 11-foot cut-and-cover conduit discharging into a stilling basin located along the right abutment. The spillway design flow is 3,840 cubic feet per second at maximum water surface elevation 2897.1.

The outlet works, located along the left abutment, is controlled by two 2.25-square-foot high pressure gates located in a control house and one 2.75-foot high-pressure gate located in the gate chamber for emergency. The capacity of the outlet works is 300 cubic feet per second at reservoir elevation 2889.0.

The 1992 reservoir survey measured a total storage capacity of 12,536 acre-feet and a surface area of 283 acres at reservoir spillway crest elevation 2889.0.

* The definition of terms such as "structural height," "hydraulic height," etc., may be found in manuals such as Reclamation's *Design of Small Dams* and *Guide for Preparation of Standing Operating Procedures for Dams and Reservoirs*, or ASCE's *Nomenclature for Hydraulics*.

SUMMARY AND CONCLUSIONS

This report presents the 1992 results of the first extensive sedimentation survey of Mann Creek Reservoir by Reclamation since construction of Mann Creek Dam. The primary objectives of the survey were to:

- gather data needed for developing new reservoir topography
- compute area-capacity relationships
- estimate storage depletion caused by sediment deposition since closure of Mann Creek Dam.

Standard land surveying methods were used to establish horizontal and vertical control points for the aerial and hydrographic surveys. A horizontal grid system was established for both surveys using monumented control points located in the reservoir area. The bathymetric survey was run using sonic depth recording equipment interfaced with an automated survey system consisting of a line-of-sight microwave positioning unit capable of determining sounding locations within the reservoir. The system continuously recorded reservoir depth and horizontal coordinates as the survey boat was steered across close-spaced gridlines covering the reservoir area. The positioning system provided information to allow the boat operator to maintain course along these gridlines. Water surface elevations measured by the land surveyors at the time of data collection were used to convert the sonic depth measurements to true lake bottom elevations.

The 1992 surface areas at predetermined 5-foot contour intervals were generated by a computer graphics program that produced a new contour map of the reservoir (fig. 3). The revised area and capacity tables were produced by a computer program that uses measured contour surface areas and a curve-fitting technique to compute area and capacity at prescribed elevation increments.

Table 1 contains a summary of reservoir watershed characteristics and sediment data for the 1992 survey. The 1992 survey determined that the reservoir has a storage capacity of 12,536 acre-feet and a surface area of 283 acres at spillway crest elevation 2889.0. Since closure in 1967, the reservoir has accumulated a volume of 555 acre-feet of sediment below spillway crest elevation 2889. This volume represents a 4.44-percent loss in total capacity and an average annual loss of 22.0 acre-feet. These figures indicate a small amount of sediment accumulated in the reservoir since the original survey, but a high percentage of volume loss for this small time period because of the small storage capacity of Mann Creek Reservoir. For sediment calculation purposes the difference between the original and 1992 capacity was used, but a question exists as to the accuracy of the original area-capacity. A resurvey of Mann Creek Reservoir should be considered in the future if major sediment inflow events occur or if a more accurate rate of sediment accumulation is needed.

DESCRIPTION OF WATERSHED

Mann Creek, which drains into Mann Creek Reservoir, originates in the Payette National Forest on the southern slopes of the Hitt Mountains. The watershed above the dam has a drainage area of about 56 square miles. Elevations in the watershed range from 2822.0 at the outlet works to about 7400 feet along the northwestern divide. The runoff of Mann Creek originates almost entirely from melting snow. The topography, climate, and cover on the

watershed is conducive to high spring runoff and low flow during the summer and winter months. The creek flows generally south-southeast in a rather narrow canyon.

The basin is characterized by steeply sloping hills and canyon walls covered with sparse grasses and sagebrush in the lower elevations of the watershed. The upper elevations of the watershed tend to be mountainous terrain with moderate to steep slopes covered with a medium dense growth of pine trees and grasses. The soil throughout the watershed is a silty clay loam.

