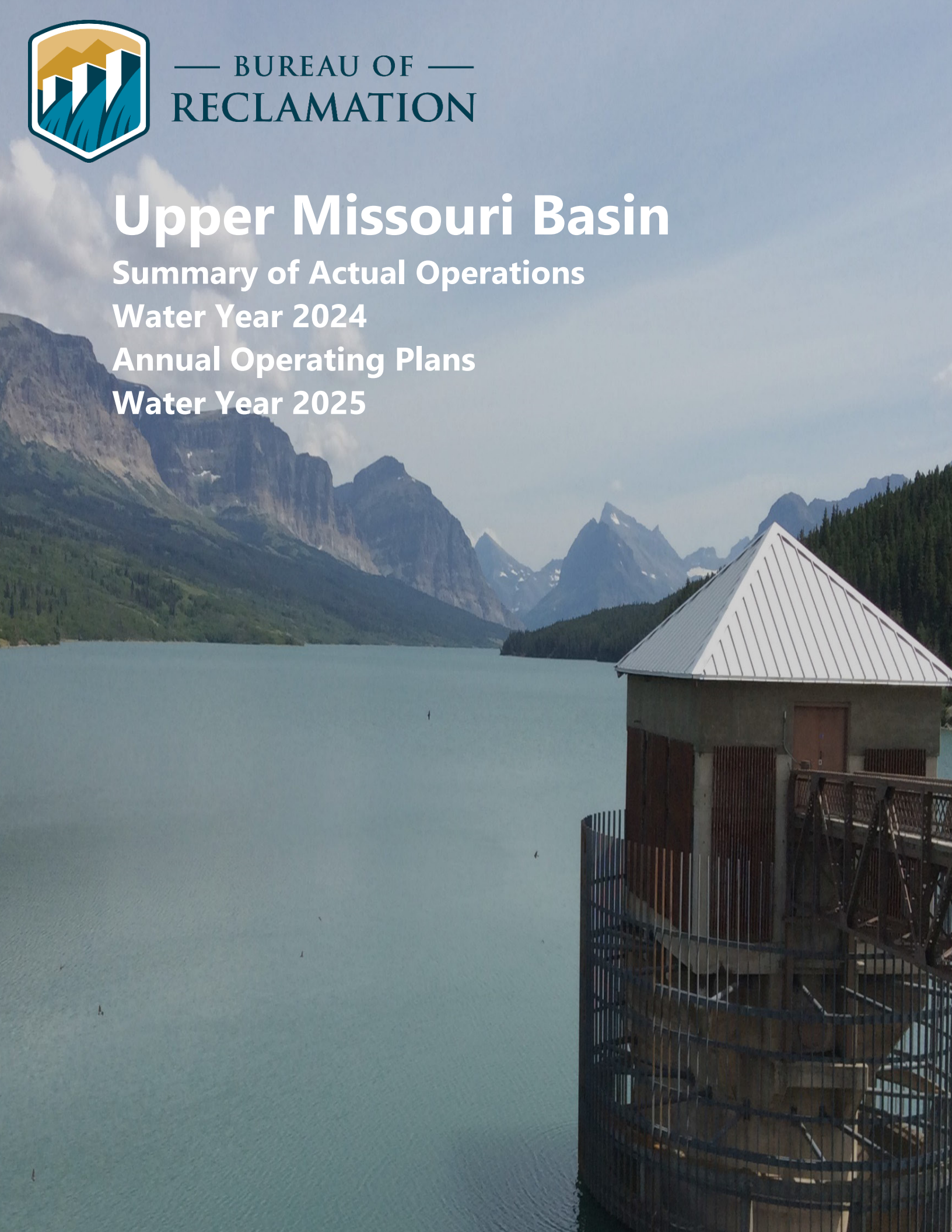
BUREAU OF RECLAMATION

Upper Missouri Basin

Summary of Actual Operations
Water Year 2024
Annual Operating Plans
Water Year 2025



Mission Statements

The U.S. Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; honors its trust responsibilities or special commitments to American Indians, Alaska Natives, Native Hawaiians, and affiliated Island Communities.

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.

Cover Image – Lake Sherburne, Glacier National Park (Department of the Interior)

Upper Missouri River Basin

Summary of Actual Operations
Water Year 2024
Annual Operating Plans
Water Year 2025

Prepared by:

Bureau of Reclamation
Technical Services Center, Hydrology and Water Operations
Wyoming Area Office
Montana Area Office
Dakotas Area Office

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Acronyms and Abbreviations

abv	above
AF	acre-feet
AOP	Annual Operating Plan
ASI	Annual Site Inspection
Avg	average
B	Boysen Reservoir
BB	Buffalo Bill Reservoir
BFID	Belle Fourche Irrigation District
CCID	Crook County Irrigation District
CR	Comprehensive Review
Div.	Diversion
EAP	Emergency Action Plan
ENSO	El Niño-Southern Oscillation
EOM	end of month
FONSI	finding of no significant impact
FID	Fort Shaw Irrigation District
ft	foot/feet
ft/day	feet per day
ft^3/s	cubic feet per second
GID	Greenfields Irrigation District
gwh	gigawatt hours
HVID	Helena Valley Irrigation District
IDF	Inflow Design Flood
IJC	International Joint Commission
Insp	Inspection
KAF	thousand acre-feet
kw	kilowatts
Max	maximum
Midvale	Midvale Irrigation District
Min	minimum

MRJBC	Milk River Joint Board of Control
msl	mean sea level
MTAO	Montana Area Office (Reclamation)
Mtn	Mountain
MW	megawatt(s)
MWh	megawatt-hours
N/A	not available
NRCS	Natural Resource Conservation Service
P-S MBP	Pick-Sloan Missouri Basin Program
PFR	Periodic Facility Review
Reclamation	Bureau of Reclamation
SM	Spirit Mountain
SMED	Spirit Mountain energy dissipation
SNOTEL	Snow Telemetry
SOD	Safety of Dams
SWE	snow water equivalent
System	System of dams, reservoirs, and powerplants on the North Platte River
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
Western	Western Area Power Administration (WAPA)
WGF	Wyoming Game and Fish Department
WY	water year
WYAO	Wyoming Area Office (Reclamation)
yr.	year

Symbols

%	percent

Contents

Tables

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Summary of Operations for Water Year 2024 for Bighorn Basin Units Under the Responsibility of the Wyoming Area Office (WYAO)

The Bureau of Reclamation's (Reclamation) Wyoming Area Office (WYAO) has oversight and operational responsibility of five reservoirs within the Bighorn Basin. These reservoirs include Bull Lake, Pilot Butte, Anchor, Boysen, and Buffalo Bill. The following sections provide background information for each reservoir and describes a summary of operations that occurred during water year 2024 (WY2024).

Riverton Unit

The Riverton Project was reauthorized as the Riverton Unit Pick-Sloan Missouri Basin Program (P-S MBP) on September 25, 1970. Major facilities of this unit are Bull Lake Reservoir, Wind River Diversion Dam, Wyoming Canal, Pilot Butte Powerplant, Pilot Butte Reservoir, and Pilot Butte Canal. The major facilities provide irrigation water to approximately 73,000 acres on the Midvale Irrigation District (Midvale). The water supply comes partly from the natural flow of the Wind River and partly from water stored in Bull Lake and Pilot Butte Reservoirs.

Bull Lake Reservoir

Bull Lake Reservoir is located on Bull Lake Creek, a tributary of the Wind River near Crowheart, Wyoming. Bull Lake has an active capacity of 151,737 acre-feet (AF) and is upstream of all unit land. It is the principal storage facility for the unit and is operated by Midvale under contract with Reclamation. A small amount of flood control benefit is provided by normal operation for other purposes. Before the completion of the new replacement Bull Lake spillway, operations were limited releases from outlet works. In the fall of 2024, the new spillway was completed.

Bull Lake Exchange Agreement

During the past several years, Midvale and Reclamation have entered into an annual agreement (Bull Lake Exchange Agreement) whereby Reclamation could store Boysen water in Bull Lake under any combination of four conditions set forth in the agreement. The Bull Lake Exchange Agreement allows Midvale to divert and store an additional 10,000 AF of water from Bull Lake to Pilot Butte Reservoir via the Wyoming Canal. The agreement simultaneously transfers an

equal amount of Boysen storage into Bull Lake Reservoir. The purpose of the agreement is to maintain a flow of no less than 20 cubic feet per second (ft^3/s) in Bull Lake Creek during the winter months. Bull Lake Creek is a prized fishery, and the agreement ensures its production.

Summary of 2024 Operations

Bull Lake Reservoir began WY2024 with 80,510 AF, 53 percent of the reservoir's active storage capacity. Construction of the new spillway was completed in the fall of 2024. First fill criteria limited the rate of fill of the reservoir. During the spring runoff season, outflows were carefully coordinated with Midvale to follow the first fill criteria, limiting the rate of fill to 1.0 foot per day (ft/day) above elevation 5,780 feet (ft). and setting a schedule for monitoring and reading instrumentation. The peak reservoir elevation was 5,803.93 ft and occurred on July 3. The peak fill was 1.07 ft shy of filling to the top of active conservation. No water was released down the new spillway. Dry conditions in late spring and continuing into the fall resulted in below average inflows, requiring more storage water from Bull Lake to meet irrigation demands. End of September storage was the lowest it has been since 2001.

The annual Bull Lake Exchange Agreement was signed, and the non-irrigation season releases were maintained above the required minimum flow rate of 20 ft^3/s.

Table WYT 1 below shows the monthly inflows, outflows, end of month (EOM) storage, and forebay elevation at Bull Lake Reservoir. First of month snow water equivalent (SWE) values, as represented by the Snow Telemetry (SNOTEL) sites near the basin above Bull Lake, are also shown. For each monthly inflow, outflow, storage, and SWE value the corresponding percentage of average (30 years of historical data) are also shown.

Table WYT 1.—Monthly inflow, outflow, storage, forebay elevation, and snow data for Bull Lake Reservoir

Month	Inflow (KAF)	% of 30-yr Average	Outflow (KAF)	% of 30-yr Average	EOM Storage (KAF)	% of 30-yr Average	Elevation (ft)	SWE (in)	% of 30-yr Average
Oct.-23	8.6	132	18.3	285	72.5	94	5,776.39	0.0	NA
Nov.-23	4.5	133	4.7	194	72.3	93	5,776.32	1.5	129
Dec.-23	2.5	106	2.5	132	72.3	92	5,776.33	2.6	80
Jan.-24	1.5	74	1.9	102	71.9	92	5,776.17	4.1	79
Feb.-24	1.8	103	1.8	103	72.0	92	5,776.19	5.8	85
Mar.-24	2.2	108	1.9	105	72.2	92	5,776.30	8.5	100
Apr.-24	7.2	169	1.9	60	77.5	97	5,778.44	12.1	110
May-24	21.2	72	5.8	43	92.8	97	5,784.44	9.9	92
June-24	71.8	108	17.4	56	147.2	112	5,803.32	5.1	281
July-24	26.9	59	52.8	119	121.3	92	5,794.74	0.0	NA
Aug.-24	13.4	69	61.8	129	72.9	70	5,776.59	0.0	NA
Sept.-24	4.5	47	45.2	121	32.3	42	5,757.69	0.0	NA
WY2024	166.2	86	216.0	112					

Inflow and outflow values are summed for the entire month, storage and elevation values are from the end of the month, and snow values are from the beginning of the month.

Using various hydrological data such as snowpack and streamflow, forecasts of the inflow volume from April through July are generated each month between January and June. Table WYT 2 shows the forecast volumes in WY2024. For each forecast, table WYT 2 shows the percent of average of the forecast compared to 30 years of historical inflow data.

Table WYT 2.—Forecasts of the April-July inflow volumes into Bull Lake Reservoir each month starting in January and ending in June

Forecast Issue Month	April-July Inflow Forecast (KAF)	% of 30-yr Average Inflow
Jan. 2024	145	99
Feb. 2024	120	82
Mar. 2024	150	103
Apr. 2024	160	110
May 2024	147	101
June 2024	128	88

Midvale began diverting water into the Wyoming Canal on April 3. Diversions for irrigation into the Wyoming Canal continued through November 4. The peak diversion of 1,584 ft^3/s occurred on June 17.

Additional hydrologic and statistical information pertaining to Bull Lake operations during 2024 can be found in tables WYT 3, 4, and 5 and figure WYG 1.

Table WYT 3.—Reservoir allocations for Bull Lake Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	5,739.00	722	722
Top of active conservation	5,805.00	152,459	151,737

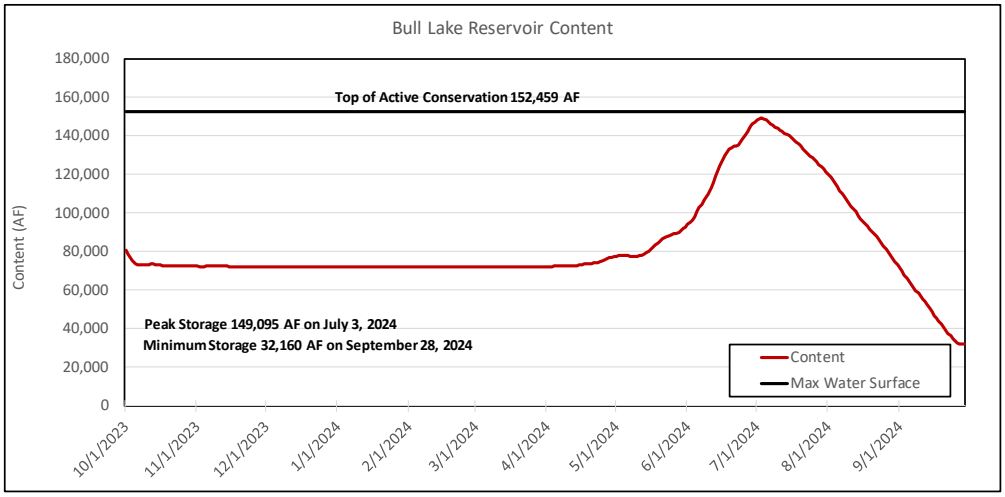
Table WYT 4.—Storage and elevation data for Bull Lake Reservoir

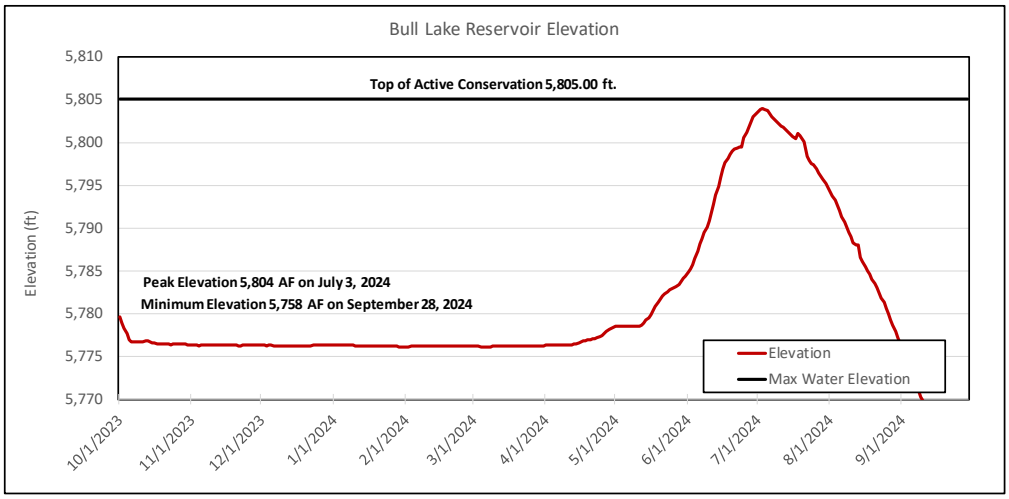
Storage-Elevation Data	Elevation (feet)	Storage (AF)	Date
Beginning of year	5,780.31	82,146	10/1/2023
End of year	5,757.69	32,292	9/30/2024
Annual low	5,757.62	32,160	9/28/2024
Historic low*	5,743.03	6,228	9/2/1950
Annual high	5,803.93	149,095	7/3/2024
Historic high	5,805.70	154,677	8/10/1965

* Prior to 1952 daily records were not available. End of month records were used to determine the historic low.

Table WYT 5.—Inflow and discharge data for Bull Lake Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	166,181	Oct. '23–Sept. '24	216,035	Oct. '23-Sept. '24
Daily peak (ft^3/s)	2,000	6/11/2024	1,144	8/5/2024
Daily minimum (ft^3/s)	0	9/16/2024	31	5/14/2024
Peak spillway flow (ft^3/s)	N/A	N/A	0	N/A
Total spillway flow (AF)	N/A	N/A	0	N/A





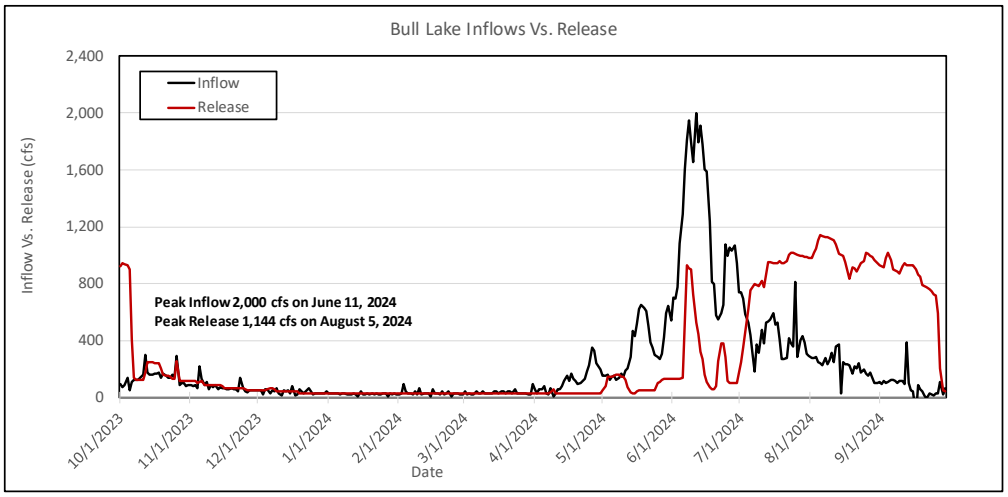


Figure WYG 1.—WY2024 storage, forebay elevation, inflow, and release at Bull Lake Reservoir.

Pilot Butte Reservoir

Pilot Butte Reservoir is an off-stream reservoir near Kinnear, Wyoming, and receives its water supply from the Wind River via the Wyoming Canal. Pilot Butte Reservoir has a total capacity of 33,721 AF. Of this amount 3,803 AF is inactive, and 29,918 AF is active conservation storage. Pilot Butte Dam and the Wyoming Canal are operated by Midvale under contract with Reclamation. The turbines at Pilot Butte are currently inactive.

Summary of 2024 Operations

Pilot Butte Reservoir began WY2024 with 27,400 AF of storage, a pool elevation of 5,452.88 ft above sea level.

Pilot Butte did not have adequate space beginning in October 2024 to store additional water for the Bull Lake Exchange Agreement. Instead of storing additional water, on September 30, 2024, 10,000 AF of Boysen water in Pilot Butte was designated to Bull Lake for winter releases in WY2024, per article 1.E. of the agreement. Between October 1, and October 6, 2023, an additional 1,110 AF was diverted and stored in Pilot Butte Reservoir that was designated to Bull Lake for winter releases. This resulted in a total of 11,110 AF of exchange water in Bull Lake.

Table WYT 6 below shows the monthly inflows, outflows, EOM storage, and forebay elevation at Pilot Butte Reservoir. For each monthly inflow, outflow, and storage value the corresponding percentage of average (30 years of historical data) are also shown.

Table WYT 6.—Monthly inflow, outflow, storage, forebay elevation, and snow data for Pilot Butte Reservoir

Month	Inflow KAF	% of 30-yr Average	Outflow , KAF	% of 30-yr Average	EOM Storage , KAF	% of 30-yr Average	Elevation ft
Oct.-23	6.2	49	5.4	215	28.3	108	5,453.74
Nov.-23	-0.2	NA	0.0	NA	28.1	103	5,453.49
Dec.-23	-0.6	NA	0.0	NA	27.4	100	5,452.72
Jan.-24	-0.1	NA	0.0	NA	27.4	99	5,452.65
Feb.-24	0.0	NA	0.0	NA	27.4	99	5,452.68
Mar.-24	0.5	326	0.0	NA	27.9	100	5,453.28
Apr.-24	7.7	142	7.3	158	28.3	98	5,453.76
May-24	17.8	83	24.0	98	22.0	86	5,445.82
June-24	35.0	99	36.6	113	20.4	71	5,443.61
July-24	38.9	105	38.1	90	21.2	91	5,444.74
Aug.-24	31.9	99	33.0	93	20.2	106	5,443.23
Sept.-24	17.9	78	26.3	104	11.8	74	5,429.89
WY2024	155.0	92	170.7	101			

Inflow and outflow values are summed for the entire month, and storage and elevation values are from the end of the month.

Additional hydrologic and statistical information pertaining to Pilot Butte Reservoir during WY2024 can be found in tables WYT 7, 8, and 9 and figure WYG 2.

Table WYT 7.—Reservoir allocations for Pilot Butte Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	5,410.00	3,803	3,803
Top of active conservation	5,460.00	33,721	29,918

Table WYT 8.—Storage and elevation data for Pilot Butte Reservoir

Storage-Elevation Data	Elevation (feet)	Storage (AF)	Date
Beginning of year	5,452.66	27,400	10/1/2023
End of year	5,429.89	11,754.00	9/30/2024
Annual low	5,429.42	11,501.00	9/26/2024
Historic low	5,409.00 (approximate)*	0 (approximate)*	10/1/2021
ANNUAL HIGH	5,454.93	29,292	4/12/2024
Historic high	5,460.60	37,465	4/20/1988

Table WYT 9.—Inflow and discharge data for Pilot Butte Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	155,015	Oct. '23–Sept. '24	170,661	Oct. '23–Sept. '24
Daily peak (ft^3/s)	925	7/7/2024	664	6/15/2024
Daily minimum (ft^3/s)	0	Winter months	0	Winter months
Peak spillway flow (ft^3/s)	N/A	N/A	0	N/A
Total spillway flow (AF)	N/A	N/A	0	N/A

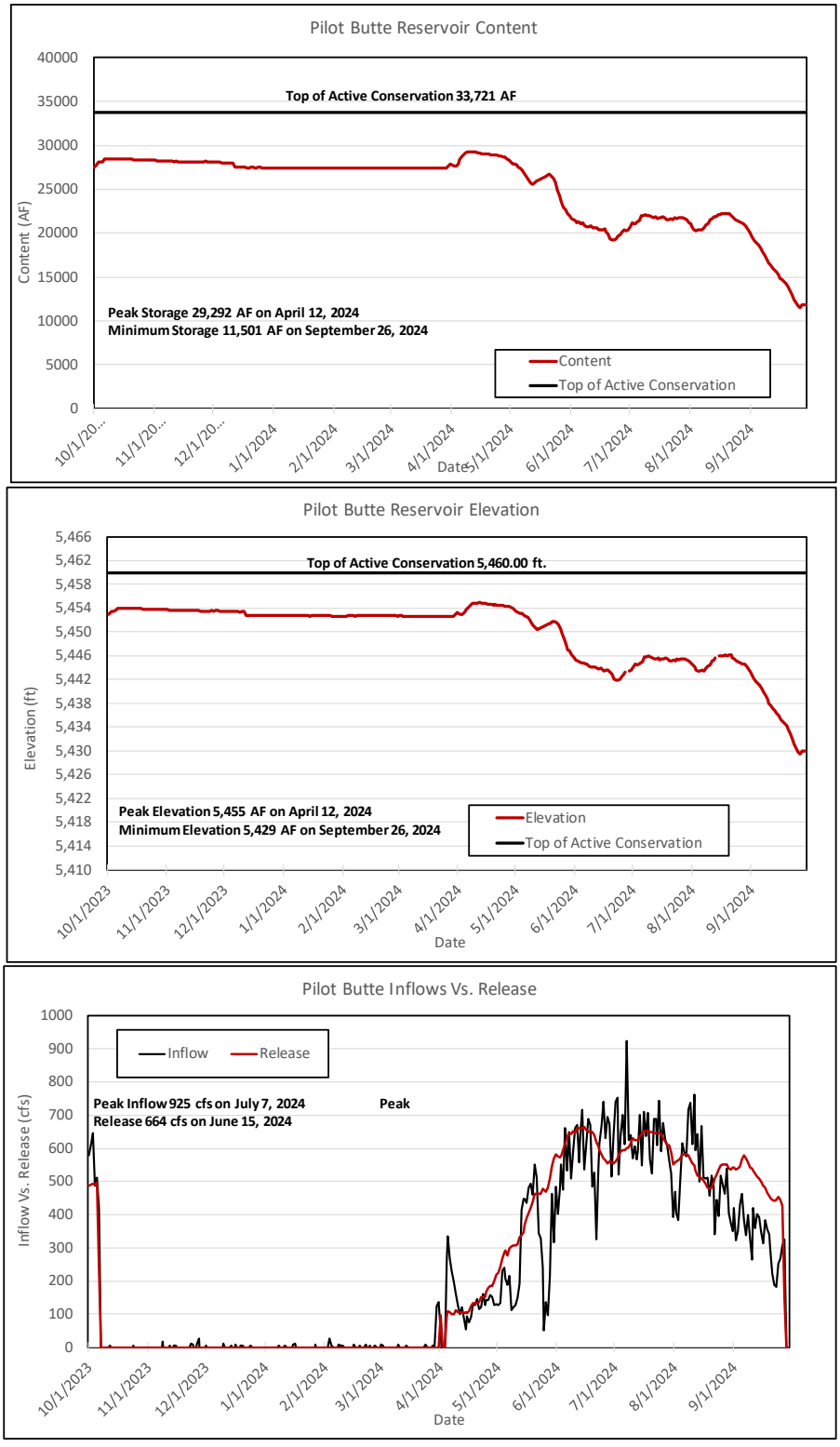


Figure WYG 2.—WY2024 storage, forebay elevation, inflow, and release at Pilot Butte Reservoir.

Boysen Reservoir and Powerplant

Boysen Reservoir (P-S MBP) is located on the Wind River above Thermopolis, WY. The dam and reservoir were built for flood control, power generation, irrigation, recreation, and fish and wildlife. Boysen Reservoir has a total capacity of 892,226 AF with 219,181 AF allocated for inactive and dead storage, 522,413 AF for active conservation storage, and 150,632 AF for exclusive flood control storage. 144,229 AF of the active conservation space are specifically allocated for joint use flood control storage. The joint-use space is located between elevation 4,717.00 ft and elevation 4,725.00 ft, which is the top of the spillway gates when closed. The exclusive flood control space is located between elevation 4,725.00 ft and elevation 4,732.20 ft. When the reservoir rises above elevation 4,724.50 ft, the spillway gates are operated to maintain a minimum of 6 inches of clearance above the reservoir level for prevention of over-topping the gates. When all flood control space is filled, releases cannot be controlled to less than 14,000 ft^3/s due to the required gate clearance.

Irrigation water is provided from the reservoir for several units, both upstream and downstream from Boysen Dam. Water is furnished downstream to about 7,500 acres in the Hanover-Bluff Unit (P-S MBP) and 3,400 acres on the Lucerne Canal in the Owl Creek Unit (P-S MBP). Supplemental water is furnished to other irrigation districts and to various individual water users below the dam. The Bighorn Canal Irrigation District and Hanover Irrigation District receive water under long-term contracts with Reclamation. Depending on availability, water is provided to Bluff Irrigation District, Kirby Ditch Irrigation District, Lower Hanover Canal Association, Bighorn Canal Irrigation District, and Hanover Irrigation District utilizing temporary water service contracts.

Summary of 2024 Operations

At the beginning of WY2024, Boysen Reservoir content was 672,041 AF. Inflows into Boysen were above average at the start of the water year but the latter half of the water year was very dry resulting in below normal inflows beginning in May and continuing through the fall. Boysen ended the water year with approximately 105 thousand acre-feet (KAF) less storage than at the beginning of the water year.

Important Events – WY2024

November 11, 2023: Releases to the river were reduced to the winter outflow rate of 1,000 ft^3/s.

July 10, 2024: To manage downstream moss conditions and at the request of irrigators, a one day flushing flow was conducted.

Table WYT 10 below shows the monthly inflows, outflows, EOM storage, and forebay elevation at Boysen Reservoir. First of month SWE values, as represented by the SNOTEL sites within/near the basin above Boysen Reservoir, are also shown. For each monthly inflow,

outflow, storage, and SWE value the corresponding percentage of average (30 years of historical data) are also shown.

Table WYT 10.—Monthly inflow, outflow, storage, forebay elevation, and snow data for Boysen Reservoir

Month	Inflow, KAF	% of 30-yr Average	Outflow KAF	% of 30-yr Average	EOM Storage KAF	% of 30-yr Average	Elevation ft	Snow in	% of 30-yr Average
Oct.-23	92.6	164	86.9	164	678.4	117	4,721.7	0.0	NA
Nov.-23	62.3	127	74.0	157	666.8	114	4,721.0	1.4	103
Dec.-23	50.5	128	62.2	130	655.1	114	4,720.4	3.0	86
Jan.-24	37.4	98	62.3	132	630.2	112	4,719.0	4.5	81
Feb.-24	50.2	126	58.4	131	622.0	111	4,718.5	5.9	81
Mar.-24	66.4	125	62.3	107	626.1	113	4,718.7	9.2	99
Apr.-24	62.6	120	123.8	163	564.9	106	4,715.0	13.3	112
May-24	97.0	68	132.8	109	529.1	96	4,712.6	12.0	101
June-24	247.3	84	99.6	53	680.3	103	4,721.8	4.7	149
July-24	49.8	37	83.5	52	646.6	102	4,719.9	0.0	NA
Aug.-24	38.6	77	78.6	87	606.6	102	4,717.6	0.0	NA
Sept.-24	38.7	83	72.2	111	573.1	99	4,715.5	0.0	NA
WY2024	893.6	90	996.7	95					

Inflow and outflow values are summed for the entire month, storage and elevation values are from the end of the month, and snow values are from the beginning of the month.

Using hydrologic data (snowpack, stream flows, etc.) forecasts of the April through July inflow volume are made each month between January and June. Table WYT 11 shows the forecast amounts that were made in WY2024. For each forecast, table WYT 11 shows the percent of average of the forecast compared to 30 years of historical inflow data.

Table WYT 11.—Forecasts of the April-July inflow volumes into Boysen Reservoir made each month starting in January and ending in June

Month Forecast Made	April–July Inflow Forecast, KAF	% of 30-yr Average
Jan. 2024	650	104
Feb. 2024	520	83
Mar. 2024	620	99
Apr. 2024	750	120
May 2024	643	103
June 2024	510	82

During WY2024, the powerplants associated with Boysen Reservoir had a gross generation of approximately 78,200 megawatt-hours (Mwh, 127 percent of average).

Additional hydrologic and statistical information pertaining to the operation of Boysen Reservoir can be found in tables WYT 12, 13, and 14 and figure WYG 3.

Table WYT 12.—Reservoir allocations for Boysen Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	4,685.00	219,181	219,181
Top of active conservation	4,717.00	597,365	378,184
Top of joint use	4,725.00	741,594	144,229
Top of exclusive flood control	4,732.20	892,226	150,632

Table WYT 13.—Storage and elevation data for Boysen Reservoir

Storage-Elevation Data	Elevation (feet)	Storage (AF)	Date
Beginning of year	4,721.36	672,770	10/1/2023
End of year	4,715.48	573,120	9/30/2024
Annual low	4,712.33	525,742	5/29/2024
Historic low elevation *	4,684.18	N/A	3/18/1956
Historic low content *	N/A	235,737	9/24/2002
Annual high	4,721.87	682,112	10/20/2023
Historic high	4,730.83	922,406	7/6/1967

* Because storage space in a reservoir is reduced as sediment settles behind the dam, reservoirs are resurveyed periodically to determine actual capacity. Based on the 1994 resurvey of Boysen Reservoir, the historic low content of 235,737 AF occurred at an elevation that was 2.69 ft higher than the historic low elevation.

Table WYT 14.—Inflow and discharge data for Boysen Reservoir

Inflow-Outflow Data	Inflow*	Date	Outflow	Date
Annual total (AF)	893,556	Oct. '23–Sept. '24	996,712	Oct. '23–Sept. '24
Daily peak (ft^3/s)	9,201	6/10/2024	2,761	7/10/2024
Daily minimum (ft^3/s)	306	1/17/2024	965	12/23/2023
Peak spillway flow (ft^3/s)	N/A	N/A	1,494	4/2/2024
Total spillway flow (AF)	N/A	N/A	8,021	Oct. '23–Sept. '24

* High winds can affect the forebay reading used to calculate inflow.

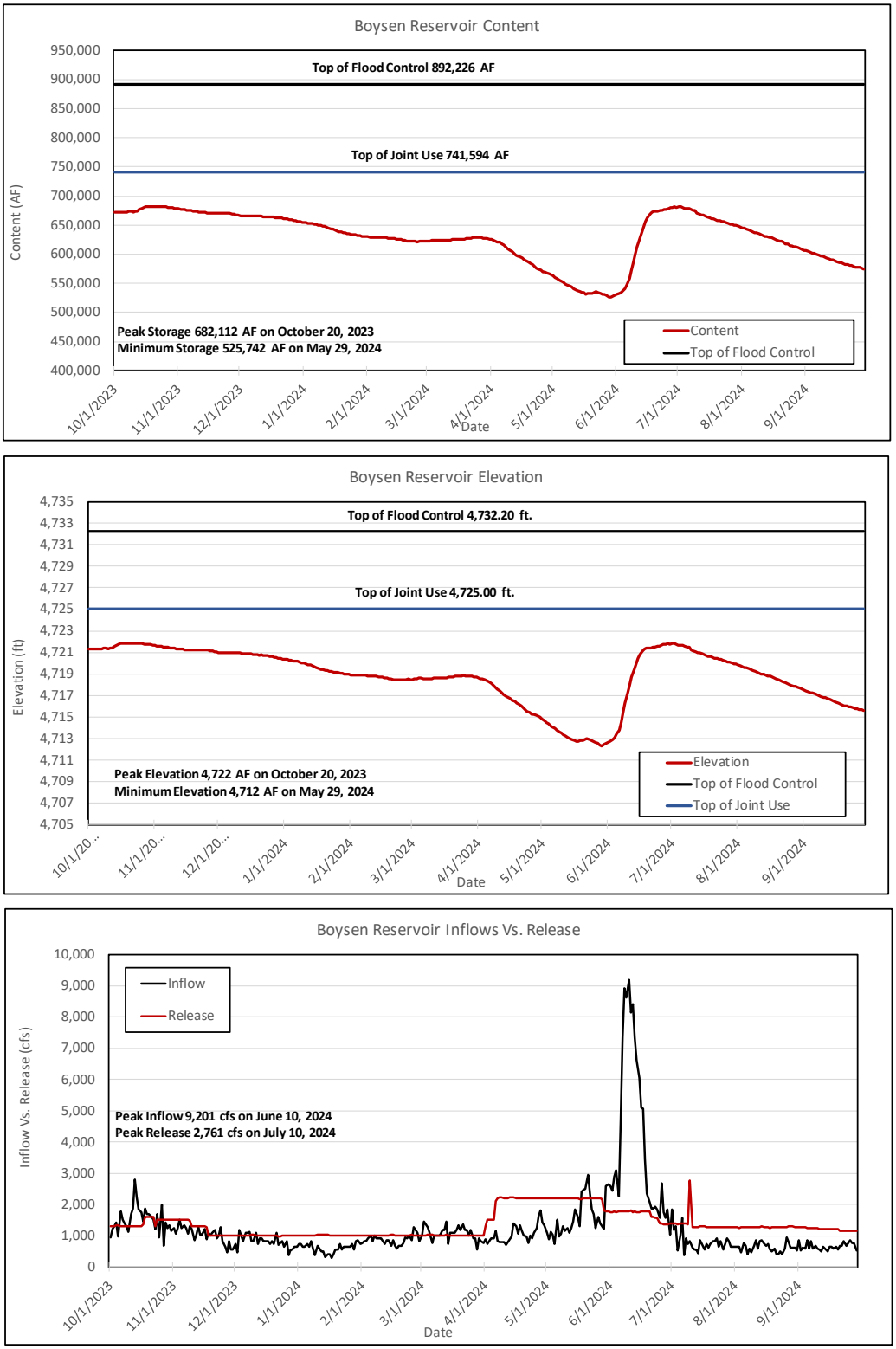


Figure WYG 3.—WY2024 storage, forebay elevation, inflow, and release at Boysen Reservoir.

Anchor Reservoir

Anchor Reservoir (P-S MBP) is located on the South Fork of Owl Creek, a tributary of the Bighorn River near Thermopolis, WY. It has a total storage capacity of 17,228 AF, including 17,160 AF of active storage. Construction of the dam provides supplemental irrigation supply for the Owl Creek Unit (P-S MBP). The dam was completed in November 1960. However, several major sinkholes developed in the lower portion of the reservoir after it began to fill, and corrective work to plug the sinkholes has not been successful. Two dikes have been in service since 1979 and partition off the portions of the reservoir with high seepage losses. The top of the two dikes is at elevation 6,415.00 ft. However, when the reservoir rises above elevation 6,412.80 ft, water flows through a notch in one of the dikes into the sinkhole area. The reservoir is operated to not exceed an elevation of 6,412.80 ft. Operation and maintenance of Anchor Dam is performed by Owl Creek Irrigation District under contract with Reclamation. Reclamation requires notification from the irrigation district any time the reservoir level is expected to exceed elevation 6,400.00 ft. Operation above 6,400.00 ft is directed by Wyoming Area Office (WYAO) staff to avoid overtopping of the dikes.

Summary of 2024 Operations

The storage content of Anchor Reservoir at the beginning of WY2024 was 1,768 AF. Storage in the reservoir peaked on June 28 at elevation 6,411.45 and storage content of 7,009 AF. Reservoir operations were directed by the WYAO from June 5 to July 17, when the reservoir was above elevation 6,400.00 ft. Table WYT 15 below shows the monthly inflows, outflows, storage, and forebay elevation at Anchor Reservoir. The negative inflows displayed in table WYT 15 are the result of the calculated inflow, which is subject to the wind influencing the pool elevation reading in addition to the normal seepage from the reservoir. For each monthly inflow, outflow, and storage value the corresponding percentage of average (30 years of historical data) are also shown.

Table WYT 15.—Monthly inflow, outflow, storage, forebay elevation, and snow data for Anchor Reservoir

Month	Inflow KAF	% of 30-yr Average	Outflow KAF	% of 30-yr Average	Storage KAF	% of 30-yr Average	Elevation ft
Oct.-23	0.5	102	0.9	200	1.3	321	6,375.8
Nov.-23	-0.2	N/A	0.0	N/A	1.1	N/A	6,372.6
Dec.-23	-0.4	N/A	0.0	N/A	0.7	N/A	6,366.5
Jan.-24	-0.1	N/A	0.0	N/A	0.6	N/A	6,364.5
Feb.-24	0.0	N/A	0.0	N/A	0.6	N/A	6,364.1
Mar.-24	0.4	172	0.0	N/A	1.0	N/A	6,371.1
Apr.-24	0.8	141	0.2	56	1.6	N/A	6,378.3
May-24	2.5	69	0.5	22	3.5	191	6,394.4
June-24	6.0	85	2.7	50	6.9	194	6,411.3
July-24	-0.4	NA	3.9	120	2.6	119	6,388.2
Aug.-24	-0.2	NA	1.9	102	0.5	76	6,362.4
Sept.-24	0.2	31	0.2	27	0.5	108	6,361.6
WY2024	9.1	60	10.4	69			

Inflow and outflow values are summed for the entire month, and storage and elevation values are from the end of the month.

Additional hydrologic and statistical data pertaining to Anchor Reservoir operations during 2024 can be found in tables WYT 16, 17, and 18 and figure WYG 4.

Table WYT 16.—Reservoir allocations for Anchor Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	6,343.75	66	66
Top of active conservation*	6,441.00	17,228	17,160

* District operation has been restricted to elevation 6,400.00 ft or less to prevent damage to the dikes and to minimize the chance of creating new sinkholes. Operations above elevation 6,400.00 ft are directed by Reclamation.

Table WYT 17.—Storage and elevation data for Anchor Reservoir

Storage-Elevation Data	Elevation (feet)	Storage (AF)	Date
Beginning of year	6,380.47	1,768	10/1/2023
End of year	6,361.58	475	9/30/2024
Annual low	6,361.07	455	1/11/2024
Historic low			
Annual high	6,411.45	7,009	6/28/2024
Historic high	6,418.52	9,252	7/3/1967

Table WYT 18.—Inflow and discharge data for Anchor Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow *	Date
Annual total (AF)	9,105	Oct '23–Sep '24	10,398	Oct '23–Sep '24
Daily peak (ft^3/s)	245	6/6/2024	114	6/12/2024
Daily minimum (ft^3/s)	0	Winter months	0	Winter months
Peak spillway flow (ft^3/s)	N/A	N/A	0	N/A
Total spillway flow (AF)	N/A	N/A	0	N/A

* Outflow is water released from the dam to Owl Creek. When the reservoir level rises above approximately 6,412.80 ft, water flows through a notch in one of the dikes into the sinkhole area. This water is neither measured nor accounted for.

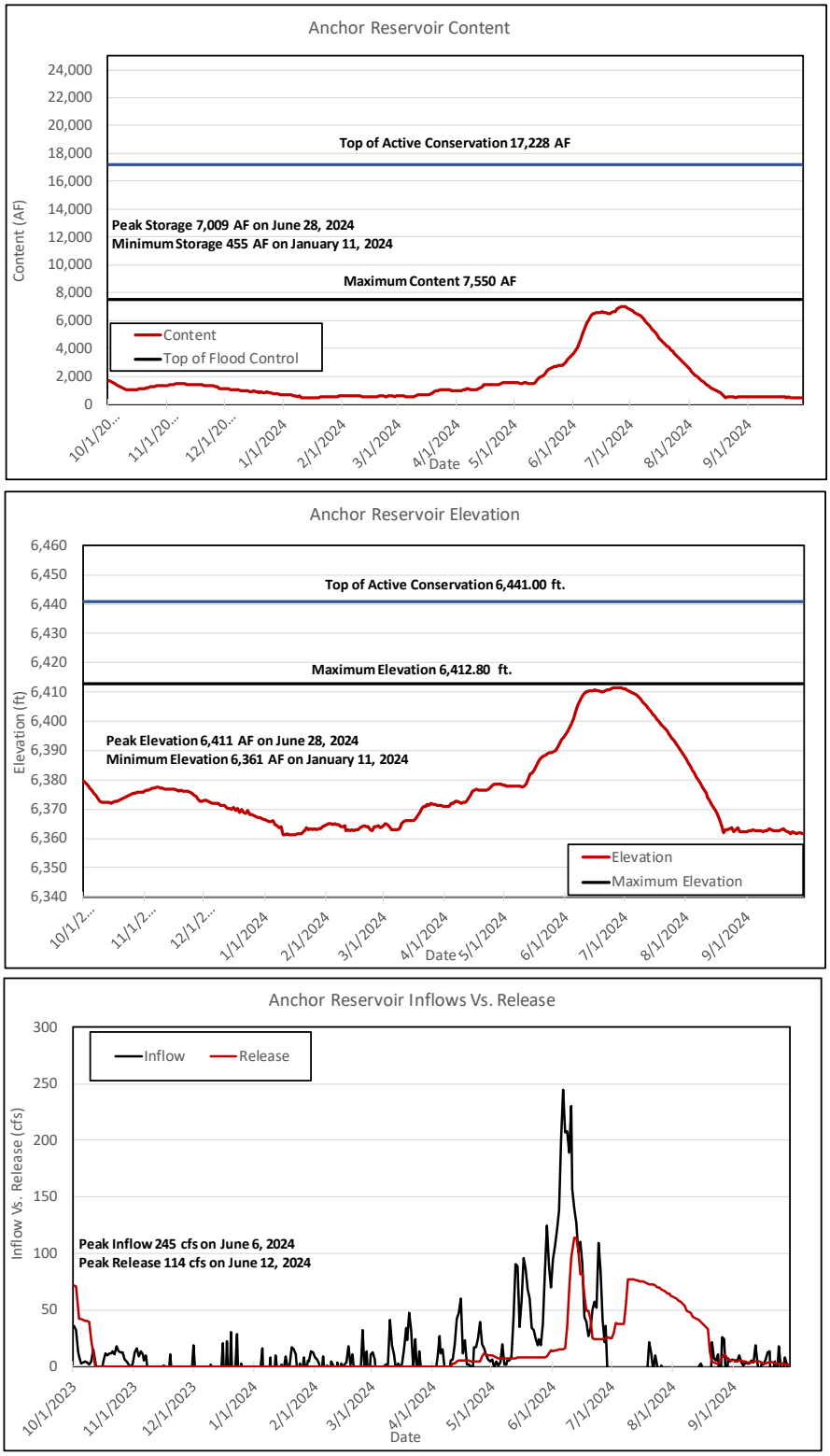


Figure WYG 4.—WY2024 storage, forebay elevation, inflow, and release at Anchor Reservoir.

Shoshone Project and Buffalo Bill Unit

The primary features of the original Shoshone Project included Buffalo Bill Dam and Reservoir, Shoshone and Heart Mountain Powerplants, and the canal and lateral systems for the Willwood, Frannie, Garland, and Heart Mountain Divisions. In 1982, the Buffalo Bill Dam and Reservoir Modifications, Shoshone Project, Wyoming, was authorized as the Buffalo Bill Unit (P-S MBP). The principal modifications included:

- Raising the height of the dam by 25 ft
- Reconstructing the Shoshone Powerplant
- Construction of the Buffalo Bill Powerplant
- Construction of the Spirit Mountain Energy Dissipation Structure
- Pressurizing a portion of the Shoshone Canyon Conduit
- Enlarging and gating the spillway
- Creating a visitor's center
- Constructing the North Fork, South Fork, and Diamond Creek Dikes

The North and South Fork dust abatement dikes were designed to impound water in areas of the enlarged reservoir that would be dry during periods when the reservoir elevation is low, thereby reducing the dust producing area of the reservoir. The Diamond Creek protective dike prevents the enlarged reservoir from inundating Irma Flats.

Controlled releases are made from Buffalo Bill Reservoir at four points:

1. Shoshone Canyon Conduit
2. Shoshone Powerplant
3. Gated spillway
4. Two river outlets (jet-flow valve and two 4X5 high-pressure gates)

Irrigation releases for the project land along the Shoshone River are made through the Shoshone Powerplant, the river outlets, or through Buffalo Bill and Heart Mountain Powerplants via the Shoshone Canyon Conduit. Water for the Willwood, Frannie, and Garland Divisions of the Shoshone Project is diverted from the Shoshone River below Buffalo Bill Reservoir. The Heart Mountain Division is irrigated by water released at the dam through a high-level outlet to the Shoshone Canyon Conduit and Heart Mountain Canal. Currently the Shoshone Project serves approximately 93,000 acres across the four divisions.

Buffalo Bill Reservoir

Buffalo Bill Dam and Reservoir, located on the Shoshone River above Cody, WY, is a multipurpose facility that provides water for domestic, irrigation, municipal, fish and wildlife, power, and recreational use. It also provides a small amount of incidental flood control, although no storage space is specifically reserved for this purpose. The total storage capacity of the reservoir is 646,565 AF at elevation 5,393.50 ft, the top of the active conservation pool.

Heart Mountain Powerplant, Shoshone Project, with a nameplate capability of 6,000 kilowatts (kW) and maximum discharge capacity of 360 ft^3/s. It is located at the end of the Shoshone Canyon Conduit. The Shoshone Canyon Conduit obtains water from a high-level outlet at an elevation of 5,233.00 ft at Buffalo Bill Dam. The powerplant is located 3.5 miles below the dam and discharges into the Shoshone River. During the summer months, the water released through the powerplant is used to satisfy a portion of the irrigation demand of lands diverting directly from the river. The powerplant is typically only operational during the irrigation season when water is delivered through the non-pressurized section of the Shoshone Canyon Conduit.

Shoshone Powerplant, reconstructed as part of the Buffalo Bill Unit (P-S MBP), is located on the left bank of the Shoshone River at the toe of Buffalo Bill Dam and releases water directly into the Shoshone River. After 56 years of continuous operation, the Shoshone Powerplant was deemed obsolete because of safety problems beyond economical repair. On March 21, 1980, the original plant was taken out of service. In 1992, one of the three generating units was replaced with a new unit having a nameplate capability of 3,000 kW. The Buffalo Bill Reservoir Enlargement Winter Release Operation Agreement 2019 established a minimum release rate of 100 ft^3/s to the Shoshone River at the base of the dam. This is normally achieved using the Shoshone Powerplant. A maximum release of approximately 200 ft^3/s can be made through the Shoshone Powerplant.

Buffalo Bill Powerplant, Buffalo Bill Unit (P-S MBP), with a nameplate capability of 18,000 kW, is located about 1mile downstream from Buffalo Bill Dam on the right bank of the Shoshone River. Water for generation at this powerplant is supplied through a portion of the Shoshone Canyon Conduit, which was pressurized as part of the Buffalo Bill modification. The maximum discharge capacity of the three units at the Buffalo Bill Powerplant is 930 ft^3/s. The powerplant first generated power on July 15, 1992.

Spirit Mountain Powerplant, Buffalo Bill Unit (P-S MBP), with a nameplate capability of 4,500 kW and discharge capacity of 560 ft^3/s, is a newly constructed energy dissipater powerplant located about 1 mile downstream from Buffalo Bill Dam on the right side of the Shoshone River. Water released through the Shoshone Canyon Conduit for Heart Mountain Canal or Heart Mountain Powerplant must be routed through the Spirit Mountain Powerplant or through associated sleeve valves to dissipate energy in the transition from the pressurized portion of the Shoshone Canyon Conduit to the free flow portion of the conduit. The discharge from the powerplant must be carried away from the plant by use of the free-flow conduit and operation of the powerplant depends on the availability of the conduit to carry discharged water. Operation of the powerplant is typically limited to the irrigation season.

Summary of 2024 Operations

Buffalo Bill began WY2024 with 451,127 AF of storage. Inflows into Buffalo Bill were above average for the beginning of WY2024. Mid to late spring, drought conditions developed and inflows into the reservoir were below average for the remainder of the water year.

Important Events – WY2024

October 18, 2023: End of irrigation diversions by the Shoshone Projects.

October 19, 2023: Releases to the Shoshone River reduced to the winter outflow rate of 200 ft^3/s.

November 8, 2023: Above average October rainfall and subsequent high inflows into Buffalo Bill the decision was made to increase releases to the Shoshone River to 300 ft^3/s to manage Buffalo Bill Reservoir levels over the winter.

April 14, 2024: Irrigation diversions by the Shoshone Project were initiated for the WY2024 irrigation season.

July 3, 2024: Buffalo Bill Reservoir reached a peak pool elevation for the water year of 5,389.33 ft.