RESERVOIR OPERATIONS

The reservoir is a multiuse facility having (following values are from June 1992 area-capacity tables):

- 2,419 acre-feet of exclusive flood control storage between elevations 2889.0 and 2897.1
- 10,917 acre-feet of active conservation storage between elevations 2825.0 and 2889.0
- 224 acre-feet of inactive storage between elevations 2822.0 and 2825.0
- 1,395 acre-feet of dead storage between elevations 2782.7 and 2822.0

Records for Mann Creek Reservoir show an average unregulated inflow of 30,535 acre-feet per year. The estimated mean annual runoff from the basin is 10.2 inches. Mann Creek Reservoir operation ranged from a minimum elevation of 2825.0 in September 1988 and 1992 to a maximum elevation of 2890.8 in April 1990. The inflow and end-of-month stage records in table 1 show the extreme annual fluctuation of the reservoir.

SURVEY METHOD AND EQUIPMENT

The Mann Creek Reservoir survey was completed using the contour method as outlined by Blanton (1982). The procedure involved collecting adequate coordinate data for developing a reliable contour map by photogrammetric and bathymetric survey methods. Standard land surveying methods were used by Columbia Basin Project Office personnel to establish horizontal and vertical control points for both survey methods. A horizontal grid system was established for both surveys using monumented points, with state plane coordinates, located in the reservoir area. The above water data were collected by aerial photography prior to the bathymetric survey. The field survey work for the bathymetric survey involved establishing a triangulation network around the reservoir to provide horizontal and vertical control for all required grid lines and shore stations. No previously established range lines existed on the lake, and it was decided not to establish permanent range lines during this survey. Because of the size and shape of the reservoir, any future survey would also employ the contour method; therefore, permanent range line end markers were not necessary.

The hydrographic survey was run on June 3, 1992, with the reservoir at water surface elevation 2866.9. The bathymetric survey was run using sonic depth recording equipment interfaced with an automated survey system consisting of a line-of-sight microwave positioning unit capable of determining sounding locations within the reservoir. This positioning system transmitted line-of-sight microwave signals to fixed shore stations and converted the reply time to range distances, which were used by the system data logger to

compute the coordinate position of the sounding boat. The survey system continuously recorded reservoir depth and horizontal coordinates as the survey boat moved across close-spaced gridlines covering the reservoir area. To produce adequate data for developing contours of Mann Creek Reservoir, grid spacing of 150 feet was selected. The system gave directions to the boat operator to assist in maintaining course along the close-spaced gridlines. During each run, the depth and position data were recorded on a floppy disk for subsequent processing by Denver Office personnel. A graph plotter was used in the field to track the boat and ensure adequate coverage during the collection process. Water surface elevations surveyed at the time of collection were used to convert the sonic depth measurements to true lake bottom elevations.

RESERVOIR AREA AND CAPACITY

Original Capacity

The original total capacity of Mann Creek Reservoir was reported as 12,950 acre-feet at the spillway crest elevation of 2889.0. For determining change in reservoir storage, the original storage-elevation relationship was recomputed using 5-foot surface area values from the October 1967 area-capacity tables for elevations 2825.0 through 2897.1, and September 1964 preliminary area values for elevations 2760.0 through 2820.0. Some question exists as to the accuracy of the original topography and resulting reservoir surface areas. A note on Reclamation drawing 354-D-45 indicates that the map topography does not agree in all cases with the ground surface elevations surveyed at the reservoir borrow areas.

Results of the original area and capacity computations are listed in table 1 and in columns (2) and (3) of table 2. The original measured surface area values at elevations 2865.0, 2870.0, 2875.0, 2890.0, and 2897.1 were found to be slightly less than the 1992 survey values at the same elevation. This difference resulted in the 1992 survey showing a slight gain of volume in the upper reservoir area compared to the original survey. As illustrated in table 2, the survey also showed the largest measured sediment volume, column (6), at elevation 2860.0. Spillway crest elevation 2889.0 was used when computing all sediment accumulation values because little sign of bank erosion was observed and these small gains in surface area were assumed to be the result of the different survey methods.

Development of 1992 Contour Areas

The 1992 contour surface areas for Mann Creek Reservoir were developed by generating a contour map from the collected aerial and underwater coordinate data. Five-foot contour intervals of the lake area were created by a computer graphics software program SURFACE II (Kansas Geological Survey, 1978). A modification of this program by the Denver Office calculated surface areas of the closed contours of the generated map. The final reservoir map shown on figure 3 was prepared by the Denver Office Computer Drafting Unit of the Drafting Section. The map has a scale of one inch equals 300 feet and a contour interval of five feet.

1992 Revised Storage Capacity

The storage-elevation relationships based on the aerial and underwater survey data were developed using the area-capacity computer program ACAP85 (Reclamation, 1985). Surface areas at 5-foot contour intervals computed from the aerial and underwater survey data were used as the control parameters for computing reservoir capacity. The program computes an

area at elevation increments of 0.01 to 1.0 foot by linear interpolation between the 5-foot contour intervals. The program begins by testing the initial capacity equation over successive intervals to ensure that the equation fits within an allowable error limit, which was set at 0.000001 for Mann Creek Reservoir. This capacity equation is then used over the full range of intervals fitting within this allowable error limit. For the first interval at which the initial allowable error limit is exceeded, a new capacity equation (integrated from the basic area curve over that interval) tests the fit until it also exceeds the error limit. Thus, the capacity curve is defined by a series of curves, each fitting a certain region of data. Final area equations are derived by differentiating the capacity equations, which are of second order polynomial form:

$$y = a + a_2x + a_3x^2$$

where:

y = capacity,
x = elevation above a reference base,
a = intercept, and
a_2 and a_3 = coefficients

Results of the 1992 Mann Creek Reservoir area and capacity computations are listed in table 1 and columns (4) and (5) of table 2. Listed in columns (2) and (3) of table 2 are the original surface areas and recomputed capacity values. A separate set of 1992 area and capacity tables has been published for the 0.01-, 0.1-, and 1-foot elevation increments (Reclamation, 1992). A description of the computations and coefficients output from the ACAP85 program is included with these tables. Both the original and 1992 area-capacity curves are plotted on figure 4. As of June 1992, at reservoir spillway crest elevation 2889.0, the surface area was 283 acres, with a total capacity of 12,536 acre-feet and an active capacity of 10,917 acre-feet.

SEDIMENT ANALYSES

Sediments have accumulated in Mann Creek Reservoir to a total volume of 555 acre-feet since dam closure in March 1967. Of the total deposited sediment, 209 acre-feet was deposited in the active pool and 376 acre-feet in the inactive pool storage areas. The average annual rate of sediment deposition between closure and June 1992 (25.2 years) was 22.0 acre-feet per year, or 0.168 acre-foot per square mile from the sediment contributing drainage area. The storage loss in terms of percent of original storage capacity was 4.44 percent. The 555 acre-feet of sediment is a small amount to have accumulated in the reservoir since the original survey, but a high percentage of volume loss for the small capacity of Mann Creek Reservoir. Table 1 and 2 contain the Mann Creek Reservoir sediment accumulation and water storage data based on the 1992 resurvey.

A 1987 study to estimate sediment accumulations (Reclamation, 1987c) was initiated at Mann Creek Reservoir to address concerns that timber harvest, depleted range cover, and channel alterations cause excessive erosion in the watershed. Depth-integrated suspended sediment samples were collected intermittently in Mann Creek above the reservoir in 1984 and 1985, and mean daily discharges were calculated from reservoir releases and daily change in contents. A flow frequency distribution was determined from average daily inflows during the 1968-86 period of record. The flow duration data were combined with the sediment rating curve to determine average annual suspended sediment inflow. Based on the available data,

the study estimated a 100-year sediment accumulation of 217 acre-feet, which was less than 2 percent of the total storage capacity.