Table WYT 19 below shows the monthly inflows, outflows, end of month storage, and forebay elevation at Buffalo Bill Reservoir. First of month SWE values, as represented by the SNOTEL sites within the basin above Buffalo Bill Reservoir, are also shown. For each monthly inflow, outflow, storage, and SWE value the corresponding percentage of average (30 years of historical data) are also shown.

Table WYT 19.—Monthly inflow, outflow, storage, forebay elevation, and snow data for Buffalo Bill Reservoir

Month	Inflow KAF	% of 30-yr Average	Outflow KAF	% of 30-yr Average	Storage KAF	% of 30-yr Average	Elevation ft	Snow inch	% of 30-yr Average
Oct.-23	53.3	183	53.7	123	452.7	103	5,367.9	0.0	N/A
Nov.-23	39.1	164	16.7	83	475.2	108	5,371.0	2.9	174
Dec.-23	22.0	129	18.6	102	478.5	109	5,371.5	4.4	94
Jan.-24	17.0	109	18.6	107	476.9	109	5,371.3	6.3	79
Feb.-24	18.6	135	17.8	98	477.6	110	5,371.3	8.0	75
Mar.-24	26.0	120	19.2	70	484.4	113	5,372.3	11.6	88
Apr.-24	63.9	138	82.5	114	465.7	116	5,369.7	15.4	99
May-2	140.2	74	124.9	89	481.0	106	5,371.8	13.9	87
June-24	325.0	95	195.8	96	610.1	103	5,388.9	8.8	117
July-24	89.8	51	132.3	74	567.6	97	5,383.5	0.0	N/A
Aug.-24	26.9	61	118.2	104	476.3	92	5,371.2	0.0	N/A
Sept.-24	22.0	86	97.5	110	400.8	89	5,360.1	0.0	N/A
WY2024	843.7	89	895.9	95					

Inflow and outflow values are summed for the entire month, storage and elevation values are from the end of the month, and snow values are from the beginning of the month.

Using hydrologic data (snowpack, stream flows, etc.) forecasts of the April through July inflow volume are made each month between January and June. Table WYT 20 shows the forecast amounts that were made in WY2024. For each forecast, table WYT 20 shows the percent of average of the forecast compared to 30 years of historical inflow data.

Table WYT 20.—Forecasts of the April–July inflow volumes made into Buffalo Bill Reservoir each month starting in January and ending in June

Month Forecast Made	April–July Inflow Forecast, KAF	% of 30-yr Average
Jan. 2024	750	99
Feb. 2024	530	70
Mar. 2024	560	74
Apr. 2024	640	85
May 2024	584	77
June 2024	604	80

During WY2024, the powerplants associated with Buffalo Bill Reservoir had a gross generation of approximately 129,800 MWh.

Table WYT 21.—Reservoir allocations for Buffalo Bill Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	5,259.60	41,748	41,748
Top of active conservation	5,393.50	646,565	604,817

Table WYT 22.—Storage and elevation data for Buffalo Bill Reservoir

Storage-Elevation Data	Elevation (feet)	Storage (AF)	Date
Beginning of year	5,367.88	453,100	10/1/2023
End of year	5,360.13	400,840	9/30/2024
Annual low	5,360.13	400,840	9/30/2024
Historic low*	5,240	19,080	1/31/1941
Annual high	5,389.33	613,281	7/3/2024
Historic high	5,393.51	646,647	7/30/1996

* Prior to 1952 daily records are not available. End-of-month data was used to determine the historic low.

Table WYT 23.—Inflow and discharge data for Buffalo Bill Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	843,686	Oct '23–Sep '24	895,946	Oct '23–Sep '24
Daily peak (ft^3/s)	9,594	6/10/2024	5,248	6/15/2024
Daily minimum (ft^3/s)	117*	1/13/2024	172	11/2/2023
Peak spillway flow (ft^3/s)			1,964	4/10/2024
Total spillway flow (AF)			30,186	Oct '23–Sep '24

* High winds in the area can result in a false forebay readings, which can affect computed inflows.

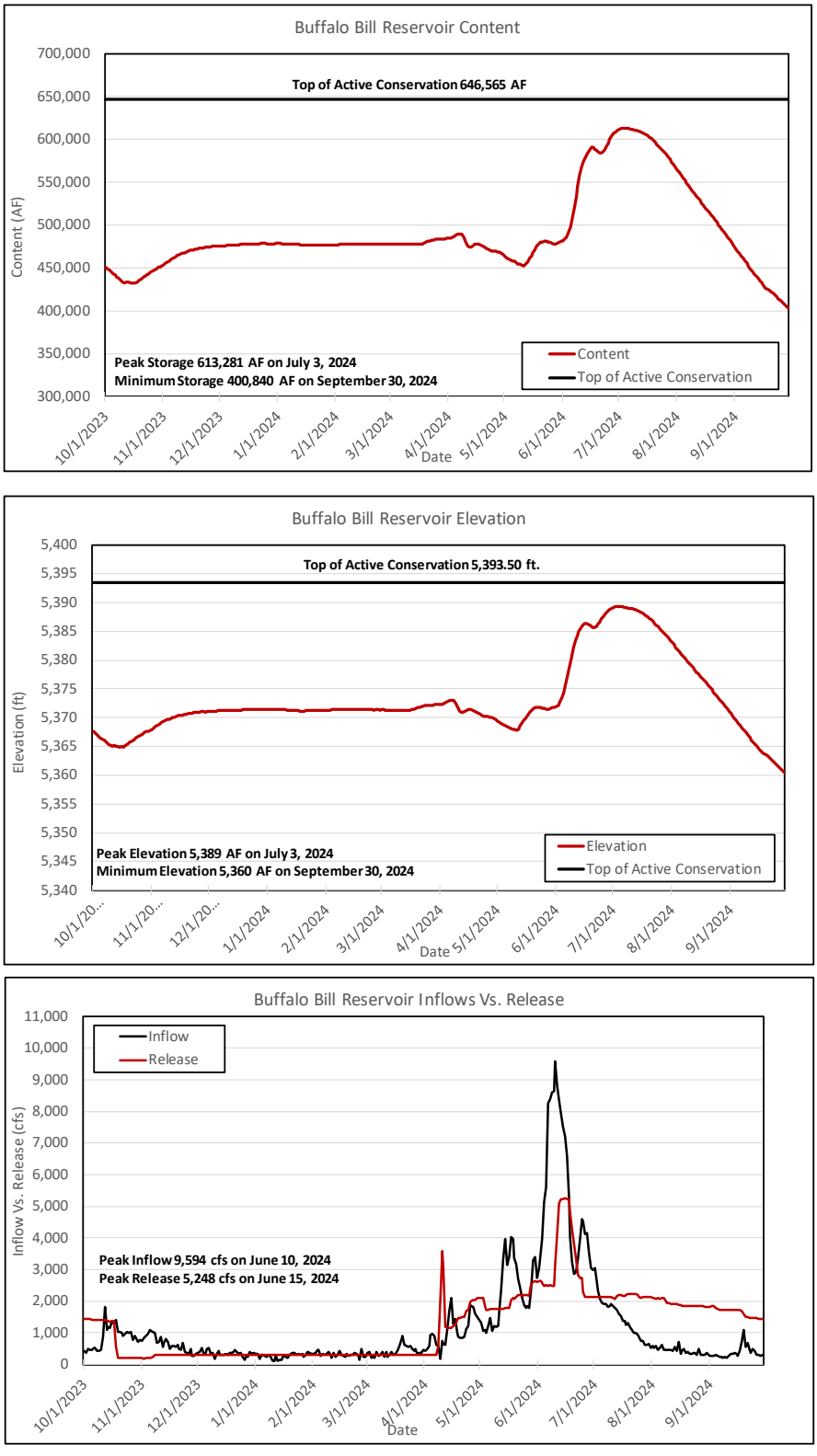


Figure WYG 5.—WY2024 storage, forebay elevation, inflow, and release at Buffalo Bill Reservoir.

Summary of Reservoir Operations for Benefit of Fish and Wildlife, Environment, and Recreation

Flushing flow from Boysen Reservoir are often performed in the spring (when possible, given other demands) to support the downstream fisheries. A spring flushing flow was not conducted in WY2024.

Flushing flows from Buffalo Reservoir are often performed in the spring (when possible, given other demands) in support the downstream fisheries. The WGF, in coordination with Willwood Working Group Two, requested a flushing flow. During the flush, Willwood Irrigation District does a controlled elevated release of sediment from Willwood Dam. The sediment release passes sediment that has naturally accumulated and facilitates operations and maintenance of the diversion structure. The purpose of the increased flows from Buffalo Bill Dam is to help protect the fishery by following the sediment release and mobilizing the sediment downstream. The sediment release and increased flow are coordinated to minimize impacts to irrigators, recreators, and aquatic life in the Shoshone River. A flush of up to 5,000 ft^3/s occurred between April 8, 2024 and April 12, 2024.

Winter releases from Buffalo Bill Dam are set to support fisheries downstream as well as mitigate ice jams. Normally the non-irrigation season releases are determined by the criteria outlined in the Buffalo Bill Reservoir Enlargement Winter Release Operation Agreement. The criteria include the previous year's annual inflow, end of year reservoir content, and state account ownership. Based on those conditions, a winter release of 100 ft^3/s, 150 ft^3/s, 200 ft^3/s, or 350 ft^3/s will be provided below Buffalo Bill Powerplant. The agreement serves to ensure a minimum release of 100 ft^3/s is always maintained below the dam. Reclamation continues to support the WGF Reservoir Research Branch in its efforts to assess fish population and species distribution in the enlarged reservoir using hydro acoustic technology and by providing WGF river access and an aluminum tube for planting fish in the Shoshone River off the deck of Buffalo Bill Powerplant. At the end of WY2023, based on the agreement, Reclamation determined that a flow of 200 ft^3/s was required for the winter release below Buffalo Bill Dam. However, due to abundant fall rainfall and subsequent high inflows, on November 7, 2023 winter releases were increased to 300 ft^3/s to maintain winter operating levels at Buffalo Bill Dam.

As Buffalo Bill Reservoir is drawn down the lakebed is exposed to wind erosion, which creates dust in the reservoir area and in the town of Cody, WY. As a part of the enlargement of Buffalo Bill Reservoir, dust abatement dikes were built on the upper ends of the North and South Fork arms of the reservoir to hold water in areas that would become dry as the reservoir level decreased, thus reducing the area of dry lakebed. The top of the North Fork Dike is approximately 5,370 ft. When the reservoir pool elevation drops below 5,370 ft, the North Fork Dike helps to minimize the amount of lakebed exposure. The number of stop-logs at the outlet control structure on the South Fork Dike are used to maintain a nearly static water level above the dike of approximately 5,393.23 ft at the end of the water year. The stop-logs provide a larger impoundment behind the dike, which benefits waterfowl habitat and fishery conditions.

The Diamond Creek Dike was constructed to prevent Diamond Creek and the Irma Flats area from being inundated by the enlarged reservoir. Inflows from the Diamond Creek drainage enter Diamond Creek Reservoir that lies at the base of the dike. This water is then pumped into Buffalo Bill Reservoir to maintain the elevation of Diamond Creek Reservoir between a maximum of 5,340.40 ft and a minimum of 5,339.50 ft. The normal water surface elevation is typically 5,340.00 ft.

Reservoir levels during throughout WY2024 were adequate for recreational activities on Buffalo Bill Reservoir.

Water Year 2024 Flood Benefits

Table WYT 24.—Flood Damage Prevented in the Wind/Bighorn and Shoshone River Systems[1]

Reservoir	Local (x$1,000)	Main Stem (x$1,000)	2024 Total (x$1,000)	1950 - 2024 Accumulation Total (x$1,000)
Bull Lake[2]	$0	$0	$0	$17,259
Boysen	$251	$55,311	$55,563	$566,030
Buffalo Bill[2]	$1,342	$0.0	$1,342	$108,070

[1] This data is received from the Army Corps of Engineers Omaha District Office and is revised annually. The period of assessment is 1950 - 2024.
[2] No space is allocated to flood control, but some flood protection is provided by operation for other purposes.

Outlook and Annual Operating Plans for Water Year 2025 for Bighorn Basin Reservoirs Under the Responsibility of the Wyoming Area Office (WYAO)

Riverton Unit: Bull Lake Reservoir

Three operating plans were prepared in October 2024 to project operations under various runoff conditions during WY2025. The projected operations for three inflow scenarios are shown in tables WYT 25, 26, and 27 and figures WYG 6. The plans are prepared to show the probable limits of operations and therefore actual conditions and operations could vary widely from the most probable plan.

The primary objective of operations at Bull Lake is to provide irrigation water to Midvale. Under normal operation, the reservoir also provides flood control benefits and a water resource for fish, wildlife, and recreation. Bull Lake is operated under the following criteria and limitations:

1. Based on forecasted inflows, March–June releases are scheduled with the objective of filling the lake to a content of 151,000 AF at elevation 5,804.50 ft during July.
2. During April-October, releases must be adequate to meet the irrigation needs of Midvale and downstream irrigators with senior water rights on Bull Lake Creek.
3. Based on the available water supply, non-irrigation season releases from Bull Lake to Bull Lake Creek are generally maintained between 20 and 45 ft^3/s.
4. Reclamation identified deficiencies in the existing spillway at Bull Lake Dam and determined the preferred corrective action was to construct a new labyrinth spillway and remove the existing spillway. Reclamation awarded a contract on September 20, 2018 to Malcolm International LLC for about $44.5 million to construct the project. Actual costs are approximately $129.3 million. Construction was completed in the fall of 2024. First fill restrictions and monitoring will exist in WY2025.
5. Operations of the reservoir below elevation 5,794.00 ft through the winter prevents damage to the concrete in the spillway inlet from ice. The reservoir is operated to have a storage level of 100,000 AF or less by November 30. The objective at the onset of winter is to be as close as possible to the 100,000 AF level (5,787.13 ft) and to also provide fishery habitat.

2025 Operating Plans

Operating plans have been generated for three scenarios for all months of the upcoming water year:

- Most probable inflow conditions are based on the historical median flows.
- Reasonable minimum inflow conditions are estimated to be lower decile flows. Lower decile flows are flows that have historically been exceeded 90 percent of the time.
- Reasonable maximum inflow conditions are estimated to be upper decile flows. Upper decile flows are flows that have historically been exceeded 10 percent of the time.

Bull Lake is expected to fill under the most probably and maximum inflow conditions but not under the minimum inflow plans. Water diverted into the Wyoming Canal can be delivered to Midvale lands directly or routed through Pilot Butte Reservoir and delivered to district lands via the Pilot Canal.

Table WYT 25—Monthly operating plans for WY2025 for Bull Lake Reservoir and other Riverton Unit features based on the most probable runoff scenario

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Bull Lake Reservoir (Initial content: 32.3 KAF)														
Reservoir inflow	kaf	4.7	3.1	2.7	2	1.6	2	5	27	75	37.4	17.6	8.5	186.6
Total dam release	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.9	1.8	27.5	46.9	49.2	137.9
Total dam release	ft^3/s	25	25	25	25	25	25	25	31	31	448	763	826	
Excess release	kaf	0	0	0	0	0	0	0	0	0	25.6	0	0	25.6
EOM content	kaf	35.5	37.1	38.2	38.7	38.9	39.4	42.9	68	141.1	151	121.7	81	
EOM elevation	ft	5,759.3	5,760.2	5,760.8	5,761	5,761.1	5,761.4	5,763.1	5,774.5	5,801.4	5,804.5	5,794.9	5,779.9	
BLR net change	kaf	3.2	1.6	1.2	0.5	0.2	0.5	3.5	25.1	73.2	9.9	-29.3	-40.7	48.7
Wind River														
Flow abv BL Creek	kaf	31	26.1	21.8	21.3	16.8	17.7	24	78.8	191.4	110.3	41.8	26.7	607.7
Crowheart gage flow	kaf	32.5	27.6	23.3	22.8	18.2	19.2	25.5	80.7	193.2	137.8	88.7	75.9	745.6
Flow below div dam	kaf	16.1	27.6	23.3	22.8	18.2	19.2	8.1	26	128.5	53.3	24.8	18.3	386.4
Gain/return flow	kaf	0	0	0	0	0	0	4.8	7.4	7.1	7.4	6.1	5.4	38.2
Indian irrigation	kaf	1.2	0	0	0	0	0	1.8	6.1	6	6.1	5.5	4.5	31.3
LeClair/Riverton	kaf	5	0	0	0	0	0	3.5	18.8	24.2	27.2	21.1	15	114.8
LeClair/River Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverton gage flow	ft^3/s	161.1	463.6	379.5	371.4	327.5	312.9	127.1	137.2	1,773.6	445.1	70	70	
Wyoming Canal														
Total diversion	kaf	16.4	0	0	0	0	0	17.4	54.7	64.7	84.5	63.9	57.6	359.2
North canal flow	kaf	0	0	0	0	0	0	9.8	26.4	31.2	40.1	36.1	27	170.6
North canal shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot Butte Reservoir (Initial content: 11.8 KAF)														
Reservoir inflow	kaf	16.4	0	0	0	0	0	7.6	28.3	33.5	44.4	27.8	30.6	188.6
Power generated	mwh	0	0	0	0	0	0	0	0	0	0	0	0	0

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Pilot canal release	kaf	0	0	0	0	0	0	6.7	28	33.1	43.9	37.4	33.3	182.4
Pilot canal shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
EOM content	kaf	28	27.8	27.7	27.6	27.5	27.3	28	28	28	28	18	15	
PBR net change	kaf	16.2	-0.2	-0.1	-0.1	-0.1	-0.2	0.7	0	0	0	-10	-3	3.2
EOM elevation	ft	5,457.8	5,457.6	5,457.5	5,457.4	5,457.3	5,457	5,457.8	5,457.8	5,457.8	5,457.8	5,445.5	5,441.3	

Based on Most probable April-July runoff of: Bull Lake – 144 kaf / Wind River ab Bull Lake Creek – 405 kaf. This plan assumes an annual demand of 171 KAF for the North Canal and 182 KAF for the Pilot Canal

Table WYT 26.—Monthly operating plans for WY2025 for Bull Lake Reservoir and other Riverton Unit features based on the minimum probable runoff scenario

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Bull Lake Reservoir (initial content: 32.3 KAF)														
Reservoir inflow	kaf	3.5	2.4	1.9	1.7	1.3	1.4	2.8	29.4	38.7	26	14.1	6	129.2
Total dam release	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.9	16.4	30.7	47.7	33.3	140.6
Total dam release	ft^3/s	25	25	25	25	25	25	25	31	276	500	776	559	
Excess release	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
EOM content	kaf	34.3	35.2	35.5	35.7	35.6	35.5	36.8	64.3	86.5	81.8	48.2	20.9	
EOM elevation	ft	5,758.7	5,759.2	5,759.4	5,759.5	5,759.4	5,759.4	5,760	5,772.9	5,782	5,780.2	5,765.7	5,751.5	
BLR net change	kaf	2	0.9	0.4	0.2	-0.1	-0.1	1.3	27.5	22.3	-4.7	-33.6	-27.3	-11.4
Wind River														
Flow abv BL Creek	kaf	28	22.4	26.3	23.3	20.9	15.8	21.1	63.5	80.6	63.1	39.2	24.8	429
Crowheart gage flow	kaf	29.5	23.9	27.8	24.8	22.3	17.3	22.6	65.4	97	93.8	86.9	58.1	569.6
Flow below div dam	kaf	13.1	23.9	27.8	24.8	22.3	17.3	5.2	21.9	27.2	50.8	24.8	16.5	275.7
Gain/return flow	kaf	0	0	0	0	0	0	4.8	7.4	7.1	7.4	6.1	5.4	38.2
Indian irrigation	kaf	1.2	0	0	0	0	0	1.8	6.1	6	6.1	5.5	2.7	29.5
LeClair/Riverton	kaf	5	0	0	0	0	0	3.5	18.8	24.2	27.2	21.1	15	114.8
LeClair/river shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Riverton gage flow	ft^3/s	112.3	401.4	452.7	403.9	401.3	282	78.4	70	70	404.5	70	70	
Wyoming Canal														
Total diversion	kaf	16.4	0	0	0	0	0	17.4	43.5	69.9	43	62.1	41.6	293.9
North canal flow	kaf	0	0	0	0	0	0	9.8	26.4	31.2	36.5	34.3	24	162.2
North canal shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot Butte Reservoir (initial content: 11.8 KAF)														
Reservoir inflow	kaf	16.4	0	0	0	0	0	7.6	17.1	38.7	6.5	27.8	17.6	131.7
Power generated	mwh	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot canal release	kaf	0	0	0	0	0	0	6.7	28	33.1	0	37.4	33.3	138.5
Pilot canal shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
EOM content	kaf	28	27.8	27.7	27.6	27.5	27.3	28	16.8	22	28	18	2	
PBR net change	kaf	16.2	-0.2	-0.1	-0.1	-0.1	-0.2	0.7	-11.2	5.2	6	-10	-16	-9.8
EOM elevation	ft	5,457.8	5,457.6	5,457.5	5,457.4	5,457.3	5,457	5,457.8	5,443.9	5,450.7	5,457.8	5,445.5	5,416.4	

Based on minimum April–July runoff of: Bull Lake – 97 kaf/Wind River ab Bull Lake Creek – 228 kaf. This plan assumes an annual demand of 162 KAF for the North Canal and 139 KAF for the Pilot Canal

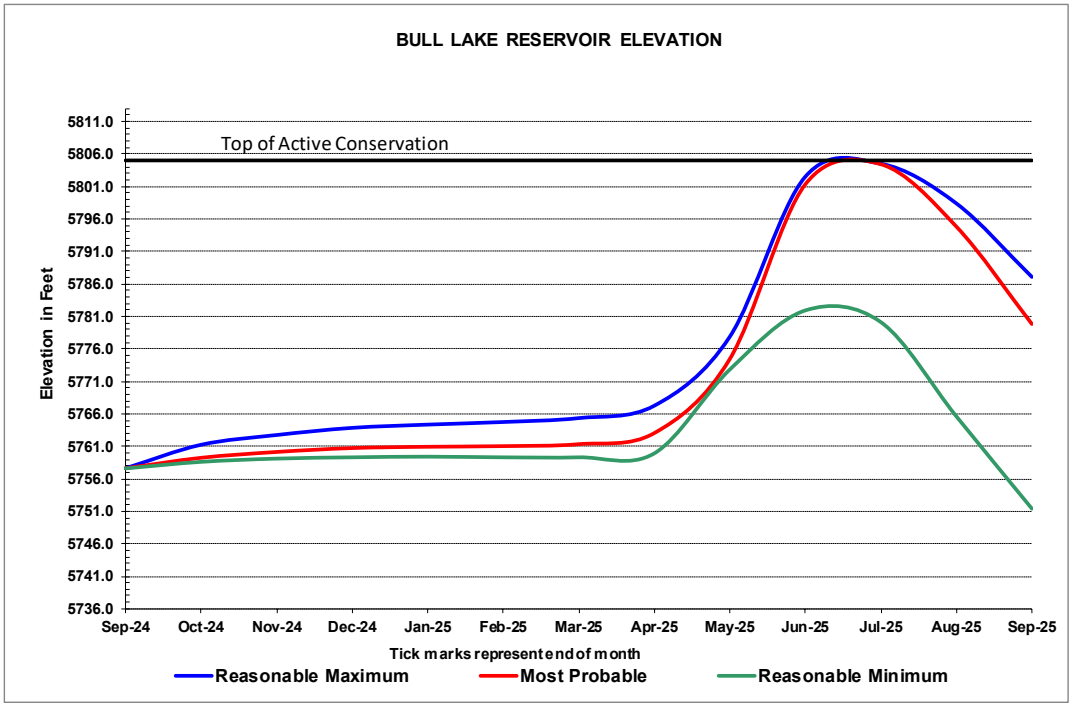
Table WYT 27.—Monthly operating plans for WY2025 for Bull Lake Reservoir and other Riverton Unit features based on the maximum probable runoff scenario

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.	Total
Bull Lake Reservoir (initial content: 32.3 KAF)														
Reservoir inflow	kaf	8.6	4.4	3.8	2.5	2.2	2.9	5.4	30.2	94.6	77.6	27.1	12.2	271.5
Total dam release	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	5.5	19.9	77.6	45.9	44.4	203.8
Total dam release	ft^3/s	25	25	25	25	25	25	25	90	334	1262	746	746	
Excess release	kaf	0	0	0	0	0	0	0	0	13.9	71.5	9	11.4	105.7
EOM content	kaf	39.4	42.3	44.5	45.5	46.3	47.7	51.6	76.3	151	151	132.2	100	
EOM elevation	ft	5,761.3	5,762.8	5,763.9	5,764.4	5,764.8	5,765.4	5,767.3	5,777.9	5,804.5	5,804.5	5,798.4	5,787.1	
BLR net change	kaf	7.1	2.9	2.3	1	0.8	1.4	3.9	24.7	74.7	0	-18.8	-32.2	67.7

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.	Total
Wind River														
Flow abv BL Creek	kaf	37.1	32.5	30.3	34.7	28	27.5	27.9	145.3	366.8	217.1	77.4	50.6	1,075.2
Crowheart gage flow	kaf	38.6	34	31.8	36.2	29.4	29	29.4	150.8	386.7	294.7	123.3	95	1,279
Flow below div dam	kaf	22.2	34	31.8	36.2	29.4	29	12	96.1	322	213.8	64.6	34.4	925.6
Gain/return flow	kaf	0	0	0	0	0	0	4.8	7.4	7.1	7.4	6.1	5.4	38.2
Indian irrigation	kaf	1.2	0	0	0	0	0	1.8	6.1	6	6.1	5.5	4.5	31.3
LeClair/Riverton	kaf	5	0	0	0	0	0	3.5	18.8	24.2	27.2	21.1	15	114.8
LeClair/river shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverton gage flow	ft^3/s	260.3	571.2	517.8	589.3	529.2	472.2	192.6	1,277.7	5,023.9	3,054.8	717.3	341.2	
Wyoming Canal														
Total diversion	kaf	16.4	0	0	0	0	0	17.4	54.7	64.7	80.9	58.7	60.6	353.4
North canal flow	kaf	0	0	0	0	0	0	9.8	26.4	31.2	36.5	30.9	27	161.8
North canal shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot Butte Reservoir (Initial content: 11.8 KAF)														
Reservoir inflow	kaf	16.4	0	0	0	0	0	7.6	28.3	33.5	44.4	27.8	33.6	191.6
Power generated	mwh	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot canal release	kaf	0	0	0	0	0	0	6.7	28	33.1	43.9	37.4	33.3	182.4
Pilot canal shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
EOM content	kaf	28	27.8	27.7	27.6	27.5	27.3	28	28	28	28	18	18	
PBR net change	kaf	16.2	-0.2	-0.1	-0.1	-0.1	-0.2	0.7	0	0	0	-10	0	6.2
EOM elevation	ft	5,457.8	5,457.6	5,457.5	5,457.4	5,457.3	5,457	5,457.8	5,457.8	5,457.8	5,457.8	5,445.5	5,445.5	

Based on maximum April–July runoff of: Bull Lake – 208 kaf / Wind River ab Bull Lake Creek – 757 kaf. This plan assumes an annual demand of 162 KAF for the North Canal and 182 KAF for the Pilot Canal

BULL LAKE RESERVOIR



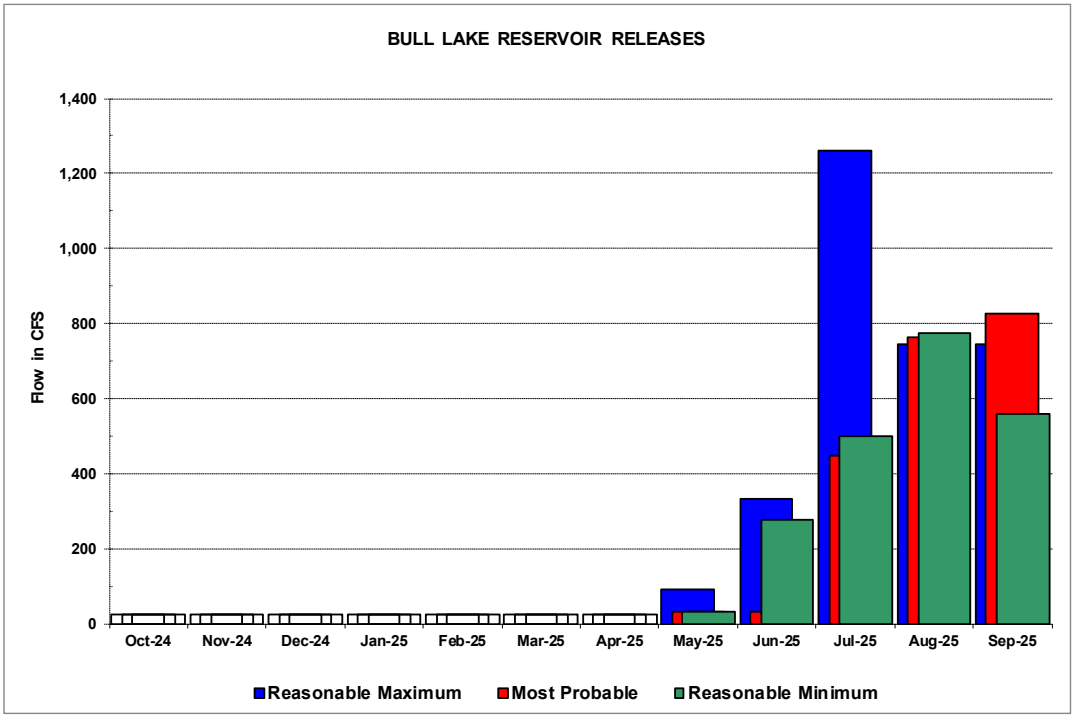


Figure WYG 6.—WY2025 forebay elevation and inflow at Bull Lake Reservoir under a minimum, expected, and maximum forecasts.

Boysen Reservoir and Powerplant

Three operating plans were prepared in October 2024 to project water operations under various inflow conditions during WY2025. The operations for the three runoff conditions are shown in tables WYT 28, 29, and 30, and figure WYG 7. These plans are presented only to show the probable limits of operations and therefore, actual conditions and operations could vary widely from the most probable plan.

The operating objectives at Boysen Dam and Reservoir are to provide water for irrigation, municipal and industrial use, and power generation; provide flood control in cooperation with the USACE; and enhance fish, wildlife, and recreation opportunities in both the reservoir and the Wind/Bighorn River.

Irrigation Season Release

During the irrigation season, water releases from Boysen Reservoir are made to satisfy all downstream senior water rights and storage contract commitments. Generally, demands for downstream senior water rights are met with a reservoir release between 900 and 1,200 ft^3/s. Releases above what is required to meet irrigation demands may be made to manage reservoir levels and generate power.

Non-irrigation Season Release

During the non-irrigation season, releases are made to produce power, enhance the river and reservoir fishery, and provide storage space for the expected spring runoff or conserve storage if the reservoir is not expected to fill. Winter releases are generally in the range between 400 ft^3/s and 1,150 ft^3/s, depending on reservoir conditions going into the winter. The Wyoming Game and Fish Department considers 800 ft^3/s to be the preferred fishery flow from October - February and flows below 600 ft^3/s to be detrimental to the river fishery. A release of approximately 1,150 ft^3/s can be made through one unit at Boysen Powerplant. By releasing less than the capacity of one powerplant unit, annual maintenance can be performed on the other unit during the winter months.

General Operating Procedures

1. October–February: Releases of water for power generation are scheduled to evacuate storage while assuring an adequate water supply for the upcoming irrigation season. It is desirable to maintain a uniform release during November–February to reduce the risk of downstream ice jams, which may cause flooding or damage to bridges and other structures.

2. March - July: Based upon monthly water supply forecasts and as soon as river ice conditions allow, releases are scheduled to meet the irrigation demand as a minimum. Greater releases may be made, if necessary, to eliminate or minimize a spill, with the objective of filling the reservoir to elevation 4,724.50 ft (731,841 AF) by the end of July. Depending on inflows, attempts will be made to provide a reservoir level of at least elevation 4,707.00 ft from the end of May through the end of August for recreational boating access. For the spawning of rainbow trout, it is desirable to have stable or slightly rising river flows from mid-March through early June. When conditions are suitable and without affecting power operations, attempts will be made to limit the drop in reservoir level to 2 ft or less during the reservoir fish spawn and hatch period (which begins in March and ends in May). A rising pool is desirable during this period.
3. August–September: As soon as storage has peaked, water releases are scheduled to meet the irrigation demand and generate power. Releases above what is needed to meet irrigation demand may be made to generate power and prevent the need to release water through the spillway gates if inflow conditions warrant.

2025 Operating Plans

Operating plans have been generated for three scenarios for all months of the upcoming water year:

- Most probable inflow conditions are based on the historical median flows.
- Reasonable minimum inflow conditions are estimated to be lower decile flows. Lower decile flows are flows that have historically been exceeded 90 percent of the time.
- Reasonable maximum inflow conditions are estimated to be upper decile flows. Upper decile flows are flows that have historically been exceeded 10 percent of the time.

Annual operating plans are found in tables WYT 28, 29, and 30 and figure WYG 7. Turbine unit outage schedules are found in figure WYG 9.

Table WYT 28.—Monthly operating plans for WY2025 for Boysen Reservoir based on the most probable runoff scenario

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Boysen Reservoir (initial content: 573.1 KAF)														
Monthly inflow	kaf	51.2	51.8	36.9	39	39.4	49.4	43.5	161	317.5	134.2	40.7	37	1,001.6
Monthly inflow	ft^3/s	833	871	600	634	709	803	731	2,618	5,336	2,183	662	622	
Turbine release	kaf	55.3	41.7	43	43	38.9	43	74.8	101.5	134.1	122.3	83	73.7	854.3
Bypass/spill/waste	kaf	0	0	0	0	0	0	0	0	67.5	0	0	0	67.5
Total release	kaf	55.3	41.7	43	43	38.9	43	74.8	101.5	201.6	122.3	83	73.7	921.8
Total release	ft^3/s	899	701	699	699	700	699	1,257	1,651	3,388	1,989	1,350	1,239	–
EOM content	kaf	569	579.1	573	569	569.5	575.9	544.6	604.1	720	731.9	689.6	652.9	–
EOM elevation	ft	4,715.21	4,715.86	4,715.47	4,715.21	4,715.24	4,715.65	4,713.61	4,717.41	4,723.89	4,724.5	4,722.27	4,720.25	–
Net change content	kaf	-4.1	10.1	-6.1	-4	0.5	6.4	-31.3	59.5	115.9	11.9	-42.3	-36.7	79.8
Boysen Power Plant														
Turbine release	kaf	55.3	41.7	43	43	38.9	43	74.8	101.5	134.1	122.3	83	73.7	854.3
Turbine release	ft^3/s	899	701	699	699	700	699	1,257	1,651	2,254	1,989	1,350	1,239	–
Generation	gwh	4.643	3.522	3.636	3.625	3.276	3.629	6.199	8.44	11.519	10.992	7.465	6.51	73.456
Max generation	gwh	11.904	11.52	11.904	11.904	10.752	11.904	11.52	11.904	11.52	11.904	11.904	11.52	140.16
% Max generation	%	39	31	31	30	30	30	54	71	100	92	63	57	–
Average	kwh/af	84	84	85	84	84	84	83	83	86	90	90	88	86
EOM power cap	mw	16	16	16	16	16	16	16	16	16	16	16	16	–

Based on most probable April–July inflow of 656 KAF.

Table WYT 29.—Monthly operating plans for WY2025 for Boysen Reservoir based on the minimum probable runoff scenario

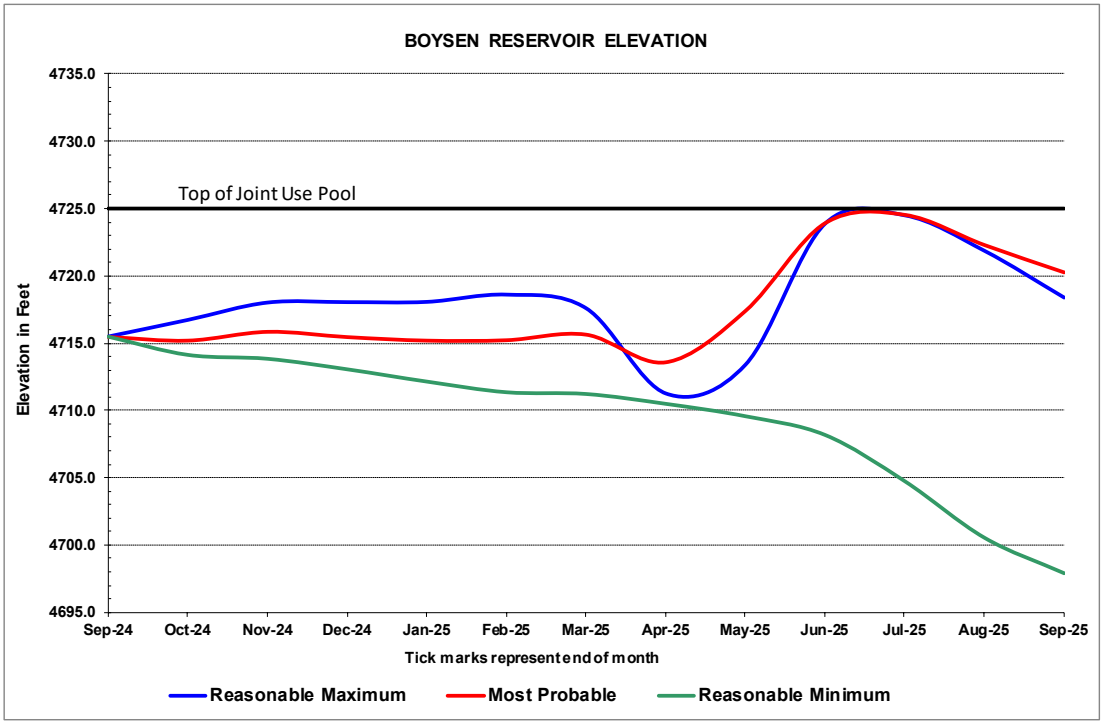
Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Boysen Reservoir (initial content: 573.1 KAF)														
Monthly inflow	kaf	34.7	37.3	31.3	29.7	27.6	41.2	31.4	61	58.7	29.9	24.2	36.3	443.3
Monthly inflow	ft^3/s	564	627	509	483	497	670	528	992	986	486	394	610	–
Turbine release	kaf	55.3	41.7	43	43	38.9	43	41.7	73.8	77.4	73.8	73.8	65.5	670.9
Bypass/spill/waste	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Total release	kaf	55.3	41.7	43	43	38.9	43	41.7	73.8	77.4	73.8	73.8	65.5	670.9
Total release	ft^3/s	899	701	699	699	700	699	701	1,200	1,301	1,200	1,200	1,101	
EOM content	kaf	552.5	548.1	536.4	523.1	511.8	510	499.7	486.9	468.2	424.3	374.7	345.5	
EOM elevation	ft	4,714.13	4,713.84	4,713.06	4,712.15	4,711.36	4,711.23	4,710.5	4,709.58	4,708.19	4,704.76	4,700.57	4,697.94	
Net change content	kaf	-20.6	-4.4	-11.7	-13.3	-11.3	-1.8	-10.3	-12.8	-18.7	-43.9	-49.6	-29.2	-227.6
Boysen Power Plant														
Turbine release	kaf	55.3	41.7	43	43	38.9	43	41.7	73.8	77.4	73.8	73.8	65.5	670.9
Turbine release	ft^3/s	899	701	699	699	700	699	701	1,200	1,301	1,200	1,200	1,101	
Generation	gwh	4.619	3.469	3.558	3.528	3.165	3.482	3.362	5.831	5.996	5.526	5.205	4.38	52.121

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Max generation	gwh	11.904	11.52	11.904	11.904	10.752	11.904	11.52	11.904	11.52	11.904	11.904	11.52	140.16
% Max generation	%	39	30	30	30	29	29	29	49	52	46	44	38	
Average	kwh/af	84	83	83	82	81	81	81	79	77	75	71	67	78
EOM power cap	mw	16	16	16	16	15	15	15	15	14	13	12	12	

Table WYT 30.—Monthly operating plans for WY2025 for Boysen Reservoir based on the maximum probable runoff scenario

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Boysen Reservoir (initial content: 573.1 KAF)														
Monthly inflow	kaf	75	62.9	43.5	43.5	48	62.8	81.6	277.3	578	258.6	75.6	60	1,666.8
Monthly inflow	ft^3/s	1,220	1,057	707	707	864	1,021	1,371	4,510	9,714	4,206	1,230	1,008	
Turbine release	kaf	55.3	41.7	43	43	38.9	79.9	137.3	139.6	138.5	134.8	125.6	121.5	1,099.1
Bypass/spill/waste	kaf	0	0	0	0	0	0	41.2	106.4	260.9	111.9	0	0	520.4
Total release	kaf	55.3	41.7	43	43	38.9	79.9	178.5	246	399.4	246.7	125.6	121.5	1,619.5
Total release	ft^3/s	899	701	699	699	700	1,299	3,000	4,001	6,712	4,012	2,043	2,042	
EOM content	kaf	592.8	614	614.5	615	624.1	607	510.1	541.4	720	731.9	681.9	620.4	
EOM elevation	ft	4,716.72	4,718.01	4,718.04	4,718.06	4,718.6	4,717.58	4,711.24	4,713.39	4,723.89	4,724.5	4,721.86	4,718.38	
Net change content	kaf	19.7	21.2	0.5	0.5	9.1	-17.1	-96.9	31.3	178.6	11.9	-50.0	-61.5	47.3
Boysen Power Plant														
Turbine release	kaf	55.3	41.7	43	43	38.9	79.9	137.3	139.6	138.5	134.8	125.6	121.5	1,099.1
Turbine release	ft^3/s	899	701	699	699	700	1,299	2,307	2,270	2,328	2,192	2,043	2,042	
Generation	gwh	4.677	3.584	3.719	3.72	3.375	6.844	11.132	10.907	11.431	11.901	11.18	10.512	92.982
Max generation	gwh	11.904	11.52	11.904	5.952	8.817	11.904	11.52	11.904	11.52	11.904	11.904	11.52	132.273
% Max generation	%	39	31	31	63	38	57	97	92	99	100	94	91	
Average	kwh/af	85	86	86	87	87	86	81	78	83	88	89	87	85
EOM power cap	mw	16	16	16	16	16	16	15	15	16	16	16	16	

BOYSEN RESERVOIR



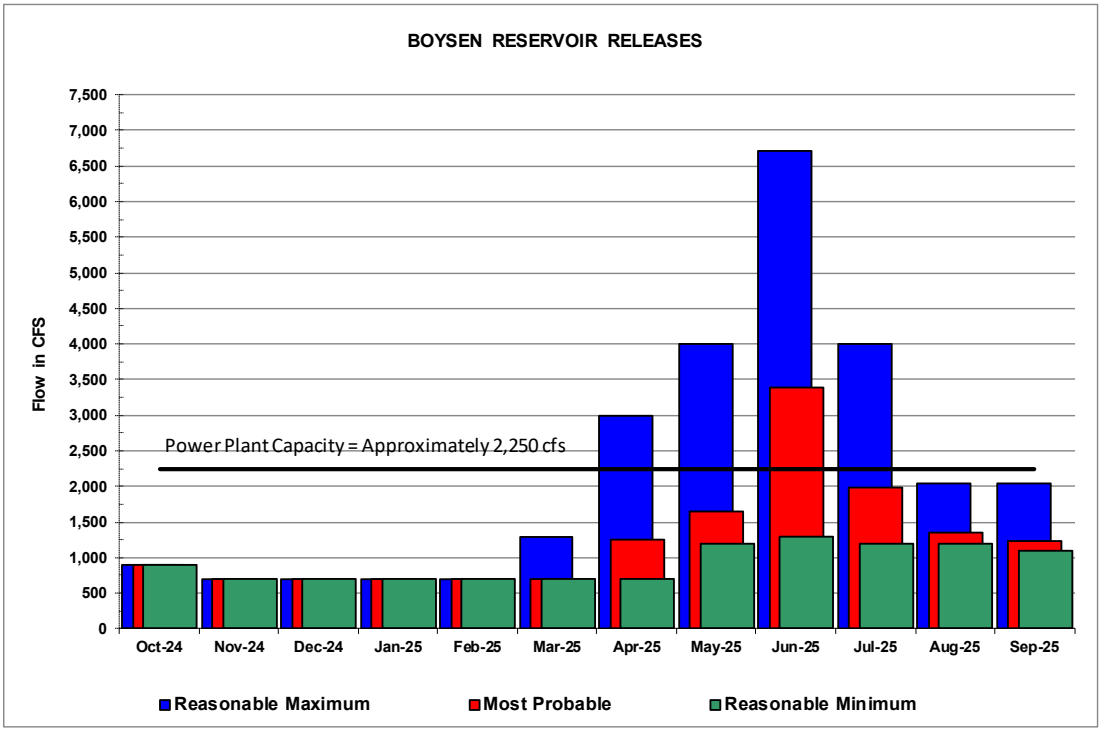


Figure WYG 7.—WY2025 forebay elevation and inflow at Boysen Reservoir under a minimum, expected, and maximum forecast.

Buffalo Bill Reservoir and Powerplants

Three operating plans were prepared for WY2025 to show the operations of Buffalo Bill Reservoir that could occur under various runoff conditions. The operations for the three runoff conditions are shown in tables WYT 31, 32, and 33 and figure WYG 8. These plans were prepared only to show the probable limits of operations; therefore, actual conditions and operations could vary widely from the most probable plan.

Normal Operating Procedures

At the end of the irrigation season, releases will be adjusted with the objective of filling the reservoir to elevation 5,393.50 ft (646,565 AF) while meeting the release criteria of the *Buffalo Bill Reservoir Enlargement Winter Release Operation Agreement (*Agreement). Under the Agreement, Buffalo Bill Reservoir will be operated to ensure that a minimum flow of 100 ft^3/s is always provided in the river below the dam. Additional winter releases beyond the 100 ft^3/s minimum release up to a combined total of 350 ft^3/s in the river below Buffalo Bill Powerplant will be provided based on the criteria set forth in the Agreement.

Reservoir releases to meet downstream irrigation requirements will, to the extent possible, be made through the most efficient power turbines available, after meeting winter flow requirements. A release of at least 100 ft^3/s will be made through the Shoshone Powerplant, whenever the powerplant is available, to provide the required river flow directly below the dam. If the Shoshone Powerplant is not available, the release will be made through the jet flow valve at the dam.

During irrigation season, releases are determined by the requirements for irrigation, and municipal and industrial demand. If snow conditions, inflow, and reservoir content indicate an assured fill of the reservoir, additional releases may be required after the start of the spring runoff to provide flood control and make optimum use of the water for power generation. An attempt is made to maintain a release of 7,000 ft^3/s or less during the runoff season and assures that outflow is less than inflow at all times of flood rate inflow.

2025 Operating Plans

Under most probable inflow conditions, projected inflows for October, November, and December of WY2025 have been adjusted to reflect the recent trends for the basin. Inflows for January through September of WY2024 are median flows or flows that have historically been exceeded 50 percent of the time.

The reasonable minimum volumes are determined from historical lower decile flows for all months of WY2025. A lower decile flow is a flow that has historically been exceeded 90 percent of the time.

Upper decile volumes are determined from flows that have historically been exceeded 10 percent of the time. These values are projected for January through September of WY2025 in the reasonable maximum inflows operating plan.

At the end of WY2024, storage in Buffalo Bill Reservoir was 400,840 AF. Winter releases under all three scenarios are the same as defined by the AOP. Based on the criteria set forth in the Agreement, the 2025 winter release would be 200 ft^3/s. Ice in the Shoshone River can limit Reclamation's ability to change releases during the winter months due to the potential of ice jams near Lovell, WY.

The Shoshone, Buffalo Bill, Heart Mountain, and Spirit Mountain Powerplants will all be available for power generation in WY2025 after all the winter maintenance is completed. Heart Mountain and Spirit Mountain Powerplants do not normally operate during the non-irrigation season. Releases from Buffalo Bill Reservoir will be dependent upon the most efficient operation of all the powerplants while providing the required flow in the Shoshone River.

Table WYT 31.—Monthly operating plans for WY2025 for Buffalo Bill Reservoir based on the most probable runoff scenario

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Buffalo Bill Reservoir (initial content: 400.8 KAF)														
Monthly inflow	kaf	24.3	23	15.3	14.9	12.4	20.6	43.4	166	366.5	138.9	37.7	20.7	883.7
Shoshone release	kaf	6.2	6	6.2	6.2	5.6	6.2	6	10.1	11.5	11.2	6.2	6	87.4
Non-power release	kaf	0	0	0	0	0	0	0	0	42.9	1.5	0	0	44.4
Total flow below dam	kaf	6.2	6	6.2	6.2	5.6	6.2	6	10.1	54.4	12.7	6.2	6	131.8
Buffalo bill release	kaf	15.2	5.9	6.1	6.1	5.5	6.1	44.9	56.6	52.1	51.5	50.2	49.6	349.8
Municipal delivery	kaf	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	2.9
Heart mtn release	kaf	14.9	0	0	0	0	0	6.3	18.6	18	18.6	16.8	9.2	102.4
Heart mtn delivery	kaf	12.2	0	0	0	0	0	7	36.5	42.9	49.5	45.1	32.6	225.8
Total outflow	kaf	48.7	12.1	12.5	12.5	11.3	12.5	64.4	122.1	167.7	132.6	118.6	97.7	812.7
Spill/waste	kaf	0	0	0	0	0	0	0	0	42.9	0.4	0	0	43.3
EOM targets	kaf		463.9	463.9		463.9	463.9	470		620	626.3		475	
EOM content	kaf	373	383.9	386.7	389.1	390.2	398.3	377.3	421.2	620	626.3	545.4	468.4	
Est total storage	kaf	376.4	387.3	390.1	392.5	393.6	401.7	380.7	424.6	623.4	629.7	548.8	471.8	
EOM elevation	ft	5,356.43	5,358.14	5,358.57	5,358.95	5,359.12	5,360.37	5,357.1	5,363.85	5,390.72	5,391.51	5,381.08	5,370.63	
Net change content	kaf	-24.4	10.9	2.8	2.4	1.1	8.1	-21	43.9	198.8	6.3	-80.9	-77	71
Flow below BB power	kaf	21.4	11.9	12.3	12.3	11.1	12.3	50.9	66.7	106.5	64.2	56.4	55.6	481.6
Flow below BB power	ft^3/s	348	200	200	200	200	200	855	1,085	1,790	1,044	917	934	
Spring inflow	kaf	3.7	3.6	3.7	3.7	3.3	3.7	3.6	3.7	3.6	3.7	3.7	3.6	43.6
Passing Cody Gage	kaf	40	15.5	16	16	14.4	16	60.8	89	128.1	86.5	76.9	68.4	627.6
Passing Cody Gage	ft^3/s	651	260	260	260	259	260	1,022	1,447	2,153	1,407	1,251	1,150	
Shoshone Power Plant														
Shoshone release	kaf	6.2	6	6.2	6.2	5.6	6.2	6	10.1	11.5	11.2	6.2	6	87.4
Generation	gwh	1.087	1.047	1.087	1.089	0.985	1.094	1.054	1.785	2.168	2.241	1.22	1.133	15.99
Max generation	gwh	2.232	2.16	2.232	2.232	2.016	1.562	2.16	2.232	2.16	2.232	2.232	2.16	25.61
% Max generation	%	49	48	49	49	49	70	49	80	100	100	55	52	
Average	kwh/af	175	175	175	176	176	176	176	177	189	200	197	189	183
EOM power cap	mw	3	3	3	3	3	2	3	3	3	3	3	3	
Buffalo Bill Power Plant														
Buffalo Bill release	kaf	15.2	5.9	6.1	6.1	5.5	6.1	44.9	56.6	52.1	51.5	50.2	49.6	349.8
Generation	gwh	3.962	1.558	1.617	1.619	1.461	1.624	11.441	13.386	12.965	13.39	13.039	12.806	88.868
Max generation	gwh	12.053	10.368	9.374	10.714	9.677	10.714	12.182	13.392	12.96	13.392	13.392	12.96	141.178
% Max generation	%	33	15	17	15	15	15	94	100	100	100	97	99	
Average	kwh/af	261	264	265	265	266	266	255	237	249	260	260	258	254
EOM power cap	mw	16	14	13	14	14	14	17	18	18	18	18	18	
Spirit Mountain Power Plant														
Spirit Mtn release	kaf	27.1	0	0	0	0	0	13.3	34.4	33.3	34.4	34.4	33.3	210.2
Generation	gwh	2.475	0	0	0	0	0	1.165	2.39	2.758	3.222	3.204	3.051	18.265
Max generation	gwh	3.348	2.592	2.678	3.348	2.903	3.248	1.296	3.348	3.24	3.348	3.348	3.24	35.937
% Max generation	%	74	0	0	0	0	0	90	71	85	96	96	94	
Average	kwh/af	91						88	69	83	94	93	92	87
EOM power cap	mw	3	0	0	0	0	0	2	4	5	5	4	4	
Heart Mountain Power Plant														

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Heart Mtn release	kaf	14.9	0	0	0	0	0	6.3	18.6	18	18.6	16.8	9.2	102.4
Generation	gwh	3.567	0	0	0	0	0	1.508	4.453	4.309	4.453	4.022	2.202	24.514
Max generation	gwh	3.571	0	0	0	0	0	1.728	4.464	4.32	4.464	4.464	4.32	27.331
% Max generation	%	100	0	0	0	0	0	87	100	100	100	90	51	
Average	kwh/af	239						239	239	239	239	239	239	239
EOM Power Cap	mw	5	0	0	0	0	0	2	6	6	6	6	6	–
Total Generation														
Total generation	gwh	11.091	2.605	2.704	2.708	2.446	2.718	15.168	22.014	22.2	23.306	21.485	19.192	147.637
EOM power cap	mw	27	17	16	17	17	16	24	31	32	32	31	31	

Based on most probable inflow of 715 kaf.