Several factors must be considered when using either the 1987 or 1992 study results. The 1987 study only had a few samples and an estimated mean daily discharge on which calculations could be based. This method does not account for any major sediment inflow event that may have occurred. The 1992 study sediment calculations were based on the difference between the original and 1992 measured reservoir capacities. This method would account for all sediment accumulation during the 25.2 years of reservoir operation, but the calculations are only as accurate as the reservoir topography maps. The original reservoir and vicinity map, Drawing No. 354-D-45, notes that ground surface profile elevations surveyed at the auger hole locations do not agree in all cases with the map topography. This discrepancy brings into question the accuracy of the original areas and capacities which were used as the base for measuring the accumulated sediment in 1992. For sediment calculation purposes, the difference between the original and 1992 capacity was used, but as noted, a question exists as to the accuracy of the original area-capacity. A resurvey of Mann Creek Reservoir should be considered in the future if major sediment inflow events occur, or if the average annual rate of sediment accumulation requires clarification.

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RESERVOIR SEDIMENT
DATA SUMMARY

Mann Creek Reservoir

NAME OF RESERVOIR

1
DATA SHEET NO.

DAM	1. OWNER Bureau of Reclamation		2. STREAM Mann Creek		3. STATE Idaho	
	4. SEC. 11 TWP. 12N RANGE 5W		5. NEAREST P.O. Weiser		6. COUNTY Washington	
	7. LAT 44° 23' 31" LONG 116° 53' 38"		8. TOP OF DAM ELEVATION 2903.0		9. SPILLWAY CREST 2889.0	
RESERVOIR	10. STORAGE ALLOCATION	11. ELEVATION TOP OF POOL	12. ORIGINAL SURFACE AREA, Ac	13. ORIGINAL CAPACITY, AF	14. GROSS STORAGE ACRE- FEET	15. DATE STORAGE BEGAN
	a. FLOOD CONTROL	2897.1	313	2,410	15,360	
	b. MULTIPLE USE	2889.0	283	11,100	12,950	3/27/67
	c. POWER					
	d. WATER SUPPLY					16. DATE NORMAL OPERATION BEGAN
	e. IRRIGATION					
	f. CONSERVATION					
	g. INACTIVE	2825.0	84	1,850	1,850	3/27/67
	17. LENGTH OF RESERVOIR 1.6 MILES			AVG. WIDTH OF RESERVOIR 0.28 MILES		
BASIN	18. TOTAL DRAINAGE AREA 56 SQUARE MILES			22. MEAN ANNUAL PRECIPITATION 11.5[1] INCHES		
	19. NET SEDIMENT CONTRIBUTING AREA 56 SQUARE MILES			23. MEAN ANNUAL RUNOFF 10.2[2] INCHES		
	20. LENGTH MILES	AV. WIDTH MILES		24. MEAN ANNUAL RUNOFF 30,535[3] ACRE-FEET		
	21. MAX. ELEVATION 7400	MIN. ELEVATION 2825.0		25. ANNUAL TEMP. MEAN 50°F RANGE -25°F to 105°F[1]		

SURVEY DATA	26. DATE OF SURVEY	27. PER. YRS.	28. ACCL. YRS.	29. TYPE OF SURVEY	30. NO. OF RANGES OR INTERVAL	31. SURFACE AREA, AC.	32. CAPACITY ACRE-FEET	33. C/I RATIO AF/AF
	3/27/67			Contour(R)		283[4]	13,091[5]	0.43
	6/3/92	25.2	25.2	Contour(D)	5-ft	283.0	12,536	0.41

26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIP.	35. PERIOD WATER INFLOW, ACRE FEET			WATER INFLOW TO DATE, AF	
		a. MEAN ANN.	b. MAX. ANN.	c. TOTAL	a. MEAN ANN.	b. TOTAL
6/3/92	11.5	30,535	68,600	769,480[3]	30,535	769,480

26. DATE OF SURVEY	37. PERIOD CAPACITY LOSS, ACRE-FEET			38. TOTAL SEDIMENT DEPOSITS TO DATE, AF		
	a. TOTAL	b. AV. ANN.	c. /MI.²-YR.	a. TOTAL	b. AV. ANNUAL	c. /MI.²-YR.
6/3/92	555[6]	22.0	0.39	555	22.0	0.39