Table WYT 32.—Monthly operating plans for WY2025 for Buffalo Bill Reservoir based on the minimum probable runoff scenario

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Buffalo Bill Reservoir (initial content: 400.8 KAF)														
Monthly inflow	kaf	18	18.4	14.3	12.9	11.5	19.4	37.1	152.1	163.2	70.8	28.2	14.6	560.5
Shoshone release	kaf	6.2	6	6.2	6.2	5.6	6.2	6	6.2	6	6.2	6.2	6	73
Non-power release	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Total flow below dam	kaf	6.2	6	6.2	6.2	5.6	6.2	6	6.2	6	6.2	6.2	6	73
Buffalo bill release	kaf	15.2	5.9	6.1	6.1	5.5	6.1	21.1	54.4	51.9	54.1	55.6	52.9	334.9
Municipal delivery	kaf	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	3.6
Heart mtn release	kaf	14.9	0	0	0	0	0	6.3	12.6	12.9	12.9	11.4	5.9	76.9
Heart mtn delivery	kaf	8	0	0	0	0	0	7	36	42	48	41	33	215
Total outflow	kaf	44.6	12.2	12.6	12.6	11.4	12.6	40.7	109.5	113.1	121.5	114.5	98.1	703.4
Spill/waste	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
EOM targets	kaf		463.9					470		623	626.2		475	
EOM content	kaf	370.8	377	378.7	379	379.1	385.9	382.3	424.9	475	424.3	338	254.5	
Est total storage	kaf	374.2	380.4	382.1	382.4	382.5	389.3	385.7	428.3	478.4	427.7	341.4	257.9	
EOM elevation	ft	5,356.08	5,357.06	5,357.32	5,357.37	5,357.39	5,358.45	5,357.89	5,364.41	5,371.55	5,364.32	5,350.79	5,335.7	
Net change content	kaf	-26.6	6.2	1.7	0.3	0.1	6.8	-3.6	42.6	50.1	-50.7	-86.3	-83.5	-142.9
Flow below BB power	kaf	21.4	11.9	12.3	12.3	11.1	12.3	27.1	60.6	57.9	60.3	61.8	58.9	407.9
Flow Below BB Power	ft^3/s	348	200	200	200	200	200	455	986	973	981	1,005	990	
Spring Inflow	kaf	3.7	3.6	3.7	3.7	3.3	3.7	3.6	3.7	3.6	3.7	3.7	3.6	43.6
Passing Cody Gage	kaf	40	15.5	16	16	14.4	16	37	76.9	74.4	76.9	76.9	68.4	528.4
Passing Cody Gage	ft^3/s	651	260	260	260	259	260	622	1,251	1,250	1,251	1,251	1,150	
Shoshone Power Plant														
Shoshone release	kaf	6.2	6	6.2	6.2	5.6	6.2	6	6.2	6	6.2	6.2	6	73
Generation	gwh	1.086	1.044	1.081	1.082	0.978	1.085	1.051	1.1	1.096	1.133	1.084	0.984	12.804
Max generation	gwh	2.232	2.16	2.232	2.232	2.016	1.562	2.16	2.232	2.16	2.232	2.232	2.16	25.61
% Max generation	%	49	48	48	48	49	69	49	49	51	51	49	46	
Ave	kwh/af	175	174	174	175	175	175	175	177	183	183	175	164	175
EOM power cap	mw	3	3	3	3	3	2	3	3	3	3	3	2	
Buffalo Bill Power Plant														
Buffalo Bill release	kaf	15.2	5.9	6.1	6.1	5.5	6.1	21.1	54.4	51.9	54.1	55.6	52.9	334.9

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Generation	gwh	3.97	1.555	1.611	1.612	1.453	1.615	5.511	13.129	12.669	13.082	13.118	12.129	81.454
Max generation	gwh	12.053	10.368	9.374	10.714	9.677	10.714	12.182	13.392	12.96	13.392	13.392	12.96	141.178
% Max generation	%	33	15	17	15	15	15	45	98	98	98	98	94	
Ave	kwh/af	261	264	264	264	264	265	261	241	244	242	236	229	243
EOM power cap	mw	16	14	13	14	14	14	17	18	18	18	17	17	
Spirit Mountain power plant														
Spirit Mtn release	kaf	22.9	0	0	0	0	0	13.3	34.4	33.3	34.4	34.4	33.3	206
Generation	gwh	2.105	0	0	0	0	0	1.228	2.554	2.567	2.57	2.364	2.052	15.44
Max generation	gwh	3.348	2.592	2.678	3.348	2.903	3.248	1.296	3.348	3.24	3.348	3.348	3.24	35.937
% Max generation	%	63	0	0	0	0	0	95	76	79	77	71	63	
Ave	kwh/af	92						92	74	77	75	69	62	75
EOM power cap	mw	3	0	0	0	0	0	2	4	4	4	3	3	
Heart Mountain Power Plant														
Heart Mtn release	kaf	14.9	0	0	0	0	0	6.3	12.6	12.9	12.9	11.4	5.9	76.9
Generation	gwh	3.567	0	0	0	0	0	1.508	3.016	3.088	3.088	2.729	1.412	18.408
Max generation	gwh	3.571	0	0	0	0	0	1.728	4.464	4.32	4.464	4.464	4.32	27.331
% Max generation	%	100	0	0	0	0	0	87	68	71	69	61	33	
Ave	kwh/af	239						239	239	239	239	239	239	239
EOM power cap	mw	5	0	0	0	0	0	2	6	6	6	6	6	
Total Generation														
Total generation	gwh	10.728	2.599	2.692	2.694	2.431	2.7	9.298	19.799	19.42	19.873	19.295	16.577	128.106
EOM power cap	mw	27	17	16	17	17	16	24	31	31	31	29	28	

Based on reasonable minimum April–July inflow of 432 kaf.

Table WYT 33.—Monthly operating plans for WY2025 for Buffalo Bill Reservoir based on the maximum probable runoff scenario

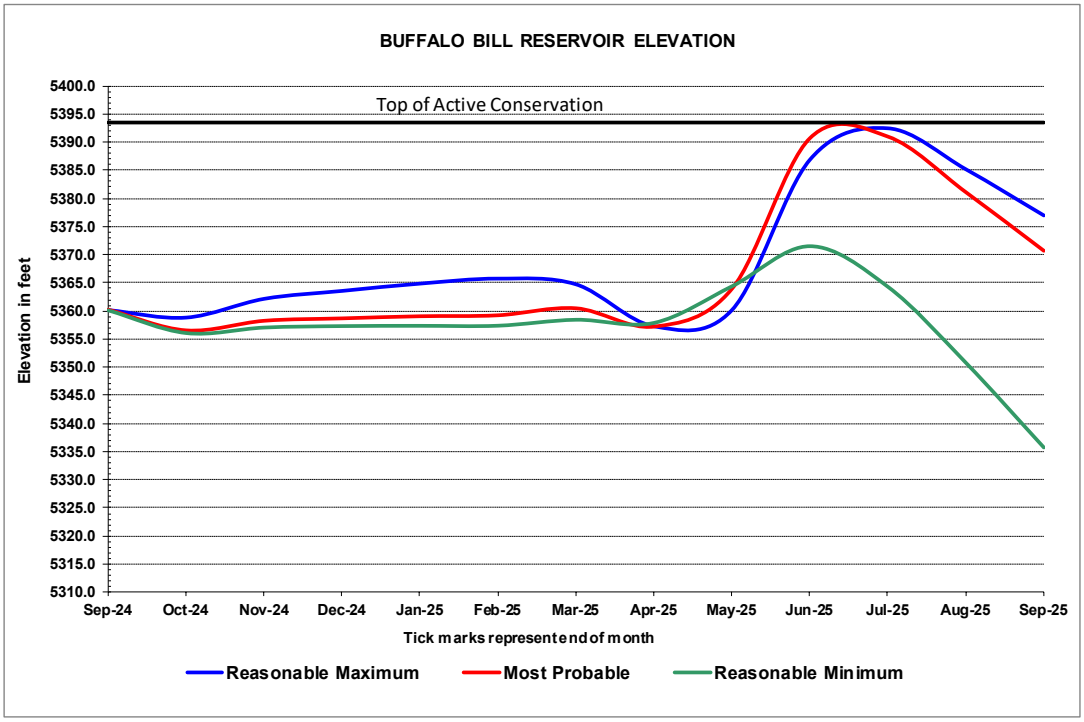
Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Buffalo Bill Reservoir (initial content: 400.8 KAF)														
Monthly inflow	kaf	35.3	33.9	21.9	21.3	17.5	32.6	62.1	275	556.7	314.8	65	36	1,472.1
Shoshone release	kaf	6.2	7.7	8	8	7.2	8	12.3	12.9	11.8	11.4	6.2	6	105.7
Non-power release	kaf	0	0	0	0	0	0	36.2	131.4	238.2	148.1	0	0	553.9
Total flow below dam	kaf	6.2	7.7	8	8	7.2	8	48.5	144.3	250	159.5	6.2	6	659.6
Buffalo Bill release	kaf	15.3	4.2	4.3	4.3	3.9	31.3	47.8	57.2	53.2	52.1	49.5	48.6	371.7
Municipal delivery	kaf	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	3.6
Heart Mtn release	kaf	14.8	0	0	0	0	0	7.2	18.6	18	18.6	17.5	10.2	104.9
Heart Mtn delivery	kaf	8	0	0	0	0	0	7	36	42	48	41	33	215
Total outflow	kaf	44.6	12.2	12.6	12.6	11.4	39.6	110.8	256.4	363.5	278.5	114.5	98.1	1,354.8
Spill/waste	kaf	0	0	0	0	0	0	0	131.4	238.2	144.7	0	0	5,14.3
EOM targets	kaf		463.9	463.9	463.9	463.9	470	475		590	626.3			
EOM content	kaf	388.1	409.8	419.1	427.8	433.9	426.9	378.2	396.8	590	626.3	576.8	514.7	
Est total storage	kaf	391.5	413.2	422.5	431.2	437.3	430.3	381.6	400.2	593.4	629.7	580.2	518.1	
EOM elevation	ft	5,358.79	5,362.13	5,363.54	5,364.84	5,365.73	5,364.71	5,357.24	5,360.14	5,386.91	5,391.51	5,385.2	5,376.98	
Net change content	kaf	-9.3	21.7	9.3	8.7	6.1	-7	-48.7	18.6	193.2	36.3	-49.5	-62.1	117.3
Flow below BB power	kaf	21.5	11.9	12.3	12.3	11.1	39.3	96.3	201.5	303.2	211.6	55.7	54.6	1,031.3

Upper Missouri River Basin
Summary of Actual Operations WY2024
Annual Operating Plans WY2025

Item	Unit	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Flow below BB power	ft^3/s	350	200	200	200	200	639	1,618	3,277	5,095	3,441	906	918	
Spring inflow	kaf	3.7	3.6	3.7	3.7	3.3	3.7	3.6	3.7	3.6	3.7	3.7	3.6	43.6
Passing Cody Gage	kaf	40	15.5	16	16	14.4	43	107.1	223.8	324.8	233.9	76.9	68.4	1,179.8
Passing Cody Gage	ft^3/s	651	260	260	260	259	699	1,800	3,640	5,458	3,804	1,251	1,150	
Shoshone Power Plant														
Shoshone release	kaf	6.2	7.7	8	8	7.2	8	12.3	12.9	11.8	11.4	6.2	6	105.7
Generation	gwh	1.092	1.361	1.429	1.437	1.3	1.444	2.162	2.23	2.169	2.237	1.23	1.157	19.248
Max generation	gwh	2.232	2.16	2.232	2.232	2.016	1.562	2.16	2.232	2.16	2.232	2.232	2.16	25.61
% Max generation	%	49	63	64	64	64	92	100	100	100	100	55	54	
Ave	kwh/af	176	177	179	180	181	181	176	173	184	196	198	193	182
EOM power cap	mw	3	3	3	3	3	2	3	3	3	3	3	3	
Buffalo Bill Power Plant														
Buffalo Bill release	kaf	15.3	4.2	4.3	4.3	3.9	31.3	47.8	57.2	53.2	52.1	49.5	48.6	371.7
Generation	gwh	4.014	1.121	1.157	1.162	1.058	8.367	12.181	13.343	12.96	13.394	13.043	12.767	94.567
Max generation	gwh	12.053	10.368	9.374	10.714	9.677	10.714	12.182	13.392	12.96	13.392	13.392	12.96	141.178
% Max generation	%	33	11	12	11	11	78	100	100	100	100	97	99	
Ave	kwh/af	262	267	269	270	271	267	255	233	244	257	263	263	254
EOM power cap	mw	16	14	13	14	14	14	17	18	18	18	18	18	
Spirit Mountain Power Plant														
Spirit Mtn release	kaf	22.8	0	0	0	0	0	13.3	34.4	33.3	34.4	34.4	33.3	205.9
Generation	gwh	2.124	0	0	0	0	0	1.178	2.331	2.641	3.178	3.337	3.205	17.994
Max generation	gwh	3.348	2.592	2.678	3.348	2.903	1.741	1.296	3.348	3.24	3.348	3.348	3.24	34.43
% Max generation	%	63	0	0	0	0	0	91	70	82	95	100	99	
Ave	kwh/af	93						89	68	79	92	97	96	87
EOM power cap	mw	3	0	0	0	0	0	2	4	5	5	5	4	
Heart Mountain Power Plant														
Heart Mtn release	kaf	14.8	0	0	0	0	0	7.2	18.6	18	18.6	17.5	10.2	104.9
Generation	gwh	3.543	0	0	0	0	0	1.724	4.453	4.309	4.453	4.189	2.442	25.113
Max generation	gwh	3.571	0	0	0	0	0	1.728	4.464	4.32	4.464	4.464	4.32	27.331
% Max generation	%	99	0	0	0	0	0	100	100	100	100	94	57	
Ave	kwh/af	239						239	239	239	239	239	239	239
EOM power cap	mw	5	0	0	0	0	0	2	6	6	6	6	6	
Total Generation														
Total generation	gwh	10.773	2.482	2.586	2.599	2.358	9.811	17.245	22.357	22.079	23.262	21.799	19.571	156.922
EOM power cap	mw	27	17	16	17	17	16	24	31	32	32	32	31	

Based on reasonable maximum April-July inflow of 1,209 kaf.

BUFFALO BILL RESERVOIR



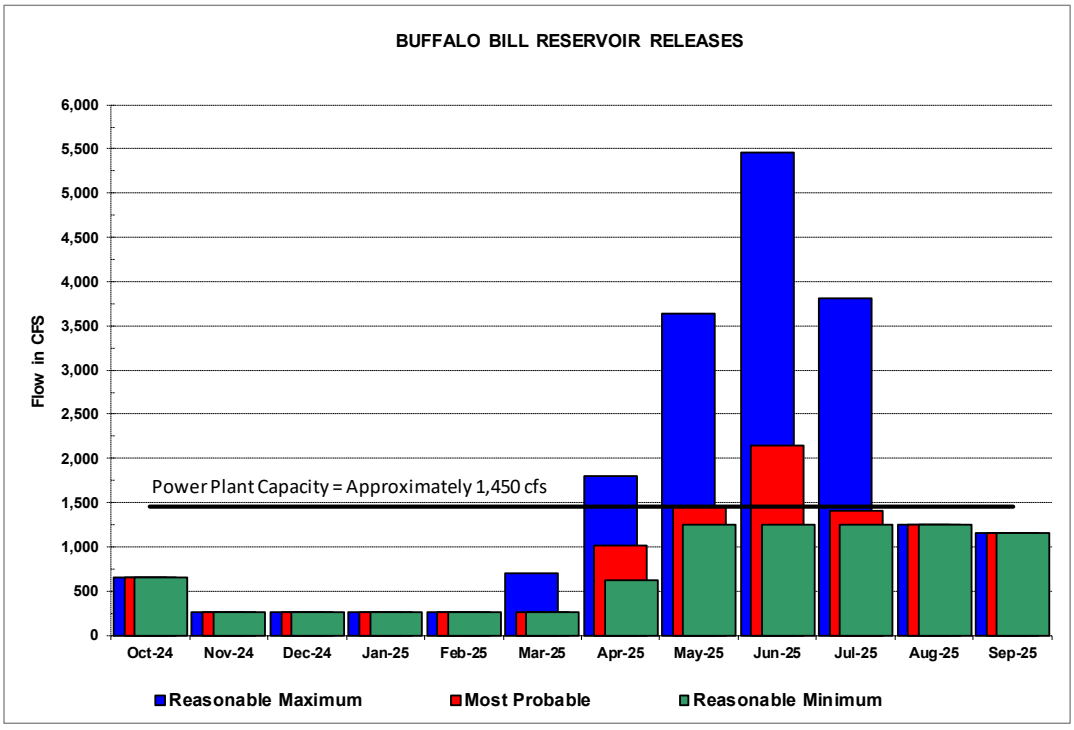


Figure WYG 8.—WY2025 forebay elevation and inflow at Buffalo Bill Reservoir under a minimum, expected, and maximum forecast.

Table WYT 34—WY2025 Scheduled Outages for Bighorn Powerplants.

Power Plant	Task Name	Start	Finish
Buffalo Bill	BB#1 Cavitation Repair	01/23/2025	01/30/2025
Buffalo Bill	BBP - KZ1A & BBP - 718	2/17/2025	02/18/2025
Buffalo Bill	BBP - KZ2A & BBP - 818	2/19/2025	2/20/2025
Boysen	Unit 2 STATOR	1/28/2025	2/13/2025
Boysen	B#2 Annual Maintenance	2/10/2025	2/13/2025
Heart Mountain	HM#1 Annual	2/10/2025	3/20/2025
Heart Mountain	HM BKR 114 & 124	2/10/2025	2/10/2025
Heart Mountain	HM BKR 114 & 124	2/11/2025	2/11/2025
Heart Mountain	HM BKR 114 & 124	2/12/2025	2/12/2025
Heart Mountain	HM BKR 114 & 124	2/13/2025	2/13/2025
Heart Mountain	HM#1 Penstock Repairs	3/10/2025	3/17/2025

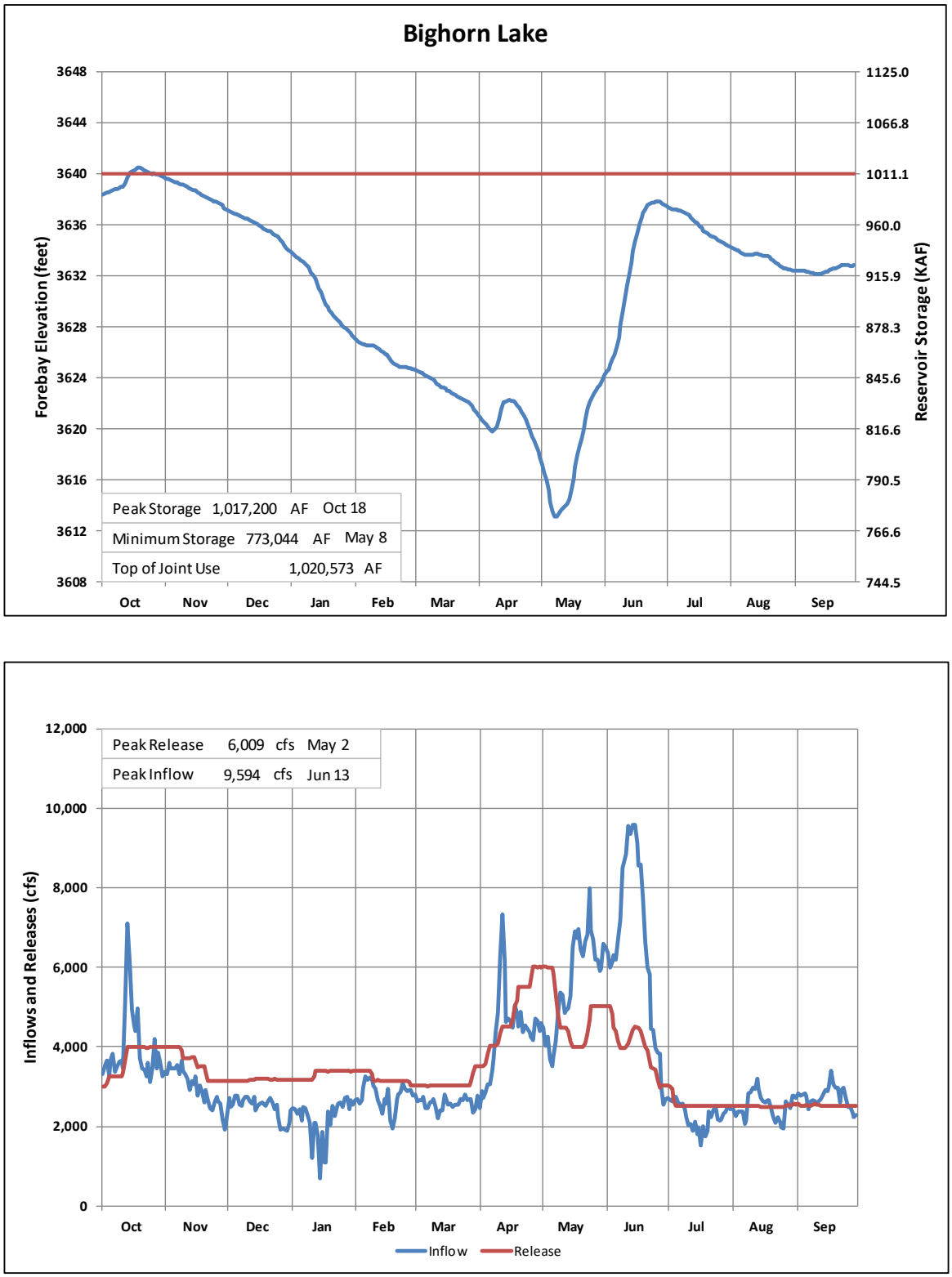


Figure WYG 9.—Bighorn Lake Storage, inflow and releases for WY2024.

Annual Operating Plans for Water Year 2024 for Missouri Basin Units Under the Responsibility of the Montana Area Office

Water Year 2024 Precipitation, Snowpack, and Water Supply Forecasts

Reclamation's Montana Area Office (MTAO) oversees and manages ten reservoirs east of the continental divide in Montana. Those reservoirs are associated with Clark Canyon Dam and Canyon Ferry Dam in the Missouri River headwaters in Southwestern Montana; Gibson Dam and associated off-stream dams of Pishkun Dikes and Willow Creek Dam along the Rocky Mountain front; Tiber Dam in Central Montana; Sherburne Dam and associated Milk River project dams of Fresno Dam and Nelson Dikes along Northern Montana; and Yellowtail Dam near the Montana-Wyoming border. The following sections will describe specific operations for WY2024 for each facility.

This section provides an overview of basin-wide conditions and specific data for each of the MTAO reservoirs. Precipitation significantly influences operational decisions and is an important factor for all reservoirs. Key data sets monitored include overall precipitation and snow water equivalent (SWE). Monthly information on valley and mountain precipitation per basin during WY2024 can be found in tables MTT 1 and 2 and figures MTG 1 and 2.

Each January, Reclamation begins to forecast the April through July runoff volumes for Reclamation reservoirs east of the Continental Divide. These forecasts involve evaluating SWE and other basin parameters such as antecedent conditions, drought indices, and El Niño-Southern Oscillation (ENSO) conditions. Other agencies that also forecast runoff include the U.S. Army Corps of Engineers (USACE) and the Natural Resource Conservation Service (NRCS).

On January 1, 2024, the NRCS reported mountain SWE throughout Montana and parts of Wyoming ranging from 16 percent of normal in the Sun River basin to 74 percent of normal in the Bighorn River basin. A tabular report of the snow water content is also shown in table MTT 3. Reclamation's water supply forecasts prepared on January 1 indicated April through July runoff volumes varied from 47 percent of average for Canyon Ferry Reservoir to 86 percent of average for Lake Sherburne, as shown in table MTT 4. All of Reclamation's reservoirs reached their peak snowpack for the year between April 10 and April 11, as shown in figure MTG 3. The tables and figures contain information on precipitation, snowpack, and forecasts throughout the runoff season.

Table MTT 1.—2024 Annual monthly precipitation data for valleys of interest in Montana and Wyoming

PRECIPITATION IN INCHES AND PERCENT OF AVERAGE
2024 VALLEY PRECIPITATION

BASIN	OCT		NOV		DEC		JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP	
	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%
Beaverhead																								
Monthly Average Precip	1.10		0.76		0.71		0.65		0.61		0.81		1.41		2.11		2.38		1.16		1.00		1.09	
Monthly Precip and % of Average	1.00	91	0.33	43	0.37	53	0.48	74	1.62	266	0.90	111	1.12	79	1.31	62	1.08	45	0.47	40	0.86	86	0.96	88
Year-to-Date Precip and % of Average	1.00	91	1.33	72	1.70	66	2.18	68	3.80	100	4.70	102	5.82	96	7.13	88	8.20	78	8.67	74	9.53	75	10.48	76
Jefferson																								
Monthly Average Precip	0.91		0.59		0.52		0.41		0.42		0.58		1.15		1.81		2.25		1.17		0.97		1.01	
Monthly Precip and % of Average	0.96	105	0.17	29	0.23	45	0.30	74	1.55	367	0.75	130	0.85	74	1.42	79	1.12	50	0.41	35	1.02	105	1.07	105
Year-to-Date Precip and % of Average	0.96	105	1.13	75	1.36	68	1.66	69	3.21	113	3.96	116	4.82	105	6.24	98	7.36	85	7.77	79	8.79	82	9.85	84
Madison																								
Monthly Average Precip	1.76		1.60		1.81		1.56		1.45		1.76		2.17		2.63		2.62		1.30		1.18		1.35	
Monthly Precip and % of Average	2.16	123	0.86	54	1.11	61	0.92	59	2.30	159	2.35	134	1.68	77	2.78	106	1.74	66	0.94	72	1.36	116	1.89	140
Year-to-Date Precip and % of Average	2.16	123	3.02	90	4.13	80	5.06	75	7.36	90	9.71	98	11.39	94	14.17	96	15.91	92	16.85	90	18.22	92	20.11	95
Gallatin																								
Monthly Average Precip	1.37		0.84		0.64		0.55		0.58		0.93		1.90		2.48		2.80		1.23		1.13		1.25	
Monthly Precip and % of Average	1.69	123	0.18	22	0.39	61	0.41	75	1.39	241	1.11	119	1.45	76	3.19	129	1.90	68	0.88	72	1.22	108	2.08	166
Year-to-Date Precip and % of Average	1.69	123	1.87	85	2.26	79	2.67	79	4.06	102	5.17	105	6.62	97	9.81	106	11.70	97	12.58	95	13.81	96	15.88	101
Missouri Above Toston																								
Monthly Precip Average	1.21		0.91		0.88		0.75		0.72		0.97		1.56		2.18		2.50		1.23		1.06		1.15	
Monthly Precip and % of Average	1.40	115	0.36	39	0.49	56	0.50	67	1.69	235	1.22	126	1.18	75	2.11	97	1.44	58	0.65	52	1.12	105	1.48	129
Year-to-Date Precip and % of Average	1.40	115	1.76	83	2.25	75	2.75	73	4.44	99	5.66	104	6.84	98	8.95	97	10.39	89	11.04	85	12.15	87	13.64	90
Sun-Teton																								
Monthly Average Precip	0.93		0.55		0.45		0.42		0.48		0.62		1.52		2.31		2.82		1.05		1.13		1.33	
Monthly Precip and % of Average	1.51	162	0.26	48	0.08	17	0.39	94	1.58	333	0.50	81	1.53	100	2.71	117	1.71	61	0.53	51	1.50	133	2.17	163
Year-to-Date Precip and % of Average	1.51	162	1.78	120	1.85	96	2.24	96	3.83	136	4.33	126	5.86	118	8.57	118	10.28	102	10.81	97	12.31	100	14.47	106
Marias																								
Monthly Average Precip	1.02		0.99		0.71		0.74		0.69		0.82		1.37		1.96		2.86		1.15		1.03		1.16	
Monthly Precip and % of Average	1.52	149	1.07	108	0.31	44	0.81	110	1.30	187	0.78	95	1.07	78	2.48	127	1.20	42	0.56	49	2.62	255	1.75	151
Year-to-Date Precip and % of Average	1.52	149	2.59	129	2.90	107	3.71	107	5.01	120	5.79	116	6.86	108	9.34	112	10.54	94	11.10	90	13.72	103	15.47	107
Milk																								
Monthly Average Precip	0.89		0.53		0.38		0.41		0.34		0.48		1.10		2.01		2.85		1.56		1.20		1.21	
Monthly Precip and % of Average	1.38	156	0.50	93	0.09	23	0.36	87	0.66	195	0.86	177	0.89	81	3.57	177	2.03	71	0.89	57	1.83	153	2.44	201
Year-to-Date Precip and % of Average	1.38	156	1.88	132	1.97	109	2.32	105	2.98	117	3.83	127	4.72	114	8.29	135	10.32	115	11.21	106	13.04	111	15.49	119
St. Mary																								
Monthly Average Precip	2.61		3.22		2.55		2.55		2.27		2.59		2.34		2.93		3.85		1.43		1.37		1.78	
Monthly Precip and % of Average	1.97	75	3.20	99	1.81	71	2.05	80	2.81	124	2.47	95	1.58	67	3.60	123	2.10	55	1.44	101	3.18	232	1.38	77
Year-to-Date Precip and % of Average	1.97	75	5.17	89	6.97	83	9.02	83	11.82	90	14.29	91	15.86	88	19.46	93	21.56	87	23.00	87	26.18	95	27.55	94
Bighorn Above Yellowtail																								
Monthly Average Precip	1.11		0.62		0.46		0.43		0.51		0.73		1.38		2.18		1.41		0.80		0.62		1.12	
Monthly Precip and % of Average	2.24	202	0.60	98	0.19	41	0.22	51	0.80	155	0.61	84	1.47	107	2.38	109	0.43	31	0.54	67	0.79	128	0.52	46
Year-to-Date Precip and % of Average	2.24	202	2.84	165	3.04	139	3.26	124	4.05	129	4.66	121	6.13	117	8.51	115	8.94	101	9.48	98	10.27	100	10.78	95

The following National Weather Service station locations were input into PRISM to compute the data in Table MTT1A:

Beaverhead.....Dillon 18 WSW, Dillon Airport, Grant 5 SE, Lima, Polaris 3.7 NNE and Wisdom

Jefferson.....Alder 19 S, Boulder 0.3 E, Diloon 18 WSW, Dillon Airport, Glen 0.2 SE, Grant 5 SE, Laurin 2 NE, Lima, Sheridan 1.4 ENE, Twin Bridges, Wisdom and Wise River 3 WNW

Madison.....Bozeman Montana State University, Ennis, Hebgen Dam, Norris Madison Power House, Old Faithful and West Yellowstone Gateway

Gallatin.....Bozeman 6 W Experimental Farm, Bozeman 1.5 SSE, Bozeman Gallatin Field Airport and Logan Landfill

Missouri Above Toston.....Alder 19 S, Boulder 0.3 E, Bozeman 1.5 SSE, Bozeman 6 W Experimental Farm, Bozeman Gallatin Airport and Bozeman Montana State University, Dillon 18 WSW, Dillon Airport, Ennis, Glen 0.2 SE, Grant 5 SE, Hebgen Dam, Laurin, Lima, Logan Landfill, Norris Madison Power House, Old Faithful, Polaris 3.7 NNE, Sheridan 1.4 ENE, Townsend, Trident, Twin Bridges, West Yellowstone Gateway, Wisdom and Wise River 3 WNW

Sun-Teton.....Cascade 5 S, Choteau 8 NE, Choteau, Dutton 3.3 ENE, Fairfield, Great Falls Weather Forecast Office, Rogers Pass 9 NNE and Sun River 4 S

Marias.....Chester, Conrad, Cut Bank Airport, Dunkirk 19 NNE, East Glacier, Galata 16 SW and Shelby

Milk.....Chinook, Fort Belknap 2 SW, Gildford, Glasgow Weather Forecast Office, Goldbutte 7 N, Harlem 20 S, Havre Airport ASOS, Hingham 12 N, Hinsdale 4 SW, Hogeland 7.0 SSE, Malta, Rudyard 21 N, Saco 1 NNW and Simpson 6 N Wildhorse

St. Mary.....East Glacier and St Mary 1 SSW

Bighorn Above Yellowtail...Basin, Black Mountain, Boysen Dam, Buffalo Bill Dam, Burris, Cody 12 SE, Cody 7.6 NNW, Deaver, Dubois, Emblem, Fort Smith 0.5 ENE, Greybull South Big Horn Co Airport, Lander 11 SSE, Lander 7.3 WNW, Lander Airport, Lovell, Pahaske, Pavillion, Powell Field Station, Rairden 2 WSW, Riverton Regional Airport, Shell 9.5 NNW, Shell, Shoshoni, Sunshine 3 NE, Ten Sleep 0.3 SSW, Tensleep 16 SSE, Thermopolis, Thermopolis 9 NE, Worland 14.4 SW and Worland Municipal Airport

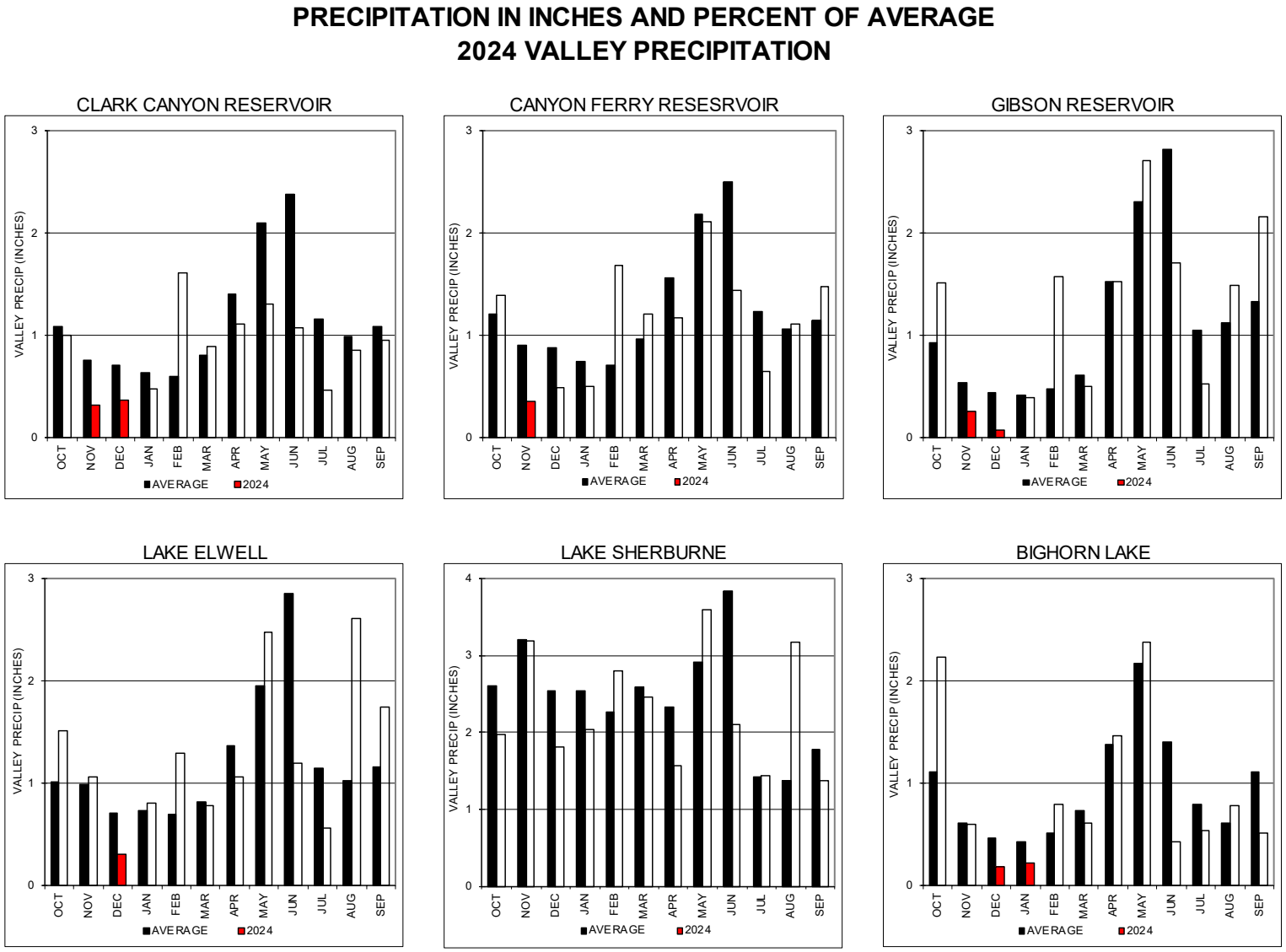


Figure MTG 1.—WY2024 monthly precipitation in valleys above MTAO managed reservoirs in Montana.

Table MTT 2.—WY2024 Annual monthly precipitation data for mountains of interest in Montana and Wyoming

PRECIPITATION IN INCHES AND PERCENT OF AVERAGE

2024 MOUNTAIN PRECIPITATION

BASIN	OCT		NOV		DEC		JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP	
	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%	IN.	%
Lima Reservoir																								
Monthly Average Precip	2.18		2.16		2.84		2.48		2.20		2.42		2.60		3.02		2.90		1.22		1.22		1.64	
Monthly Precip and % of Average	3.02	139	1.22	56	1.56	55	1.88	76	3.48	158	3.68	152	1.40	54	2.52	83	1.50	52	0.90	74	1.58	130	1.98	121
Year-to-Date Precip and % of Average	3.02	139	4.24	98	5.80	81	7.68	80	11.16	94	14.84	104	16.24	96	18.76	94	20.26	89	21.16	88	22.74	90	24.72	92
Clark Canyon Reservoir																								
Monthly Average Precip	2.26		2.44		2.64		2.40		2.17		2.53		3.09		3.39		3.17		1.20		1.26		1.70	
Monthly Precip and % of Average	2.04	91	1.69	69	1.79	68	1.89	79	3.00	138	2.91	115	1.96	63	2.91	86	1.37	43	0.77	64	1.09	86	1.87	110
Year-to-Date Precip and % of Average	2.04	91	3.73	79	5.51	75	7.40	76	10.40	87	13.31	92	15.27	87	18.19	87	19.56	81	20.33	80	21.41	81	23.29	82
Jefferson Drainage																								
Monthly Average Precip	2.23		2.52		2.76		2.52		2.25		2.53		3.11		3.32		3.18		1.33		1.32		1.68	
Monthly Precip and % of Average	1.87	84	1.50	60	1.71	62	1.79	71	3.03	135	2.63	104	2.19	70	2.98	90	1.98	62	0.69	52	1.33	101	1.68	100
Year-to-Date Precip and % of Average	1.87	84	3.37	71	5.08	68	6.88	69	9.91	81	12.54	85	14.73	82	17.71	83	19.68	81	20.38	79	21.71	80	23.39	81
Madison Drainage																								
Monthly Average Precip	3.06		3.63		4.38		3.91		3.49		3.81		4.06		3.94		3.30		1.49		1.53		2.00	
Monthly Precip and % of Average	3.59	117	2.40	66	2.51	57	2.60	66	4.69	134	5.05	132	2.74	67	3.25	83	2.56	78	0.86	58	1.76	116	2.19	109
Year-to-Date Precip and % of Average	3.59	117	5.99	90	8.50	77	11.10	74	15.79	86	20.84	94	23.58	90	26.83	89	29.39	88	30.25	86	32.01	87	34.20	89
Gallatin Drainage																								
Monthly Average Precip	3.37		3.50		3.60		3.30		3.30		3.87		5.00		4.70		4.00		1.93		1.80		2.13	
Monthly Precip and % of Average	4.40	131	2.03	58	2.10	58	1.73	53	3.60	109	4.53	117	4.83	97	6.27	133	3.47	87	1.27	66	2.07	115	3.00	141
Year-to-Date Precip and % of Average	4.40	131	6.43	94	8.53	82	10.27	75	13.87	81	18.40	88	23.23	90	29.50	96	32.97	95	34.23	94	36.30	95	39.30	97
Canyon Ferry Reservoir																								
Monthly Average Precip	2.55		2.93		3.31		3.00		2.71		3.00		3.51		3.59		3.25		1.42		1.41		1.79	
Monthly Precip and % of Average	2.60	102	1.78	61	1.97	60	2.00	67	3.57	132	3.45	115	2.57	73	3.33	93	2.27	70	0.78	55	1.50	106	2.01	113
Year-to-Date Precip and % of Average	2.60	102	4.39	80	6.36	72	8.36	71	11.93	82	15.37	88	17.95	85	21.28	87	23.54	85	24.32	83	25.82	84	27.83	86
Gibson Reservoir																								
Monthly Average Precip	2.46		2.67		2.68		2.37		2.37		2.44		2.73		3.65		3.87		1.38		1.55		1.93	
Monthly Precip and % of Average	1.42	58	1.80	67	0.66	25	1.76	74	3.39	143	1.33	55	1.81	66	4.25	116	2.76	71	0.67	48	3.46	222	3.10	161
Year-to-Date Precip and % of Average	1.42	58	3.22	63	3.88	50	5.65	55	9.03	72	10.37	69	12.18	69	16.42	77	19.18	76	19.85	75	23.31	83	26.41	88
Lake Elwell Reservoir																								
Monthly Average Precip	3.22		4.04		4.20		4.00		3.58		3.70		3.62		4.14		4.30		1.60		1.66		2.38	
Monthly Precip and % of Average	1.72	53	3.30	82	1.54	37	2.76	69	4.36	122	2.14	58	2.10	58	5.16	125	2.98	69	0.78	49	3.90	235	3.52	148
Year-to-Date Precip and % of Average	1.72	53	5.02	69	6.56	57	9.32	60	13.68	72	15.82	70	17.92	68	23.08	76	26.06	75	26.84	74	30.74	81	34.26	85
Sherburne Reservoir																								
Monthly Average Precip	5.50		7.65		7.15		7.30		5.50		6.30		4.50		4.05		5.30		1.90		1.85		3.15	
Monthly Precip and % of Average	2.65	48	6.35	83	5.90	83	6.30	86	6.60	120	5.70	90	2.80	62	5.60	138	4.65	88	0.85	45	4.05	219	1.90	60
Year-to-Date Precip and % of Average	2.65	48	9.00	68	14.90	73	21.20	77	27.80	84	33.50	85	36.30	83	41.90	87	46.55	87	47.40	86	51.45	90	53.35	89
Bighorn Lake																								
Monthly Average Precip	2.47		2.37		2.35		2.16		2.19		2.63		3.33		3.63		2.52		1.35		1.26		2.01	
Monthly Precip and % of Average	3.83	155	1.65	70	1.41	60	1.30	60	2.78	127	3.35	127	2.77	83	3.78	104	0.80	32	1.09	81	1.22	97	1.65	82
Year-to-Date Precip and % of Average	3.83	155	5.48	113	6.89	96	8.19	88	10.97	95	14.32	101	17.09	98	20.87	99	21.67	92	22.76	91	23.98	91	25.63	91

The following Natural Resources Conservation Service SNOTEL site data was used to compute Table MTT1B:

Lima Reservoir.....Crab Creek, Divide, Island Park, Lakeview Ridge and Tepee Creek

Clark Canyon Reservoir.....Beagle Springs, Bloody Dick, Darkhorse Lake, Divide, Lakeview Ridge, Lemhi Ridge and Tepee Creek

Jefferson Drainage.....Beagle Springs, Bloody Dick, Calvert Creek, Clover Meadow, Darkhorse Lake, Divide, Frohner Meadow, Lakeview Ridge, Lemhi Ridge, Lower Twin, Moose Creek, Mule Creek, Rocker Peak, Saddle Mtn, Short Creek and Tepee Creek

Madison Drainage.....Beaver Creek, Black Bear, Carrot Basin, Clover Meadow, Lower Twin, Madison Plateau, Tepee Creek and Whiskey Creek

Gallatin Drainage.....Carrot Basin, Lick Creek and Shower Falls

Canyon Ferry Reservoir.....Beagle Springs, Beaver Creek, Black Bear, Bloody Dick, Calvert Creek, Carrot Basin, Clover Meadow, Darkhorse Lake, Divide, Frohner Meadow, Lakeview Ridge, Lemhi Ridge, Lick Creek, Lower Twin, Madison Plateau, Moose Creek, Mule Creek, Rocker Peak Saddle Mtn, Short Creek, Shower Falls, Tepee Creek and Whiskey Creek

Gibson Reservoir.....Dupuyer Creek, Mount Lockhart, Waldron and Wood Creek, Gibson (NWS/PRISM)

Lake Elwell Reservoir.....Badger Pass, Dupuyer Creek, Mount Lockhart, Pike Creek and Waldron

Sherburne Reservoir.....Flattop Mountain and Many Glacier

Bighorn Lake.....Bald Mountain, Bear Trap Meadow, Blackwater, Bone Springs Div, Cold Springs, Deer Park, Evening Star, Grave Springs, Hobbs Park, Kirwin, Little Warm, Middle Powder, Owl Creek, Powder River Pass, Shell Creek, South Pass, St. Lawrence Alt, Sylvan Lake, Sylvan Road, Timber Creek, Togwotee Pass, Townsend Creek and Younts Peak

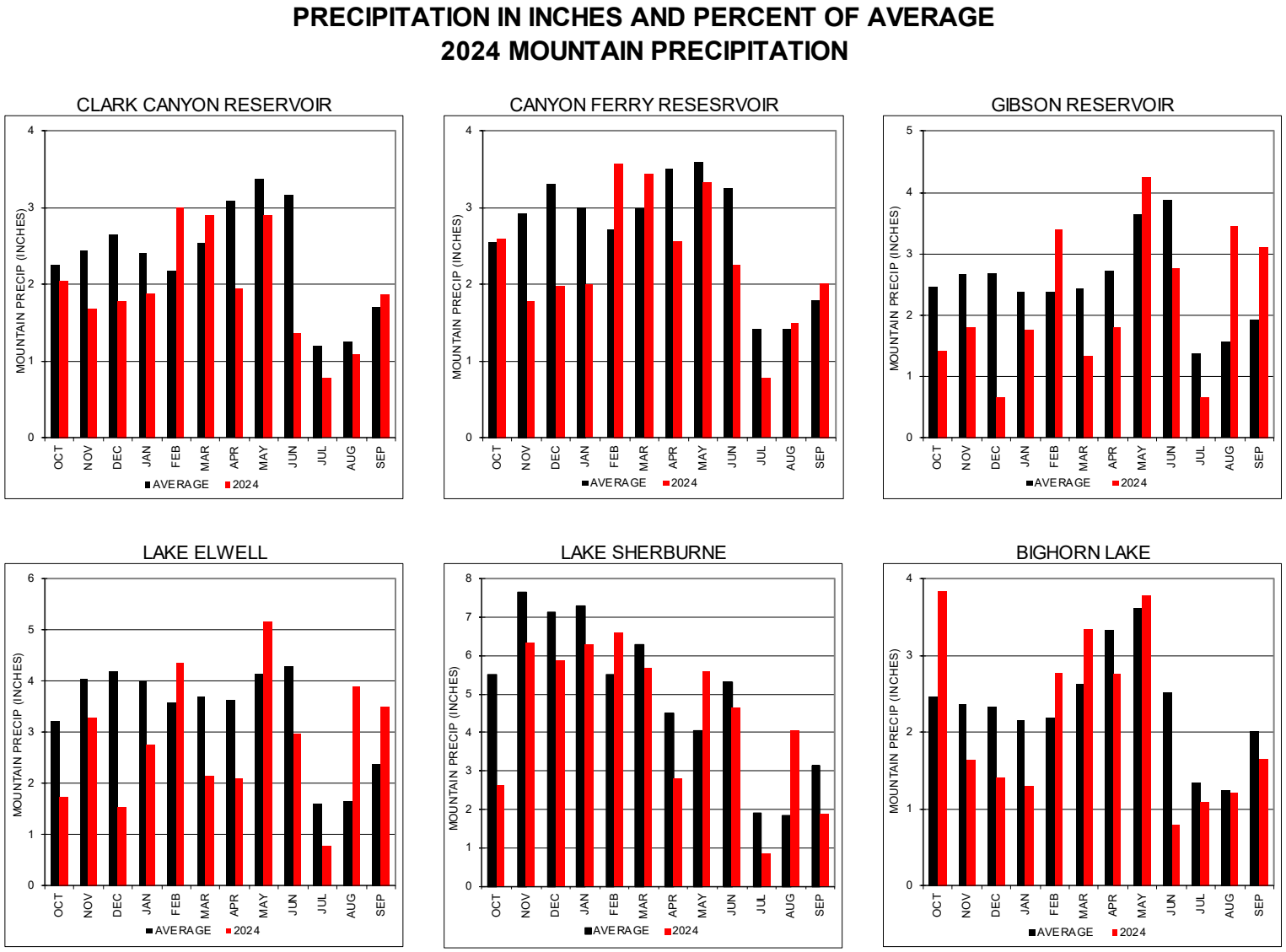


Figure MTG 2.—WY2024 monthly precipitation in mountains above MTAO managed reservoirs in Montana.