26. DATE OF SURVEY	39. AV. DRY WT. (#/FT³)	40. SED. DEP. TONS/MI.²-YR.		41. STORAGE LOSS, PCT.		42. SEDIMENT INFLOW, PPM	
		a. PERIOD	b. TOTAL TO DATE	a. AV. ANNUAL	b. TOTAL TO DATE	a. PER.	b. TOT.
6/3/92				0.168[7]	4.44[7]		

26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW SPILLWAY CREST ELEVATION										
	129.0-119.0	119.0-109.0	109.0-99.0	99.0-89.0	89.0-79.0	79.0-69.0	69.0-59.0	59.0-49.0	49.0-39.0	39.0-29.0	29.0-crest
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION										
6/3/92	2.7	9.7	17.0	7.8	10.9	13.0	12.8	11.1	11.4	3.6	0.0

26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR														
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-105	105-110	110-115	115-120	120-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														
	N/A														

Table 1. - Reservoir sediment data summary (page 1 of 2).

45. RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AF	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AF
1967	2888.1	2849.8	19,200	1968	2889.2	2848.9	15,400
1969	2889.4	2849.8	32,800	1970	2889.3	2852.5	34,600
1971	2889.8	2851.8	51,800	1972	2889.6	2835.9	32,000
1973	2889.6	2837.5	16,300	1974	2889.6	2837.3	47,200
1975	2889.9	2843.3	38,700	1976	2889.0	2847.5	24,200
1977	2854.8	2826.3	2,800	1978	2890.1	2828.0	42,400
1979	2889.7	2838.9	20,200	1980	2889.9	2838.0	28,900
1981	2889.7	2841.5	20,300	1982	2889.9	2843.3	53,700
1983	2888.6	2859.5	68,600	1984	2889.3	2851.6	50,000
1985	2888.3	2846.4	24,200	1986	2889.7	2840.8	36,000
1987	2889.8	2825.6	13,900	1988	2879.7	2825.0	10,940
1989	2889.3	2825.6	43,020	1990	2890.8	2839.1	17,450
1991	2889.6	2829.4	14,650	1992	2880.8	2825.0	10,220[8]

46. ELEVATION - AREA - CAPACITY DATA FOR ORIGINAL CAPACITY [9]

ELEV.	AREA	CAP.	ELEV.	AREA	CAP.	ELEV.	AREA	CAP.
2760	0	0	2805	45.4	676	2855	160	5,590
2765	1.5	4	2810	56.0	930	2860	178	6,435
2770	3.0	15	2815	66.1	1,235	2865	195	7,368
2775	5.3	36	2820	77.0	1,593	2870	211	8,383
2780	8.0	69	2825	84	1,995	2875	230	9,485
2782.7	(11)	94	2830	97	2,448	2880	251	10,688
2785	13.0	121	2835	108	2,960	2885	269	11,988
2790	19.0	201	2840	118	3,525	2889	(283)	13,091
2795	26.8	316	2845	130	4,145	2890	286	13,375
2800	36.0	473	2850	144	4,830	2897.1	313	15,502

46. ELEVATION - AREA - CAPACITY DATA FOR 1992 TOTAL CAPACITY [10]

ELEV.	AREA	CAP.	ELEV.	AREA	CAP.	ELEV.	AREA	CAP.
2782.7	0	0	2825	77.6	1,619	2870	214.1	7,823
2785	1.2	1	2830	90.1	2,038	2875	230.2	8,934
2790	13.6	38	2835	101.4	2,517	2880	250.4	10,135
2795	23.2	130	2840	113.0	3,053	2885	268.6	11,433
2800	31.1	266	2845	123.6	3,644	2889	(283)	12,536
2805	39.4	442	2850	136.6	4,295	2890	286.7	12,821
2810	48.8	663	2855	154.4	5,022	2897.1	314.0	14,955
2815	59.8	934	2860	176.7	5,850	2903	336.8	16,876
2820	68.2	1,254	2865	199.2	6,790			

47. REMARKS AND REFERENCES

[1] Project Data Book of Mann Creek Project, 1966 - 80, BOR.

[2] Calculated using mean annual runoff value of 30,535 AF (Item 24).

[3] Unregulated monthly inflow records for reservoir operation period.