Table MTT 3.—2024 NRCS mountain snow water content as a percent of normal (median)

Drainage Basin	Jan. 1	Feb. 1	Mar. 1	Apr. 1	May 1
Missouri headwaters	54	58	76	82	74
Sun	16	33	63	63	47
Marias	35	34	56	58	44
St. Mary	51	55	73	78	81
Milk River	41	47	61	65	
Bighorn Basin	74	73	90	95	88

Table MTT 4.—2024 Reclamation water supply forecasts.

Reservoir	Jan. 1, KAF[1]	Percent of Average	Feb. 1, KAF[1]	Percent of Average	Mar. 1, KAF[1]	Percent of Average	Apr. 1, KAF[2]	Percent of Average	May 1, KAF[3]	Percent of Average	June 1, KAF[4]	Percent of Average	Actual April-July, KAF[5]	Percent of Average	Percent of April Forecast[6]
Clark Canyon	59	74	44	55	60	79	67	88	39	61	31	65	61	76	91
Canyon Ferry	850	47	828	45	993	54	1,290	71	909	60	757	77	1,263	69	98
Gibson	238	58	205	51	254	63	266	66	184	51	111	53	200	49	75
Tiber	219	58	150	40	200	53	226	60	146	46	70	37	189	50	84
Sherburne	85	86	76	77	82	83	87	88	72	81	49	85	83	84	95
Fresno[7]	44	54	39	48	47	58	44	86	28	63	16	65	46	55	98
Yellowtail	1,045	83	762	60	852	67	1,172	93	704	65	455	59	1,135	90	97

[1] Runoff Forecast for April-July; Fresno Reservoir is March through September
[2] Runoff Forecast for April-July; Fresno Reservoir is April through September
[3] Runoff Forecast for May-July; Fresno Reservoir is May through September
[4] Runoff Forecast for June-July; Fresno Reservoir is June through September
[5] Fresno Reservoir is actual March through September forecast
[6] Fresno Reservoir is percent of March forecast
[7] Fresno Reservoir Forecast is natural flow of Milk River at Eastern Crossing for March through September and percents are based on median values; forecasts provided by Alberta Environment and Protected Areas

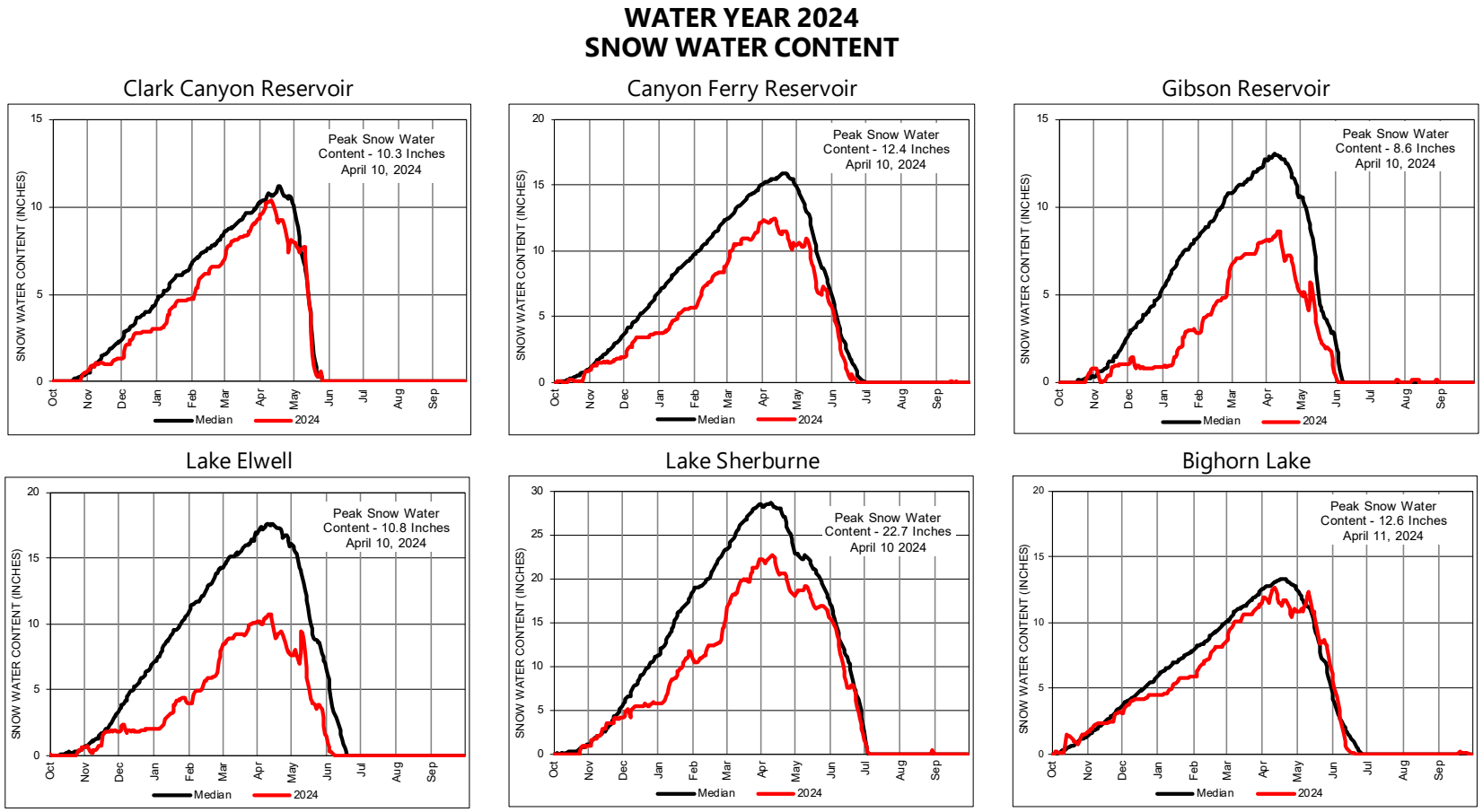


Figure MTG 3.—WY2024 Snow Water Equivalent and average SWE in the mountains above MTAO managed reservoirs in Montana.

Flood Benefits

The USACE evaluated reservoir regulation data and indicated that the following four reservoirs provided flood relief to the Missouri River mainstem during WY2024: Clark Canyon Reservoir on the Beaverhead River, Canyon Ferry Lake on the Missouri River, Lake Elwell on the Marias River and Bighorn Lake on the Bighorn River. Peak inflows regulated by reservoir operations are listed in table MTT 5.

Table MTT 5.—Water Year 2024 peak flows regulated at Reclamation reservoirs

Reservoir	Peak Inflow (ft^3/s)	River Discharge (ft^3/s)	Date
Clark Canyon Reservoir	588	101	11/04/23
Canyon Ferry Lake	12,532	5,734	06/12/24
Lake Elwell	2,368	416	05/19/24
Bighorn Lake	12,607	4,429	06/13/24

The USACE estimated reservoir operations reduced flood damages by $102,198,000 in WY2024. Flood damages are prevented by storing water which would have contributed to flooding and are categorized as local or Missouri River mainstem (downstream from Fort Peck Reservoir). Flood damages prevented are listed in table MTT 6. Figure MTG 4 shows annual flood damages prevented since 1950.

Table MTT 6.—Water Year 2024 flood damages prevented (thousands of dollars)

Reservoir	Local	Mainstem	WY2024 Total	Total Since 1950[3]
Clark Canyon Reservoir	0	14	14	67,185
Canyon Ferry Lake	0	25,154	25,154	962,140
Lake Elwell	0	11,141	11,141	421,848
Fresno Reservoir	188	0	188	65,481
Gibson Reservoir[1]	0	0	0	17,460
Bighorn Lake	0	65,701	65,701	614,467
Lake Sherburne[2]	0	0	0	33,145
Total	**188**	**102,010**	**102,198**	**2,181,726**

[1] No space allocated for flood control, but some flood protection provided through other purposes.
[2] Includes USACE estimated flood damages.
[3] Indexed to present value

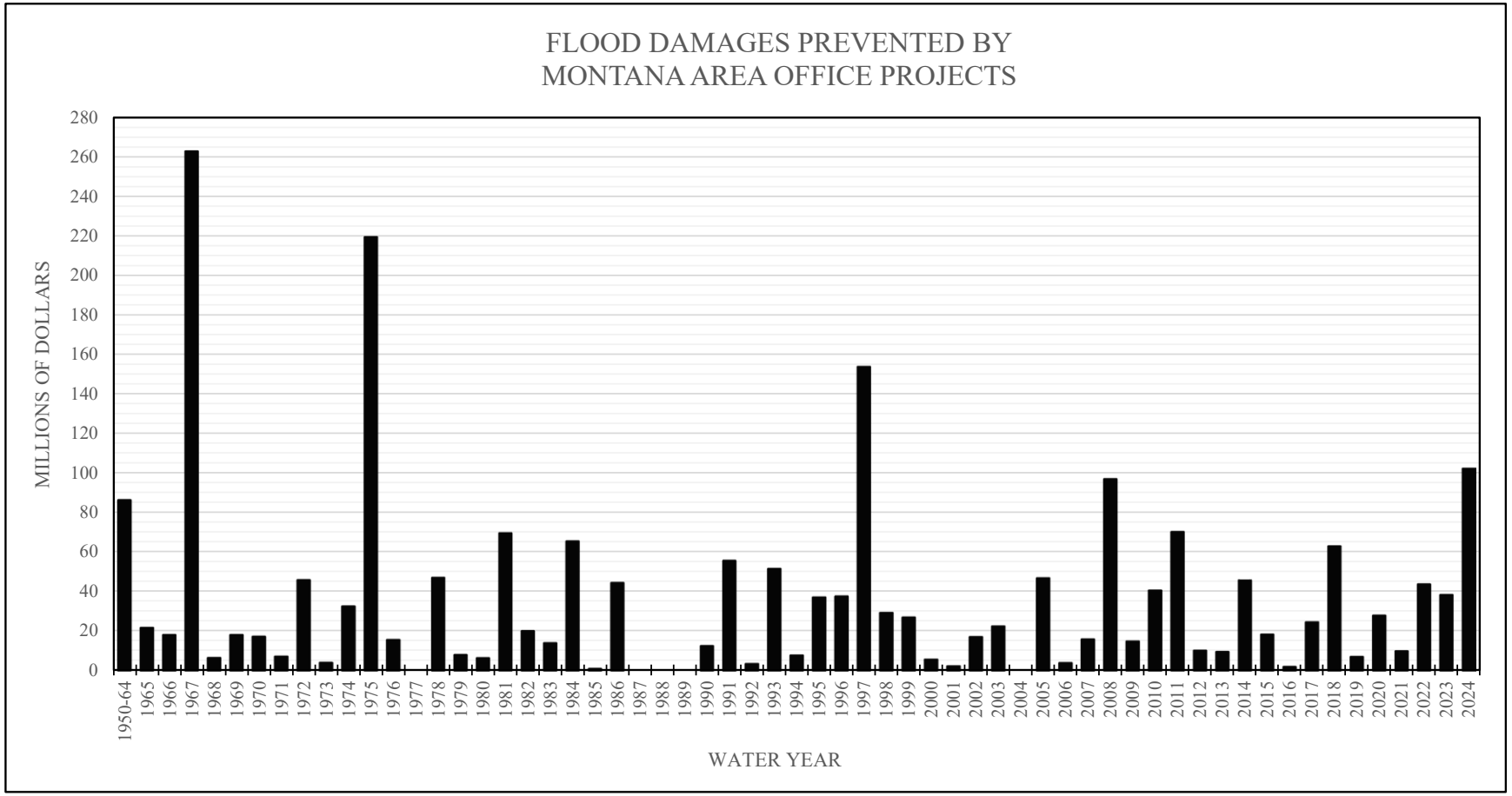


Figure MTG 4.—Flood damages prevented by Montana Area Office dams, indexed to current value.

Unit Operational Summaries for Water Year 2024

Clark Canyon Reservoir

Clark Canyon Reservoir is located on the Beaverhead River approximately 20 miles upstream of Dillon, MT. The reservoir is the storage facility for the East Bench Irrigation Unit. Flood control, recreation, and fish and wildlife are among the other functions served by the reservoir.

Figure MTG 5.—Aerial view of Clark Canyon Reservoir.

Summary of Water Year 2024 Operations

Late summer and fall precipitation in WY2023 led to above average carryover storage and winter inflows in Clark Canyon Reservoir. The high initial storage and ample runoff prior to the irrigation season resulted in Clark Canyon Reservoir filling for the first time since 2018. Drier conditions during WY2024 caused reservoir drawdown but storage remained above average throughout the year.

October through December

WY2024 started with a winter release rate of 100 ft^3/s, set by the East Bench Unit Joint Board (Joint Board) with concurrence by Reclamation. The Joint Board consists of three representatives from the East Bench Irrigation District (EBID) and three representatives from Clark Canyon Water Supply Company (CCWSC). Drought conditions did not exist in the Red Rock or the Beaverhead basins at the start of WY2024. Storage carryover in October was high, nearly 145 percent of average or 35,000 AF. Inflows averaged 370 ft^3/s during October through

December further increasing the storage in Clark Canyon Reservoir. Contrary to the above average inflows, precipitation was below average during October through December. See tables MTT 8 through 10 for specific data related to Clark Canyon Reservoir inflows, releases, and storage content. High winter inflows required releases from Clark Canyon to be increased to 150 ft^3/s in November and increased to 200 ft^3/s in December to meet the end of February flood control elevation/storage target of 5,542.1 ft, 154,195 AF. This target is set by the USACE water control manual for Clark Canyon Dam and Reservoir.

January through March

In January, Reclamation begins to forecast the April through July runoff volume evaluating snowpack measurements and other basin parameters. The January 1 forecasted runoff was 74 percent of average, see table MTT 4 for monthly forecasted runoff volumes. January exhibited below normal temperature and precipitation patterns throughout the Beaverhead and Red Rock basins. Releases were decreased in January to 125 ft^3/s when seasonal low temperatures caused severe ice-jam flooding on the Beaverhead River near Dillon. There was a lot of coordination between EBID, Reclamation, Montana Fish, Wildlife and Parks (MTFWP), and Montana Disaster and Emergency Services (DES), and the USACE during the flood event.

Conditions were drier than average through January and wetter than average in February and March. Drought conditions in the Beaverhead and Red Rock basins developed during the winter. Drought conditions were abnormally dry to moderate by the end of March according to the Montana drought monitor map (figure MTG 6).

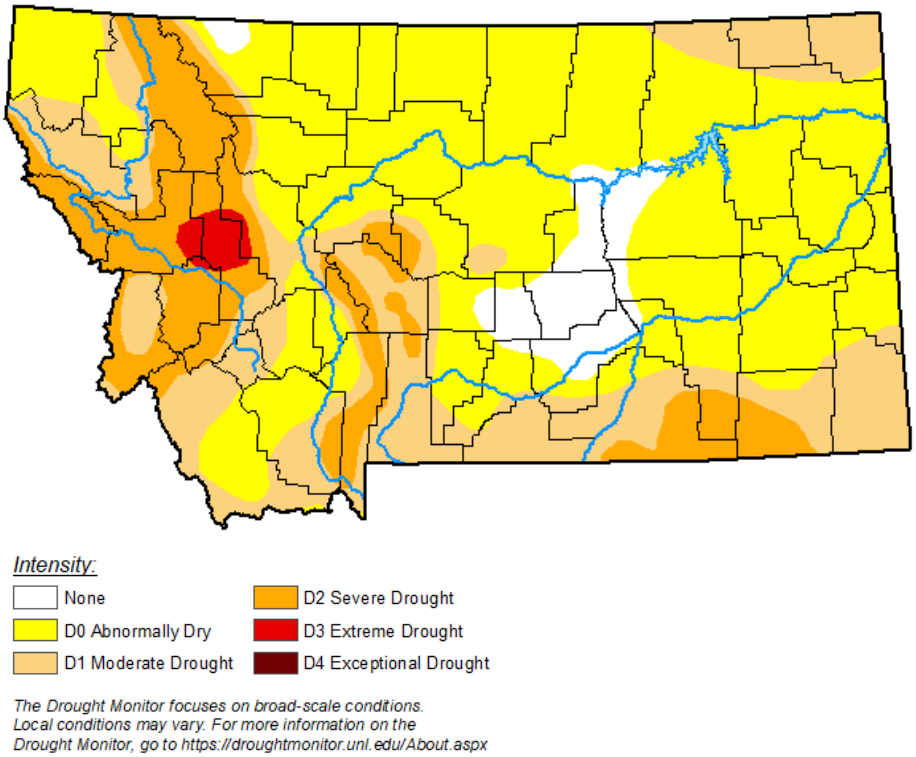


Figure MTG 6.—Montana Drought Monitor Map March 26, 2024

The Joint Board met in early March 2024 to discuss the water supply outlook for the 2024 irrigation season. The projected storage content prepared and presented by Reclamation showed resulting storage contents with full allotments. The Joint Board reviewed and discussed the forecasts and operational plans, setting the irrigation water supply at full allotments.

April through July

On April 1, the Red Rock and Beaverhead basin SWE was near 78 and 73 percent of median, respectively. The April 1 forecasted runoff volume into Clark Canyon increased to 67,000 AF, 88 percent average. Releases to the Beaverhead River were maintained near 125 ft^3/s going into April to fill the reservoir. On April 7, Clark Canyon Reservoir filled and entered the exclusive flood control pool. Releases were increased to 700 ft^3/s on April 13 to evacuate water from the exclusive flood control pool at the direction of the USACE.

On May 1, Reclamation's May through July forecasted inflow volume decreased to 61 percent of average. May and June are historically the highest months in the year to receive rainfall and augment the snowmelt runoff volume. Precipitation was low in May and June and by the end of June, the drought status designation worsened to moderate drought for most of the basin,

although the reservoir remained full into early May. Release changes from Clark Canyon Dam during May and June were required to meet irrigation demands. The actual April through July runoff volume into Clark Canyon was 60,592 AF, 76 percent of average.

The drainage area above Lima Reservoir accounts for about 25 percent of the total drainage area above Clark Canyon Reservoir. Lima Reservoir is a private irrigation facility located upstream of Clark Canyon Reservoir on the Red Rock River. Lima Reservoir filled in early May and spilled the additional runoff into June which was captured in Clark Canyon Reservoir.

August through September

Releases for irrigation were continued during August and early September. Inflows were approximately 230 ft^3/s and 180 ft^3/s during the two months. Since releases exceeded inflows during this period, storage decreased. The Joint Board met in early September to discuss winter release rates and end of season shut down schedules. Releases from Clark Canyon were stepped down from 300 ft^3/s on September 18 to a winter release rate of 50 ft^3/s by September 30.

During WY2024, most of the water released from Clark Canyon Reservoir from May through September was to meet downstream irrigation demands. Storage in Clark Canyon Reservoir ended the year at 93,855 AF, 122 percent of average.

Important Events – Water Year 2024

January 14–23: Severe ice-jam flooding occurred along the Beaverhead River near Dillon, Montana in connection with extreme cold temperatures.

March 7, 2024: East Bench Joint Board set full irrigation allotments.

April 7, 2024: Clark Canyon Reservoir filled and entered the exclusive flood control pool.

May 6, 2024: Releases from Clark Canyon Reservoir were increased to meet irrigation demands for the first time in 2024.

September 30, 2024: Releases for irrigation ended for the season and the winter release rate was set at 50 ft^3/s.

Table MTT 7.—Reservoir allocations for Clark Canyon Reservoir*

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	5,470.60	1,115	1,115
Top of active conservation	5,535.70	125,016	123,901
Top of joint use	5,546.10	174,300	49,284
Top of exclusive flood control	5,560.40	251,436	77,136

* 2016 reservoir survey and revised area-capacity table was implemented on October 1, 2019.

Table MTT 8.—Storage and elevation data for Clark Canyon Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	5,532.58	112,269	10/1/2023
End of year	5,527.96	93,855	9/30/2024
Annual low	5,527.78	93,191	9/25/2024
Annual high	5,546.33	175,483	4/10/2024
Historic high	5,564.70	283,073	6/25/1984

Table MTT 9.—Inflow and discharge data for Clark Canyon Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	195,535	10/1/2023-9/30/2024	213,622	10/1/2023–9/30/2024
Daily peak (ft^3/s)	588	11/4/2023	889	7/21/2024
Daily minimum (ft^3/s)	81	9/8/2024	83	9/29/2024
Peak spill (ft^3/s)			0	N/A
Total spill (AF)			0	N/A

Table MTT 10.—Water Year 2024 monthly inflow, outflow, and storage data for Clark Canyon Reservoir

Month	Inflow KAF	Percent of 30-yr Avg	Outflow KAF	Percent of 30-yr Avg	Content KAF	Percent of 30-yr Avg
October	24.9	142	8.5	99	128.3	147
November	24.5	142	7.6	98	145.1	149
December	18.1	123	10.6	138	152.6	144
January	13.9	106	9.6	145	156.8	139
February	13.9	117	7.2	122	163.5	137
March	16.0	109	7.8	114	171.8	135
April	19.4	128	17.2	207	174.0	130
May	15.6	94	22.9	103	166.8	130
June	11.2	42	39.0	122	138.9	116
July	14.4	69	45.0	103	108.3	115
August	11.3	75	22.1	70	97.5	126
September	12.4	83	16.0	94	93.9	122
Annual	195.5	98	213.6	108		
April–July	60.6	76				

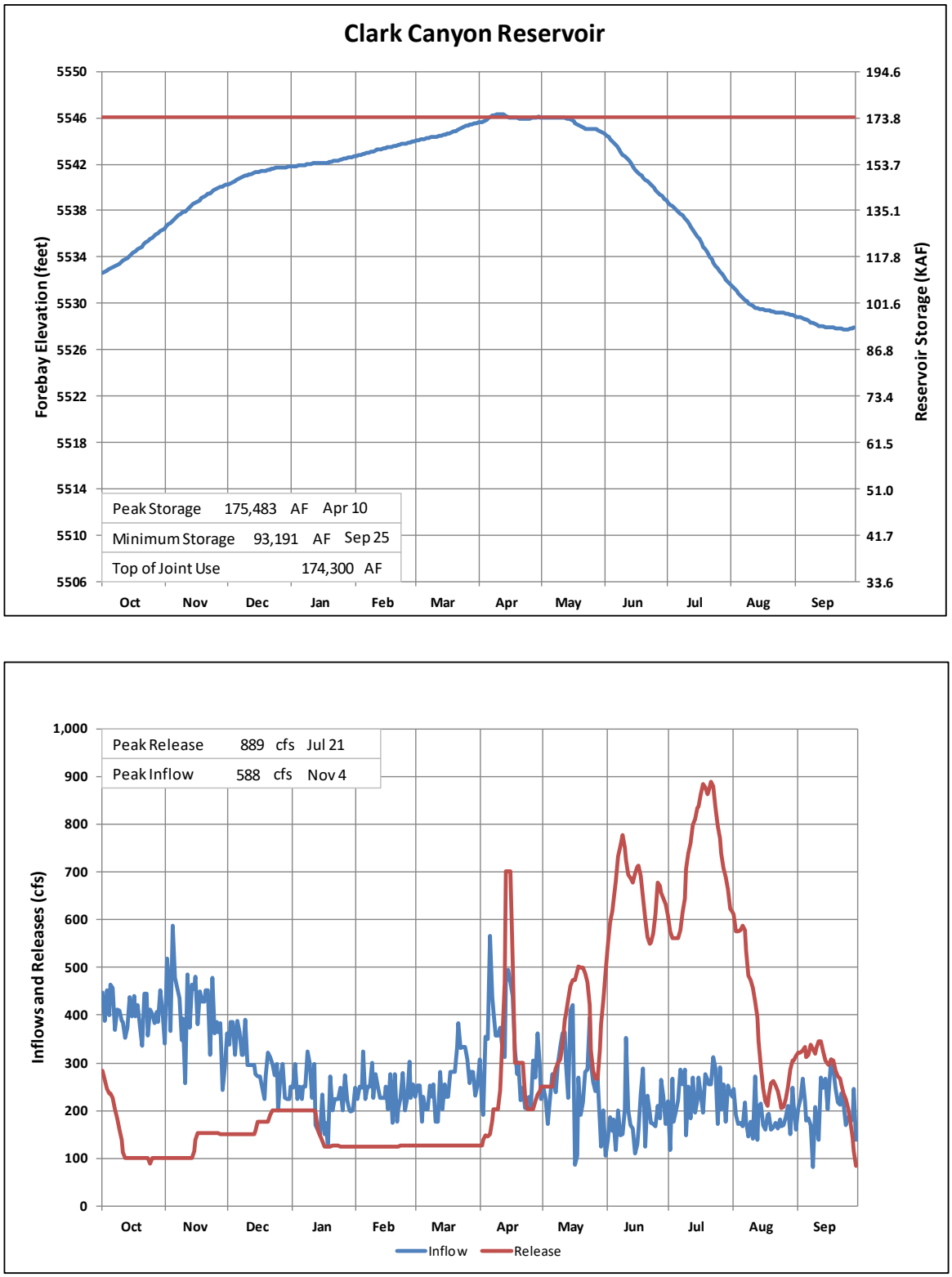


Figure MTG 7.—Water Year 2024 hydrologic data for Clark Canyon Reservoir.

Canyon Ferry Lake and Powerplant

Canyon Ferry Lake, formed by Canyon Ferry Dam, is located on the Missouri River near Helena, MT. Canyon Ferry storage is operated primarily for power generation and irrigation; however, flood control, recreation, and fish and wildlife are among the other purposes served by the reservoir. The main irrigation projects include the Crow Creek Unit, the Helena Valley Unit, and replacement storage for the East Bench Unit. A small amount of municipal water is also furnished to the city of Helena, Montana, through facilities for the Helena Valley Unit.

Figure MTG 8.—Canyon Ferry Dam and Powerplant.

Summary of Water Year 2024 Operations

Canyon Ferry Reservoir began WY2024 with above average storage. Dry conditions during runoff led to inflows decreasing sooner than forecasted limiting Canyon Ferry Reservoir filling to just below full pool. Storage in Canyon Ferry Reservoir ended the year below average due to the dry conditions experienced during WY2024.

October through December

The beginning of WY2024 featured very warm temperatures and below normal precipitation; climate conditions that continued through November and into December, resulting in record low snowpack in the Missouri headwaters basin. However, because of the relatively wet precedent conditions from WY2023, inflows were forecasted near 115 percent of average, and storage content was above average in Canyon Ferry Reservoir. Releases below Holter Dam were held at 4,200 ft^3/s and storage in Canyon Ferry slowly declined through the end of December. At the end of December, releases were increased by 400 ft^3/s as requested by Northwestern Energy in

accordance with the operational agreement. Northwestern Energy can supplement river flows and use up to 47,500 AF of water in Canyon Ferry Reservoir during December through February. The reservoir continued to draft as releases were greater than inflows, typical for wintertime operations. By December 31, the U.S. Drought Monitor categorized the drought conditions above Canyon Ferry as abnormally dry to moderate. See tables MTT 11 through 14 for specific data related to Canyon Ferry Reservoir inflows, releases, and storage content.

January through March

In January, Reclamation begins to forecast the April through July runoff volume, by evaluating SWE and other basin parameters. The January 1 forecasted runoff was 47 percent of average; see table MTT 4 for monthly forecasted runoff volumes. The much lower than average forecast followed the near record low snowpack in the basins above Canyon Ferry reservoir, which was 53 percent of median on January 1, 2024. On January 8, releases were increased to 4,800 ft^3/s with Northwestern Energy's call for water. The February 1 forecasted runoff decreased to 45 percent of average with the lack of snow in January. Releases were maintained at 4,800 ft^3/s below Holter Dam to meet Northwestern's call for water. The flows were decreased to 4,200 ft^3/s at the end of January. Northwestern Energy continued their call for water through February when their storage account ran out and flows were decreased to 3,800 ft^3/s. The March 1 runoff forecast increased slightly to 54 percent of average as snowpack began to accumulate in February. In accordance with the most probable operational plan, releases were maintained at 3,800 ft^3/s for the first part of March and later decreased to 3,400 ft^3/s near the end of March.

April through July

On April 1, the drought monitor map showed progressive severity in the drought indices in the watershed above Canyon Ferry. However, the April through July forecasted inflow volume increased to 71 percent of average with improvement to the snowpack (82 percent of median on April 1). Although the snowpack improved, many of the SNOTEL sites in the Missouri Headwaters continued to be near record lows. The operational plan was to fill Canyon Ferry Reservoir though April by maintaining releases as inflows increased. Diversions for Helena Valley Irrigation District (HVID) to the Helena Valley Reservoir began the third week of April. Peak snowpack for the year (figure MTG 3) was measured on April 10, 2024, at approximately 12.4 inches of SWE. The snowpack started melting in April and runoff increased into Canyon Ferry. Overall, the inflows for the month averaged 5,050 ft^3/s. Releases were maintained at a monthly average of 3,500 ft^3/s resulting in a water surface elevation of 3,789.7 ft at the end of April.

On May 1, Reclamation's May through July forecasted inflow volume was 60 percent of average. May and June are historically the most productive months of the year for rainfall to augment the snowmelt runoff, but rainfall was below average for both months. The weather was warm causing the snowpack to melt and inflows slowly increased from 5,000 ft^3/s to 8,000 ft^3/s during the month of May. The increased inflows required gradual increases in releases from 3,400 ft^3/s to 5,500 ft^3/s over the course of the month. The end of the month elevation was near 3,792.7 ft. Inflows during May were 68 percent of average.

The peak inflow into Canyon Ferry occurred on June 12 near 12,530 ft^3/s and releases were increased to 6,500 ft^3/s to control the remaining available space in the reservoir. By June 17 the snowpack in the Upper Missouri basin had completely melted (figure MTG 8) at the SNOTEL sites. By mid-June inflows matched releases with the reservoir near full pool. As inflows declined during the second half of the month, releases were also decreased to 4,100 ft^3/s below Holter Dam. The reservoir was short of full pool by half a foot by the end of the month. Full pool is elevation 3,797.0 ft.

Inflows declined to near 1,700 ft^3/s by the middle of the month. Releases from Canyon Ferry were maintained at 4,100 ft^3/s for recreation and fishery on the Missouri River downstream from Holter Dam. Precipitation was below normal, and temperatures were above normal for the month of July. The April through July runoff into Canyon Ferry during WY2024 was 69 percent of average, totaling 1,262,700 AF.

August through September

Releases from Canyon Ferry were managed to maintain flows below Holter Dam near 4,100 ft^3/s. Storage in Canyon Ferry continued to decline, as normal, throughout August. Releases from Canyon Ferry were decreased during September to 3,500 ft^3/s. The HVID diversions continued to be adjusted to meet irrigation demands. Temperatures were above normal during August and September, while precipitation was much below average. Canyon Ferry reservoir ended the water year at elevation 3,784.7 ft, 95 percent of average.

Important Events -Water Year 2024

December 2023 through February 2024: In coordination with Northwestern Energy, base flow releases were increased when the weather was colder. The volume delivered was in accordance with the operation agreement which is 47,500 AF of water.

April 17, 2024: Helena Valley Irrigation District started pumping water to the Helena Valley Reservoir. Diversions from Canyon Ferry Reservoir were adjusted throughout the season to meet irrigation demands from the Helena Valley Reservoir.

October 1, 2024: HVID discontinued diversions to Helena Valley Reservoir.

Table MTT 11.—Reservoir allocations for Canyon Ferry Reservoir*

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	3,728.00	388,641	388,641
Top of active conservation	3,770.00	1,087,216	698,575
Top of joint use	3,797.00	1,886,950	799,734
Top of exclusive flood control	3,800.00	1,993,036	106,086

*2016 reservoir survey and revised area-capacity table was implemented on October 1, 2020.

Table MTT 12.—Storage and elevation data for Canyon Ferry Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	3,790.11	1,655,320	10/1/2023
End of year	3,784.67	1,485,222	9/30/2024
Annual low	3,784.80	1,485,222	9/30/2024
Annual high	3,796.39	1,865,607	6/22/2024
Historic high	3,800.00	2,050,900	6/23/1964

Table MTT 13.—Inflow and discharge data for Canyon Ferry Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	2,893,169	10/1/2023–9/30/2024	3,063,588	10/1/2023–9/30/2024
Daily peak (ft^3/s)	12,532	6/12/2024	6,850	6/17/2024
Daily minimum (ft^3/s)	726	1/13/2024	3,272	10/17/2023
Peak spill (ft^3/s)			4,555	6/17/2024
Total spill (AF)			723,843	10/1/2023–9/30/2024

Table MTT 14.—Water Year 2024 monthly inflow, outflow, and storage data for Canyon Ferry Reservoir

Month	Inflow, KAF	Percent of 30-yr Avg	Outflow Pumped to HVID, KAF	Percent of 30-yr Avg	Outflow to river, KAF	Percent of 30-yr Avg	Content, KAF	Percent of 30-yr Avg
October	251.3	111	0.3	105	230.4	100	1,675.9	107
November	252.5	105	0.0		251.5	110	1,676.8	107
December	218.0	104	0.0		266.3	105	1,628.9	106
January	176.1	82	0.0		278.5	107	1,526.5	103
February	238.0	117	0.0		235.8	96	1,528.7	106
March	252.8	99	0.0		227.3	82	1,554.1	109
April	301.5	96	4.4	59	207.7	70	1,643.5	115
May	364.5	68	12.5	75	256.5	72	1,739.0	109
June	454.0	64	21.7	118	312.4	70	1,859.0	101
July	142.8	52	21.5	104	242.6	73	1,737.7	99
August	112.0	84	20.7	101	242.6	104	1,586.3	97
September	129.8	84	13.5	112	217.4	100	1,485.2	95
Annual	2,893.2	83	94.6	98	2,969.0	88		
April–July	1,262.7	69						

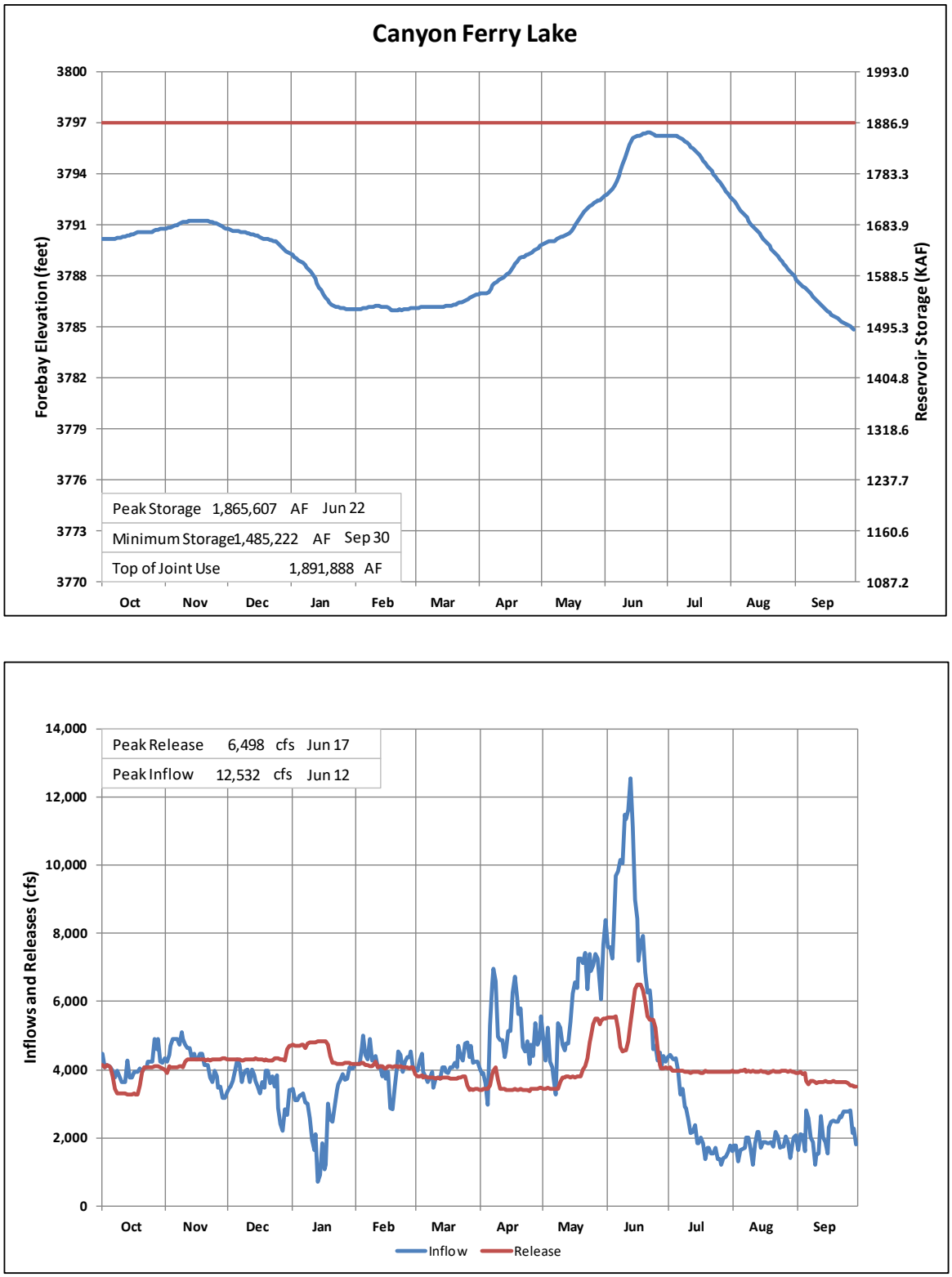


Figure MTG 9.—Water Year 2024 hydrologic data for Canyon Ferry Reservoir.

Helena Valley Reservoir

Helena Valley Reservoir is a regulating off-stream reservoir for Helena Valley Unit, located west of Canyon Ferry Reservoir. It has a total capacity of 10,451 AF, which is used for irrigation and furnishing a supplemental municipal water supply to the city of Helena, MT.
Helena Valley Reservoir receives its entire water supply by pumping from Canyon Ferry Reservoir. Helena Valley Unit can irrigate about 14,100 acres of full-service land and 3,500 acres of supplemental service lands. Presently, HVID services about 13,867 full-service acres, including 5,200 acres previously irrigated by pumping from Helena Valley Reservoir or from other streams.

Figure MTG 10.—View of Helena Valley Reservoir and Dam.

Summary of Water Year 2024 Operations

At the beginning of the water year, storage in Helena Valley Reservoir was approximately 3 ft below full pool. The reservoir slowly declined throughout the winter in response to municipal demands and seepage, drafting another 4 ft by the middle of April. The operating criteria goals are to fill Helena Valley Reservoir by May 1 and maintain it nearly full through June. Diversions to the Helena Valley Unit from Canyon Ferry Reservoir started on April 17. Storage in Helena Valley Reservoir steadily increased with diversions from Canyon Ferry. Diversions were made as needed throughout the year to meet irrigation demands and refill the reservoir. All irrigation deliveries were discontinued for the 2024 season on October 1, 2024. The reservoir provided an adequate water supply to satisfy all irrigation requirements for the Helena Valley Unit and supplement the city of Helena's municipal water supply.

Statistical information pertaining to Helena Valley Reservoir is shown in tables MTT 15 through 18.

Table MTT 15.—Reservoir allocations for Helena Valley Reservoir*

Reservoir Allocations	Elevation (feet)	Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive storage	3,805.00	4,554	4,554
Top of active conservation storage	3,820.07	10,451	5,897

* Based on original area-capacity table

Table MTT 16.—Storage and elevation data for Helena Valley Reservoir

Storage Elevation Data	Elevation (feet)	Storage (AF)	Date
Beginning of Year	3,817.64	9,241	10/01/2023
End of Year	3,818.40	9,608	9/30/2024
Annual low	3,813.80	7,541	4/16/2024
Annual high	3,819.92	10,373	7/7/2024
Historic high	3,820.60	10,738	6/2/1975

Table MTT 17.—Inflow and discharge data for Helena Valley Reservoir.

Inflow-Outflow Data	Annual (AF)
Pumped from Canyon Ferry to Helena Valley Unit	94,621
Released from reservoir for irrigation	68,908
Delivered to the City of Helena for municipal use	1,732

Table MTT 18.—Water Year 2024 monthly elevation and storage data for Helena Valley Reservoir

Month	Forebay Elevation (Feet)	Storage Content (KAF)	Pumped to Helena Valley (KAF)
October	3,816.95	8.9	0.3
November	3,816.23	8.6	0.0
December	3,815.53	8.3	0.0
January	3,814.83	8.0	0.0
February	3,814.57	7.9	0.0
March	3,814.13	7.7	0.0
April	3,819.18	10.0	4.4
May	3,817.15	9.0	12.5
June	3,816.36	8.6	21.7
July	3,814.90	8.0	21.5
August	3,818.58	9.7	20.7
September	3,818.40	9.6	13.5
Annual			94.6

Sun River Project

Storage for the Sun River Project is provided by Gibson, Willow Creek, and Pishkun Reservoirs, which are all single purpose irrigation structures. The project serves 95,000 acres on the Greenfields and Fort Shaw Irrigation Districts. A diversion dam is located on the Sun River about 3 miles below Gibson Reservoir to divert flows down the Pishkun Supply Canal to Pishkun Reservoir, or down the Willow Creek Feeder Canal to Willow Creek Reservoir. Releases are made from Pishkun Reservoir to supply Greenfields Irrigation District (GID). Releases from Willow Creek Reservoir reenter the Sun River where they can be diverted at the Fort Shaw Diversion Dam to supply Fort Shaw Irrigation District (FID).

Figure MTG 11.—Gibson Reservoir and Dam.

Gibson Reservoir

Summary of 2024 Operations

Gibson Reservoir is located on the Sun River west of Augusta, Montana. Gibson Reservoir typically enjoys adequate inflows to fill each year. However, given the low snowpack, Gibson Reservoir did not fill during WY2024 and the water supply for irrigation was about half of normal.

October through December

Gibson Reservoir typically begins a new water year nearly empty as irrigation demands require all available storage. Releases from Gibson during October normally mimic inflows and are passed through the reservoir to either the river or through canals to assist in refilling Willow Creek Reservoir. Gibson storage levels slightly increased for part of the period but by the end of December, storage was near where it was at the start of October. Approximately 55 ft^3/s of the 160 ft^3/s released from Gibson was diverted to the Willow Creek feeder canal until about mid-October. Diversions to Willow Creek Reservoir were shutoff for a period for repairs and were restarted about mid-November and continued until mid-December.

In addition to moving water to Willow Creek Reservoir, river releases below Sun River Diversion Dam help meet remaining downstream irrigation demands while also providing beneficial flows for the fall brown trout spawn. See tables MTT 19 through 22 for specific data related to Gibson Reservoir inflows, releases, and storage content.

Releases were higher when water was being moved to Willow Creek Reservoir and were lower during the pause for repairs. Releases from Gibson were decreased from 170 ft^3/s to 115 ft^3/s on December 18 as diversions to the canal ceased. October through December precipitation was below average, and temperatures were above average in the Sun River basin.

January through March

In January, Reclamation begins to forecast the April through July runoff volume by evaluating snowpack measurements and other basin parameters. The January 1 forecasted runoff was 58 percent of average or 238,000 AF. Snowpack was very low from the start of the year through most of February. There was a long stretch of record low snowpack with a SWE of 16 percent of average at the beginning of January and 33 percent of average by the beginning of February. The February 1 runoff forecast dropped to 51 percent of average. Inflows during February averaged near 130 ft^3/s while releases were maintained near 85 ft^3/s. A snowstorm near the end of the month brought the SWE up to 63 percent of median by March 1. Gibson Reservoir storage slowly filled another 11 ft to elevation 4,631.00 ft, or 14,512 AF by the end of March.

April through June

The April 1, April through July forecast for Gibson Reservoir was 266,000 AF, 66 percent of average. April temperatures were above normal while precipitation was below normal. Snowpack peaked on April 10 at 60 percent of normal. During the spring, water is moved to Willow Creek and Pishkun reservoirs to meet irrigation demands throughout the summer. See the next sections for more information on Willow Creek and Pishkun Reservoirs.

The May through July forecast for Gibson was 184,000 AF, 51 percent of average. Diversions to Pishkun Reservoir via the Pishkun Supply Canal started mid-May. The snow melted rapidly and resulted in a peak inflow of 2,566 ft^3/s on May 17. May runoff filled the reservoir 40 ft to elevation 4,714.87 ft. The snow at the SNOTEL sites upstream of Gibson melted out by June 2. Depending on runoff conditions and reservoir levels, Gibson's spillway gates remain open until inflows and remaining snowpack indicate that the runoff is receding. Once runoff has peaked, the spillway gates are gradually closed to fill the reservoir another 12 ft to the top of the conservation pool at elevation 4,724.0 ft. Since the peak runoff was in early May, the spillway gates were closed on May 20 to allow the reservoir to fill. Releases were set near 1,400 ft^3/s on June 1 to meet irrigation demands.

Gibson Reservoir elevation peaked at 4,717.29 ft on June 12. This is the first time since 2001 Gibson Reservoir did not fill. Releases exceeded inflows for the second part of June since the snow was melted out and there was little to no precipitation. Irrigation operations were in place for all of June with reduced allotments.

July through September

July temperatures were above normal, and little precipitation fell within the Sun River drainage. Irrigation requirements were high, and Gibson Reservoir was drafting quickly. The actual April through July runoff totaled 199,795 AF, 49 percent of average. Releases from Gibson Reservoir continued to be adjusted to meet downstream senior water rights and minimum river flows while also diverting water to Pishkun Reservoir. Diversions to Pishkun were discontinued on August 1 as Gibson Reservoir reached the minimum content at approximately 5,500 AF.

Releases from Gibson during August and September were set to pass all inflows for downstream users. Therefore, Gibson reservoir remained near the minimum content for the rest of the water year. Temperatures in September were above normal, and precipitation remained below normal. By the end of September, the Montana drought monitor designated the Sun River area drought conditions as moderate to severe.

Pishkun Reservoir

Pishkun Reservoir, near Augusta, Montana is an off-stream reservoir supplied by a feeder canal which diverts water from the Sun River below Gibson Reservoir. Releases are made from Pishkun Reservoir to supply GID.

Figure MTG 12.—Aerial view of Pishkun Reservoir.

Summary of Water Year 2024 Operations

The content in Pishkun Reservoir at the beginning of WY2024 was 35,972 AF at elevation 4,362.52 ft. Storage during the fall and winter decreased to 34,643 AF through seepage and evaporation. Diversions from the Sun River started refilling the reservoir on May 21, 2024.

The reservoir reached near the top of active conservation pool at elevation 4,370.0 ft in early June. Irrigation releases from Pishkun Reservoir also began on May 21. Pishkun releases from May through early August were for irrigation demands. Drought conditions in the basin allowed GID to deliver a reduced allotment of 1.0 AF per acre (full allotment is 2.0 AF per acre) to its water users in WY2024. Approximately 169,532 AF of water was released from Pishkun Reservoir from May 21 through August 7 to help meet irrigation demands. All diversions from the Sun River into Pishkun Reservoir were discontinued on August 7.

Additional hydrologic and statistical data pertaining to Pishkun Reservoir can be found in tables MTT 23 through 26.

Willow Creek Reservoir

Willow Creek Reservoir obtains its water supply from Willow Creek and the Sun River via the Willow Creek Feeder Canal. Releases from Willow Creek Reservoir enter the Sun River and can be diverted for irrigation at the Fort Shaw Diversion Dam, the Floweree Canal of the Broken O Ranch, and other downstream senior water users.

Figure MTG 13.—View of Willow Creek Dam and Reservoir.

Summary of Water Year 2024 Operations

Willow Creek Reservoir began to refill during October through the Willow Creek Feeder canal. Diversions were paused for a while during October for repairs. The diversions were discontinued mid-December once the weather was too cool to keep diverting water. Natural inflows into Willow Creek Reservoir also contributes to the overall inflows. Storage increased approximately 9,500 AF or 9 ft of elevation from October through March 31.

From late April through early-June, GID again initiated diversions from the Sun River via the Willow Creek Feeder Canal to continue filling the reservoir another 3.8 ft. Willow Creek reservoir reached elevation 4,138.91 ft (full pool is 4,140.03 ft) on June 4. On June 4, releases from Willow Creek Reservoir began meeting downstream demands. These releases continued to fluctuate throughout the summer until releases ceased on August 2. Willow Creek Feeder Canal diversions began again on September 1 to begin refilling the reservoir in preparation for the following year.

Additional hydrologic and statistical data pertaining to Willow Creek Reservoir can be found in tables MTT 27 through 30.

Important Events – Water Year 2024

April 25, 2024: Began diversion to Willow Creek Feeder Canal.

May 21, 2024: Diversions to the Pishkun Supply Canal were initiated.

June 4, 2024: Releases from Willow Creek Reservoir were initiated to supplement the Sun River.

August 7, 2024: Releases from Pishkun Reservoir for irrigation deliveries were discontinued for the season.

Table MTT 19.—Reservoir allocations for Gibson Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	4,557.50	0	0
Top of active conservation	4,724.00	98,688	98,688

* 2009 reservoir survey and revised area-capacity table was implemented on January 1, 2013.