[4] Surface area at reservoir elevation 2889.0.

[5] Capacity at elevation 2889.0. Computed by Reclamation's ACAP program using original surface areas. Some question as to the accuracy of the original surface areas.

[6] Total capacity loss calculated by comparing recomputed capacity (see remark #5) and 1992 capacity at spillway crest elevation 2889. The 1992 areas measured slightly greater then original areas (<2%) at El. 2865, El. 2870, and El. 2897.1 which was probably due the differences in survey methods and/or some bank erosion. Maximum capacity loss of 585 AF recorded at elevation 2860 due to this.

[7] Average annual and total sediment deposits of 22.0 AF and 555 AF respectfully divided by 13,091 AF. Capacity at El. 2889.0 computed by ACAP using original surface area data.

[8] Calculated inflow for Oct. 1991 through May 1992.

[9] Original total capacity computed by ACAP using 9/64 preliminary areas for El. 2760 through El. 2820 and areas from 10/67 area-capacity tables for El. 2825 through El. 2897.1. Some question as to the accuracy of the original surface areas. Areas in ( ) calculated by ACAP.

[10] 1992 total capacity computed by ACAP using 1992 measured areas. Area in ( ) calculated by ACAP.

48. AGENCY MAKING SURVEY Bureau of Reclamation

49. AGENCY SUPPLYING DATA Bureau of Reclamation | DATE June 1993

Table 1. - Reservoir sediment data summary (page 2 of 2).

(1) Elevation (ft)	(2) Original area (acres)	(3) Original total capacity (acre-ft)	(4) 1992 area (acres)	(5) 1992 capacity (acre-ft)	(6) Measured sediment volume (acre-ft)	(7) Measured Sediment (%)	(8) Reservoir Depth (%)
2897.1	313.0	15,502	314.0	14,955	547	100.0	100.0
2890.0	286.0	13,375	286.7	12,821	554	100.0	94.8
2889.0	283.0	13,091	283.6	12,536	555	100.0	94.1
2880.0	251.0	10,688	250.4	10,135	553	100.0	87.5
2870.0	211.0	8,383	214.1	7,823	560	100.0	80.2
2860.0	178.0	6,435	176.7	5,850	585	100.0	72.9
2850.0	144.0	4,830	136.6	4,295	535	96.4	65.6
2840.0	118.0	3,525	113.0	3,053	472	85.0	58.4
2830.0	97.0	2,448	90.1	2,038	410	73.9	51.0
2820.0	77.0	1,593	68.2	1,254	339	61.1	43.8
2810.0	56.0	930	48.8	663	267	48.1	36.5
2800.0	36.0	473	31.1	266	207	37.2	29.2
2790.0	19.0	201	13.6	38	163	29.4	21.9
2782.7	11.0	94	0.0	0	94	16.9	16.6
2780.0	8.0	69	0.0	0	69	12.4	14.6
2770.0	3.0	15	0.0	0	15	2.7	7.3
2760.0	0.0	0	0.0	0	0	0.0	0.0

(1) Elevation of reservoir water surface.
(2) Original reservoir surface area values.
(3) Original reservoir capacity recomputed using ACAP85.
(4) Reservoir surface area from 1992 survey.
(5) 1992 calculated reservoir capacity from 1992 survey data.
(6) Measured sediment volume = column (3) - column (5).
(7) Measured sediment expressed in percentage of total sediment (555), measured at spillway crest El. 2889. 100% measured from elevation 2860 and above. 1992 areas measured slightly greater than original at El. 2870, 2890, and 2897.1, probably due to difference in survey methods or some bank erosion.
(8) Depth of reservoir expressed in percentage of total depth (137.1 feet).

Table 2. - Summary of 1992 survey results.

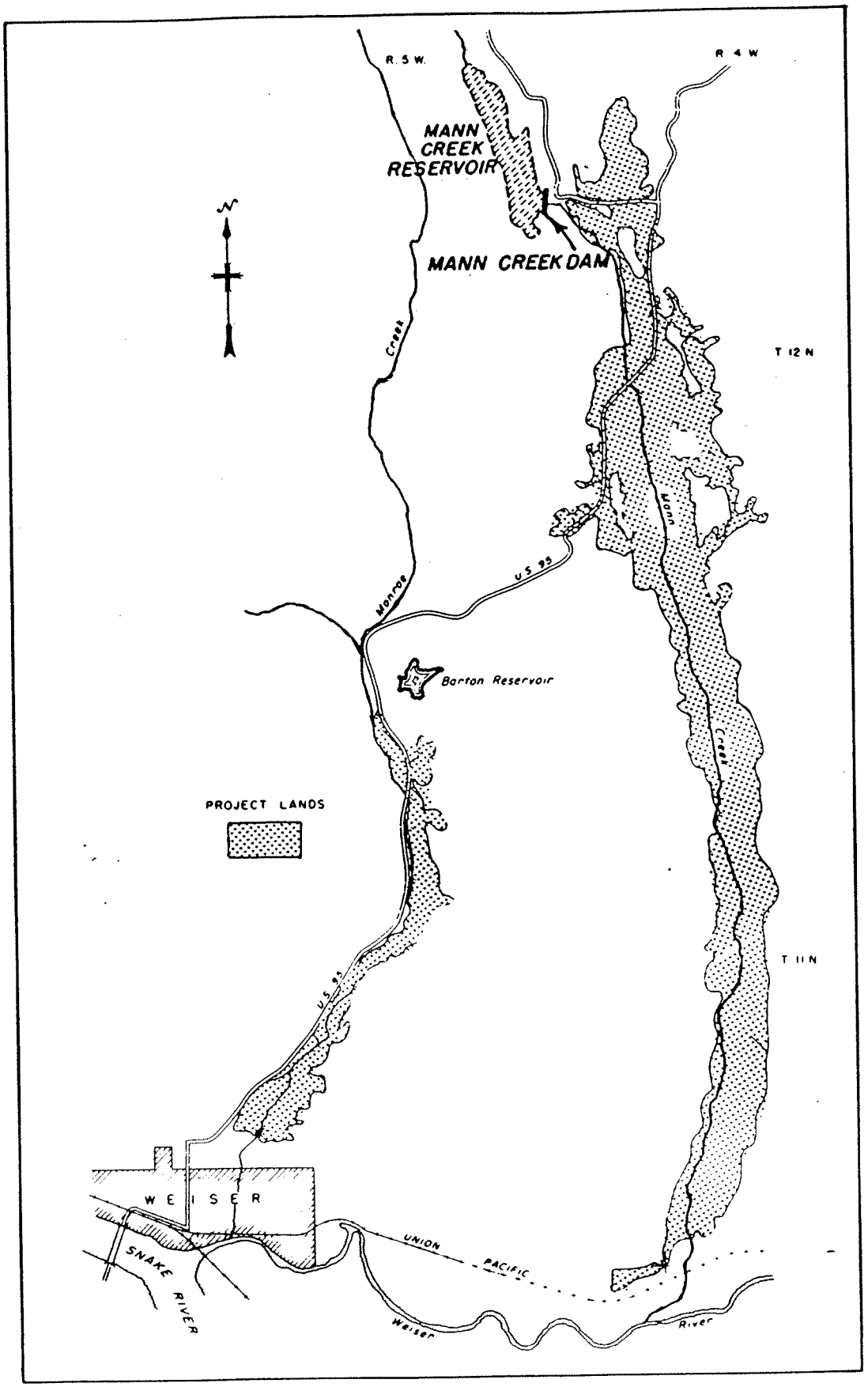

Figure 1. - Mann Creek location map.

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354-D-143

Mann Creek Dam
Crest El. 2903

Spillway Inlet

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MANN CREEK PROJECT

MANN CREEK RESERVOIR
TOPOGRAPHY

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Figure 3. - Mann Creek Reservoir topographic map.