Table MTT 20.—Storage and elevation data for Gibson Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	4,611.78	6,027	10/1/2023
End of year	4,613.74	6,742	9/30/2024
Annual low	4,610.12	5,478	9/8/2024
Annual high	4,717.29	89,912	6/12/2024
Historic high	4,732.23	116,400	6/8/1964

Table MTT 21.—Inflow and discharge data for Gibson Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	274,444	10/1/2023–9/30/2024	274,275	10/1/2023–9/30/2024
Daily peak (ft^3/s)	2,566	5/17/2024	1,535	6/4/2024
Daily minimum (ft^3/s)	59	1/12/2024	84	2/2/2024

Table MTT 22.—Water Year 2024 monthly inflow, outflow, and storage data for Gibson Reservoir

Month	Inflow, KAF	Percent of 30-yr Avg	Outflow to Canal, KAF	Percent of 30-yr Avg	Outflow to River, KAF	Percent of 30-yr Avg	Content, KAF	Percent of 30-yr Avg
October	10.0	79	1.7	50	9.5	131	7.2	42
November	9.3	68	4.5	127	7.0	90	7.1	35
December	7.9	70	3.7	1,045	7.2	76	5.9	26
January	7.7	78	0.0		8.0	90	7.2	28
February	7.5	82	0.0		7.0	85	9.7	34
March	10.3	73	0.0		7.5	77	14.5	44
April	35.3	82	0.9	11	8.8	48	42.4	82
May	75.3	49	20.0	43	13.1	17	86.8	96
June	65.9	72	78.5	121	8.5	9	69.2	75
July	23.3	45	82.0	100	6.9	41	6.6	15
August	12.5	61	1.1	3	13.3	141	5.6	36
September	9.5	73	4.0	39	7.6	91	6.7	55
Annual	274.4	54	196.3	75	104.4	37		
April–July	199.8	49						

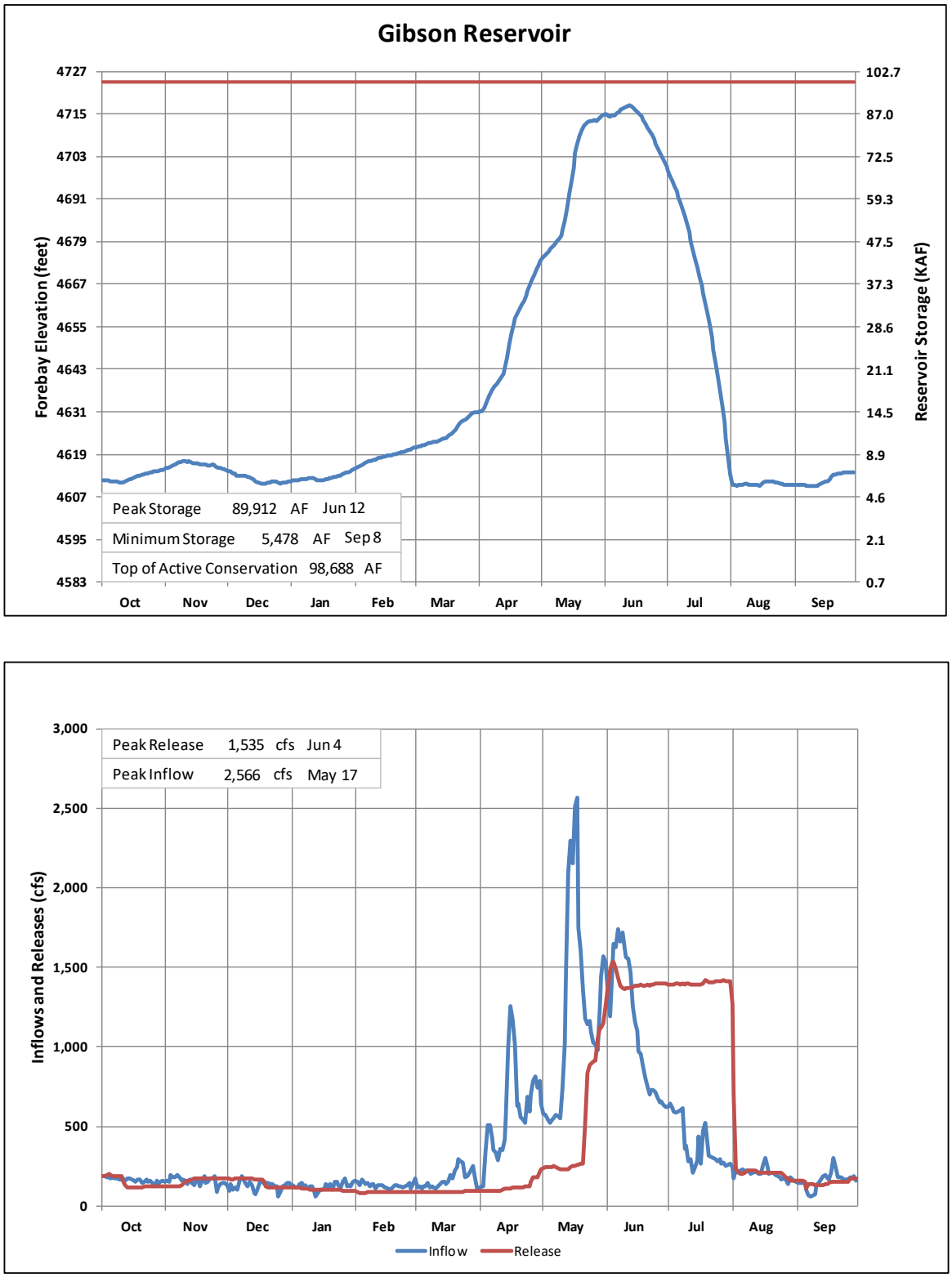


Figure MTG 14.—Water Year 2024 hydrologic data for Gibson Reservoir.

Table MTT 23.—Reservoir allocations for Pishkun Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	4,342.00	16,008	16,008
Top of active conservation	4,370.00	46,694	30,686

* 2002 reservoir survey and revised area-capacity table was implemented on October 1, 2005.

Table MTT 24.—Storage and elevation data for Pishkun Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	4,362.52	35,972	10/1/2023
End of year	4,362.60	36,079	9/30/2024
Annual low	4,361.51	34,643	5/8/2024
Annual high	4,368.65	44,662	7/9/2024
Historic high	4,371.40	48,950	7/4/1953

Table MTT 25.—Inflow and discharge data for Pishkun Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	169,652	10/1/2023–9/30-2024	169,532	10/1/2023–9/30-2024
Daily peak (ft^3/s)	1,358	7/19/2024	1,656	6/12/2024

Table MTT 26.—Water Year 2024 monthly inflow, outflow, and storage data for Pishkun Reservoir

Month	Inflow, KAF	Percent of 30-yr Avg	Outflow, KAF	Percent of 30-yr Avg	Content, KAF	Percent of 30-yr Avg
October	-0.4		0.0		35.6	125
November	-0.3		0.0		35.3	120
December	-0.3		0.0		35.0	119
January	0.0		0.0		35.0	120
February	0.1		0.0		35.1	121
March	-0.2		0.0		34.9	116
April	-0.1		0.0		34.8	96
May	14.3	33	5.8	17	43.2	94
June	75.4	119	76.2	110	42.5	105
July	79.6	101	80.3	98	41.8	113
August	2.1	5	7.2	16	36.7	106
September	-0.6		0.0		36.1	126
Annual	169.7	69	169.5	69		

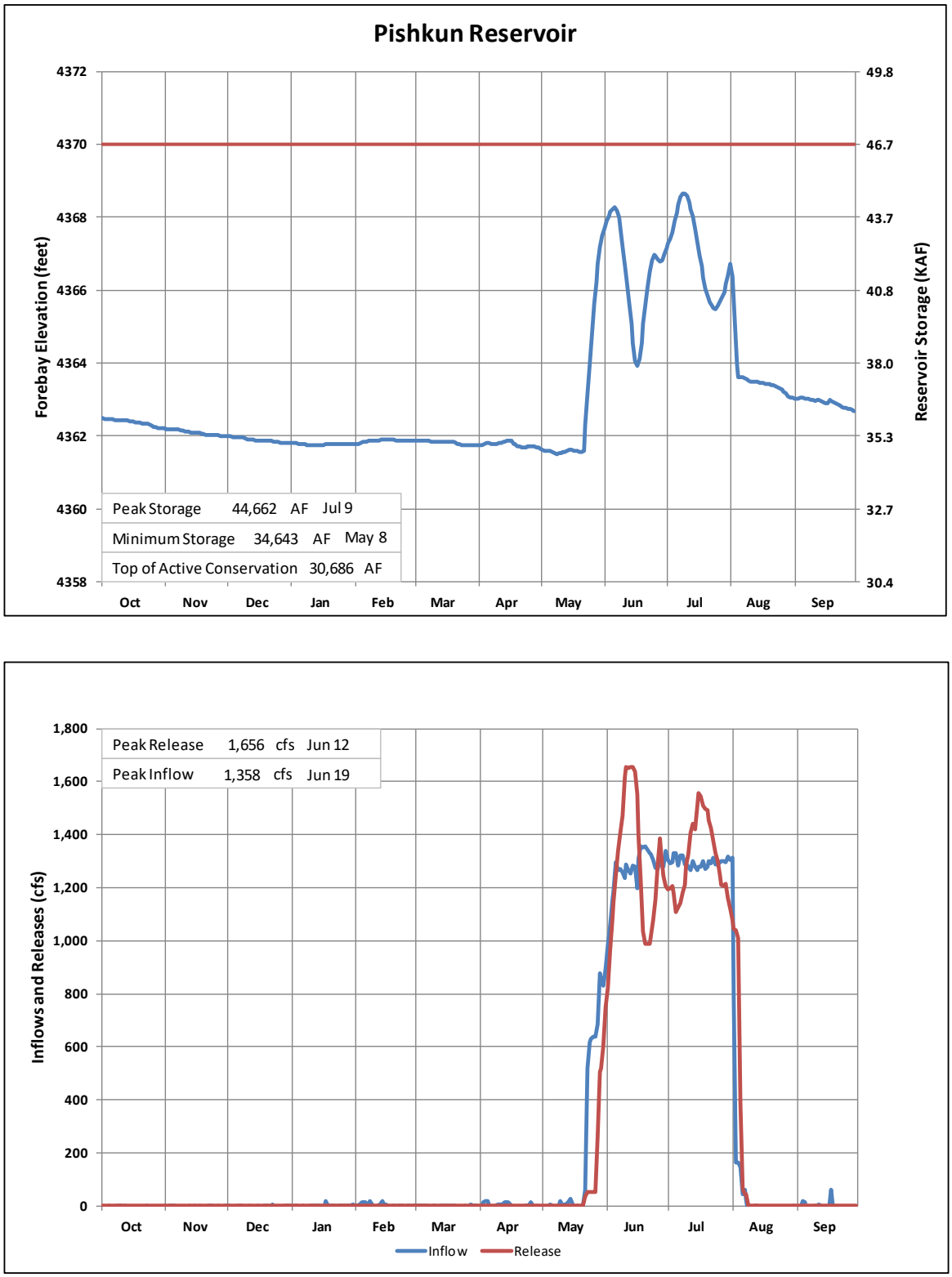


Figure MTG 15.—Water Year 2024 hydrologic data for Pishkun Reservoir.

Table MTT 27.—Reservoir allocations for Willow Creek Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	4,085.28	1	1
Top of active conservation	4,142.00	31,852	31,851

* 2021 reservoir survey and revised area-capacity table was implemented on October 1, 2021.

Table MTT 28.—Storage and elevation data for Willow Creek Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	4,126.18	12,968	10/1/2023
End of year	4,119.45	7,679	9/30/2024
Annual low	4,115.93	5,597	8/31/2024
Annual high	4,138.91	27,516	6/4/2024
Historic high	4,144.80	36,033	6/22/2018

Table MTT 29.—Inflow and discharge data for Willow Creek Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	16,882	10/1/2023–9/30-2024	22,159	10/1/2023–9/30/2024
Daily peak (ft^3/s)	111	12/11/2023	300	6/13/2024

Table MTT 30.—Water Year 2024 monthly inflow, outflow, and storage data for Willow Creek Reservoir

Month	Inflow KAF	Percent of 30-yr Avg	Outflow KAF	Percent of 30-yr Avg	Content KAF	Percent of 30-yr Avg
October	1.4	69	0.0		14.3	72
November	3.5	177	0.0		17.8	82
December	3.5	573	0.0		21.3	95
January	0.3	84	0.0		21.6	95
February	0.6	160	0.0		22.2	96
March	0.3	64	0.0		22.5	95
April	0.4	23	0.0		22.9	90
May	4.1	102	0.0		27.0	95
June	0.9	26	10.3	445	17.6	59
July	0.0	1	11.6	152	6.0	27
August	-0.1		0.3	6	5.6	30
September	2.1	289	0.0		7.7	41
Annual	16.9	101	22.2	131		

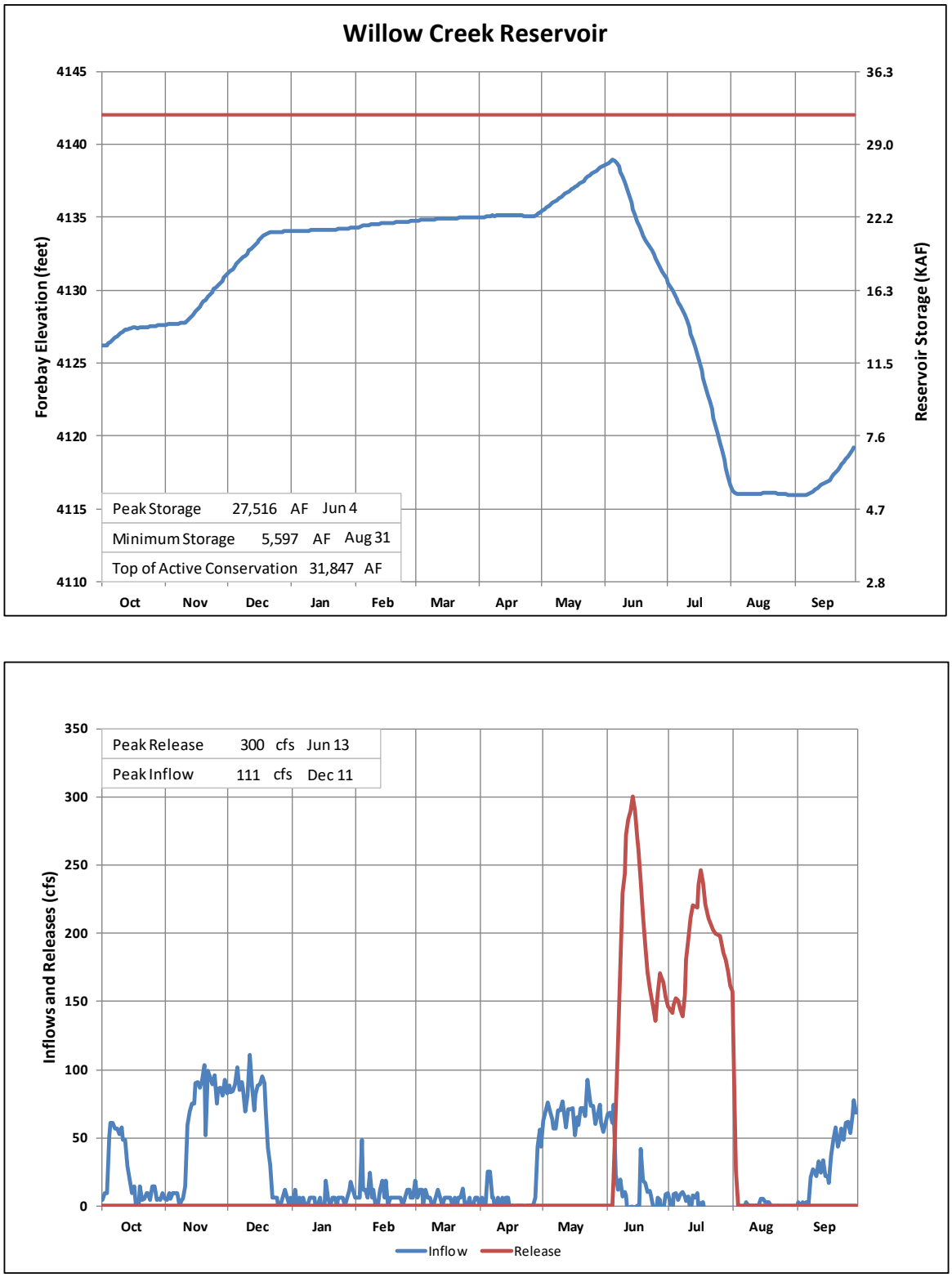


Figure MTG 6.—Water Year 2024 hydrologic data for Willow Creek Reservoir.

Lake Elwell (Tiber Dam)

Tiber Dam P-S MBP is located on the Marias River near Chester, MT. It was built to provide water supply for 127,000 acres in the Lower Marias Unit and for flood control. However, the irrigation distribution works were not constructed. The reservoir is operated for flood control, fishery, and recreation benefits. The reservoir provides irrigation water to municipalities and several individual operators by water service contracts. Reclamation has a storage allocation agreement with the Chippewa Cree Tribe for 10,000 AF of water and Blackfeet Tribe for 45,000 AF.

The river outlet works underwent extensive modification to incorporate the addition of a 7.5-MW powerplant, privately owned by Tiber Montana, LLC. Construction of the powerplant was completed and it was brought on-line in June 2004. The Tiber Montana, LLC powerplant capacity is approximately 700 ft^3/s.

Figure MTG 7.—View of Tiber Dam and Lake Elwell.

Summary of 2024 Operations

The hydrologic conditions in the Marias River basin during WY2024 started dry and warm. WY2024 was a dry year with peak snowpack near record lows during April. Releases were reduced at the beginning of October from 500 ft^3/s to 450 ft^3/s, and then further reduced to 400 ft^3/s in March and held there for the rest of the year. The reservoir drafted to a low point of 2,980.07 ft by the middle of March and peaked 6 ft below full in July. The year ended at 96 percent of average storage. The following is a summary of WY2024 hydrologic conditions in

the Marias River basin and corresponding operations of Lake Elwell and Tiber Dam. See tables MTT 31 through 34 for specific data related to Lake Elwell inflows, releases, and storage content.

October through December

Storage in Lake Elwell started the year near normal at 96 percent of average even through WY2023 was a low water year. Conditions were drier and warmer than average during October through December and inflow totaled 71 percent of average. Releases were decreased from 500 ft^3/s to 450 ft^3/s at the beginning of October. At the end of December 2023, Lake Elwell storage was at 2,981.6 ft or 731,853 AF, 98 percent of average.

January through March

In January, Reclamation begins to forecast the April through July runoff volume by evaluating snowpack measurements and other basin parameters. Snowpack was at a record low at 29 percent of median at the start of January. Runoff was forecasted to be 58 percent of average. Precipitation was below average in January, above average in February, and below average in March. Overall, this period of the year was drier than average. Inflows remained well below average through March.

April through July

April precipitation was below average. Snowpack peaked on April 10 at 61 percent of the median peak snowpack. April through July inflow forecasts remained below average throughout the runoff season. Overall, the runoff period was drier than average producing only 50 percent of average runoff. Lake Elwell storage peaked near elevation 2,987 ft on July 8, 6 ft below normal full pool.

August through September

August and September were drier than average, and inflows remained well below average. Releases were kept at 400 ft^3/s for the rest of the water year to conserve storage

Important Events – Water Year 2024

None

Table MTT 31.—Reservoir allocations for Lake Elwell*

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	2,966.40	543,079	543,079
Top of active conservation	2,976.00	655,956	112,877
Top of joint use	2,993.00	918,394	262,438
Top of exclusive flood control	3,012.50	1,323,068	404,674

* 2021 reservoir survey and revised area-capacity table was implemented on October 1, 2022.

Table MTT 32.—Storage and elevation data for Lake Elwell

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	2,984.49	775,948	10/1/2023
End of year	2,983.82	765,457	9/30/2024
Annual low	2,980.07	710,394	2/22/2024
Annual high	2,987.00	815,993	7/6/2024
Historic high	3,011.42	1,303,858	7/19/2011

Table MTT 33.—Inflow and discharge data for Lake Elwell

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	297,063	10/1/2023–9/30/2024	307,410	10/1/2023–9/30/2024
Daily peak (ft^3/s)	2,368	5/19/2024	512	10/1/2023
Daily minimum (ft^3/s)	-239	7/26/2024	394	3/16/2024
Peak spill (ft^3/s)			0	NA
Total spill (AF)			0	NA

Table MTT 34.—Water Year 2024 monthly inflow, outflow, and storage data for Lake Elwell

Month	Inflow KAF	Percent of 30-yr Avg	Outflow KAF	Percent of 30-yr Avg	Content KAF	Percent of 30-yr Avg
October	8.4	57	27.9	70	756.5	98
November	14.9	74	26.4	80	744.9	98
December	13.8	79	26.8	83	731.9	98
January	7.7	48	26.8	84	712.9	98
February	23.8	119	24.2	82	712.5	99
March	25.6	62	25.2	72	712.9	98
April	44.2	80	24.3	63	732.7	99
May	76.0	57	25.5	47	783.2	95
June	55.0	37	24.4	34	813.7	91
July	14.0	35	25.4	39	802.3	92
August	6.6	63	25.7	51	783.2	94
September	7.0	82	24.7	59	765.5	96
Annual	297.1	57	307.4	59		
April–July	189.1	50				

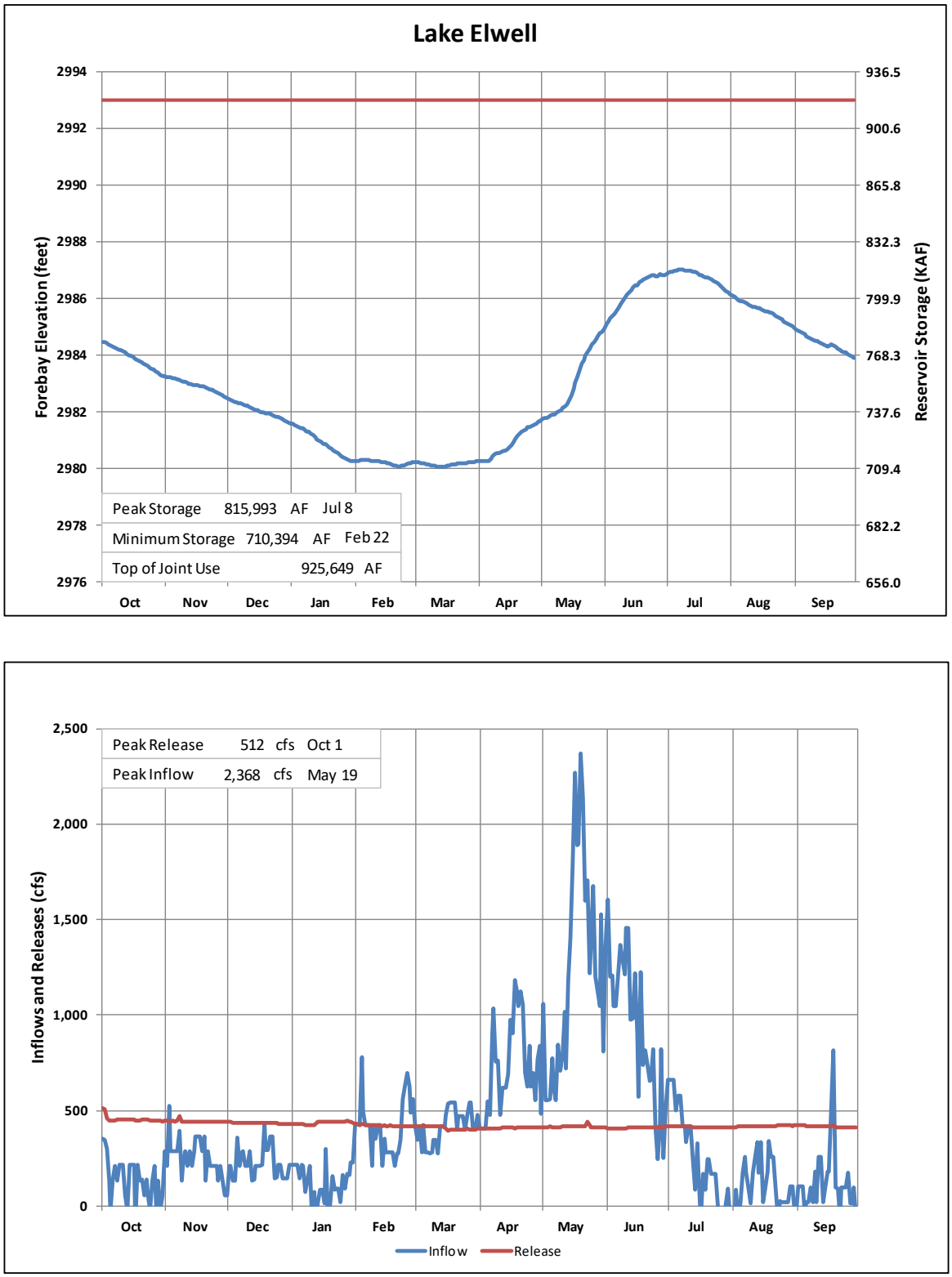


Figure MTG 8.—Water Year 2024 hydrologic data for Lake Elwell.

Milk River Project

The 117,000-acre Milk River Project, in north-central Montana, is served by Sherburne, Fresno, and Nelson Reservoirs. Sherburne and Nelson Reservoirs are single-purpose irrigation structures. Fresno Reservoir has joint-use flood control space, provides a municipal water supply to several municipalities on or near the project, and serves as the primary irrigation storage structure for the project. Approximately 101,500 acres are served by irrigation districts, 9,500 acres are served by private facilities and between 5,000 and 6,000 acres are served supplemental water by the Fort Belknap Indian Irrigation Project.

Lake Sherburne

Lake Sherburne is in Glacier National Park on Swiftcurrent Creek, a tributary of the St. Mary River in the Hudson Bay drainage basin. The use of boundary waters of the St. Mary and Milk Rivers are divided between Canada and the United States by the 1909 Boundary Waters Treaty. The United States utilizes its entitlement to St. Mary River water by regulating flows through storage in Lake Sherburne and diverting St. Mary River flows through the St. Mary Canal to the Milk River basin.

Figure MTG 19.—Lake Sherburne's outlet works.

Summary of Water Year 2024 Operations

WY2024 began with near average storage in Lake Sherburne. Snowpack peaked well below average. Due to the failure of the St. Mary siphons in June 2024, Sherburne storage and operations did not have any impact on the available water supply in the Milk River basin. Storage was drawn down to winter targets during October 2024. See tables MTT 35 through 38 for specific data related to Lake Sherburne inflows, releases, and storage content.

October through December

At the start of WY2024, storage content in Lake Sherburne was near average. Diversions to the canal were turned off on September 1, 2023, in response to lack of storage and natural runoff in the St. Mary River basin. Releases from Lake Sherburne were shut off on October 2, 2023. Releases from Lake Sherburne are required until October 1 in accordance with the biological opinion for bull trout. Temperatures were warmer than average during October through December. Although conditions were dry overall, a rain event during December did increase inflows. Inflows were 110 percent of average from October 1 through December 31. By the end of December, Lake Sherburne storage was 123 percent of average. However, snowpack was near record lows at the end of December.

January through March

In January, Reclamation begins to forecast the April through July runoff volume evaluating snowpack measurements and other basin parameters. On January 1, 2024, the NRCS reported mountain snowpack SWE in the St. Mary basin was 51 percent of median and the runoff forecast was 86 percent of average. Temperatures and precipitation fluctuated through the January through March period. Snowpack improved to 78 percent of median by the end of March.

April through July

Releases from Lake Sherburne started on March 25 to provide water for St. Mary Canal diversions. The day after startup, an area of the St. Mary Canal siphon that was recently repaired started to fail. The canal and Lake Sherburne releases were shutoff for the repair. While the canal was shut down for repairs, a canal drain outlet gate failed. Repairs were made to both areas before restarting the canal.

The St. Mary Canal and releases from Lake Sherburne were restarted on April 10 to begin the transfer of water from the St. Mary River basin to Fresno Reservoir. The St. Mary Canal reached the 600 ft^3/s capacity on April 16.

The U.S. can create a deficit delivery during March, April, and May in the St. Mary River basin. During deficit delivery, Canada receives less natural flow than their entitlement. Accounting and use of St. Mary and Milk River natural flow is tracked in accordance with the International Joint Commission (IJC) Procedures Manual for natural flow calculations of the St. Mary and Milk River basins (Procedures Manual). The specific guidance on deficit deliveries is called the Letter of Intent (LOI). A deficit delivery allows Reclamation to conserve storage in Lake Sherburne or maintain desired flows in the St. Mary Canal when there is insufficient natural flow. A small deficit delivery to Canada in the St. Mary River basin occurred during the first half of April and first half of May.

Snowpack levels peaked on April 10 at 79 percent of median. Precipitation during April was below average, but inflows were slightly above average. Inflows increased in the middle of May and Lake Sherburne began refilling. Diversions to the St. Mary Canal were reduced on May 17

and 18 to 500 ft^3/s in response to heavy runoff in the Milk River basin and Fresno Reservoir filling. The diversion to the canal was increased to 600 ft^3/s on May 29 and 30 as irrigation demands increased in the Milk River basin.

On June 17 at approximately 8:45 a.m., the north St. Mary siphon failed. The siphons have leaked for several years with several fixes made over the years to keep them operational. Additional leakage near the failure was observed shortly before failure. About 30 minutes after failure, the gates on the St. Mary Canal headworks were closed. The failure caused significant flooding and erosion as the canal drained and later that afternoon the south siphon failed. A technical assessment was conducted in the latter part of June and determined there were not any viable short-term fixes and that the canal would not be operable again until late 2025.

Figure MTG 20.—St. Mary siphons failure.

After the failure of the St. Mary siphon, the outlook and operations dramatically changed from normal operations. Storage in Lake Sherburne and natural flow of the St. Mary River were no longer needed for St. Mary Canal diversions.

Lake Sherburne filled to near normal full pool near the end of June and peaked in elevation for the year on July 7 at 4,787.26 ft. Since the storage was not needed for St. Mary Canal diversions, the release was set at 350 ft^3/s and held there until nearly the end of July.

Releases were increased to 600 ft^3/s on July 30 to evacuate storage prior to St. Mary Canal headworks and St. Mary Canal siphon bridge construction.

August through September

Releases from Lake Sherburne were reduced to the minimum amount on August 26 to accommodate construction work at the headworks and siphon bridge. Releases remained at that level until October 16 when releases were ramped up to 500 ft^3/s to evacuate additional water prior to winter. Releases from Lake Sherburne were shut off on November 4. Based on provisional data, diversions from the St. Mary River to the Milk River totaled 73,460 AF in WY2024. This amount is far less than normal because of the failure of the St. Mary siphons.

During WY2024, there were several conference calls with the IJC Field Representatives to give status updates on the St Mary siphon replacement project. Deficit deliveries on St. Mary River were repaid between September 16 and 30.

Fresno Reservoir

Fresno Reservoir is located upstream of all Milk River project lands on the Milk River near Havre, Montana. The top 33,841 AF of storage is used jointly for flood control and conservation and is typically not filled until the start of spring runoff. Fresno Reservoir stores the natural flow of the Milk River along with water diverted into the Milk River from the St. Mary River and Lake Sherburne. Stored water is used principally for irrigation but Havre and Chinook, Montana have a contract for a minimum flow in the river of 25 ft^3/s during the winter to maintain suitable water for municipal use. The city of Harlem and the Hill County Water District also have contracts for municipal water use.

Figure MTG 21.—Aerial view of Fresno Reservoir and Dam.

Summary of Water Year 2024 Operations

Fresno Reservoir storage began the year well below average. Heavy rain in May filled Fresno Reservoir. Nelson Reservoir filled in April from snowmelt runoff. The early water supply outlook before Fresno Reservoir filled set the irrigation allotment at 1.0 AF per acre for the season. Although conditions improved, the season ended early due to the failure of the St. Mary Siphons on June 17. See tables MTT 39 through 42 for specific data related to Fresno Reservoir inflows, releases, and storage content.

October through December

Releases from Fresno Reservoir were 40 ft^3/s at the start of the water year. This is the minimum release from Fresno Reservoir using the minimum gate opening for one gate on the river outlet works. Storage was only 59 percent of average at the start of the water year because of high irrigation demand in WY2023.

Inflows during October through December were only 46 of average. Precipitation in the Milk River basin above Fresno Reservoir was below average during October through December. It was wetter than average downstream from Fresno Reservoir during October and November. Temperatures were above average during November and December. By the end of December, there was almost no snow on the ground and storage in Fresno Reservoir was only 53 percent of average.

January through February

Snowpack in the Bear Paw Mountains was 40 percent of median on January 1. January precipitation and temperatures were below average, but February precipitation and temperatures were above average.

March through June

Spring runoff season generally occurs during March through June. The most reliable water supply runoff forecast for the Milk River basin occurs on March 1. The March 1 forecast for natural runoff above Fresno Reservoir for March through September was only 58 percent of median. The Milk River runoff forecast was provided by Alberta Environment and Protected Areas. The March water supply outlook showed that Fresno and Nelson Reservoirs were not expected to fill, and irrigation allotments would need to be reduced.

March and April precipitation was below average. Inflows were much below average from March 1 through April 30 at 49 percent of average. St. Mary River basin water diverted through the St. Mary Canal started reaching Fresno Reservoir on April 20 increasing inflows. Storage in Fresno Reservoir at the end of April was only 65 percent of average.

The Milk River Joint Board of Control (MRJBC) set the initial irrigation allotment for the 2024 irrigation season at 1.0 AF/acre at their May 1 meeting. That is about half of the normal allotment. Irrigation was to start about mid-May with a reevaluation of the water supply at the end of June or early July.

The May 1 forecast projected that Fresno Reservoir would be short of filling by about 40 kaf with irrigation starting mid-May. Heavy rain just upstream of Fresno Reservoir during May 7–9 dramatically increased Fresno Reservoir inflows. Inflows peaked near 2,300 ft^3/s on May 8. Fresno Reservoir was essentially full by May 17 and releases were being increased to control the rate of fill. Fresno Reservoir storage peaked for the season on May 24 at elevation 2,574.68 ft or 90,106 acre-feet. Fresno Reservoir releases were 500 ft^3/s to control storage levels in Fresno Reservoir. Releases were increased above 500 ft^3/s on June 7 to meet expected irrigation demands.

On June 17, the St. Mary Canal siphons failed and diversions through the St. Mary Canal were done for the year. By the end of June, Fresno Reservoir inflows were entirely dependent on Milk River natural flow.

June precipitation was well below average and Fresno Reservoir inflow was only 42 percent of average. The first irrigation of the season was done by the end of June and the end of June storage was at elevation 2,572.37 ft or 79,035 AF, 108 percent of average.

July through September

Precipitation was below average for July while temperatures were above average. Irrigation releases from Fresno Reservoir started ramping up on July 7 for the second irrigation. Irrigation demands were high and releases for irrigation were made until July 25 when releases starting ramping down for the season. On July 31, releases from Fresno Reservoir were reduced to 100 ft^3/s. The 100 ft^3/s release was for Fort Belknap Indian Irrigation Project and the downstream municipalities. Releases were decreased to the winter release of approximately 40 ft^3/s on

September 18. Without St. Mary Canal, inflows into Fresno Reservoir during July through September were the lowest on record. Storage in Fresno Reservoir reached its minimum for WY2024 on September 30 at 2,551.4 ft or 21,506 AF.

Nelson Reservoir

Nelson Reservoir, located near Malta, MT, is an off-stream reservoir, receiving its water supply from the Milk River by diversion through the Dodson South Canal. Nelson Reservoir is the only source of water supply for the lower portion of the Malta Irrigation District. Nelson Reservoir also serves the Glasgow Irrigation District when water is not available from Fresno Reservoir.

Figure MTG 22.—Aerial view of Nelson Reservoir and Dikes.

Summary of Water Year 2024 Operations

October through March

Storage in Nelson Reservoir at the start of WY2024 was 116 percent of average. Storage slowly decreased through seepage and evaporation until March. Storage in Nelson Reservoir on February 29 was still 115 percent of average.

March inflows were 305 percent of average with Malta Irrigation District moving water to Nelson Reservoir from the Milk River. End of March storage was 129 percent of average.

April through July

Nelson Reservoir nearly filled as storage peaked at 2,221.48 ft, 78,432 AF on May 6. Irrigation releases started on April 30 through Nelson South Canal.

Releases through the Nelson North Canal for Glasgow Irrigation District occurred from July 12 through August 2. Releases to Nelson South Canal stopped on June 24 at the end of the first irrigation. Releases restarted on July 15 through the Nelson South Canal for the second irrigation.

August through September

Irrigation releases were shut off for the season on August 2. Malta Irrigation District continued to operate the Dodson South Canal until August 9 to capture natural runoff and irrigation return flows at Dodson Diversion Dam. Storage in Nelson Reservoir was at 111 percent of average at the end of WY2024.

Additional hydrologic and statistical information pertaining to the operation of Nelson Reservoir during 2024 can be found in tables MTT 43 through 46 and figure MTG 25.

Important Events – Water Year 2024

October 2, 2023: Releases from Lake Sherburne are shut off for the winter season.

March 2, 2024: Runoff and diversions to Dodson South Canal reach Nelson Reservoir.

April 9, 2024: A MRJBC meeting was held. Water supply was discussed at the meeting, but no allotment was set.

April 10, 2024: Releases begin from Lake Sherburne for the irrigation season.

April 10, 2024: Diversions to St. Mary Canal started to move water to the Milk River basin.

April 15, 2024: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments. This was the first call of the season.

May 1, 2024: MRJBC set the irrigation allotment at 1.0 AF/acre at a MRJBC meeting.

May 17, 2024: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments.

June 7, 2024: Fresno Reservoir releases were increased for the start of the irrigation season.

June 17, 2024: St. Mary siphons failed, and diversions were discontinued for the season.

June 26, 2024: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments.

July 10, 2024: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments.

July 25, 2024: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments.

July 31, 2024: Releases from Fresno Reservoir are set at approximately 100 ft^3/s to serve the municipalities and Fort Belknap Irrigation District.

August 2, 2024: Releases from Nelson Reservoir were discontinued.

September 18, 2024: Releases from Fresno Reservoir are set to the winter release rate of approximately 40 ft^3/s.

September 27, 2024: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments.

November 4, 2024: Lake Sherburne releases were discontinued.

Table MTT 35.—Reservoir allocations for Lake Sherburne

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	4,729.30	1,899	1,899
Top of active conservation	4,788.00	66,147	64,248

*2002 reservoir survey and revised area-capacity table was implemented on October 1, 2005.

Table MTT 36.—Storage and elevation data for Lake Sherburne

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	4,747.50	14,595	10/1/2023
End of year	4,770.34	39,168	9/30/2024
Annual low	4,747.66	14,737	10/01/2023
Annual high	4,787.26	64,879	7/7/2024
Historic high	4,788.30	68,371	6/30/1986

Table MTT 37.—Inflow and discharge data for Lake Sherburne

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	126,171	10/1/2023–9/30/2024	101,598	10/1/2023–9/30/2024
Daily peak (ft^3/s)	1,001	5/17/2024	694	8/15/2024
Daily minimum (ft^3/s)	-14	1/12/2024	0	*

* During non-irrigation season

Table MTT 38.—Water Year 2024 monthly inflow, outflow, and storage data for Lake Sherburne

Month	Inflow, KAF	Percent of 30-Yr Avg	Outflow, KAF	Percent of 30-Yr Avg	Content, KAF	Percent of 30-Yr Avg
October	5.2	78	0.1	2	19.7	102
November	6.5	84	0.0		26.2	105
December	8.4	216	0.0		34.6	123
January	3.4	124	0.0		38.0	124
February	4.9	204	0.0		42.9	129
March	3.7	97	0.1	3	46.4	143
April	10.5	107	20.1	113	36.8	151
May	26.6	85	20.9	117	42.6	112
June	29.3	74	8.7	46	63.2	106
July	16.2	89	22.1	85	57.3	112
August	7.8	94	27.7	87	37.5	138
September	3.7	69	1.9	11	39.2	258
Annual	126.2	90	101.6	72		
April–July	82.7	84				

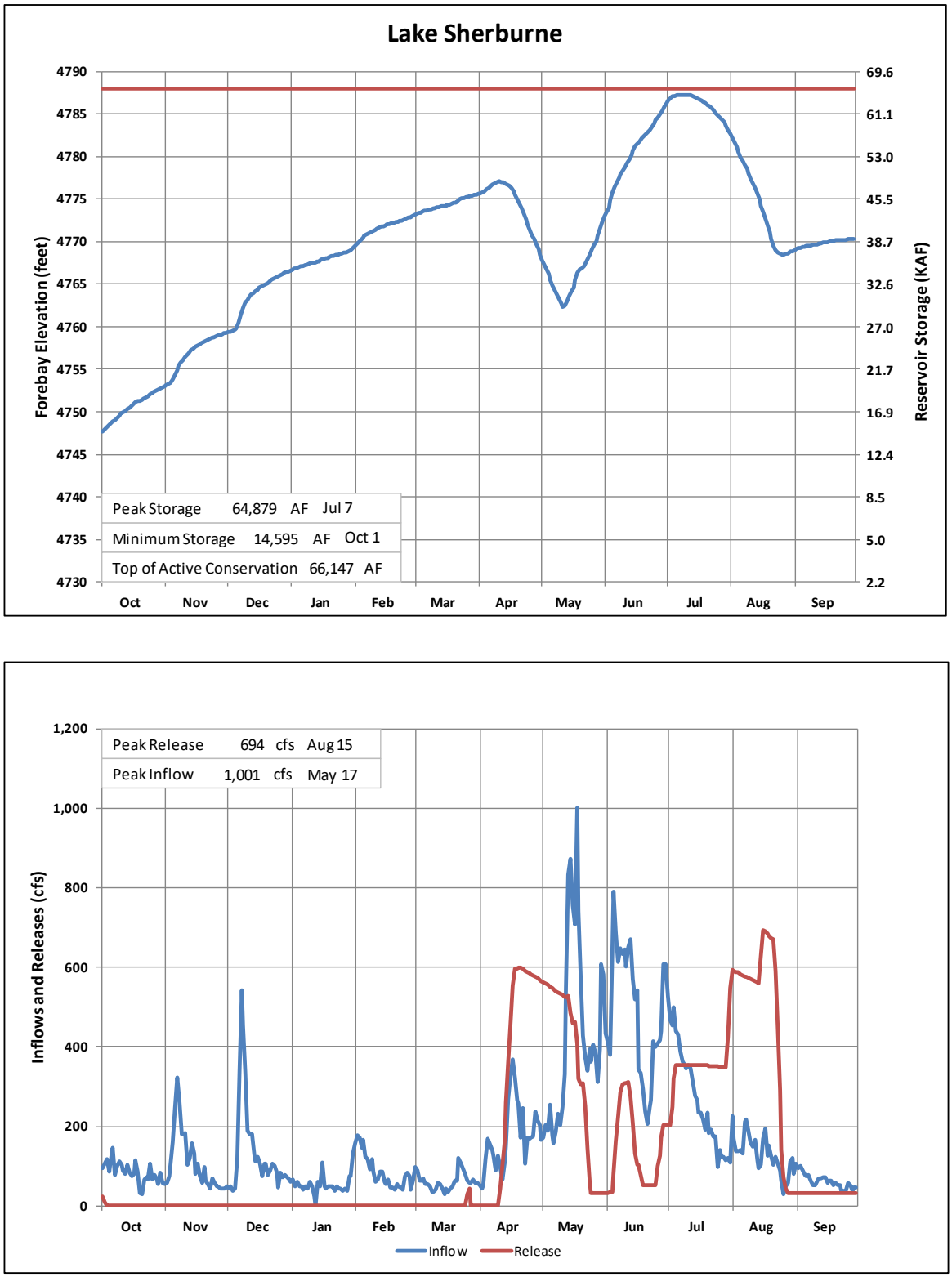


Figure MTG 23.—Water Year 2024 hydrologic data for Lake Sherburne.

Table MTT 39.—Reservoir allocations for Fresno Reservoir*

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	2,530.00	158	158
Top of active conservation	2,567.00	57,905	57,747
Top of joint use	2,575.00	91,746	33,841

* 2010 reservoir survey and revised area-capacity table was implemented on October 1, 2013.

Table MTT 40.—Storage and elevation data for Fresno Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	2,553.54	25,223	10/1/2023
End of year	2,551.43	21,506	9/30/2024
Annual low	2,550.64	20,180	2/24/2024
Annual high	2,574.68	90,106	5/24/2024
Historic high	2,579.30	153,694	4/2/1952

Table MTT 41.—Inflow and discharge data for Fresno Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	112,662	10/1/2023–9/30/2024	115,945	10/1/2023–9/30/2024
Daily peak (ft^3/s)	2,294	5/8/2024	1,196	7/23/2024
Daily minimum (ft^3/s)	-317	7/11/2024	39	2/25/2024

Table MTT 42.—Water Year 2024 monthly inflow, outflow, and storage data for Fresno Reservoir

Month	Inflow, KAF	Percent of 30-yr Avg	Outflow, KAF	Percent of 30-yr Avg	Content, KAF	Percent of 30-yr Avg
October	1.9	29	2.6	47	24.0	55
November	2.0	68	2.4	78	23.6	54
December	1.3	75	2.4	80	22.5	53
January	0.3	23	2.4	79	20.4	50
February	3.7	85	2.2	73	21.9	51
March	10.6	47	2.5	25	30.0	59
April	17.2	51	2.5	15	44.8	65
May	60.1	144	15.7	37	89.2	131
June	20.6	42	30.8	67	79.0	108
July	-5.9		41.9	83	31.2	63
August	-0.1		6.2	15	24.9	65
September	1.0	5	4.4	24	21.5	52
Annual	112.7	47	116.0	48		
April–July	92.1	60				

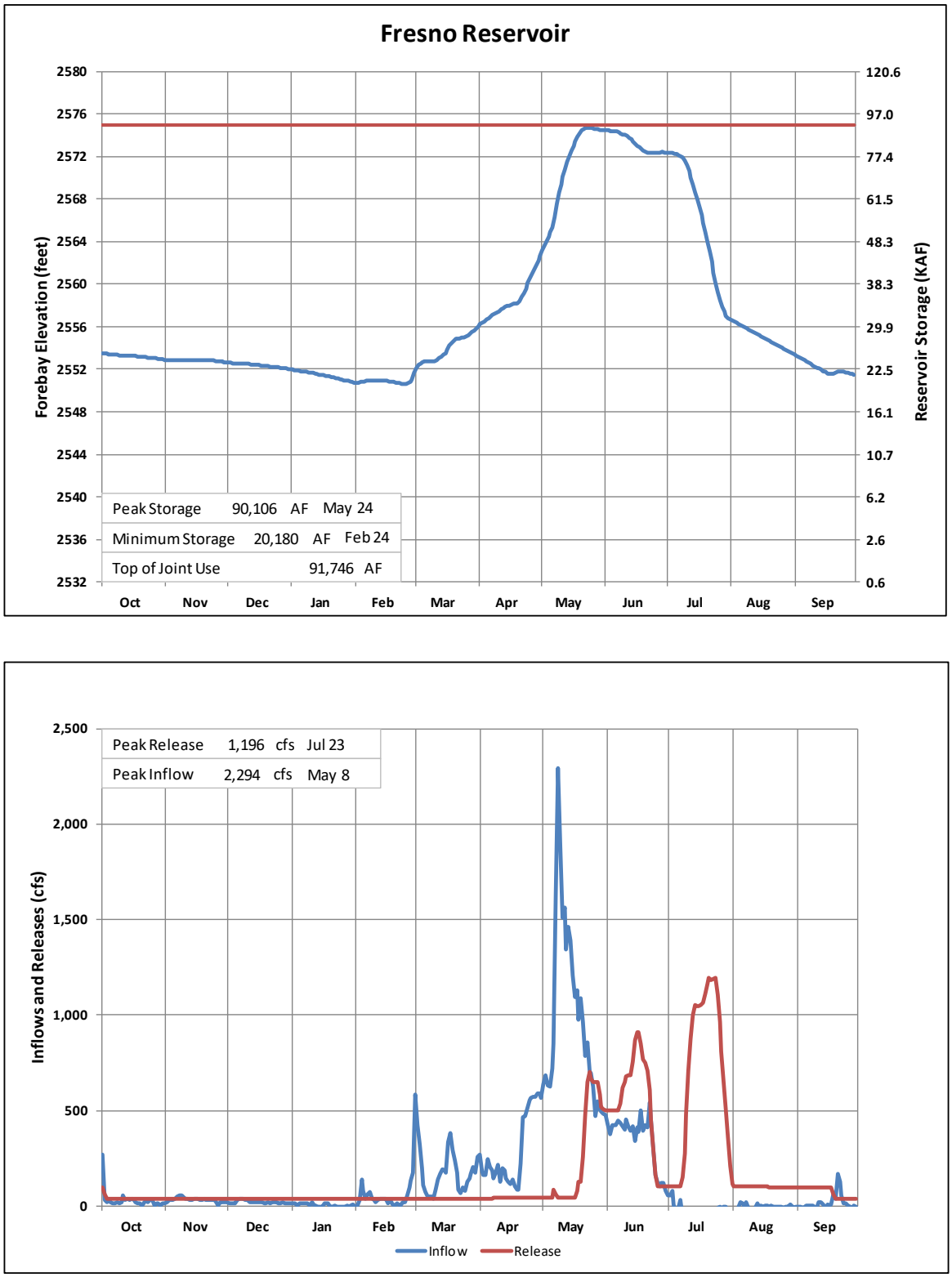


Figure MTG 24.—Water Year 2024 hydrologic data for Fresno Reservoir.

Table MTT 43.—Reservoir allocations for Nelson Reservoir

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	2,200.00	18,140	18,140
Top of active conservation	2,221.60	78,950	60,810

* 1999 reservoir survey and revised area-capacity table was implemented on October 1, 2001.