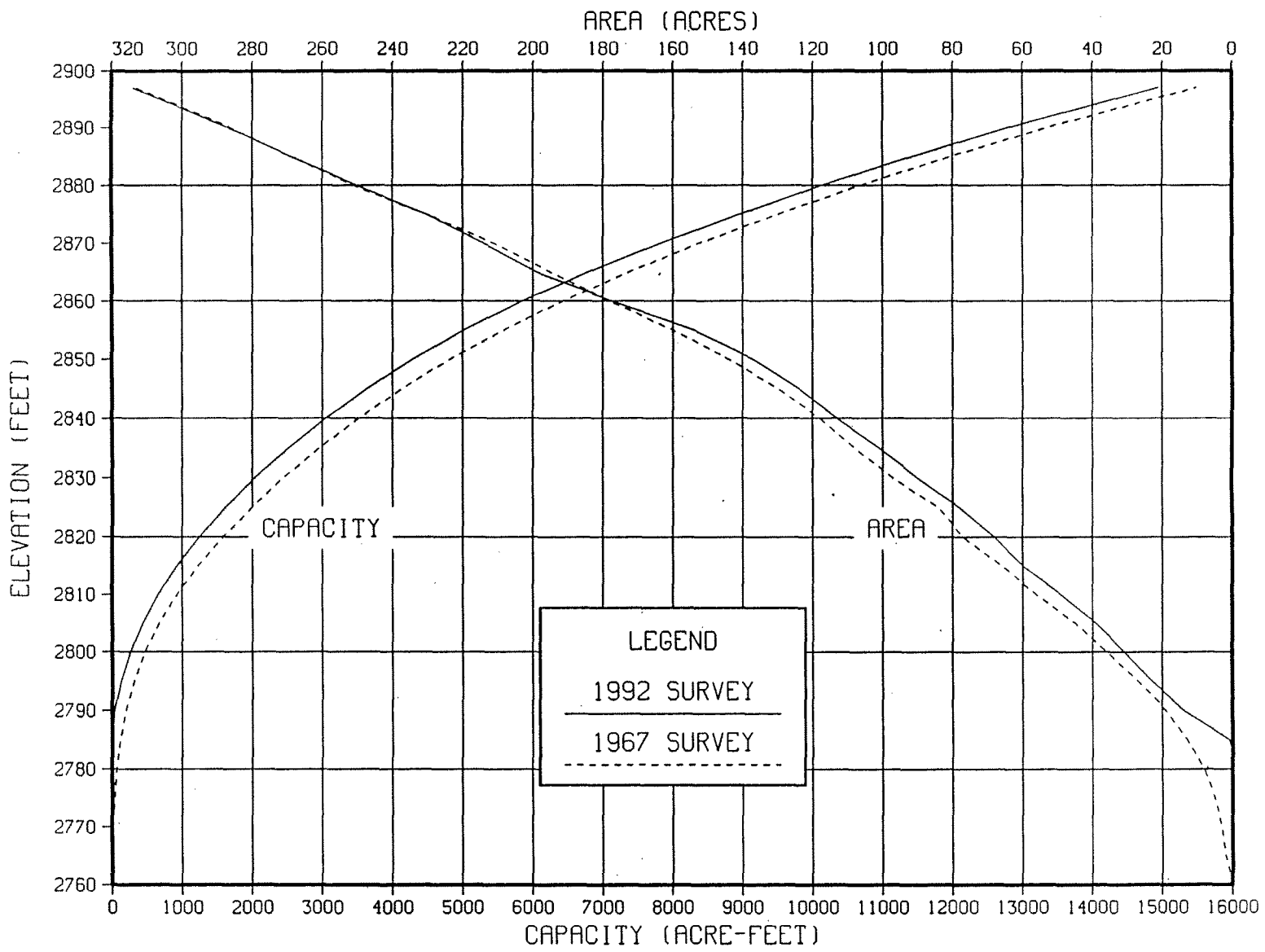

Figure 4. - 1992 area and capacity curves.

Mission

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American Public.

A free pamphlet is available from the Bureau entitled "Publications for Sale." It describes some of the technical publications currently available, their cost, and how to order them. The pamphlet can be obtained upon request from the Bureau of Reclamation, Attn D-7923H, PO Box 25007, Denver Federal Center, Denver CO 80225-0007.