Table MTT 44.—Storage and elevation data for Nelson Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	2,218.30	65,452	10/1/2023
End of year	2,217.47	62,263	9/30/2024
Annual low	2,216.52	58,712	3/1/2024
Annual high	2,221.48	78,432	5/6/2024
Historic high	2,221.68	79,297	6/1/2007

Table MTT 45.—Inflow and discharge data for Nelson Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	25,770	10/1/2023–9/30/2024	28,959	10/1/2023–9/30/2024
Daily peak (ft^3/s)	375	6/27/2024	351	7/20/2024
Daily minimum (ft^3/s)	-190	5/16/2024	0	*

Table MTT 46.—Water Year 2024 monthly inflow, outflow, and storage data for Nelson Reservoir

Month	Inflow KAF	Percent of 30-yr Avg	Outflow KAF	Percent of 30-yr Avg	Content KAF	Percent of 30-yr Avg
October	0.1	5	0.0	0	65.6	115
November	-2.3		0.0	0	63.3	114
December	-2.1		0.0	0	61.1	114
January	-1.8		0.0	0	59.3	113
February	-0.5		0.0	0	58.8	115
March	11.8	305	0.0	0	70.6	129
April	7.4	72	0.1	11	77.9	121
May	1.7	18	9.3	99	70.3	111
June	6.4	66	8.3	88	68.4	107
July	4.9	74	10.5	74	62.8	114
August	2.5	28	0.8	7	64.6	121
September	-2.3		0.0	0	62.3	111
Annual	25.8	48	29.0	59		

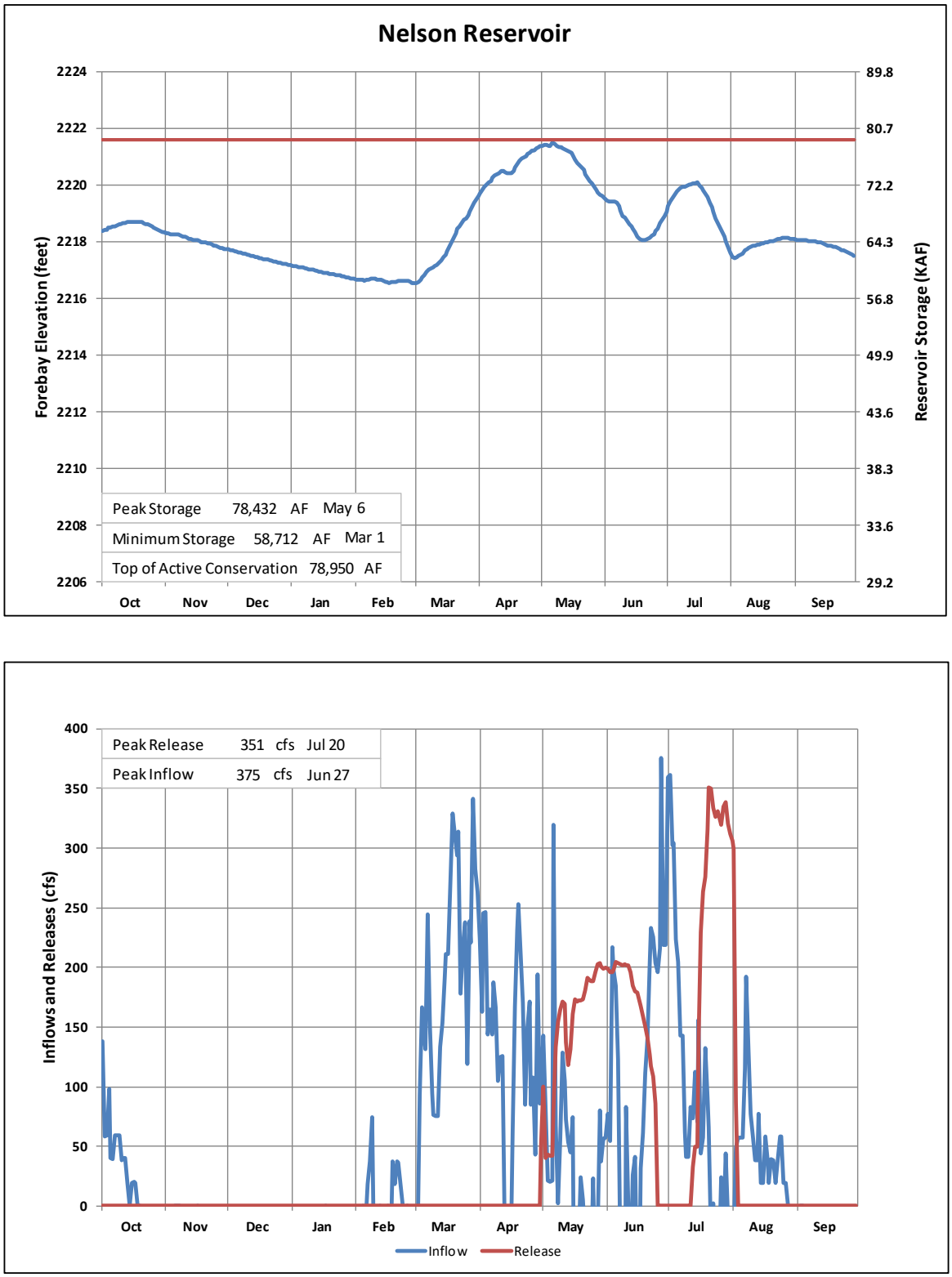


Figure MTG 25.—Water Year 2024 hydrologic data for Nelson Reservoir.

Bighorn Lake and Yellowtail Powerplant

Bighorn Lake is located on the Bighorn River about 45 miles southwest of Hardin, MT. The dam and reservoir were built for power generation, irrigation, flood control, fish and wildlife and recreation. Reclamation has a storage allocation agreement with the Northern Cheyenne Tribe for 30,000 AF and the Crow Tribe for up to 300,000 AF of water. Reclamation has an industrial water service contract with Talen Energy for 6,000 AF. Bull Lake, Boysen, and Buffalo Bill Reservoirs are three major tributary reservoirs located in Wyoming upstream of Bighorn Lake. These reservoirs are operated and managed by Reclamation's Wyoming Area Office (WYAO) and all reservoir and river operations in the Bighorn River basin are closely coordinated between the MTAO and WYAO.

Figure MTG 26.—View of Yellowtail Dam and Powerplant.

Summary of Water Year 2024 Operations

Yellowtail Dam operations during WY2024 were near average. Coming off a high-water year, the hydrologic conditions in the basin were wet at the start of WY2024. Snowpack peaked near average resulting in near average runoff. The last quarter of WY2024 was dry and releases were decreased to conserve storage. See tables MTT 47 through 50 for specific data related to Bighorn Lake inflows, releases, and storage content.

October

Storage in Bighorn Lake started WY2024 at elevation 3,638.28 ft or 113 percent of the 30-year average. Releases started off the year at 3,000 ft^3/s.

October was much wetter than average. Inflows increased to 7,090 ft^3/s and releases were increased to 4,000 ft^3/s. Storage rose into the flood control pool on October 15, 2023, and dropped back out of the flood control pool on October 25. The storage peak of 3,640.45 ft, 1,017,200 AF, on October 18 was the peak storage level for WY2024.

November through February

Winter river releases are set during the early part of November based on established operating criteria involving current storage in Bighorn Lake, forecasted inflows and a March 31 elevation target of 3,617 ft. However, the winter release could not be set in early November because inflows were higher than the projected winter release and the storage level remained high. As inflows receded, releases were slowly decreased until reaching the winter release rate of 3,150 ft^3/s on November 20, 2023.

Releases were slightly adjusted during the winter months to stay on track with the end of March elevation target. No major changes were needed and near the end of February, river releases were 3,130 ft^3/s. However, releases were decreased to 3,000 ft^3/s on February 26 because inflows were forecasted to be lower than average.

March

On March 1, the operational focus shifts from March 31 to April 30 in accordance with established operating criteria. Snowpack conditions were mixed throughout the basin and the runoff forecast was below average. The storage target for April 30 was 3,617.2 ft based on the March 1 April through July inflow forecast of 852,000 AF, 67 percent of average.

Climate conditions varied throughout the basin during March. Some areas received above average precipitation while other areas remained dry. River releases were increased to 3,500 ft^3/s during March based on actual inflow being greater than expected. Storage decreased as planned throughout the month to elevation 3,621.1 ft on March 31.

April through June

The April 1 forecast for April through July inflow increased substantially to 1,172,00 AF as snowpack was above average. Under this forecast, Bighorn Lake was expected to fill to normal full pool, 3,640 ft. Releases were increased to 6,000 ft^3/s during April. April precipitation was also a mix with some areas being drier and other areas being wetter than average. Snowpack peaked below average on April 11 at 91 percent of median in the Bighorn basin. Storage in Bighorn Lake ended the month at 3,617.71 ft, 106 percent of average.

The May 1 forecast was lower at 65 percent of average due to snowpack peaking lower than normal. The climate during May was cool and wet for a large part of the basin. Releases were reduced to 4,000 ft^3/s by mid-May based on storage in Bighorn Lake and the lower forecasted inflows but were increased back to 5,000 ft^3/s by the end of the month due to the wetter than average conditions during May. The reservoir was at elevation 3,624.18 ft. on May 31.

The June 1 forecast was also much lower than average. Releases were expected to decrease to 2,500 ft^3/s under median inflow conditions but ended up only decreasing to 3,000 ft^3/s with higher-than-expected inflows. Storage peaked on June 26 at elevation 3,637.84 ft or 982,635 AF. June was slightly warmer than average and much drier than average.

July through September

Releases were decreased to 2,500 ft^3/s in early July and remained there for the rest of WY2024. Storage ended WY2024 at elevation 3,632.80 ft, 924,206 AF, 106 percent of average.

Total generation produced at Yellowtail Powerplant during WY2024 was 880,254 MWh, 114 percent of average. Approximately 94 percent of all water released from Yellowtail Dam during WY2024 was released through the powerplant, 2,392,695 AF. The remaining 146,970 AF was released either through the river outlet gates or the spillway gates.

The reservoirs in the Bighorn River basin ended the water year lower than the year before. With the forecasted releases from Boysen and Buffalo Bill, winter releases were set in November 2024 at 2,210 ft^3/s.

Important Events – Water Year 2024

April 17, 2024: The Bighorn Canal was started for the irrigation season.

September 23, 2024: The Bighorn Canal was shut down for the irrigation season.

For more detailed information on the operations of Boysen and Buffalo Bill Reservoirs during WY2024, refer to the narratives for Boysen Reservoir and Powerplant and Shoshone Project under the responsibility of the WYAO.

Table MTT 47.—Reservoir allocations for Bighorn Reservoir*

Reservoir Allocations	Elevation (feet)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	3,547.00	467,473	467,473
Top of active conservation	3,614.00	778,317	310,844
Top of joint use	3,640.00	1,011,052	232,735
Top of exclusive flood control	3,657.00	1,263,682	252,630

* 2017 reservoir survey and revised area-capacity table was implemented on October 1, 2020.

Table MTT 48.—Storage and elevation data for Bighorn Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	3,638.28	988,258	10/1/2023
End of year	3,632.80	924,206	9/30/2024
Annual low	3,613.11	773,044	5/8/2024
Annual high	3,640.45	1,017,200	10/18/2023
Historic high	3,656.36	1,363,994	7/6/1967

Table MTT 49.—Inflow and discharge data for Bighorn Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	2,475,410	10/1/2023–9/30/2024	2,494,273*	10/1/2023–9/30/2024
Daily peak (ft^3/s)	9,594	6/13/2024	6,142*	5/5/2024
Daily minimum (ft^3/s)	696	1/14/2024	2,167*	9/28/2024
Peak spill (ft^3/s)			1,900	5/1/2024
Total spill (KAF)			146,970	Apr-Aug, 2024

* Discharge to the Bighorn River

Table MTT 50.—Water Year 2024 monthly inflow, outflow, and storage data for Bighorn Reservoir

Month	Inflow, KAF	Percent of 30-yr Avg	Outflow to canal, KAF	Percent of 30-yr Avg	Outflow to river, KAF	Percent of 30-yr Avg	Content, KAF	Percent of 30-yr Avg
October	241.8	145	0.0	0	227.6	141	1,006.7	114
November	176.0	142	0.0		211.6	146	974.0	112
December	152.7	143	0.0		195.1	132	935.6	111
January	135.1	125	0.0		204.0	136	870.9	108
February	159.6	144	0.0		184.1	129	850.7	109
March	158.6	100	0.0		189.6	106	823.9	107
April	263.8	144	2.6	168	287.9	141	801.4	106
May	348.5	113	10.1	92	297.1	128	847.0	104
June	382.7	78	20.5	99	235.6	70	977.7	105
July	139.8	50	24.8	92	156.7	56	940.1	104
August	154.7	98	25.2	95	154.5	88	919.8	106
September	162.2	98	12.7	79	150.4	98	924.2	106
Annual	2,475.4	105	95.9	91	2,494.3	108		
April–July	1,134.8	90						

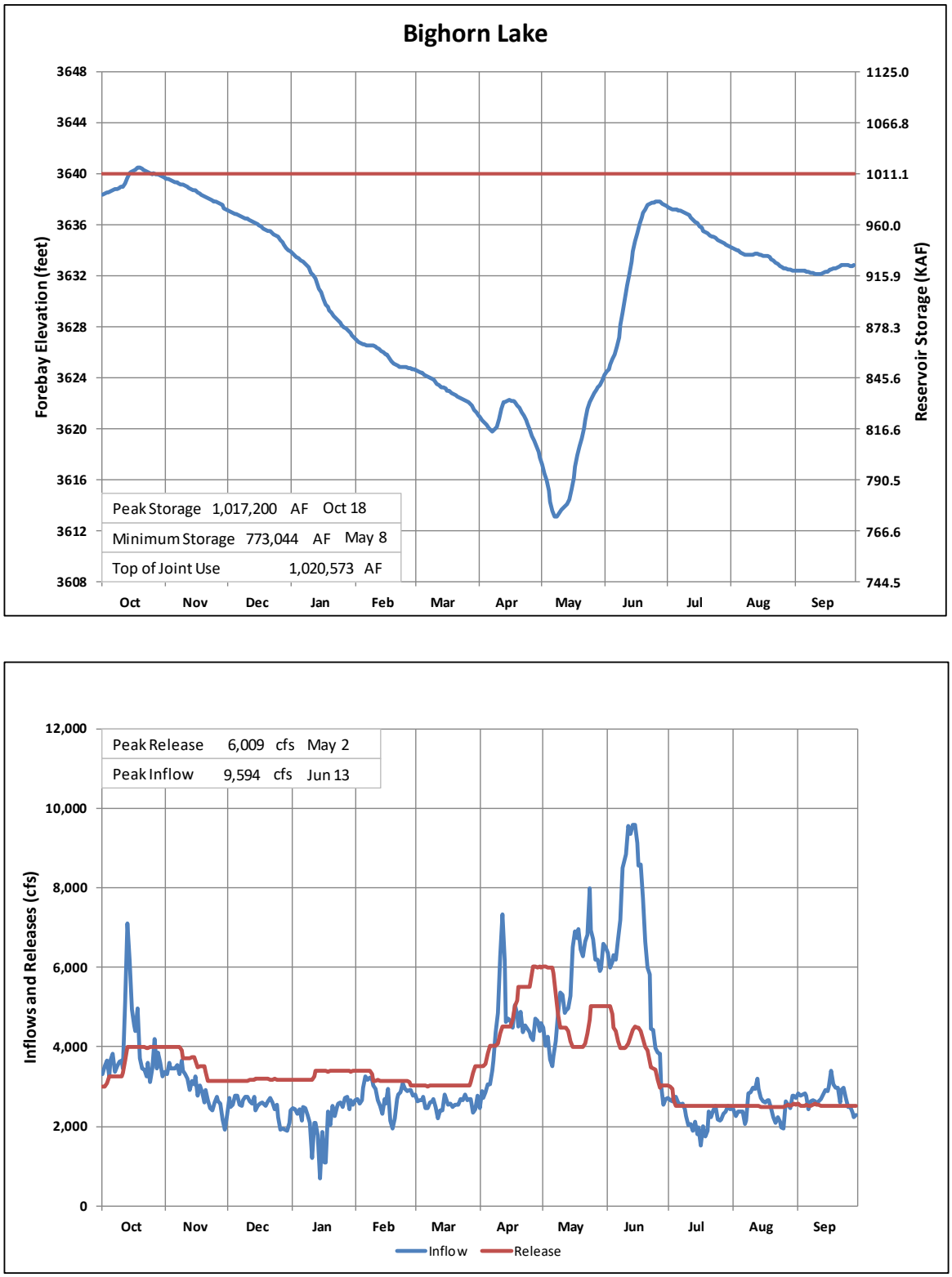


Figure MTG 27.—Water Year 2024 hydrologic data for Bighorn Reservoir.

Summary of Operations for Water Year 2024 & Annual Operating Plan for Water Year 2025 – Dakotas Area Office

Missouri Basin & Arkansas-Rio Grande-Texas Gulf Regions

Weather Summary for North Dakota, South Dakota and Northeastern Wyoming

Total annual precipitation for Reclamation facilities in North Dakota, South Dakota, and northeastern Wyoming is shown in table DKT 1.

October

Precipitation was well above average at Deerfield and Pactola reservoirs, above average at Dickinson, Heart Butte and Keyhole reservoirs, below average at Angostura, Belle Fourche and Shadehill reservoirs and well below average at Jamestown reservoir.

November

Precipitation was below average at Keyhole and Shadehill reservoirs and well below average at Angostura, Belle Fourche, Deerfield, Dickinson, Heart Butte, Jamestown and Pactola reservoirs.

December

Precipitation was well above average at Jamestown and Pactola reservoirs, about average at Shadehill reservoir, below average at Belle Fourche, Deerfield, Dickinson and Heart Butte reservoirs and well below average at Angostura and Keyhole reservoirs.

January

Precipitation was below average at Angostura, Deerfield, Dickinson, Keyhole and Shadehill reservoirs and well below average at Belle Fourche, Heart Butte, Jamestown and Pactola reservoirs.

February

Precipitation was well above average at Angostura, Deerfield and Pactola reservoirs, above average at Dickinson reservoir, about average at Heart Butte reservoir, below average at Belle Fourche, Keyhole and Shadehill reservoirs and well below average at Jamestown reservoir.

March

Precipitation was well above average at Dickinson and Heart Butte reservoirs, below average at Belle Fourche, Keyhole and Shadehill reservoirs and well below average at Angostura, Deerfield, Jamestown and Pactola reservoirs.

April

Precipitation was well above average at Belle Fourche, Jamestown and Pactola reservoirs, above average at Heart Butte and Shadehill reservoirs and below average at Angostura, Deerfield, Dickinson and Keyhole reservoirs.

May

Precipitation was well above average at Shadehill reservoir, above average at Heart Butte reservoir, about average at Belle Fourche and Dickinson reservoirs and below average at Angostura, Deerfield, Jamestown, Keyhole and Pactola.

June

Precipitation was well above average at Jamestown reservoir, about average at Dickinson reservoir, below average at Heart Butte and Shadehill reservoirs and well below average at Angostura, Belle Fourche, Deerfield, Keyhole and Pactola reservoirs.

July

Precipitation was below average at Angostura, Heart Butte, Jamestown, Keyhole, Pactola and Shadehill reservoirs and well below average at Belle Fourche, Deerfield and Dickinson reservoirs.

August

Precipitation was well above average at Belle Fourche reservoir, above average at Dickinson and Jamestown reservoirs, about average at Angostura, Keyhole and Pactola reservoirs and below average at Deerfield, Heart Butte and Shadehill reservoirs.

September

Precipitation was above average at Shadehill reservoir, below average at Deerfield reservoir and well below average at Angostura, Belle Fourche, Dickinson, Heart Butte, Jamestown, Keyhole and Pactola reservoirs.

Table DKT 1.—Total annual precipitation for reclamation reservoirs in North Dakota, South Dakota, and northeastern Wyoming in inches

Reservoir	2024	Average	Percent of Average
Dickinson	15.20	17.35	88
Heart Butte	14.83	16.79	88
Jamestown	18.65	19.84	94
Angostura[1]	11.50	18.61	62
Belle Fourche[2]	12.04	16.65	72
Deerfield[3]	10.52	18.11	58
Keyhole[4]	10.66	17.07	62
Pactola	13.28	19.21	69
Shadehill[5]	15.85	16.29	97

[1] Angostura Reservoir's annual precipitation data is from the Hot Springs, SD, climate station.
[2] Belle Fourche Reservoir's annual precipitation data is from the Newell, SD climate station.
[3] Deerfield reservoir's annual and average precipitation data is from the Deerfield Dam flip bucket rain gauge recorded by HydroMet.
[4] Keyhole Reservoir's annual precipitation data is from the Sundance, WY climate station.
[5] Shadehill Reservoir's annual precipitation data is from the Lemmon, SD climate station.

Table DKT 2.—Comparison of End-of-Water-Year Storage Content for Reservoirs in North Dakota, South Dakota, and Northeastern Wyoming in AF

Reservoir	Storage Sept. 30, 2023	Storage Sept. 30,2024	Change in Storage
Dickinson	7,771	6,084	-1,687
Heart Butte	58,546	55,081	-3,465
Jamestown	31,032	29,340	-1,692
Angostura	92,889	80,277	-12,662
Belle Fourche	142,498	80,141	-62,357
Deerfield	15,048	14,665	-383
Keyhole	130,164	111,977	-18,187
Pactola	53,420	49,922	-3,498
Shadehill	116,151	80,608	-35,543

Flood Damage Prevented for North Dakota, South Dakota and Northeastern Wyoming

Two Reclamation reservoirs in North Dakota provided flood relief during WY2024.

The information on the distribution of flood damages prevented is provided by the USACE. The distributions of flood damages prevented for each reservoir are as follows:

Table DKT 3.—Flood damage prevented in 2024 and accumulated total 1950–2024, adjusted and unadjusted

Reservoir	Local	Mainstem	2024 Total	1950–2024 Accumulation Totals (Unadjusted)	1950–2024 Accumulation Totals (Adjusted)[1]
Angostura	$0	$0	$0	$22,900	$164,100
Keyhole	$0	$0	$0	$5,064,000	$15,499,100
Pactola	$0	$0	$0	$4,993,900	$15,786,100
Shadehill	$0	$0	$0	$14,470,400	$135,574,400
Heart Butte	$0	$924,200	$924,200	$21,143,300	$184,253,600
Jamestown	$2,909,100	$0	$2,909,100	$271,144,100	$548,076,200
Total[2]	$2,909,100	$924,200	$3,833,300	$316,838,600	$899,353,500

[1] Adjusted for inflation with the Building Cost Index (BCI)

[2] Flood damages prevented by Dakotas Area Office reservoirs between Garrison and Gavins Point Dams are shown on Figure DKG 1

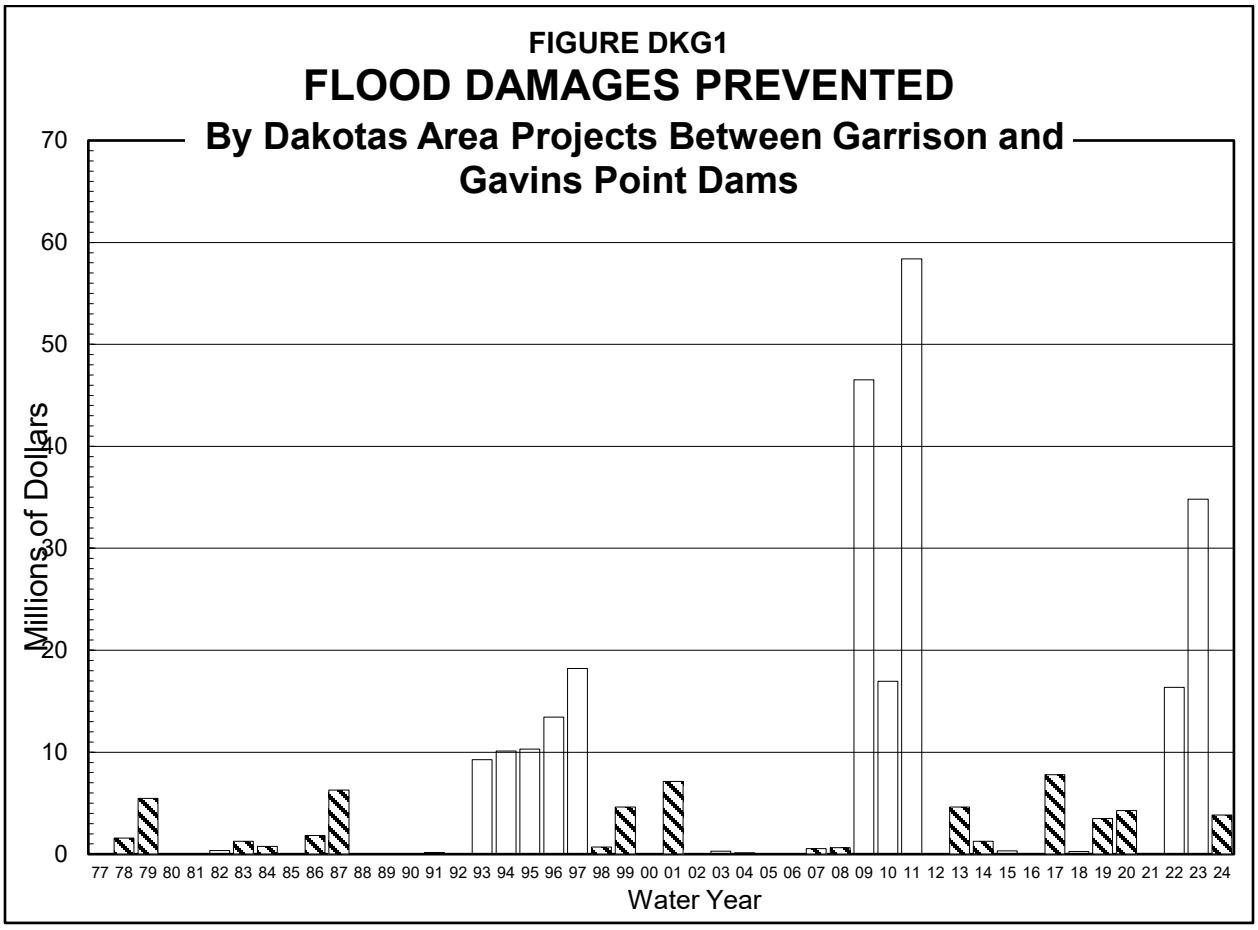


Figure DKG 1.—Flood damages prevented by Dakotas Area Projects between Garrison and Gavins Point Dams.

Unit Operational Summaries for Water Year 2024

Dickinson Reservoir

Background

Dickinson Dam is located on the Heart River one mile west of Dickinson, ND. The reservoir has a dead capacity of 349 AF, an inactive capacity of 89 AF and an active conservation capacity of 8,041 AF (for a total storage capacity of 8,479 AF at the top of conservation elevation 2,420 ft). Reservoir water is used for irrigating approximately 230 acres along the Heart River downstream from the dam and for municipal use by the Dickinson Parks and Recreation District.

Operations Summary

E.A. Patterson Lake (Dickinson Reservoir) started WY2024 at elevation 2,419.41 ft and with a storage of 7,793 AF, which is 0.59 ft and 686 AF below the top of the conservation pool. Precipitation for WY2024 was 15.2 inches, which is 88 percent of its 17.53 inches average.

Inflows for WY2024 totaled 3,105 AF, 16 percent of its 19,561 AF average. Peak inflows occurred in March, totaling 1,079 AF for the month. The peak reservoir elevation for WY2024 was 2,419.51 ft, with a storage of 7,907 AF, occurring on November 7, 2023. The minimum elevation for WY2024 was 2,417.77 ft, with a storage of 6,084 AF, occurring on September 30, 2024. WY2024 ended at elevation 2,417.77 ft with a storage of 6,084 AF, which is 2.23 ft and 2,395 AF below the top of the conservation pool.

Dickinson Dam did not go into internal alert or any response levels during the water year and remained in normal operation for the entire water year.

An emergency management program, orientation seminar and communications drill were conducted on April 18, 2024.

An annual site inspection was conducted on August 29, 2024, by personnel from DKAO.

Monthly Statistics

In relation to data from 73 years of recordkeeping, the following monthly records or near-records were documented:

- November had its ninth highest inflow and December had its seventh highest inflow.
- No record or near-record end-of-month content occurred in WY2024.

Additional statistical information on Dickinson Reservoir and its operations during WY2024 can be found on table DKT 3 and figure DKG 2.

Table DKT 4.—Hydrological Data for Dickinson Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	2,405.00	438	438
Top of active conservation	2,420.00	8,479	8,041
Top of surcharge	2,430.60	26,462	17,983
Storage-Elevation Data	**Elevation (ft)**	**Storage (AF)**	**Date**
Beginning of year	2,419.41	7,793	Oct. 01, 2023
End of year	2,417.77	6,084	Sept. 30, 2024
Annual low	2,417.77	6,084	Sept. 30, 2024
Annual high	2,419.51	7,907	Nov. 7, 2023
Historic high	2,422.19	*9,348	Mar. 21, 1997

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	3,106	Oct. 23–Sept. 24	4,793	Oct. 23–Sept. 24
Daily peak (ft^3/s)	66.5	Apr. 16, 2024	20.68	Nov 8, 2023
Daily minimum (ft^3/s)	-38.74	June 16, 2024	0	**

	Inflow		Outflow		Content	
Month	**AF**	**% of Avg**	**AF**	**% of Avg**	**AF**	**% of Avg**
October	123	20	10	1	7,884	141
November	361	209	1,057	439	7,188	131
December	339	244	707	626	6,820	123
January	251	89	323	189	6,748	120
February	802	75	276	38	7,274	122
March	1,079	16	616	11	7,737	110
April	495	11	596	14	7,636	106
May	280	12	446	18	7,470	104
June	209	19	275	12	7,404	104
July	-256	-30	287	21	6,861	104
August	-176	-53	200	25	6,485	106
September	-401	-297	0	0	6,084	104
Annual	3,106	16	4,793	25		114
April–July	728	7	1,604	15		105

* Due to new area-capacity table, the capacity that corresponds to the new historic high elevation is less than a previous historic high-capacity amount (11,520 AF at elevation 2,421.08 ft on June 9, 1982)

** Frequently observed during fall and winter months

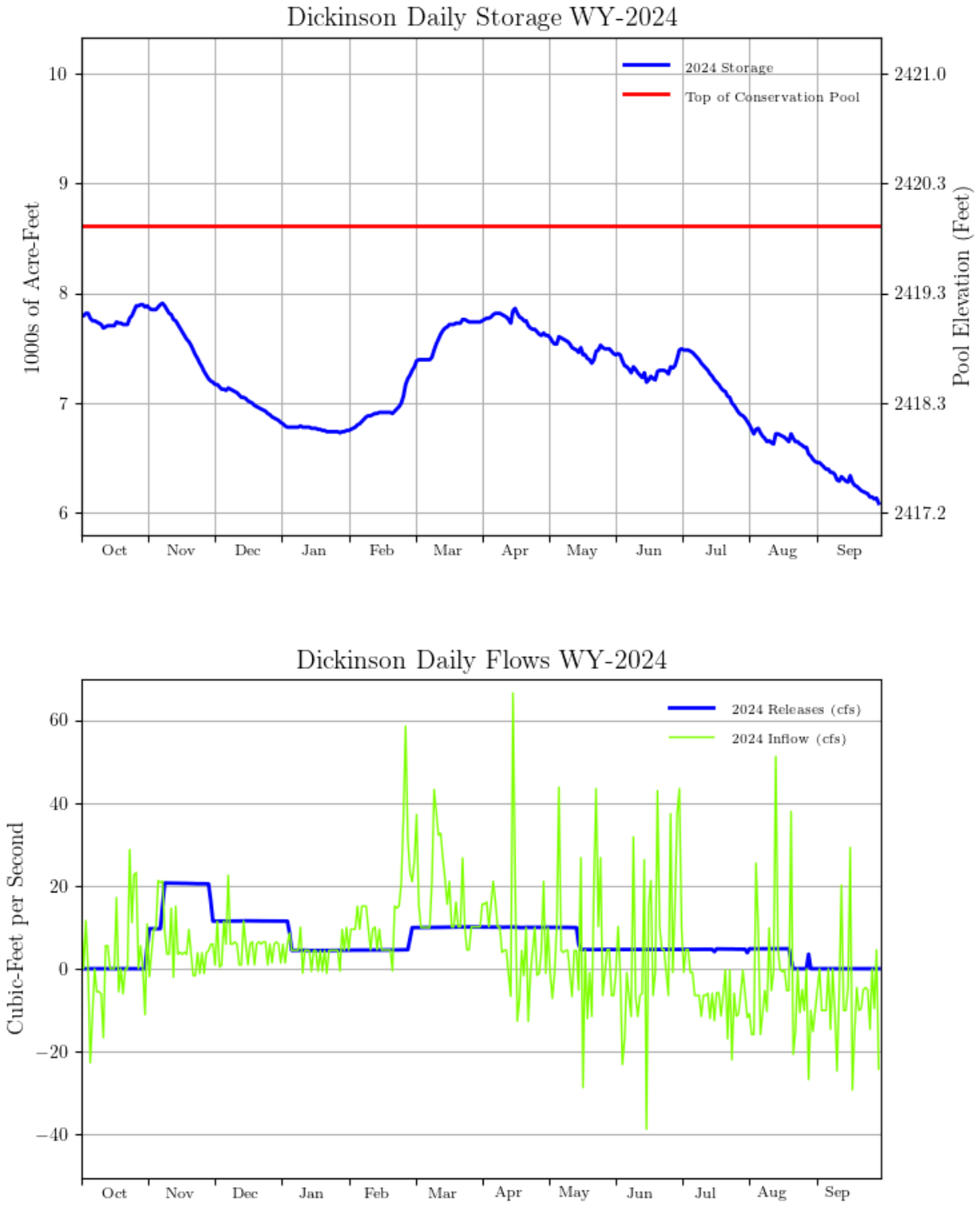


Figure DKG 2.—Dickinson Reservoir.

Heart Butte Reservoir

Background

Heart Butte Dam is located on the Heart River 15 miles south of Glen Ullin, North Dakota. The reservoir has a dead storage capacity of 4,328 AF, an active conservation capacity of 60,763 AF (for a total storage capacity of 65,091 AF at the top of active conservation elevation 2,064.5 ft), and an exclusive flood control space of 147,605 AF. Flood control storage is located above the crest of an ungated morning glory inlet spillway. Heart Butte Reservoir is primarily used for flood control and the authorized irrigation of up to 13,100 acres, of which about 7,767 acres are now being irrigated.

Operations Summary

Lake Tschida (Heart Butte Reservoir) started WY2024 at elevation 2,062.3 ft and with a storage of 58,456 AF, which is 2.2 ft and 6,635 AF below the top of the conservation pool. Precipitation for WY2024 was 14.83 inches, which is 88 percent of its 16.79 inches average. Inflows for WY2024 totaled 35,918 AF, 41 percent of its 87,490 AF average. Peak inflows occurred in March, totaling 9,313 AF for the month. The peak reservoir elevation for WY2024 was 2,064.98 ft, with a storage of 66,631 AF occurring on April 5, 2024. The minimum elevation for WY2024 was 2,061.13 ft, with a storage of 55,081 AF, occurring on September 30, 2024. WY2024 ended at elevation 2,061.13 ft, and storage of 55,081 AF, which is 3.37 ft and 10,010 AF below the top of the conservation pool.

Heart Butte Dam went into internal alert on March 13, with a reservoir elevation over 2,064.5 ft. The computed maximum daily inflow was 479 ft^3/s on July 9 and the maximum daily outflow rate was 145 ft^3/s on April 4. The reservoir remained in internal alert until April 27, when the reservoir returned to normal operations, with a reservoir under 2,064.5 ft and remained in normal operations for the remainder of the water year.

Heart Butte Dam has remained in internal alert since 2013 due to sediment transport into the conduit and a boil downstream from the dam.

Final design of a Safety of Dams modification project is underway to reduce the risk of internal erosion failure.

An emergency management program, orientation seminar and communications drill were conducted on April 16, 2024.

An annual site inspection was conducted on July 9, 2024, by personnel from DKAO.

Monthly Statistics

In relation to data from 75 years of recordkeeping, the following monthly records or near-records were documented:

- November had its sixth highest inflow and December had its sixth highest inflow.

- No record or near-record end-of-month content occurred.

Additional statistical information on Heart Butte Reservoir and its operations during WY2024 can be found in table DKT 5 and figure DKG 3.

Table DKT 5.—Hydrological data for Heart Butte Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of dead	2,030.00	4,328	4,328
Top of active conservation	2,064.50	65,091	60,763
Top of exclusive flood control	2,094.50	212,696	147,605
Storage-Elevation Data	**Elevation (ft)**	**Storage (AF)**	**Date**
Beginning of year	2,060.73	58,456	Oct. 01, 2023
End of year	2,062.30	55,081	Sept. 30, 2024
Annual low	2,061.13	55,081	Sept. 30, 2024
Annual high	2,064.98	66,631	Apr. 5–6, 2024
Historic high	2,086.23	173,203	Apr. 09, 1952

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
Annual total (AF)	35,919	Oct. 23–Sept. 24	39,294	Oct. 23–Sept. 24
Daily peak (ft^3/s)	479.27	July 9, 2024	144.86	Apr. 4, 2024
Daily minimum (ft^3/s)	-297.90	Sept. 13, 2024	0	*

	Inflow		Outflow		Content	
Month	AF	% of Avg	AF	% of Avg	AF	% of Avg
October	1,687	107	1,892	83	58,251	101
November	3,431	262	2,609	185	59,073	102
December	2,336	243	2,366	184	59,043	103
January	949	81	2,061	179	57,931	101
February	6,130	171	1,945	95	62,116	105
March	9,313	33	5,383	31	66,046	95
April	6,031	25	7,268	29	64,809	94
May	3,764	37	4,628	43	63,945	93
June	2,033	21	2,524	27	63,454	92
July	950	23	3,491	46	60,913	93
August	-205	-12	2,981	54	57,727	94
September	-500	-75	2,146	72	55,081	93
Annual	35,919	41	39,294	45		97
April–July	12,778	26	17,911	34		93

* Frequently observed during fall and winter months

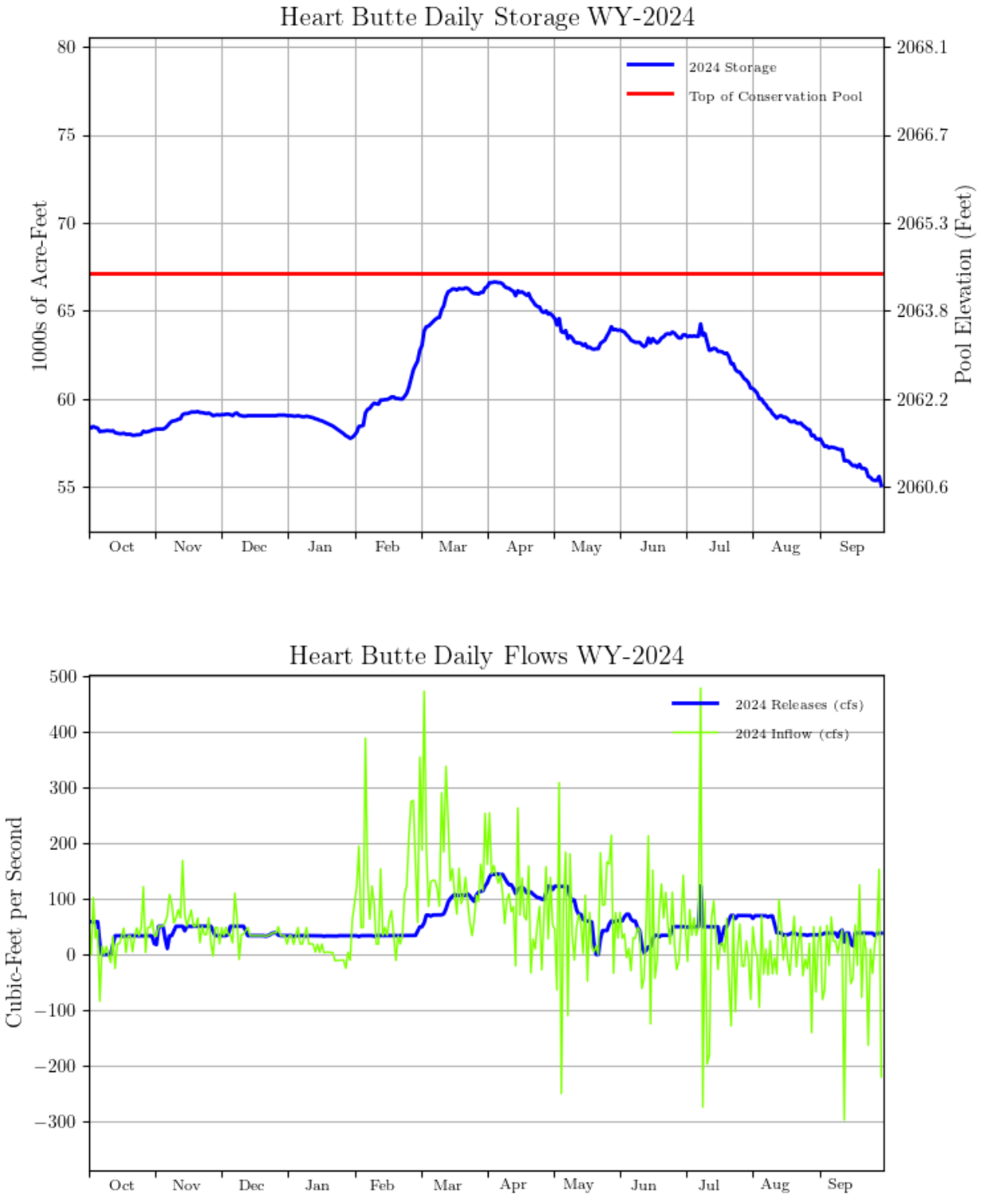


Figure DKG 3.—Heart Butte storage, inflows, and releases for WY2024.

Jamestown Reservoir

Background

Jamestown Dam is located on the James River just above the city of Jamestown, ND. The reservoir has a dead capacity of 292 AF, an active conservation capacity of 23,934 AF (for a total top of active conservation capacity of 24,226 AF at elevation 1,428 ft), a joint-use capacity of 6,262 AF, and an exclusive flood control space of 190,502 AF. Exclusive flood control storage is located below the crest of an ungated morning glory inlet spillway and flood control releases are controlled by two gated outlets. The joint-use space is available for flood control at the beginning of spring runoff and is used for conservation purposes during the summer months.

Operations Summary

Jamestown Reservoir started WY2024 at elevation 1,431.21 ft and with a storage of 30,984 AF, which is 3.21 ft and 6,758 AF above the top of the conservation pool. Precipitation for WY2024 was 18.65 inches, 94 percent of its 19.84 inches average. Inflows for WY2024 were 116,705 AF, 184 percent of its 63,367 AF average. Peak inflows occurred in July, totaling 29,723 AF for the month. The peak reservoir elevation for WY2024 was 1,433.73 ft with a storage of 37,559 AF occurring on July 9, 2024. The minimum reservoir elevation for WY2024 was 1,429.35 ft with a storage of 26,869 AF occurring on October 31, 2023. WY2024 ended at elevation 1,430.5 ft with storage of 29,340 AF, which is 0.5 ft and 1,148 AF below the top of active conservation pool. The maximum instantaneous discharge of 650 ft^3/s occurred on July 16, 2024. The maximum 24 hour computed inflows occurred on June 18 with 1,088 ft^3/s.

Jamestown Dam went into internal alert on March 18, when the reservoir elevation reached 1,431 ft or over and remained there until August 11, when the reservoir went to normal operations when the reservoirs elevation reached 1,430.99 ft or below.

Jamestown Dam went back into internal alert on August 29, when the reservoirs elevation reached 1,431 ft or over and remained there until September 23, when the reservoir went to normal operations when the reservoir elevation reached 1,430.99 ft or below and remained in normal operations for the remainder of the water year.

No water was released specifically for downstream irrigation.

An emergency management program, orientation seminar and communications drill were conducted on April 3, 2024.

An annual site inspection was conducted on July 24, 2024, by personnel from the Dakotas Area Office.

Monthly Statistics

In relation to data from 71 years of recordkeeping, the following monthly records or near-records were documented:

- October had its sixth highest inflow, November had its tenth highest inflow,
- December had its eighth highest inflow, February had its ninth highest inflow, June had its third highest inflow, July had its third highest inflow, August had its fourth highest inflow and September had its third highest inflow.
- February had its tenth highest end-of-month content.

Additional statistical information on Jamestown Reservoir and its operations during WY2024 can be found on table DKT 6 and figure DKG 4.

Table DKT 6.—Hydrological Data for Jamestown Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of dead	1,400.00	292	292
Top of active conservation	1,428.00	24,226	23,934
Top of joint use	1,431.00	30,488	6,262
Top of exclusive flood control	1,454.00	220,990	190,502
Storage-Elevation Data	**Elevation (ft)**	**Storage (AF)**	**Date**
Beginning of year	1,431.21	30,984	Oct. 01, 2023
End of year	1,430.50	29,340	Sept. 30, 2024
Annual low	1,429.35	26,869	Oct. 31-Nov. 29, 2023
Annual high	1,433.73	37,559	July 09, 2024
Historic high	1,454.10	222,318	Apr. 26, 2009

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	116,705	Oct. 23–Sept. 24	118,397	Oct. 23–Sept. 24
Daily peak (ft^3/s)	1,088.23	June 18, 2024	650.23	Jul 16, 2024
Daily minimum (ft^3/s)	-158.34	Oct. 31, 2023	0	*

	Inflow		Outflow		Content	
Month	**AF**	**% of Avg**	**AF**	**% of Avg**	**AF**	**% of Avg**
October	6,607	258	10,770	280	26,869	102
November	2,323	137	2,282	111	26,910	104
December	1,413	214	0	0	28,323	110
January	593	242	0	0	28,915	113
February	1,109	272	0	0	30,024	118
March	3,472	55	2,129	233	31,637	102
April	3,515	14	3,563	38	31,319	67
May	12,134	102	11,157	68	32,296	77
June	27,494	600	23,352	208	36,438	103
July	29,723	684	30,841	420	35,320	109
August	16,766	422	20,379	400	31,707	101
September	11,557	794	13,924	293	29,340	105
Annual	116,705	184	118,397	188		98
April–July	72,866	158	68,913	155		89

* Frequently observed during fall and winter months

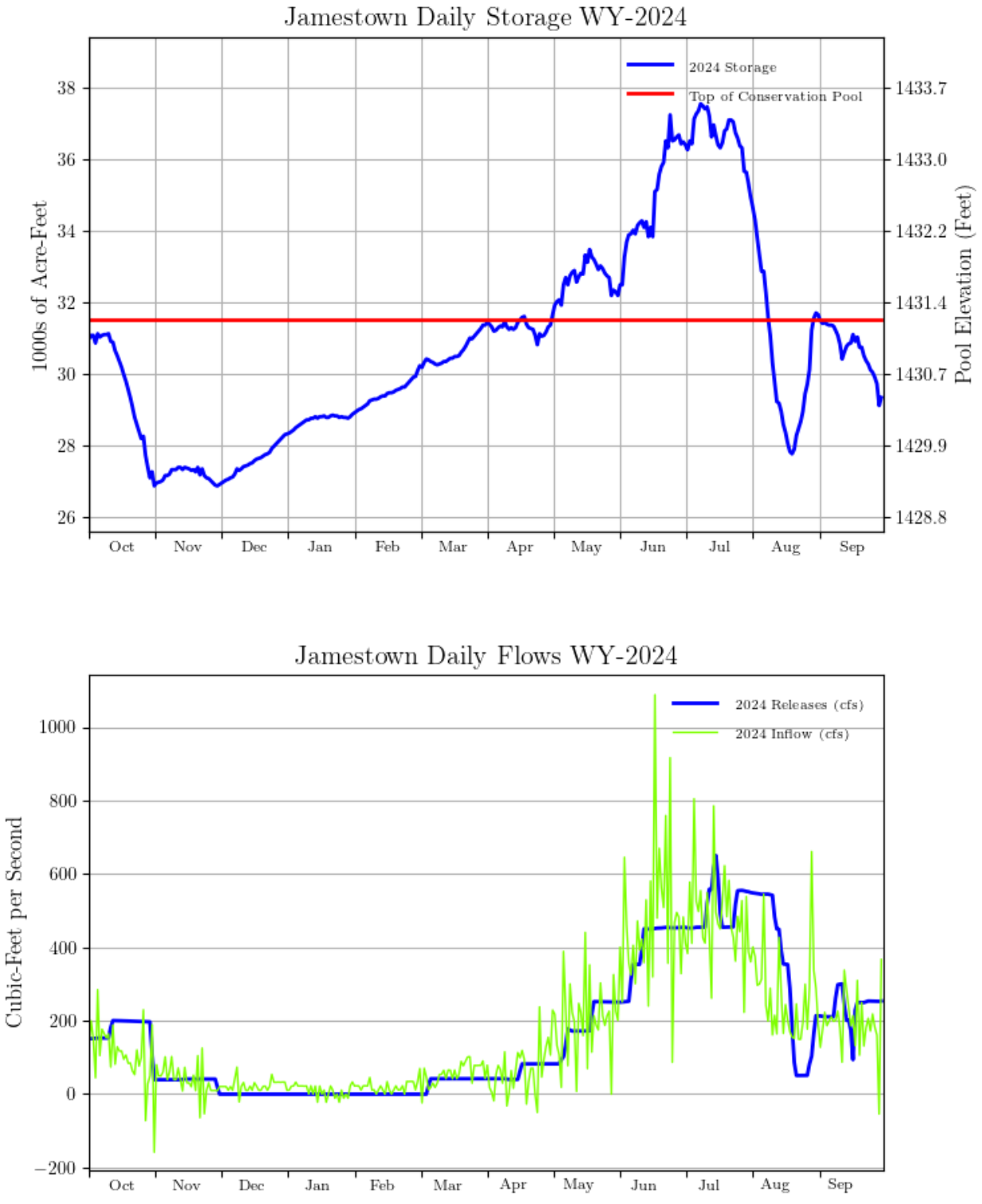


Figure DKG 4.—Jamestown storage, inflows, and releases for WY2024.

Angostura Reservoir

Background

Angostura Dam, located on the Cheyenne River above Hot Springs, South Dakota, was built to service about 12,200 acres in the Angostura Unit and for power generation. The reservoir has a total capacity of 123,048 AF with an additional surcharge capacity of 57,308 AF. Its principal use is for irrigation of the Angostura Unit, which diverts its water from a high-level outlet at the dam. In the early years, water surplus to irrigation needs was released to the river through a small power plant with a nameplate capacity of 1,200 kw. Because of the low runoff, and because actual irrigation diversions were higher than previously anticipated, it was concluded that continued operation of the power plant was economically infeasible. Except for a few operations of less than 24 hours each, the plant was last operated in February 1959. In 1966, the plant was officially closed, and the equipment was declared surplus in March 1968. Disposal of this equipment was completed in 1971. Releases for irrigation are made through the canal outlet works into the Angostura Main Canal having a design capacity of 290 ft^3/s. Releases to the Cheyenne River are only made when the reservoir is assured of filling.

Reclamation's Sedimentation and River Hydraulics Group of the Technical Service Center in Denver conducted a sedimentation survey of Angostura Reservoir in 2004 and provided a survey report and new Area and Capacity Tables in August 2005. The previous survey was done in 1979. Angostura Reservoir accumulated 7,716 AF of sediment since the last survey. Since construction in 1949, Angostura has accumulated 36,867 AF of sediment. The sedimentation rate from 1949–2004 has averaged 670 AF per year. The new Area and Capacity Tables were first used in WY2006.

Operations Summary

Angostura Reservoir Started WY2024 at elevation 3,180.03 ft and with a storage of 92,889 AF, which is 7.17 ft and 30,159 AF below the top of the conservation pool. Precipitation for WY2024 was 13.14 inches at Oral Station, 74 percent of average. Inflows for WY2024 totaled 45,684 AF (55 percent of average). Peak inflows occurred in October totaling 9,558 AF for the month. The peak reservoir elevation for WY2024 was 3,186.68 ft, storage of 120,664 AF, which is 0.52 ft and 2,384 AF below the top of the conservation pool, occurring on May 15, 2024. The minimum elevation for WY2024 was 3,176.54 ft, storage of 80,277 AF, which is 10.66 ft and 42,771 AF below the top of the conservation pool occurring on September 26, 2024. WY2024 ended at elevation 3,176.54 ft, and storage of 80,227 AF, which is 10.66 ft and 42,771 AF below the top of the conservation pool. Angostura Reservoir ended the water year with 38,072 AF in active storage.

The Angostura Irrigation District had a full water allotment for its irrigators. Releases for irrigation began May 10, 2024, and reached a peak of 245 ft^3/s on July 10, 2024. The irrigation releases were terminated on September 23, 2024. Total irrigation releases were 40,227 AF.

An emergency management/security tabletop exercise was held on March 19, 2024.

A periodic facility review was performed May 1, 2024. There are three incomplete SOD recommendations to be completed by the Denver Technical Response Team regarding the following:

1. Probabilistic Seismic Hazard Analysis. The seismic loadings were contracted in FY2023 and are scheduled to be completed in FY2025.
2. Seismic Analysis of Structural Elements. Civil analysis and development of the finite element model are anticipated to begin in FY2025 and be completed in FY2027.
3. Methodology/accuracy of historic toe drains flow data. CCTV inspections of the embankment toe drains, and concrete dam pressure relief drains were completed in FY2024. Seepage flow measurement review and analysis is anticipated to be completed by FY2027 prior to the FY2028 CR.

No dam safety related incidents occurred during WY2024.

Angostura Dam entered internal alert on May 13, 2024, after reaching reservoir elevation 3,186 ft (3,187.2 ft is the top of conservation and top of spillway gates). The reservoir elevation was at 3,186.57 ft and inflows were approximately 150 ft^3/s from the Cheyenne River. The Angostura Irrigation District started releasing approximately 100 ft^3/s through the river outlet works and eventually switched to making releases through the Angostura Canal as the District geared up for the irrigation season. The highest elevation for WY2024 was 3,186.68 ft on May 15, 2024. Normal operations were resumed on June 13, 2024, after reaching reservoir elevation 3,185.5 ft and low precipitation forecasted. The Angostura Irrigation District was making irrigation deliveries to Angostura Canal for a release of 118 ft^3/s. Inflows were approximately 20 ft^3/s from the Cheyenne River.

There were no large construction contracts at Angostura in 2024.

Monthly Statistics

In relation to data from 73 years of recordkeeping, the following monthly records or near-records were documented:

- October had its fifth highest inflow and December had its fourth highest inflow.
- No record or near-record end-of-month elevation occurred.

Additional statistical information on Angostura Reservoir and its operations during WY2024 can be found in table DKT 7 and figure DKG 5.

Table DKT 7.—Hydrological Data for Angostura Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	3,163.00	42,205	42,205
Top of active conservation	3,187.20	123,048	80,843
Top of surcharge	3,198.10	180,356	57,308

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	3,180.06	93,004	Oct. 01, 2023
End of year	3,176.54	80,277	Sept. 30, 2024
Annual low	3,176.54	80,277	Sept. 30, 2024
Annual high	3,186.68	120,664	May 15-16, 2023
Historic high	3,189.37	*152,228	May 20, 1978

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	45,684	Oct. 23–Sept. 24	58,182	Oct 23–Sept. 24
Daily peak (ft^3/s)	757.39	Oct. 16, 2023	348.24	June 08, 2024
Daily minimum (ft^3/s)	-87.34	June 29, 2024	0.80	Apr 20, 2024

Month	Inflow		Outflow		Content	
	AF	% of Avg	AF	% of Avg	AF	% of Avg
October	9,558	428	152	14	102,295	105
November	3,290	139	1,323	91	104,262	106
December	4,503	220	3,799	564	104,966	106
January	3,688	164	3,896	666	104,758	104
February	6,318	143	3,224	371	107,852	103
March	3,243	24	130	2	110,965	99
April	7,050	92	61	2	117,954	102
May	6,072	34	6,207	45	117,819	99
June	931	5	8,815	44	109,935	93
July	214	3	13,872	87	96,277	88
August	749	23	11,158	888	85,754	86
September	68	6	5,545	103	80,277	84
Annual	45,684	55	58,182	70		98
April-July	14,267	27	28,955	54		96

* Due to new area-capacity table, the capacity that corresponds to the new historic high elevation is less than a previous high-capacity amount (169,020 AF at elevation 3,189 ft on June 18, 1962)

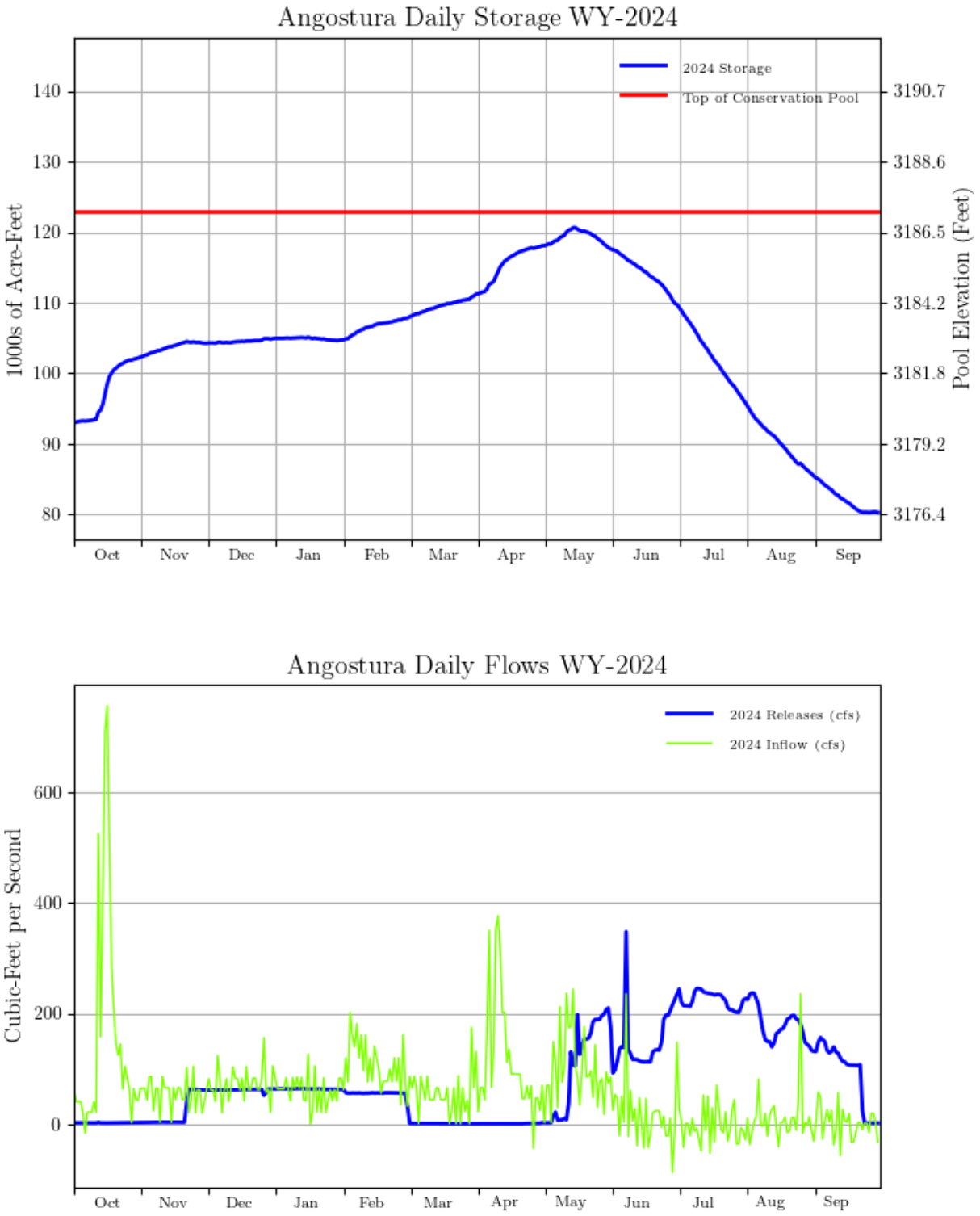


Figure DKG 5.—Angostura storage, inflows, and releases for WY2024.

Belle Fourche Reservoir

Background

Belle Fourche Dam, located near Belle Fourche, SD, was built on Owl Creek, a tributary of the Belle Fourche River. The reservoir has a total capacity of 172,873 AF (169,790 AF active). It is filled by diverting water from the Belle Fourche River through the Inlet Canal, which has a capacity of 1,300 ft^3/s. The reservoir is used for irrigation of 57,000 acres in the Belle Fourche Project, which also receives a supplemental supply from Keyhole Reservoir. From November 1965 - May 1977, the active capacity of the reservoir was temporarily limited to 160,300 AF at elevation 2,981.8 ft until the damaged spillway was replaced.

When the Belle Fourche Reservoir storage right is satisfied by the reservoir filling, the South Dakota Department of Environment and Natural Resources provide guidelines for complying with water rights on the Belle Fourche River. The district is required to continue to bypass 5 ft^3/s for domestic use prior to diverting the Johnson Lateral water right for up to 40 ft^3/s. If flows into the diversion dam are greater than 45 ft^3/s, the district is required to bypass up to 60 ft^3/s for downstream irrigation rights. Any flows exceeding these amounts can be diverted into the reservoir and stored. If all these rights are not needed, the district can divert flows into the reservoir.

Operations Summary

Belle Fourche Reservoir started WY2024 at elevation 2,971.05 ft and with a storage of 142,498 AF of storage, which is 3.95 ft and 30,375 AF below top of conservation pool. Precipitation for WY2024 was 17.37 inches at Belle Fourche Station, 110 percent of average. Inflows for WY2024 totaled 47,338 AF (41 percent of average). Peak inflows occurred in March totaling 11,484 AF for the month. The peak reservoir elevation for WY2024 was 2,974.27 ft, storage of 167,051 AF, occurring on June 3, 2024. The minimum elevation for WY2024 was 2,960.89 ft, storage of 79,567 AF, occurring on September 26, 2024. WY2024 ended at elevation 2,961 ft and storage of 80,141 AF, which is 14 ft and 92,732 AF below the top of the conservation pool. Belle Fourche Reservoir ended the water year with 77,058 AF in active storage.

The Belle Fourche Irrigation District (BFID) had a full water allotment of 18 inches for its irrigators. The North Canal and South Canals were turned on May 6, 2024. Releases reached a peak of 360 ft^3/s on July 26, 2024, for North Canal and a peak of 260 ft^3/s on August 6, 2024, for South Canal. The North and South Canal were both shut off on September 27, 2024. Total irrigation releases for the 2024 season were 113,652 AF and total deliveries were 62,728 AF.

An emergency management/security tabletop exercise was held on March 14, 2024.

The annual site inspection for Belle Fourche Dam was conducted on June 18, 2024.

There are no incomplete SOD recommendations.

No dam safety related incidents occurred in 2024.

Belle Fourche Road Maintenance Contract No. 140R6023C0003 was awarded to Bachman Construction LLC in 2024 with a base year and four option years. The total amount of the contract with all option years is $260,860.00. The contract includes watering, scarifying, blading and mowing road shoulders for approximately 15.5 miles of government managed gravel roads and two gravel parking areas at Belle Fourche Reservoir six times per year during the summer recreation seasons. It also includes loading, delivering, and dressing government supplied gravel as needed. This contract will extend into FY2025.

Monthly Statistics

In relation to data from 73 years of recordkeeping, the following monthly records or near-records were documented:

- October had its second lowest inflow, November had its lowest inflow, December had its lowest inflow, and January had its fourth lowest inflow.
- October had its second highest end-of-month elevation and November had its fifth highest elevation.

Additional statistical information on Belle Fourche Reservoir and its operations during WY2024 can be found in table DKT 8 and figure DKG 6.

Table DKT 8.—Hydrological Data for Belle Fourche Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of dead	2,927.00	3,083	3,083
Top of active conservation	2,975.00	172,873	169,790
Top of surcharge	2,984.40	259,012	86,139
Storage-Elevation Data	**Elevation (ft)**	**Storage (AF)**	**Date**
Beginning of year	2,971.11	142,939	Oct. 01, 2023
End of year	2,961.00	80,141	Sept. 30, 2024
Annual low	2,960.89	79,567	Sept. 26, 2024
Annual high	2,974.27	167,051	June 03, 2024
Historic high	2,975.92	196,792	May 30, 1996

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	47,338	Oct. 23–Sep 24	109,695	Oct. 23–Sept. 24
Daily peak (ft^3/s)	1,176.79	Sept. 17, 2024	610	*
Daily minimum (ft^3/s)	-1,151.71	Sept. 18, 2024	0	**

	Inflow		Outflow		Content	
Month	Af	% of Avg	Af	% of Avg	Af	% Of Avg
October	-660	-6	658	111	141,180	184
November	-1,605	-17	0	0	139,575	162
December	-870	-10	0	0	138,705	146
January	-72	-1	0	0	138,633	134
February	9,345	100	0	0	147,978	131
March	11,484	73	0	0	159,462	125
April	3,109	23	0	0	162,571	115
May	9,926	68	6,316	83	166,181	112
June	7,355	64	20,969	126	152,567	107
July	-795	-20	34,660	97	117,112	105
August	4,625	159	29,151	85	92,586	117
September	5,496	107	17,941	105	80,141	119
Annual	47,338	41	109,695	97		127
April-July	19,595	45	61,945	103		110

* Occurred on five nonconsecutive days in late July and early August

** Frequently observed during fall and winter months

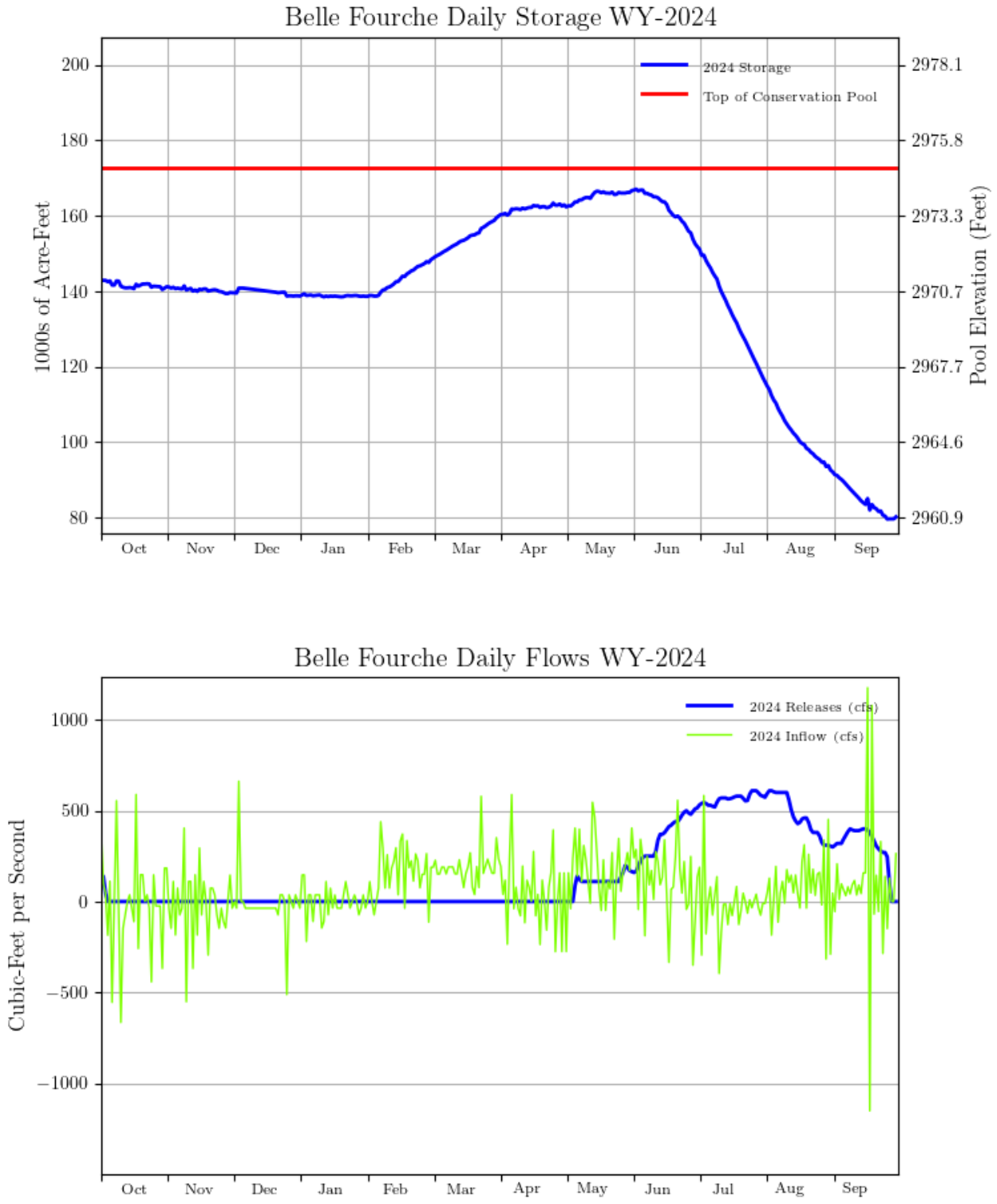


Figure DKG 6.—Belle Fourche storage, inflows, and releases for WY2024.

Deerfield Reservoir

Background

Deerfield Dam is located on Castle Creek, a tributary of Rapid Creek above Rapid City. Deerfield Reservoir and Pactola Reservoir furnish a supplemental irrigation supply to about 8,900 acres in the Rapid Valley Water Conservancy District and furnish replacement water for a portion of the water used from Rapid Creek by Rapid City. A contract is in place between the United States, Rapid City, South Dakota, and the district for the storage space at Deerfield Reservoir. Most prior rights to the flows of Rapid Creek during the irrigation season are held by individuals and ditch companies in the Rapid Valley Water Conservancy District.

In 1985, Deerfield Dam was modified to accommodate a larger flood as determined from the results of the probable maximum flood analysis. These modifications consisted of raising the crest of the dam 38 ft, excavating an unlined auxiliary spillway, removing, and filling in the old spillway, and extending the existing emergency gate passageway to the new control house at the higher crest elevation. The reservoir has a total capacity of 15,654 AF with an additional 26,657 AF of surcharge capacity.

During the winter of 1995–1996 the hollow jet valves were removed to allow the installation of the jet flow valves as part of the outlet works modification contract. The work was done to improve fish habitat in 1.5 miles of the creek immediately downstream from the dam. The stream improvement project was a cooperative effort accomplished by the City of Rapid City, Rapid Valley Water Conservancy District, Black Hills Fly Fishers, Bureau of Reclamation, U.S. Forest Service, and SD Game Fish and Parks. The project modified the outlet works of Deerfield Dam by installing Jet Flow Gates to allow greater minimum winter releases than the 6-inch bypass can provide.

Operations Summary

Deerfield Reservoir started WY2024 at elevation 5,906.53 ft and with a storage of 15,048 AF, which is 1.47 ft to full and 606 AF below the top of the conservation pool. Precipitation for WY2024 was 20.42 inches, 142 percent of average. Inflows for WY2024 totaled 10,156 AF, 96 percent of average. Peak inflows occurred in May, totaling 1,245 AF for the month. The peak reservoir elevation for WY2024 was 5,907.73 ft, storage of 15,550 AF and occurred on June 10, 2024. The minimum elevation for WY2024 was 5,905.43 ft, with a storage of 14,595 AF, and occurred on September 25, 2024. WY2024 ended at elevation 5,905.6 ft and with a storage of 14,665 AF, which is 2.40 ft and 989 AF below the top of the conservation pool. Deerfield ended the water year with 14,514 AF in active storage.

Natural flows in Rapid Creek were below average above the Canyon Lake stream gage but were more normal through Rapid City based on the Rapid Creek at Rapid City stream gage. The city of Rapid City purchased 234 AF of storage water from Pactola for WY2024. Otherwise, there were enough natural flows to meet the water demands so Rapid Valley Water Conservancy

District did not purchase storage water from Deerfield for irrigation in WY2024. Rapid City did not purchase storage water from Deerfield for municipal use in WY2024.
An emergency action plan orientation meeting was held on March 12, 2024.

The annual site inspection for Deerfield Dam was conducted on July 9, 2024. There are no incomplete SOD recommendations.

No dam safety related incidents occurred in 2024.

No construction contracts occurred at Deerfield Dam in 2024.

Monthly Statistics

In relation to data from 72 years of recordkeeping, the following monthly records or near-records were documented:

- No record or near-record inflow was documented.
- November had its third highest end-of-month elevation.

Additional statistical information on Deerfield Reservoir and its operations during WY2024 can be found in table DKT 9 and figure DKG 7.

Table DKT 9.—Hydrological Data for Deerfield Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of dead	5,839.00	151	151
Top of active conservation	5,908.00	15,654	15,503
Top of surcharge	5,953.00	42,311	26,657
Storage-Elevation Data	**Elevation (ft)**	**Storage (AF)**	**Date**
Beginning of year	5,906.57	15,064	Oct. 01, 2023
End of year	5,905.60	14,665	Sept. 30, 2024
Annual low	5,905.43	14,595	Sept. 25–26, 2024
Annual high	5,907.73	15,550	June 10, 2024
Historic high	5,909.05	16,157	Feb. 25, 1985

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	11,131	Oct. 23–Sept. 24	10,539	Oct 23–Sept. 24
Daily peak (ft^3/s)	126.46	Mar. 30, 2024	78.43	May 24, 2024
Daily minimum (ft^3/s)	-128.74	June 28, 2024	10	*

	Inflow		Outflow		Content	
Month	AF	% of Avg	AF	% of Avg	AF	% of Avg
October	1,025	143	799	98	15,185	118
November	962	149	799	171	15,348	118
December	886	132	1,107	260	15,127	114
January	957	144	1,107	265	14,730	109
February	848	139	901	218	14,677	107
March	1,140	123	653	100	14,977	107
April	1,007	82	728	69	15,256	108
May	1,339	92	1,048	76	15,453	109
June	636	49	1,087	82	15,002	106
July	819	86	799	67	14,829	106
August	820	111	799	66	14,685	109
September	692	104	712	63	14,665	113
Annual	11,131	106	10,539	101		110
April–July	3,801	77	3,662	74		107

* Occurred frequently in March, April and September

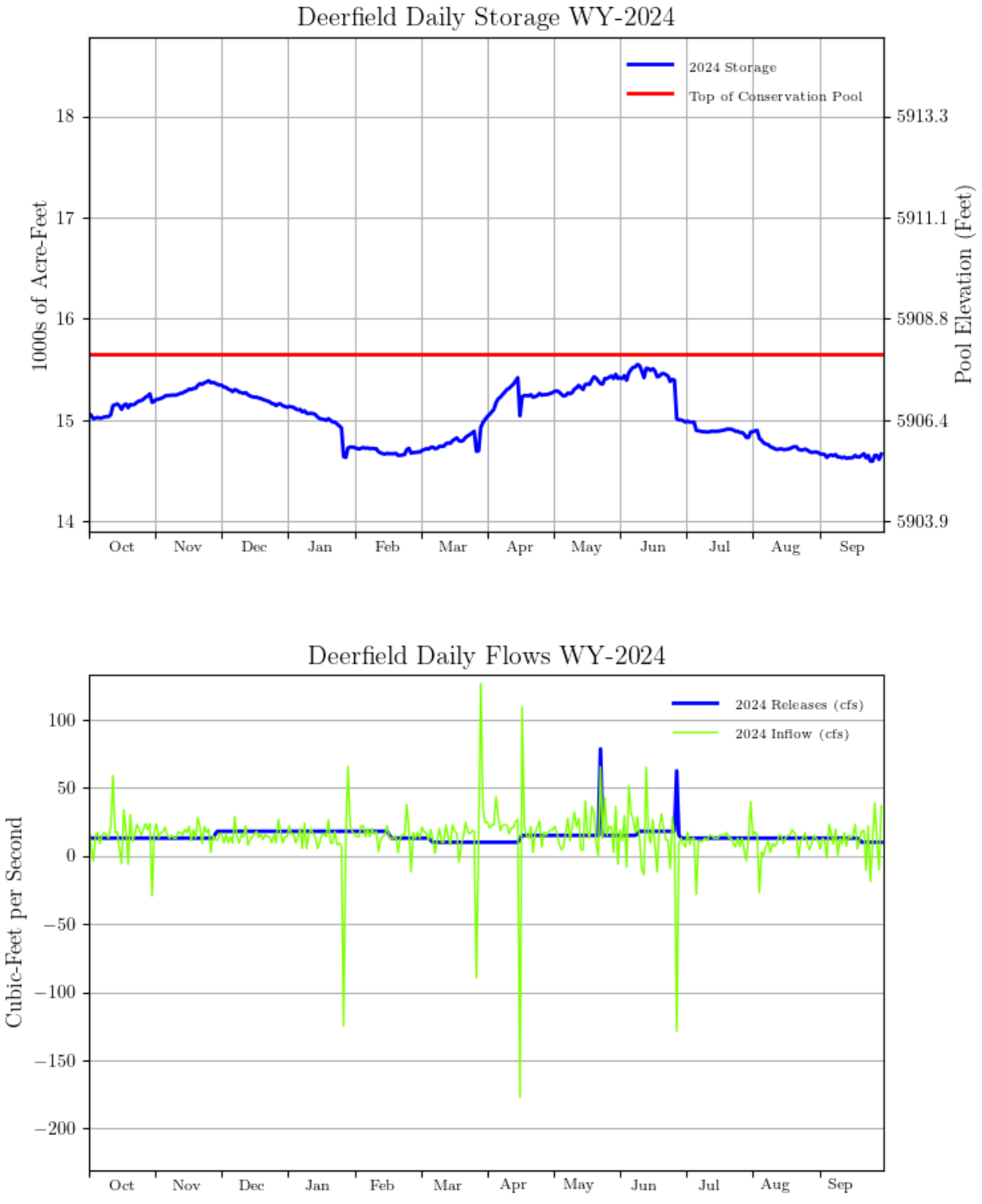


Figure DKG 7.—Deerfield storage, inflows, and releases for WY2024.

Keyhole Reservoir

Background

Keyhole Dam is located on the Belle Fourche River below Moorcroft, WY. The reservoir has a conservation capacity of 188,671 AF (182,079 AF active) and 140,463 AF of exclusive flood control space. It was constructed to furnish a supplemental irrigation supply to 57,000 acres in the Belle Fourche Project and for flood control. Keyhole Reservoir is subject to the Belle Fourche River Compact, and the inflows and storage in the reservoir are allocated 10 percent to Wyoming users and 90 percent to South Dakota users, subject to prior rights. On January 3, 1963, the Belle Fourche Irrigation District executed a long-term contract for the use of 7.7 percent of active storage space in the reservoir. This space will be used to store water belonging to the irrigation district under its prior water right along with the district's pro rata share of storable inflows to Keyhole Reservoir. On January 1, 1985, the Crook County Irrigation District's contract for 18,080 AF of space in Keyhole Reservoir became effective. The allocated space is used by each organization to store its pro rata share of inflows to Keyhole Reservoir. The flood control space at Keyhole Reservoir is all located above an ungated spillway. The spillway capacity is 11,000 ft^3/s at maximum water surface elevation. The downstream safe channel capacity is 3,000 ft^3/s. Formulas for forecasting inflows have not been developed. Research by the Soil Conservation Service during water years 1992–1994 show that inflow forecasting to Keyhole Reservoir is not reliable since there is no consistent snowpack and precipitation is highly cyclical. No further efforts to develop forecast models are planned.

Reclamation's Sedimentation and River Hydraulics Group of the Technical Service Center in Denver conducted a sedimentation survey of Keyhole Reservoir in 2003 and provided a survey report and new area and capacity tables in July of 2005. The previous survey was done in 1978. Keyhole Reservoir accumulated 5,082 AF of sediment since the previous survey. Since construction in 1952, Keyhole has accumulated 12,495 AF of sediment. The sedimentation rate from 1952-2003 has averaged 240 AF per year. The new Area and Capacity Tables were first used in WY2006.

Operations Summary

Keyhole Reservoir started WY2024 at elevation 4,092.67 ft and storage of 133,640 AF, which is 6.63 ft and 55,031 AF below the top of the conservation pool. Precipitation for WY2024 was 14.97 inches, 78 percent of average. Inflows for WY2024 totaled -12,219 AF (seepage and evaporation was greater than inflow). Peak inflows occurred in May, totaling 3,536 AF for the month. The peak reservoir elevation for WY2024 was 4,092.67 ft, with a storage of 134,640 AF, occurring on May 21, 2024. The minimum elevation for WY2024 was 4,089.38 ft, storage of 111,855 AF, occurring on September 27, 2024. WY2024 ended at elevation 4,089.4 ft and storage of 111,977 AF, which is 9.9 ft and 76,694 AF below the top of the conservation pool. Keyhole Reservoir ended the water year with 105,385 AF in active storage.

There was irrigation releases ordered by both the Belle Fourche Irrigation District (BFID) and the Crook County Irrigation District (CCID) for WY2024. BFID ordered 5,001 AF. The CCID ordered 869 AF. The BFID and CCID releases began July 16, 2024 and ended August 21, 2024 with a total of 97 AF used from storage.

An emergency action plan orientation meeting was held March 6, 2024.

The mechanical and civil inspection for the comprehensive review (CR) was conducted on April 30, 2024. The final CR report hasn't been issued but it is anticipated there will be a SOD recommendation.

No dam safety related incidents occurred at Keyhole in 2024.

There were no construction contracts at Keyhole in 2024.

Monthly Statistics

In relation to data from 73 years of recordkeeping, the following monthly records or near-records were documented:

- March had its lowest inflow; June had its fourth lowest inflow and September had its second lowest inflow.
- No record or near-record end-of-month elevation occurred.

Additional statistical information on Keyhole Reservoir and its operations during WY2024 can be found in table DKT 10 and figure DKG 8.

Table DKT 10.—Hydrological Data for Keyhole Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	4,051.00	6,592	6,592
Top of active conservation	4,099.30	188,671	182,079
Top of exclusive flood control	4,111.50	329,134	140,463
Top of surcharge	4,128.73	623,943	294,809
Storage-Elevation Data	**Elevation (ft)**	**Storage (AF)**	**Date**
Beginning of year	4,092.24	130,585	Oct. 01, 2023
End of year	4,089.40	111,977	Sept. 30, 2024
Annual low	4,089.38	111,855	Sept. 27, 2024
Annual high	4,092.67	133,640	May 21, 2024
Historic high	4,100.38	210,222	May 21, 1978

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	-12,219	Oct. 23–Sept. 24	5,968	Oct. 23–Sept. 24
Daily peak (ft^3/s)	460.81	May 7, 2024	96.96	July 26, 2024
Daily minimum (ft^3/s)	-351.40	July 05, 2024	0	*

	Inflow		Outflow		Content	
Month	AF	% of Avg	AF	% of Avg	AF	% of Avg
October	-559	142	0	0	129,605	132
November	-489	153	0	0	129,116	132
December	-69	-37	0	0	129,047	132
January	69	14	0	0	129,116	132
February	419	16	0	0	129,535	129
March	-279	-4	0	0	129,256	120
April	419	17	0	0	129,675	121
May	3,536	73	0	0	133,211	120
June	-3,188	-105	0	0	130,023	116
July	-3,592	402	2,707	70	123,724	116
August	-3,955	209	3,261	92	116,508	115
September	-4,531	263	0	0	111,977	113
Annual	-12,219	-75	5,968	41		123
April–July	-2,825	-30	2,707	31		118

* Occurred entire year except for parts of July and August

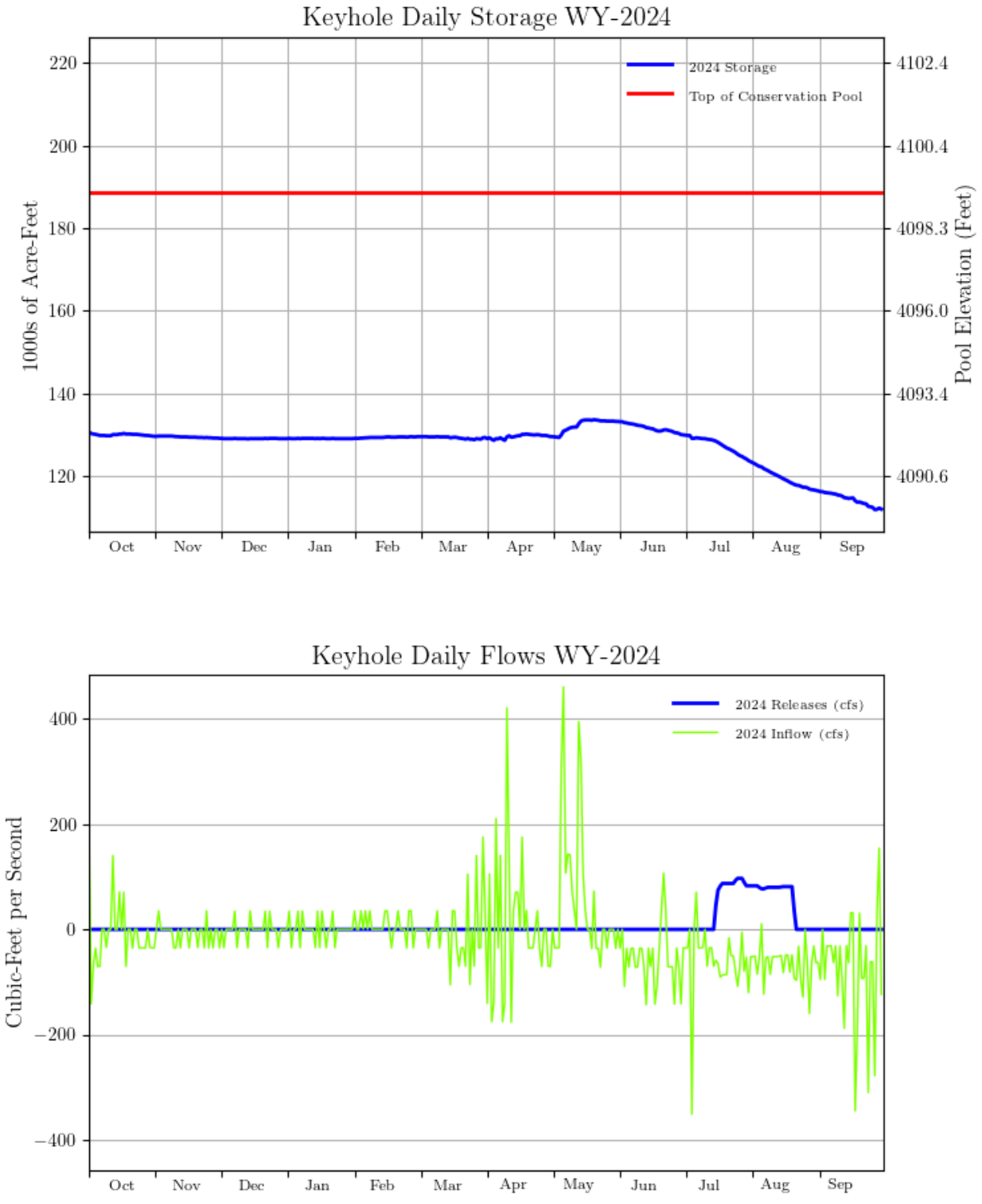


Figure DKG 8.—Keyhole storage, inflows, and releases for WY2024.

Pactola Reservoir

Background

Pactola Dam is located on Rapid Creek above Rapid City, SD and acts in conjunction with Deerfield Reservoir to furnish a supplemental irrigation supply to about 8,900 acres in the Rapid Valley Water Conservancy District, replacement water for Rapid City, and a supply of domestic water for private water systems both above and below the city. The reservoir is also operated to provide flood control. It has a conservation capacity of 55,972 AF (54,955 AF active) and 43,057 AF of exclusive flood control space. The flood control space is all below the ungated spillway crest, and releases in this pool are controlled by the river outlet works. Rapid City has contracts for Pactola and Deerfield Reservoir water. The Rapid Valley Sanitation District and Hisega Meadows Water Inc. also have contracts for water service from Pactola Reservoir. Operation of the two reservoirs is integrated to maintain as much water as possible in the upstream facility, Deerfield Reservoir, and at the same time maintain a uniform outflow from Deerfield to maximize fishery benefits in the stream between the reservoirs. Since no inflow forecasts are available, the reservoir is normally operated as full as possible. Two SNOTEL (North Rapid Creek and Blind Park) sites were installed in the Pactola and Deerfield drainage basin in May of 1990.

As part of the Safety Examination of Existing Structures (Safety of Dams) Program, a study was made in the early 1980s to determine the adequacy of Pactola Dam, Spillway, and Reservoir to safely pass the new inflow design flood (IDF). The studies showed that the facility was not able to safely handle the new IDF. Modification work was completed in 1987 and provided sufficient surcharge storage and spillway capacity to pass the IDF. Modification work consisted of raising the crest of the dam 15 ft, widening the existing rock-cut spillway chute and stilling basin from 240 ft to 425 ft, relocating Highway 385 to the new dam crest, extending the existing gate access shaft to the higher crest elevation, and reconstructing a new two-level gate control house at the higher crest elevation.

A new long-term storage contract was signed on July 31, 2007, between Reclamation and Rapid City. The contract provides storage space of 49,000 AF for Rapid City and 6,000 AF was retained by Reclamation.

Operations Summary

Pactola Reservoir started WY2024 at elevation 4,577.18 ft and with a storage of 53,420 AF, which is 3.02 ft and 2,552 AF below the top of the conservation pool. Precipitation for WY2024 was 23.93 inches, 116 percent of average. Inflows for WY2024 totaled 29,287 AF (75 percent of average). Peak inflows occurred in May, totaling 3,877 AF for the month. The peak reservoir elevation for WY2024 was 4,579.79 ft, with a storage of 55,625 AF, occurring on June 27, 2024. The minimum elevation for WY2024 was 4,572.85 ft, with a storage of 49,922 AF, occurring on September 30, 2024. WY2024 ended at elevation 4,572.85 ft and storage of 49,922 AF, which is

7.35 ft and 6,050 AF below the top of the conservation pool. Pactola Reservoir ended the water year with 48,905 AF in active storage.

Natural flows in Rapid Creek were below average above the Canyon Lake stream gage but were more normal through Rapid City based on the Rapid Creek at Rapid City stream gage. Rapid City purchased 234 AF of storage water from Pactola for WY2024. Otherwise, there were enough natural flows to meet the water demands so Rapid Valley Water Conservancy District did not purchase storage water from Deerfield for irrigation in WY2024. Rapid City did not purchase storage water from Deerfield for municipal use in WY2024.

An emergency action plan orientation meeting was held on March 12, 2024.

The annual site inspection for Pactola Dam was conducted on July 11, 2024. There is one incomplete SOD recommendation regarding an issue evaluation (IE) study to understand the risks with static potential failure modes at the dam. The inundation study was completed in November 2024 and PAR estimate was completed in January 2024. Consequences will be re-estimated using RCEM in 2027 in conjunction with the next CR.

No dam safety related incidents occurred at Pactola Dam during 2024.

No construction contracts occurred at Pactola Dam during 2024.

Monthly Statistics

In relation to data from 69 years of recordkeeping, the following monthly records or near-records were documented:

- No record or near-record end-of-month inflow occurred.
- No record or near-record end-of-month elevation occurred.

Additional statistical information on Pactola Reservoir and its operations during WY2024 can be found in table DKT 11 and figure DKG 9.

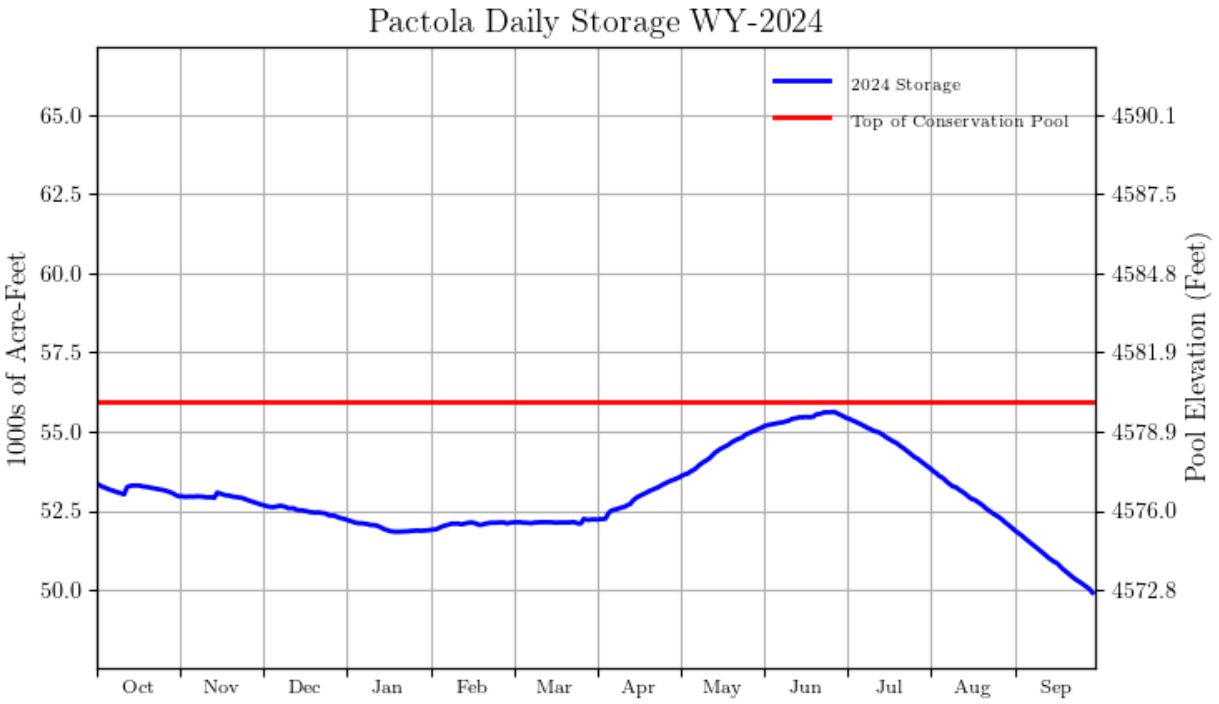
Table DKT 11.—Hydrological Data for Pactola Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of inactive and dead	4,456.10	1,017	1,017
Top of active conservation	4,580.20	55,972	54,955
Top of exclusive flood control	4,621.50	99,029	43,057
Top of surcharge	4,651.70	140,921	41,892

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of year	4,577.11	53,361	Oct. 01, 2023
End of year	4,572.85	49,922	Sept. 30, 2024
Annual low	4,572.85	49,922	Sept. 30, 2024
Annual high	4,579.79	55,623	June 27, 2024
Historic high	4,589.43	64,246	June 29, 2015

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	30,128	Oct. 23–Sept. 24	32,785	Oct. 23–Sept. 24
Daily peak (ft^3/s)	161.62	Oct. 12, 2023	64.63	Oct. 02, 2023
Daily minimum (ft^3/s)	-7.92	Sept. 30, 2024	34.26	Mar. 28, 2024

Month	Inflow		Outflow		Content	
	AF	% of Avg	AF	% of Avg	AF	% of Avg
October	2,601	112	3,507	154	52,964	116
November	2,414	138	2,677	168	52,701	115
December	2,339	156	2,805	177	52,235	114
January	2,313	148	2,647	177	51,901	113
February	2,629	170	2,393	178	52,137	113
March	2,299	89	2,201	118	52,235	112
April	3,344	77	2,093	70	53,486	111
May	4,103	59	2,270	40	55,093	112
June	2,823	40	2,388	36	55,528	112
July	2,164	50	3,400	57	53,953	112
August	1,894	64	3,564	83	52,007	113
September	1,205	52	3,290	112	49,922	110
Annual	30,128	77	32,785	86		113
April–July	12,434	55	10,151	48		112



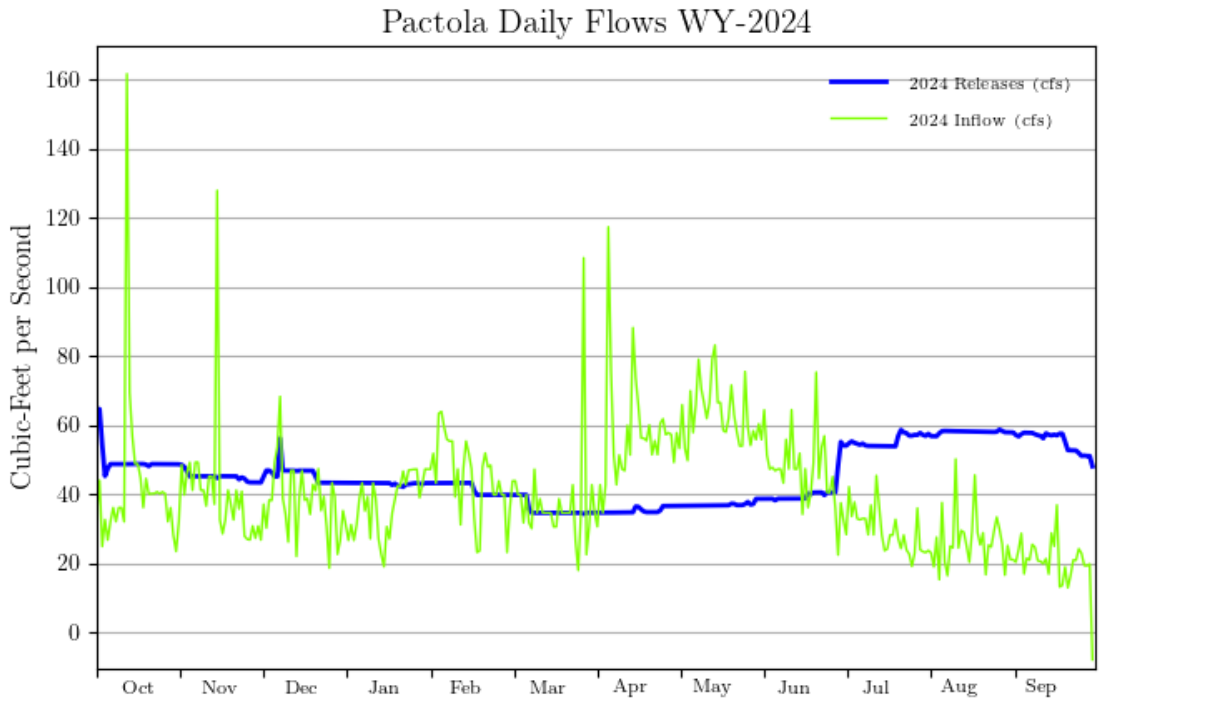


Figure DKG 9.—Pactola storage, inflows, and releases for WY2024.

Shadehill Reservoir

Background

Shadehill Dam is located on the Grand River near Shadehill, South Dakota, and was constructed for irrigation of 9,700 acres and for flood control, recreation, and fish and wildlife purposes. The reservoir has a dead and conservation capacity totaling 120,172 AF with an additional exclusive flood control capacity of 230,004 AF and a surcharge capacity of 119,560 AF. Flood control space is all located above the crest of an un-gated glory-hole spillway. Because of the questionable quality of water, it was decided to postpone construction of distribution works for irrigation.

After further study, it was concluded that water from Shadehill Reservoir can be used for sustained irrigation if certain limitations of soils, leaching water, soil amendments, and drainage are met. A definite plan report covering 6,700 acres which meets these limitations has been completed, approved by the Commissioner, and released for distribution. On December 17, 1963, landowners within the area voted 24 to 21 against formation of an irrigation district. Further action on development of the area was deferred until the attitude of the landowners was more favorable. Pending more extensive irrigation development, an additional 51,500 AF of space between elevations 2,260 ft and 2,272 ft was allocated to flood control. Allocations and evacuation of this space was made possible by modification of the outlet works in 1969 to permit a discharge of 600 ft^3/s to the river. In June 1975, the West River Conservancy Sub-District was formed combining all but one of the old individual contracts for water supply from the reservoir into one. Acreage contracted for by the district was 5,000 acres; however, only 3,064 acres were developed. On March 18, 1986, the contract between Reclamation and the West River Conservancy Sub-District was assigned to the Shadehill Water User District, an organization, which succeeded the Sub-District under South Dakota law. This contract has expired and presently conservation releases are meeting irrigation demands. Should irrigation releases be required a temporary water service contract will need to be executed with the Shadehill Water User District.

Because certain release criteria reduced the effectiveness of flood control operations in the zone between elevations 2,260 ft and 2,272 ft, and because the USACE has constructed Bowman Haley Reservoir upstream from Shadehill Reservoir with 53,800 AF of flood control space, the USACE requested that the interim flood control agreement be terminated and that responsibility for the operations of Shadehill Reservoir when the pool is between elevations 2,260 ft and 2,272 ft revert to Reclamation. By a revised field working agreement dated May 15, 1972, it was agreed that the space between elevations 2,260 ft and 2,272 ft (51,500 AF) be reallocated to conservation use. However, space below elevation 2,272 ft will continue to be evacuated before the start of the spring runoff, but to a lesser extent than in the past.

Operations Summary

Shadehill Reservoir started WY2024 at elevation 2,271.19 ft and with a storage of 116,151 AF, which is 0.81 ft and 4,021 AF below the top of the conservation pool. Precipitation for WY2024 was 20.55 inches which was 115 percent of average. Inflows for WY2024 totaled -19,604 AF. Peak inflows occurred in April, totaling 558 AF for the month. The peak reservoir elevation for WY2024 was 2,271.16 ft, storage of 116,003 AF, occurring on October 1, 2023. The minimum elevation for WY2024 was 2,263.03 ft, storage of 80,608 AF, and occurring on September 30, 2024. WY2024 ended at elevation 2,263.03 ft and storage of 80,608 AF, which is 8.97 ft and 39,564 AF below the top of the conservation pool. Shadehill Reservoir ended the water year with 36,739 AF in active storage.

All irrigation demands were met from river maintenance releases. There were no storage releases for irrigation needed during WY2024.

An emergency action plan orientation meeting was held on March 27, 2024.

An annual site inspection for Shadehill Dam was conducted on August 13, 2024. There was one SOD recommendation to permanently abandon the hydraulic piezometer (HP) terminal well at Shadehill Dam by backfilling with ASTM C33 concrete sand. DKAO abandoned the hydraulic piezometer well by filling it with sand in July 2024. The project completion report was transmitted in July 2024 and the OVIC and L-23 were revised in August 2024 to include inspections around the abandoned well. A decision memo for completion was issued on February 20, 2025.

No dam safety related incidents occurred at Shadehill in 2024.

No construction contracts occurred at Shadehill in 2024.

Monthly Statistics

In relation to data from 73 years of recordkeeping, the following monthly records or near-records were documented:

- October had its lowest inflow, November had its second lowest inflow, December had its fourth lowest inflow, March had its lowest inflow, April had its fifth lowest inflow, May had its second lowest inflow, August had its lowest inflow, and September had its lowest inflow.
- No record or near-record end-of-month elevation occurred.

Additional statistical information on Shadehill Reservoir and its operations during WY2024 can be found in table DKT 12 and figure DKG 10.

Table DKT 12.—Hydrological Data for Shadehill Reservoir WY2024

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of dead	2,250.80	43,869	43,869
Top of active conservation	2,272.00	120,172	76,303
Top of exclusive flood control	2,302.00	350,176	230,004
Top of surcharge	2,312.00	469,736	119,560
Storage-Elevation Data	**Elevation (ft)**	**Storage (AF)**	**Date**
Beginning of year	2,271.16	116,003	Oct. 01, 2023
End of year	2,263.03	80,608	Sept. 30, 2024
Annual low	2,263.03	80,608	Sept. 30, 2024
Annual high	2,271.16	116,003	Oct. 01–02, 2024
Historic high	2,297.90	318,438	Apr. 10, 1952

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual total (AF)	-19,604	Oct. 23-Sept. 24	16,619	Oct. 23-Sept. 24
Daily peak (ft^3/s)	113.18	Apr. 21-May 6, 24	25.07	Oct. 11–13, 23
Daily minimum (ft^3/s)	-258.03	Sept. 04, 2024	19.42	Sept. 30, 2024

	Inflow		Outflow		Content	
Month	AF	% of Avg	AF	% of Avg	AF	% of Avg
October	-3,476	-275	1,496	39	111,859	103
November	-1,427	-162	1,448	44	108,894	103
December	-908	-120	1,476	59	106,600	102
January	-716	-80	1,450	62	104,434	102
February	255	8	1,350	65	103,339	99
March	-338	-1	1,424	13	101,577	87
April	558	-3	1,365	8	100,770	84
May	-819	-7	1,399	14	89,552	82
June	21	0	1,334	16	97,239	80
July	-791	-23	1,373	26	95,075	80
August	-7,118	-2,498	1,319	32	86,638	75
September	-4,845	13,095	1,815	34	80,608	72
Annual	-19,604	-27	16,619	23		89
April–July	-1,031	-2	5,471	13		82

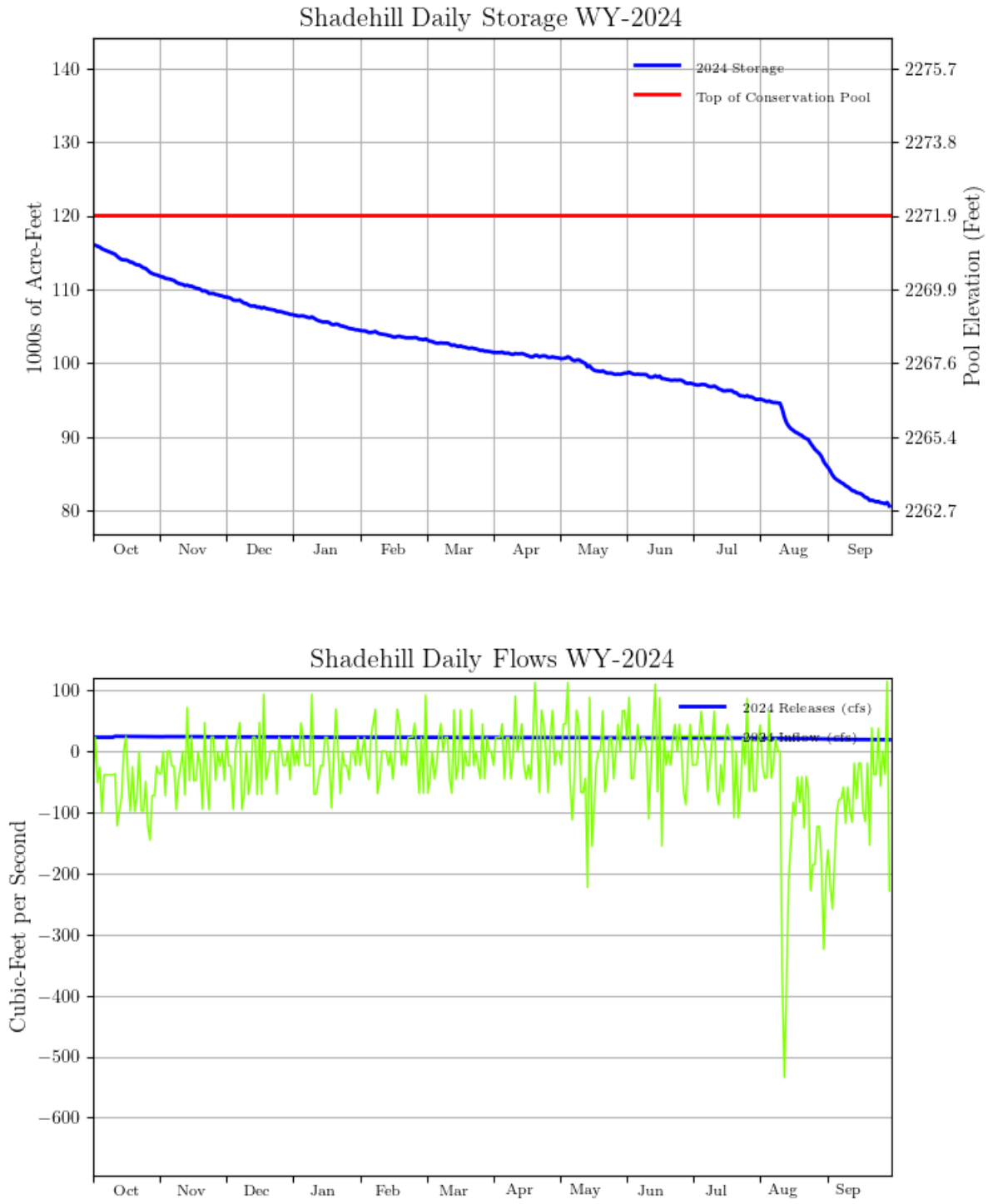


Figure DKG 10.—Shadehill storage, inflows, and releases for WY2024.

Unit Operational Summaries for Water Year 2024

Dickinson Reservoir

The reservoir is normally operated as full as possible. Excess water will be released by spilling over the Bascule gate after the reservoir has filled, and by gated releases through the 24-inch river outlet valve. No releases are planned until irrigation water is required or if the spring runoff deems it necessary for flood protection.

Heart Butte Reservoir

Since there are no accurate inflow forecasts available, plans are to operate the reservoir as close to the top of the conservation pool as possible while regulating releases required, maintaining downstream conservation commitments, and preserving flood control space. During winter months, and when the reservoir level is below the spillway crest at elevation 2,064.5 ft, the river releases will be maintained at about 10 ft^3/s to ensure a live stream flow below Heart Butte Dam. This will continue through the winter until the spring runoff requires higher releases sometime in late March or early April. Excess water is released only when the reservoir is full or forecasted to fill.

Jamestown Reservoir

Water releases will be shut off when the reservoir elevation reaches approximately 1,429.8 ft and will continue shut throughout the winter until spring runoff requires releases to be made for flood control. The reservoir is normally operated under the following criteria and limitations set forth in the Field Working Agreement between the USACE and Reclamation that reads:

Flood Control Regulation of Joint-Use Pool

The joint space between elevations 1,428 ft and 1,431 ft will be used for seasonal multipurpose regulation. For purposes of flood control storage, the reservoir water elevation will be no higher than 1,429.8 ft at the beginning of spring runoff period. That portion of the joint-use pool between elevations 1,429.8 ft and 1,431.0 ft will be used for storage and regulation of the spring runoff and summer rainstorms. In addition, water stored in this zone may be used during the summer months for conservation purposes. Storage remaining in the joint-use pool above elevation 1,429.8 ft after September 1 will be evacuated as directed by the USACE.

Reclamation has the option of lowering the reservoir below elevation 1,429.8 ft should it be desirable based on water supply needs. There are no requirements for maintaining a specified minimum reservoir release.

Season: Beginning of Spring Runoff to September 1

Elevation 1,429.8 ft (base of flood control zone) to elevation 1,431 ft (top of joint use pool)

Release greater of:

- Conservation releases, or
- Based on inflows occurring at the time and the existing potential for further inflows, releases will be maintained as necessary to result in a pool elevation of 1,431 ft at the time inflows cease.

Season: September 1 to November 1

Make releases necessary to evacuate reservoir to elevation 1,429.8 ft prior to November 1.

Season: November 1 to Beginning of Spring Runoff

Make releases necessary to maintain elevation 1,429.8 ft.

Angostura Reservoir

Since Angostura Reservoir is the principal source of water for the Angostura Irrigation District and no accurate inflow forecasts are available for this reservoir, it is normally operated as full as possible. Water may be released from the facility if the reservoir is expected to fill to meet irrigation demands; excess water is released through the spillway – or, for larger events, through the river outlet and then the gates – when the reservoir is nearly full or assured of filling.

Releases are made from Angostura Reservoir for flood control or irrigation requirements. Flood control releases are not expected unless precipitation events fill the reservoir.

Spillway contract work will begin in 2025.

Belle Fourche Reservoir

Normal operation at the Diversion Dam during the winter is to maintain flows in the Inlet Canal to store water in Belle Fourche Reservoir. A bypass of 5 ft^3/s is made at the Belle Fourche Diversion Dam to provide flows for domestic use between the diversion dam and the Belle Fourche River confluence with Owl Creek. No releases from the reservoir are planned until irrigation begins in the spring. When the volume of water supply available from the reservoir can be estimated in May or June, the Belle Fourche Irrigation District will establish allotments of water to each irrigator and the storage will be used accordingly. The Standing Operating Procedures for Belle Fourche Dam limit the maximum drawdown of the reservoir to 0.3 ft/day as established in the 1984 Safety Evaluation of Existing Dams report.

Higher rates of drawdown are acceptable if the total drawdown is limited to 20 ft. This restriction will affect delivery rates to water users in the late summer if the reservoir does not fill. At low reservoir levels, the draw down rate becomes the governing factor for releases.

Deerfield Reservoir

A target of 15,000 AF of storage by March 1 will usually dictate the winter release, which is set near December 1. The winter release is set based on water usage from Deerfield by the Rapid Valley Water Conservancy District (District) and the storage target of 15,000 AF by March 1. The goal is to be near full by May 1, the start of the irrigation season.

A release of around 13 ft^3/s will be maintained until the spring runoff requires higher releases in late March or early April. Excess water is normally released only when the reservoir is full or assured of filling. Since no inflow forecasts are available, the reservoir is normally operated as full as possible. Two SNOTEL sites (North Rapid Creek and Blind Park) are operated in the Pactola and Deerfield drainage basin. Deerfield storage may be required to meet District irrigation needs in WY2025.

The jet flow gates are used for winter releases and provide minimum stream flows of 6 ft^3/s, enhancing winter fishery conditions in Castle Creek and improving fishery production conditions in the stream. In addition, the bypass pipe is operated during the winter to avoid freezing with a maximum discharge of 2 ft^3/s.

Storage at the end of water year will depend on the amount of inflow to the Pactola-Deerfield system and the need for project water deliveries from Deerfield Reservoir. During average and above average inflow years, summer releases will be made to bring the reservoir storage to about 14,900 AF by September 30. This is to accommodate minimum releases of 6 ft^3/s into Castle Creek during the winter. The actual release will depend on runoff conditions and will consider downstream ice conditions in Castle Creek.

Keyhole Reservoir

Releases from Keyhole Reservoir are made for either irrigation requirements or flood control. Releases are not anticipated from the reservoir from October–May. Flood control releases are not expected unless extreme precipitation events fill the reservoir.

Discharges from toe drains of the dam and downstream inflows normally satisfy downstream requirements for stock water and other minor uses during this period. Releases from storage accounts will be made during the summer in response to irrigation demand from the Belle Fourche Irrigation District in South Dakota and the Crook County Irrigation District in Wyoming. Each organization maintains a storage account in Keyhole Reservoir and the contract with the Belle Fourche Irrigation District also includes provisions for the annual purchase of additional unsold South Dakota storage. Peak irrigation demand releases are normally between 125 and 175 ft^3/s.

The Belle Fourche Irrigation District has lands along the inlet canal that during drought conditions can depend entirely on Keyhole Reservoir for storage. These lands are served with flows from the Belle Fourche River and storage from Keyhole. Additionally, water contracted by Belle Fourche Irrigation District may be released from Keyhole Reservoir to supplement storage in Belle Fourche Reservoir if necessary. Finally, Crook Country Irrigation District also contracts irrigation water from Keyhole Reservoir.

Pactola Reservoir

Although it is not mandatory, if possible, Pactola Releases can be adjusted during the summer months to aim for 40 ft^3/s passing the gauging station in Founder's Park. Also, if possible, during the cooler fall months Reclamation aims for 30 to 35 ft^3/s passing the gauging station in Founder's Park. Such releases are dependent on U.S. storage and inflows from the watershed below the dam.

The irrigators need to order flows from storage if their demand limits natural flows past Farmingdale to less than 10 ft^3/s. Also, the Bureau of Reclamation has an instream flow right for U.S. storage release flows that is in addition to the 10 ft^3/s minimum required by the state for natural flows past Farmingdale.

The winter release for WY2025 is approximately 30 ft^3/s and has been coordinated with the City of Rapid City, SD Department of Game, Fish, and Parks, local water users, Forest Service, and USACE.

With a reservoir content of 29,000 AF and above, a release of 20 ft^3/s has been specified in the Finding of No Significant Impact for the Environmental Assessment for the Pactola Reservoir Water Service Contact Renewal (FONSI No. DK600-00-03).

Pactola winter releases can be increased by 2 or 3 ft^3/s during extremely cold weather to replace water that is lost in the formation of ice in the creek channel. Once the channel is covered with ice and snow, which provides insulation for the stream, the releases can be reduced if below average snowpack and inflow conditions indicate a need to conserve storage. During the flood control season, total releases will be controlled between 20 ft^3/s and 1,000 ft^3/s. Releases exceeding 200 ft^3/s when storage is below the top of the conservation pool at elevation 4,580.2 ft will be cleared with the USACE. The USACE will issue release orders on a current basis when storage is in the exclusive flood control pool. Contract negotiations with water users at Pactola Reservoir will provide the basis for future reservoir operations.

During the irrigation season of May 1 to October 30 sufficient natural flows to meet prior rights of the irrigators will be bypassed through the reservoir. Orders by water users will be released under the provisions of contracts with the water users. Drought conditions that have existed in past years have resulted in conservation measures being initiated by water users. Continuation of water conservation measures will assist in conserving reservoir storage and refilling of the reservoir.

With No Water in the U.S. Storage

Operating criteria established for the reservoir in the Definite Plan Report called for minimum winter conservation releases to be 7 ft^3/s from October 1 to April 15 and 20 ft^3/s from April 15 to October 1 when the reservoir content is below 29,000 AF and releases of 15 ft^3/s from October 1 to March 1 and 20 ft^3/s from March 1 through October 1 are established for reservoir content above 29,000 AF. Minimum summer conservation releases are 20 ft^3/s at all reservoir contents:

Reservoir content less than 29,000 AF:

October 1–April 15	7 ft^3/s
April 15–October 1	20 ft^3/s

Reservoir content greater than 29,000 AF:

October 1–March 1	15 ft^3/s
March 1–October 1	20 ft^3/s

With Water in the U.S. Storage

Pactola Reservoir is operated as close to the top of the conservation pool as possible, while regulating releases required to maintain a downstream fishery and to preserve flood control space. The new long-term storage contract for Pactola, between Reclamation and the City of Rapid City, was signed on July 31, 2007. New operating criteria for releases to Rapid Creek were established in the Standard Operating Plans.

The following minimum releases will be made if water is available in the Fisheries, Wildlife, and Recreation Pool:

Reservoir content less than 29,000 AF:

October 1 – April 15	15 ft^3/s
April 15 - October 1	20 ft^3/s

Reservoir content greater than 29,000 AF:

Year round	20 ft^3/s

Shadehill Reservoir

The winter release will be maintained at approximately 20 ft^3/s to prepare the reservoir elevation for spring inflows. Generally, this release rate will be maintained until ice comes out of the channel in the spring to prevent ice jams at crossings, and afterward will be adjusted based on inflows and storage; this year, due to the reservoir elevation, it is likely to continue unless and until the reservoir fills. Operation is to fill the reservoir in the spring, maintain a near full reservoir during the summer and position the reservoir in the fall as discussed in the SOP. Releases for irrigation demands will be met by conservation releases.

Shadehill Reservoir releases water year-round to meet minimum basic natural flow requirements of downstream water users which consist primarily of ranchers.

Summary of Operations for Water Year 2023 for Reservoirs Under the Responsibility of the U.S. Army Corps of Engineers

Big Bend South Dakota, Fort Peck Montana, Fort Randall South Dakota, Garrison, North Dakota, Gavins Point, Nebraska, and Oahe, South Dakota

Overview

The Missouri River main stem reservoir system, consisting of six reservoirs located in Montana, North Dakota, South Dakota, and Nebraska provides for the following beneficial uses: flood control, irrigation, navigation, power, municipal and industrial water supply, water quality control, fish and wildlife, and recreation. Based on information from the USACE's 2024–2025 AOP, the capacity and storage allocations of the main stem system were updated to current values and are shown in table CET1 in upstream to downstream order as follows:

Table CET 1.—Reservoir storage allocation (1,000 acre-feet)

Dam	Permanent	Carryover Multiple Use	Flood Control and Multiple Use	Exclusive Flood Control	Storage
Fort Peck, MT	4,088	10,700	2,704	971	18,463
Garrison, ND	4,794	12,951	4,211	1,495	23,451
Oahe, SD	5,315	13,353	3,208	1,107	22,983
Big Bend, SD	1,631	0	118	61	1,810
Fort Randall, SD	1,469	1,532	1,306	986	5,293
Gavins Point, NE	295	0	79	54	428
Totals	17,592	38,536	11,626	4,674	72,428

Each main stem facility serves a powerplant. The number of generating units and total nameplate capabilities are shown in table CET2 below:

Table CET 2.—U.S. Army Corps powerplant generating capacity for the main stem Missouri

Powerplant	Units	Capacity (kilowatts)
Fort Peck, MT	5	185,250
Garrison, ND	5	583,300
Oahe, SD	7	786,030
Big Bend, SD	8	517,470
Fort Randall, SD	8	320,000
Gavins Point, NE	3	132,300
Totals	36	2,524,350

Main stem system releases are regulated to support the multiple use purposes of the reservoirs. The navigation season on the Missouri River below the dams normally is from late March to late November. Generally, releases from the system for navigation are higher during late summer and fall lowering the system storage. During that time, much of the system's hydropower is generated from the lower most projects. During closure of the navigation season, higher releases are made, and more power is generated from the upstream Fort Peck and Garrison Reservoirs. This offsets the reduced release and generation from the downstream projects during winter closure of the river for navigation. The desired annual target system storage level is 56.1 million AF on the first of March.

Operation of the Missouri River main stem reservoir system provides the following eight beneficial uses: flood control, irrigation, navigation, power, municipal and industrial water supply, water quality control, fish and wildlife, and recreation. Table 99 presents the regulation benefit for most of those uses as recorded in 2023–2024, 2022–2023, and the average. Benefits are defined as the tons of produce shipped, dollars of damages prevented, kilowatt hours of electricity produced, and reservoir elevation and river stages maintained. For the shipping information, estimates also were provided this year which included the sand, gravel, and waterway material shipped. Table CET 3 shows damages prevented at September 2024 price levels.

Table CET 3.—Main stem reservoir system comparison of present and past benefits

Use of Regulated Water	Period of Use or Season	Totals	Totals	Long-Term
Navigation[1]	April–December[2]	0.640 million tons[3] (2024)	0.640 million tons[3] (2023)	1.54 million tons[4]
Flood damages prevented	October–September	$0.7 billion (2024)	$0.7 billion (2023)	$103.7 billion[5]
Energy	August–July	7.7 billion kWh (Aug. 23-July 24)	7.7 billion kWh (Aug. 22-July 23)	9.4 billion kWh[6]

[1] If sand, gravel, and waterway material are included:
4.788 million tons (2023) (estimated)
4.638 million tons (2022)
6.42 million tons (1967-2023 average)
[2] End of navigation season shortened three days in 2022 and extended zero days in 2023.
[3] 2023 tonnages are estimated.
[4] 1967 - 2023 average. Peak tonnage shipped in 1977 (3.336 million tons)
[5] Total damages prevented (1938-2023)
[6] 1968 - 2023 Average

A detailed description of the main stem system operations is presented in annual operating reports prepared by and available for distribution from the U.S. Missouri River Basin Water Management Division, U.S. Army Corps of Engineers, Northwestern Division, Omaha, Nebraska.

Energy Generation

There are 14 Federal powerplants located in the Upper Missouri River Basin that are currently operating. Eight of the power plants are owned and operated by Reclamation and have a total capacity of 348,100 kilowatts. The other six are owned and operated by the USACE and have a total capacity of 2,524,350. Energy generated by the 14 power plants is marketed by the Department of Energy.

Total generation in the combined system in WY2024 was 9,073.217 million kilowatt hours, 569.644 million kilowatt hours more than in WY2023. A summary of the past 10 years of energy generation within the Upper Missouri River Basin is shown in table CET 4 below.

Table CET 4.—Reclamation and USACE energy generation (million kilowatt-hours)

Year	Reclamation	USACE	Total
2024	1,394.193	8,126.548	9,520.741
2023	1,303.438	7,769.779	9,073.217
2022	1,047.699	7,455.874	8,503.573
2021	957.399	8,873.925	9,831.324
Year	**Reclamation**	**USACE**	**Total**
2020	1,470.049	11,772.247	13,242.296
2019	1,488.146	12,506.578	13,994.724
2018	1,790.992	11,355.764	13,146.756
2017	1,560.628	9,092.514	10,653.142
2016	1,164.801	7,652.158	8,816.959
2015	1,316.344	9,323.682	10,640.026

A comparison of 2023 and 2024 generation and other data from Missouri Basin Region powerplants is shown in table CET 5. Tables CET 6 through CET 11 show the monthly generation, power releases, and total downstream releases, respectively, for all Federal plants in the Missouri Basin Region. The annual energy generation for each of the last several years for all Reclamation, USACE, and combined plants is shown graphically in figures CEG 1, 3, and 5, respectively. Monthly generation for each month during the past several years is shown graphically in figures CEG 2, 4, and 6.

For a more detailed account of powerplants operation at Reclamation facilities during the year, refer to the 2023 operation summaries. Information on the USACE's powerplants operations can be obtained from the annual operating reports prepared by and available for distribution from the Missouri River Basin Water Management Division, U.S. Army Corps of Engineers, Northwestern Division, Omaha, NE.

Table CET 5.—Annual energy production statistics (million Kwh) for WY2024

Reclamation Powerplants	Installed Capacity (KW)	Million Kwh Generated 2023	Million Kwh Generated 2024	Water Used for Generation (KAF)	Percent of Total Water Released	Kwh per AF	River Release (KAF)	Total Release (KAF)
Canyon Ferry	50,000	281.454	280.197	2,148.254	70.12	130.43	2,969.0	3,063.6
Pilot Butte[1]	1,600	0.000	0.000	0.000	0.00	N/A	167.3	167.3
Boysen	15,000	75.017	78.203	914.852	91.79	85.48	996.7	996.7
Shoshone	3,000	20.293	20.480	155.766	17.39	131.48		
Buffalo Bill	18,000	70.236	70.552	297.983	33.26	236.77		
Heart Mountain	6,000	19.802	21.471	102.087	11.39	210.32		
Spirit Mountain [2]	4,500	16.712	17.190	164.293	18.34	104.63		
Total for Buffalo Bill[3]	31,500	127.043	129.693	720.129	80.38	180.10	652.7	895.9
Yellowtail	250,000	780.887	880.254	2,392.694	94.21	367.89	2,494.3	2,539.7
Subtotal	**348,100**	**1,264.401**	**1,368.347**	**6,175.929**	**80.59**	**221.56**	**7,279.9**	**7,663.2**
USACE Powerplants								
Fort Peck	185,250	709.185	762.705	5,006.00	95.19	152.36	5,259.0	5,259.0
Garrison	583,300	2,060.960	2,146.115	13,881.00	100.00	154.61	13,881.0	13,881.0
Oahe	786,030	2,040.782	2,128.663	14,309.00	100.00	148.76	14,309.0	14,309.0
Big Bend	494,320	777.137	792.022	14,506.00	100.00	54.60	14,506.0	14,506.0
Fort Randall	320,000	1,450.847	1,563.688	14,960.00	98.24	104.52	15,228.0	15,228.0
Gavins Point	132,300	730.868	733.265	16,015.00	91.28	45.79	17,544.0	17,544.0
Subtotal	**2,501,200**	**7,769.779**	**8,126.458**	**78,677.00**	**97.46**	**103.29**	**80,727.0**	**80,727.0**
Basin Total	**2,849,300**	**9,034.180**	**9,494.805**	**84,852.93**	**96.00**	**111.90**	**88,006.9**	**88,390.2**

[1] River Release and Total Release at Pilot Butte Reservoir is computed inflow to Pilot Butte Reservoir due to the location of the powerplant at inlet of supply canal.

[2] Spirit Mountain Powerplant is used to dissipate energy in the transition from the pressurized portion of the Shoshone Canyon Conduit to the free flow section of the conduit.
Water used for generation at Spirit Mountain Powerplant is then routed to Heart Mountain Canal or used for generation at Heart Mountain Powerplant.

[3] This represents the total for the four separate powerplants at Buffalo Bill Dam.

Table CET 6.—Monthly generation at Reclamation Power powerplants (million Kwh)

Month	Canyon Ferry	Pilot Butte	Boysen	Heart Mountain	Spirit Mountain	Buffalo Bill	Shoshone	Yellowtail	Total
October	20.576	0.000	6.704	2.038	1.588	3.677	1.466	82.737	**118.786**
November	23.785	0.000	5.487	0.000	0.000	0.841	1.652	76.712	**108.477**
December	24.783	0.000	5.418	0.000	0.000	1.027	1.766	69.909	**102.903**
January	24.296	0.000	5.572	0.000	0.000	0.906	1.787	72.529	**105.090**
February	21.256	0.000	5.200	0.000	0.000	0.858	1.594	63.418	**92.326**
March	23.878	0.000	1.566	0.000	0.000	0.977	1.680	64.677	**92.778**
April	24.521	0.000	9.674	1.886	1.180	8.573	1.615	97.330	**144.779**
May	24.852	0.000	10.420	3.749	2.775	11.562	1.651	92.114	**147.123**
June	17.157	0.000	8.566	3.442	2.885	12.226	1.827	88.100	**134.203**
July	25.562	0.000	6.914	3.218	3.158	12.615	1.999	68.230	**121.696**
August	24.906	0.000	6.704	3.614	2.947	10.402	1.843	53.080	**103.496**
September	24.625	0.000	5.978	3.524	2.657	6.888	1.600	51.418	**96.690**
Total	**280.197**	**0.000**	**78.203**	**21.471**	**17.190**	**70.552**	**20.480**	**880.254**	**1,368.347**

Table CET 7.—Water used for power generation (KAF) at Bureau of Reclamation

WY 2022 Month	Canyon Ferry	Boysen	Pilot Butte	Shoshone	Buffalo Bill	Heart Mountain	Spirit Mountain[1]	Yellowtail	Total
October	169.315	75.423	0.000	12.594	15.175	9.844	15.253	202.779	**500.383**
November	185.930	60.043	0.000	12.666	3.885	0.000	0.000	198.792	**461.315**
December	172.316	62.182	0.000	13.355	5.079	0.000	0.000	191.094	**444.026**
January	173.181	62.318	0.000	13.456	5.002	0.000	0.000	199.808	**453.765**
February	167.616	58.422	0.000	12.072	5.611	0.000	0.000	180.107	**423.828**
March	189.146	17.649	0.000	12.724	6.286	0.000	0.000	185.359	**411.164**
April	193.000	117.579	0.000	12.231	31.847	8.870	11.663	266.950	**642.140**
May	191.337	132.811	0.000	12.503	50.987	17.682	27.042	253.302	**685.664**
June	129.375	98.534	0.000	13.814	48.036	16.354	27.748	230.516	**564.377**
July	189.761	79.382	0.000	14.910	49.646	15.725	30.044	177.421	**556.888**
August	191.266	78.619	0.000	13.703	42.849	16.993	26.609	148.740	**518.777**
September	196.010	71.891	0.000	11.739	33.580	16.620	25.935	157.828	**513.602**
TOTAL	**2,148.254**	**914.852**	**0.000**	**155.766**	**297.983**	**102.087**	**164.293**	**2,392.694**	**6,175.929**

[1] Spirit Mountain Powerplant is used to dissipate energy in the transition from the pressurized portion of the Shoshone Canyon Conduit to the free flow section of the conduit. Water used for generation at Spirit Mountain Powerplant is then routed to Heart Mountain Canal or used for generation at Heart Mountain Powerplant.

Table CET 8.—Monthly Generation at USACE Power powerplants (Million Kwh)

Month	Fort Peck	Garrison	Oahe	Big Bend	Fort Randall	Gavins Point	Total	Basin Total
October	45.553	164.371	196.793	74.652	180.535	90.473	**752.377**	**871.163**
November	39.759	159.382	182.130	70.345	152.096	62.046	**665.758**	**774.235**
December	45.366	163.413	96.644	37.888	60.021	39.643	**442.975**	**545.878**
January	49.354	171.505	147.096	56.869	73.314	41.997	**540.135**	**645.225**
February	42.788	214.482	90.308	40.253	43.335	35.476	**466.642**	**558.968**
March	44.092	149.269	187.730	67.347	123.511	52.843	**624.792**	**717.570**
April	54.027	144.077	224.071	87.557	157.485	56.949	**724.166**	**868.945**
May	105.640	183.891	163.916	60.340	140.185	60.585	**714.557**	**861.680**
June	109.201	200.464	204.802	72.188	122.076	66.702	**775.433**	**909.636**
July	85.722	213.728	110.830	37.422	124.094	58.190	**629.986**	**751.682**
August	86.196	212.723	260.727	91.232	180.037	80.888	**911.803**	**1,015.299**
September	55.007	168.810	263.616	95.929	206.999	87.473	**877.834**	**974.524**
TOTAL	**762.705**	**2,146.115**	**2,128.663**	**792.022**	**1,563.688**	**733.265**	**8,126.458**	**9,494.805**

Table CET 9.—Monthly water used for power generation (KAF) at USACE powerplants

WY 2024 Month	Fort Peck	Garrison	Oahe	Big Bend	Fort Randall	Gavins Point	Total
October	297.000	1,046.000	1,329.000	1,342.000	1,696.000	2,051.000	**7,761.000**
November	274.000	1,016.000	1,232.000	1,247.000	1,576.000	1,356.000	**6,701.000**
December	324.000	1,049.000	677.000	658.000	611.000	821.000	**4,140.000**
January	341.000	1,128.000	1,005.000	997.000	742.000	885.000	**5,098.000**
February	308.000	1,430.000	621.000	712.000	407.000	748.000	**4,226.000**
March	309.000	982.000	1,248.000	1,228.000	1,178.000	1,143.000	**6,088.000**
April	360.000	946.000	1,512.000	1,615.000	1,490.000	1,223.000	**7,146.000**
May	657.000	1,203.000	1,088.000	1,149.000	1,296.000	1,313.000	**6,706.000**
June	675.000	1,287.000	1,355.000	1,354.000	1,128.000	1,464.000	**7,263.000**
July	548.000	1,350.000	734.000	741.000	1,122.000	1,243.000	**5,738.000**
August	556.000	1,359.000	1,710.000	1,696.000	1,716.000	1,784.000	**8,821.000**
September	357.000	1,085.000	1,798.000	1,767.000	1,998.000	1,984.000	**8,989.000**
Total	**5,006.000**	**13,881.000**	**14,309.000**	**14,506.000**	**14,960.000**	**16,015.000**	**78,677.000**

Table CET 10.—Total Water Releases (KAF) for WY2024 at Reclamation powerplants

Month	Ferry	Boysen	Pilot Butte	Buffalo Bill	Bull Lake	Anchor	Yellowtail	Total
October	230.715	86.926	5.352	53.679	18.309	0.941	223.304	**619.225**
November	251.492	74.002	0.000	16.725	4.655	0.000	208.564	**555.438**
December	266.281	62.182	0.000	18.618	2.507	0.000	191.094	**540.681**
January	278.494	62.323	0.000	18.646	1.913	0.000	199.808	**561.183**
February	235.848	58.422	0.000	17.848	1.788	0.000	180.107	**494.014**
March	227.313	62.340	0.000	19.196	1.912	0.000	185.359	**496.118**
April	212.070	123.803	7.350	82.546	1.940	0.236	286.271	**714.216**
May	269.018	132.811	24.027	124.929	5.839	0.505	302.890	**860.020**
June	334.028	99.595	36.624	195.808	17.400	2.681	252.009	**938.145**
July	264.078	83.502	38.058	132.334	52.769	3.878	177.421	**752.040**
August	263.340	78.619	29.625	118.161	61.818	1.946	175.011	**728.519**
September	230.912	72.189	26.263	97.457	45.184	0.212	157.828	**630.045**
Total	**3,063.588**	**996.713**	**167.299**	**895.947**	**216.035**	**10.398**	**2,539.665**	**7,889.644**

Table CET 11.—Total water releases (KAF) for WY2024 at USACE powerplants

Month	Fort Peck	Garrison	Oahe	Big Bend	Fort Randall	Gavins Point	Total
October	297.000	1,046.000	1,329.000	1,342.000	1,893.000	2,098.000	**8,005.000**
November	274.000	1,016.000	1,232.000	1,247.000	1,647.000	1,840.000	**7,256.000**
December	324.000	1,049.000	677.000	658.000	611.000	821.000	**4,140.000**
January	341.000	1,128.000	1,005.000	997.000	742.000	885.000	**5,098.000**
February	308.000	1,430.000	621.000	712.000	407.000	748.000	**4,226.000**
March	309.000	982.000	1,248.000	1,228.000	1,178.000	1,281.000	**6,226.000**
April	369.000	946.000	1,512.000	1,615.000	1,490.000	1,750.000	**7,682.000**
May	701.000	1,203.000	1,088.000	1,149.000	1,296.000	1,556.000	**6,993.000**
June	813.000	1,287.000	1,355.000	1,354.000	1,128.000	1,546.000	**7,483.000**
July	555.000	1,350.000	734.000	741.000	1,122.000	1,243.000	**5,745.000**
August	556.000	1,359.000	1,710.000	1,696.000	1,716.000	1,784.000	**8,821.000**
September	412.000	1,085.000	1,798.000	1,767.000	1,998.000	1,992.000	**9,052.000**
Total	**5,259.000**	**13,881.000**	**14,309.000**	**14,506.000**	**15,228.000**	**17,544.000**	**80,727.000**

Table CET 12.—Total water storage (KAF) for WY2023 and WY2024

Reclamation Reservoirs	Top of Conservation Capacity [3]	Dead And Inactive Capacity	2023 End Year Storage	2024 End Year Storage	2023 Percent of Average	2024 Percent of Average
Clark Canyon	174.4	1.1	111.9	93.9	119	100
Canyon Ferry	1,891.9	396.0	1,655.3	1,485.2	102	92
Helena Valley	10.5	4.6	9.2	9.6	123	128
Gibson	96.5	0.0	6.0	6.7	25	28
Willow Creek	31.8	1.0	13.0	7.7	64	38
Pishkun	46.7	16.0	36.0	36.1	111	111
Lake Elwell	925.6	554.3	775.9	765.5	98	97
Sherburne	66.1	1.9	14.6	39.2	86	231
Fresno	92.9	0.4	25.2	21.5	55	46
Nelson	79.0	18.1	65.5	62.3	115	109
Bull Lake	152.5	0.7	82.1	32.3	108	43
Pilot Butte	33.7	3.8	27.4	11.8	152	65
Boysen	741.6	219.2	672.8	573.1	112	96
Anchor[1]	17.2	0.1	1.8	0.5	539	145
Buffalo Bill[2]	646.6	41.7	453.1	400.8	102	90
Bighorn Lake	1,020.6	469.9	988.3	924.2	104	97
E. A. Patterson	8.6	0.5	7.8	6.1	125	98
Lake Tschida	67.1	5.2	58.5	55.1	103	97
Jamestown Reservoir	31.5	0.8	31.0	29.3	108	102
Shadehill Reservoir	120.2	43.9	116.2	80.6	110	76
Angostura Reservoir	123.0	42.2	92.9	80.3	109	95
Deerfield Reservoir	15.7	0.2	15.0	14.7	113	110
Pactola Reservoir	56.0	1.0	53.4	49.9	115	108
Keyhole Reservoir	188.7	6.6	130.2	112.0	147	126
Belle Fourche Reservoir	172.9	3.1	142.5	80.1	193	108
Subtotal	**6,811.2**	**1,832.3**	**5,585.6**	**4,978.4**		
U.S. Army Corps Reservoirs						
Fort Peck	17,578.0	4,073.0	13,387.0	13,364.0		
Garrison	22,332.0	4,980.0	15,673.0	18,124.0		
Oahe	22,035.0	5,373.0	15,612.0	16,887.0		
Big Bend	1,738.0	1,621.0	1,691.0	1,681.0		
Fort Randall	4,433.0	1,517.0	2,727.0	3,109.0		

U.S. Army Corps Reservoirs				
Gavins Point	393.0	307.0	376.0	367.0
Subtotal	**68,509.0**	**17,871.0**	**49,466.0**	**53,532.0**
TOTAL UPPER MISSOURI BASIN	**75,320.2**	**19,703.3**	**55,051.6**	**58,510.4**

[1] Percent of average content of Anchor Reservoir is based on a 22-year average, 1991-2012.

[2] Percent of average content of Buffalo Bill Reservoir is based on a 20-year average, 1993-2012; to reflect the operation of the reservoir since 1992 when the dam was raised and the capacity of the reservoir was increased to 646,565 acre-feet.

[3] Includes joint-use space.

Table CET 13.—WY2023 end of month reservoir contents (KAF)

RECLAMATION RESERVOIRS	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
CLARK CANYON RESERVOIR	128.3	145.1	152.6	156.8	163.3	171.8	174.0	166.8	138.9	108.3	97.5	93.9
% of Average	124.0%	129.5%	129.4%	127.6%	128.0%	126.7%	121.9%	120.8%	105.7%	97.9%	103.8%	99.6%
CANYON FERRY RESERVOIR	1,675.9	1,676.8	1,628.9	1,526.5	1,528.3	1,554.1	1,643.5	1,739.0	1,859.0	1,737.7	1,586.3	1,485.2
% of Average	102.5%	101.4%	101.7%	99.4%	102.8%	106.3%	110.7%	105.8%	100.4%	97.3%	94.7%	91.7%
HELENA VALLEY RESERVOIR	8.9	8.6	8.3	8.0	7.9	7.7	10.0	9.0	8.6	8.0	9.7	9.6
% of Average	127.8%	127.8%	127.8%	130.6%	136.8%	134.8%	108.4%	98.5%	96.6%	107.7%	119.9%	128.3%
GIBSON RESERVOIR	7.2	7.1	5.9	7.2	9.5	14.5	42.4	86.8	69.2	6.6	5.6	6.7
% of Average	24.5%	21.3%	16.3%	18.0%	22.1%	30.3%	67.7%	96.7%	76.7%	12.7%	20.8%	28.4%
WILLOW CREEK	14.3	17.8	21.3	21.6	22.1	22.5	22.9	27.0	17.6	6.0	5.6	7.7
% of Average	0.1%	82.7%	97.1%	97.1%	97.7%	95.6%	90.1%	94.9%	60.3%	24.8%	27.4%	38.1%
PISHKUN RESERVOIR	35.6	35.3	35.0	35.0	35.1	34.9	34.8	43.2	42.5	41.8	36.7	36.1
% of Average	0.1%	102.9%	102.8%	104.0%	104.1%	102.3%	87.4%	94.2%	101.3%	112.9%	102.4%	111.4%
LAKE ELWELL (TIBER DAM)	756.5	744.9	731.9	712.9	712.5	712.9	732.7	783.2	813.7	802.3	783.2	765.5
% of Average	99.4%	99.2%	99.2%	98.7%	99.6%	99.1%	99.3%	95.8%	92.7%	93.6%	95.3%	96.5%
SHERBURNE LAKE	19.7	26.2	34.6	38.0	42.7	46.4	36.8	42.6	63.2	57.3	37.5	39.2
% of Average	98.8%	104.3%	124.0%	123.1%	128.9%	161.5%	181.0%	124.0%	112.2%	117.1%	133.2%	230.9%
FRESNO RESERVOIR	24.0	23.6	22.5	20.4	20.8	30.0	44.8	89.2	79.0	31.2	24.9	21.5
% of Average	53.0%	52.2%	51.5%	48.2%	47.6%	50.8%	59.2%	123.0%	104.2%	53.7%	54.7%	46.5%
NELSON RESERVOIR	65.6	63.3	61.1	59.3	58.8	70.6	77.9	70.3	68.4	62.8	64.6	62.3
% of Average	111.4%	109.6%	109.2%	109.1%	110.7%	129.6%	126.9%	115.7%	112.7%	113.9%	118.8%	109.4%
BULL LAKE	72.5	72.3	72.3	71.9	72.0	72.2	77.5	92.8	147.2	121.3	72.9	32.3
% of Average	96.9%	95.8%	95.3%	94.5%	94.6%	94.9%	102.2%	104.3%	116.8%	94.1%	70.8%	42.6%
PILOT BUTTE RESERVOIR	28.3	28.1	27.4	27.4	27.4	27.9	28.3	22.0	20.4	21.2	20.2	11.8
% of Average	106.5%	101.4%	99.1%	98.4%	98.1%	94.8%	92.3%	81.9%	68.6%	83.6%	94.4%	65.2%
BOYSEN RESERVOIR	678.4	666.8	655.1	630.2	622.3	626.1	564.9	529.1	680.3	646.6	606.6	573.1
% of Average	113.9%	113.0%	114.5%	113.2%	113.9%	116.0%	107.4%	96.4%	103.7%	99.6%	98.2%	95.6%
ANCHOR RESERVOIR	1.34	1.10	0.70	0.60	0.56	0.99	1.56	3.52	6.88	2.64	0.51	0.48
% of Average[1]	472.7%	445.6%	297.0%	260.3%	216.2%	271.9%	313.4%	229.9%	202.6%	120.5%	85.5%	144.9%
BUFFALO BILL RESERVOIR	452.7	475.2	478.5	476.9	477.7	484.4	465.7	481.0	610.1	567.6	476.3	400.8
% of Average[2]	107.1%	111.5%	112.7%	112.8%	114.2%	117.0%	118.1%	109.8%	107.5%	98.7%	93.7%	90.0%
BIGHORN LAKE	1,006.7	974.0	935.6	870.9	851.0	823.9	801.4	847.0	977.7	940.1	919.8	924.2
% of Average	104.7%	104.0%	105.3%	103.5%	104.7%	102.6%	101.6%	98.0%	97.9%	95.7%	97.4%	97.3%
E. A. PATTERSON LAKE	7.9	7.2	6.8	6.7	7.3	7.7	7.6	7.5	7.4	6.9	6.5	6.1
% of Average	132.0%	121.7%	116.1%	113.9%	112.3%	98.7%	96.5%	96.1%	96.6%	96.2%	98.1%	97.7%
LAKE TSCHIDA	58.3	59.1	59.0	57.9	61.9	66.0	64.8	63.9	63.5	60.9	57.7	55.1
% of Average	101.9%	102.8%	102.7%	100.9%	103.6%	97.3%	98.4%	97.7%	97.1%	98.3%	99.1%	97.0%
JAMESTOWN RESERVOIR	26.9	26.9	28.3	28.9	29.9	31.4	31.3	32.3	36.4	35.3	31.7	29.3
% of Average	99.9%	101.8%	106.5%	108.2%	110.9%	86.1%	55.2%	71.1%	97.8%	103.9%	97.0%	102.1%
SHADEHILL RESERVOIR	111.9	109.0	106.6	104.4	103.2	101.6	100.8	98.6	97.2	95.1	86.6	80.6
% of Average	109.1%	107.6%	106.7%	105.9%	102.2%	88.2%	86.1%	84.2%	83.9%	83.4%	79.0%	76.4%
ANGOSTURA RESERVOIR	102.3	104.3	105.0	104.8	107.8	111.0	118.0	117.8	109.9	96.3	85.8	80.3
% of Average	118.3%	119.3%	117.7%	114.7%	112.6%	108.4%	111.5%	107.7%	101.2%	97.3%	96.5%	94.6%
DEERFIELD RESERVOIR	15.2	15.3	15.1	14.7	14.7	15.0	15.3	15.5	15.0	14.8	14.7	14.7
% of Average	113.4%	113.5%	110.1%	105.6%	104.0%	104.6%	106.1%	106.8%	104.1%	105.0%	107.7%	109.9%
PACTOLA RESERVOIR	53.0	52.7	52.2	51.9	52.1	52.2	53.5	55.1	55.5	54.0	52.0	49.9
% of Average	113.7%	112.6%	112.2%	111.5%	111.7%	110.2%	109.9%	110.4%	110.1%	110.9%	110.5%	107.6%
KEYHOLE RESERVOIR	129.6	129.1	129.0	129.1	129.5	129.3	129.7	133.2	130.0	123.7	116.5	112.0
% of Average	146.7%	146.7%	146.3%	145.6%	141.8%	132.5%	131.1%	131.0%	128.1%	128.9%	128.5%	126.3%
BELLE FOURCHE RESERVOIR	141.2	139.6	138.7	138.6	147.6	159.5	162.6	166.2	152.6	117.1	92.6	80.1
% of Average	171.4%	151.2%	137.0%	125.5%	123.6%	119.4%	112.5%	107.0%	102.2%	99.2%	107.8%	108.3%
CORPS RESERVOIRS	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
FORT PECK RESERVOIR	13,745.0	13,817.0	13,846.0	13,832.0	14,035.0	14,199.0	14,229.0	14,288.0	14,014.0	13,769.0	13,474.0	13,364.0
GARRISON RESERVOIR	18,568.0	18,455.0	18,128.0	17,568.0	17,030.0	17,079.0	17,083.0	17,898.0	19,245.0	19,199.0	18,562.0	18,124.0
OAHE RESERVOIR	16,215.0	15,958.0	16,478.0	16,454.0	17,486.0	17,426.0	17,061.0	17,351.0	17,401.0	18,041.0	17,671.0	16,887.0
BIG BEND RESERVOIR	1,683.0	1,670.0	1,687.0	1,675.0	1,666.0	1,693.0	1,694.0	1,645.0	1,680.0	1,673.0	1,667.0	1,681.0
FORT RANDALL RESERVOIR	2,759.0	2,237.0	2,390.0	2,658.0	3,164.0	3,228.0	3,528.0	3,441.0	3,868.0	3,486.0	3,421.0	3,109.0
GAVINS POINT RESERVOIR	365.0	376.0	374.0	360.0	340.0	344.0	368.0	327.0	349.0	335.0	339.0	367.0

[1] Percent of average content of Anchor Reservoir is based on a 22-year average, 1991-2012; this is due to the availability of data for Anchor Reservoir.

[2] Percent of average content of Buffalo Bill Reservoir is based on a 20-year average, 1993-2012; to reflect the operation of the reservoir since 1992 when the dam was raised, and the capacity of the reservoir was increased

Table CET 14.—CETWY2023 monthly inflows (KAF) into Bureau of Reclamation Reservoirs

RECLAMATION RESERVOIRS	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
CLARK CANYON RESERVOIR	24.9	24.5	18.1	13.9	13.9	16.0	19.4	15.6	11.2	14.4	11.3	12.4	195.5
% of Average	118.9%	122.2%	108.5%	97.4%	109.6%	98.0%	114.0%	73.7%	35.3%	55.4%	59.9%	69.2%	83.8%
CANYON FERRY RESERVOIR	251.3	252.5	218.0	176.1	238.0	252.8	301.5	364.5	454.0	142.8	112.0	129.8	2,893.2
% of Average	98.7%	95.2%	100.3%	82.5%	115.1%	99.9%	98.5%	73.2%	66.2%	48.6%	72.9%	71.0%	81.9%
HELENA VALLEY RESERVOIR	-0.3	-0.3	-0.3	-0.3	-0.1	-0.2	2.3	8.8	15.1	15.8	18.1	12.4	71.0
% of Average	N/A	N/A	N/A	N/A	N/A	N/A	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
GIBSON RESERVOIR	10.0	9.3	7.9	7.7	7.5	10.3	35.3	75.3	65.9	23.3	12.5	9.5	274.4
% of Average	62.2%	56.3%	57.7%	63.6%	69.6%	70.8%	84.1%	51.2%	43.6%	41.4%	52.1%	54.9%	52.6%
WILLOW CREEK	1.4	3.5	3.5	0.3	0.6	0.3	0.4	4.1	0.9	0.0	-0.1	2.1	16.9
% of Average	0.2%	0.5%	0.8%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	N/A	0.5%	0.1%
PISHKUN RESERVOIR	-0.4	-0.3	-0.3	0.0	0.1	-0.2	-0.1	14.3	75.4	79.6	2.1	-0.6	169.7
% of Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0%	0.1%	0.1%	0.0%	N/A	0.1%
LAKE ELWELL (TIBER DAM)	8.4	14.9	13.8	7.8	23.8	25.6	44.2	76.0	55.0	14.0	6.6	7.0	297.1
% of Average	50.1%	69.7%	81.3%	49.4%	109.6%	66.3%	83.8%	61.3%	40.9%	33.4%	53.8%	60.6%	58.5%
SHERBURNE LAKE	5.2	6.5	8.4	3.4	4.9	3.7	10.5	26.6	29.3	16.2	7.8	3.7	126.2
% of Average	79.1%	93.8%	246.9%	114.5%	209.6%	105.2%	96.6%	86.4%	79.1%	87.1%	88.6%	60.7%	91.5%
FRESNO RESERVOIR	1.9	2.0	1.3	0.3	3.7	10.6	17.2	60.1	20.6	-5.9	-0.1	1.0	112.7
% of Average	26.0%	88.6%	152.6%	33.5%	96.6%	44.7%	57.9%	139.8%	42.2%	N/A	N/A	4.7%	46.0%
NELSON RESERVOIR	0.1	-2.3	-2.1	-1.8	-0.5	11.8	7.4	1.7	6.4	4.9	2.5	-2.3	25.8
% of Average	0.0%	N/A	N/A	N/A	N/A	0.8%	0.1%	0.0%	0.1%	0.1%	0.0%	N/A	0.1%
BULL LAKE	8.6	4.5	2.5	1.5	1.8	2.2	7.2	21.2	71.8	26.9	13.4	4.5	166.2
% of Average	153.8%	142.7%	102.7%	71.1%	114.8%	120.1%	191.7%	75.7%	116.6%	58.2%	64.3%	47.9%	89.0%
PILOT BUTTE RESERVOIR[1]	6.2	-0.2	-0.6	-0.1	0.0	0.5	7.7	17.8	35.0	38.9	28.5	17.9	151.7
% of Average	55.9%	N/A	N/A	N/A	17.6%	32.6%	110.0%	75.5%	94.1%	94.3%	87.9%	76.3%	84.7%
BOYSEN RESERVOIR	92.6	62.3	50.5	37.4	50.2	66.4	62.6	97.0	247.3	49.8	38.6	38.7	893.6
% of Average	156.9%	127.1%	134.2%	102.0%	134.4%	127.7%	128.0%	80.9%	96.6%	38.0%	67.5%	74.2%	95.4%
ANCHOR RESERVOIR	0.52	-0.25	-0.39	-0.10	-0.02	0.40	0.81	2.46	6.04	-0.36	-0.18	0.18	9.11
% of Average[2]	0.1%	N/A	N/A	N/A	N/A	0.1%	0.1%	0.1%	0.1%	N/A	N/A	0.0%	0.1%
BUFFALO BILL RESERVOIR	53.3	39.1	22.0	17.0	18.6	26.0	63.9	140.2	325.0	89.8	26.9	22.0	843.7
% of Average	207.2%	183.0%	140.2%	116.3%	142.5%	137.1%	156.0%	88.4%	108.0%	56.0%	60.0%	88.5%	100.4%
BIGHORN LAKE	241.8	176.0	152.7	135.1	159.6	158.6	263.8	348.5	382.7	139.8	154.7	162.2	2,475.4
% of Average	144.0%	136.3%	139.5%	122.4%	142.7%	107.4%	185.6%	136.7%	93.7%	55.0%	102.3%	97.9%	115.0%
E. A. PATTERSON LAKE	0.1	0.4	0.3	0.3	0.8	1.1	0.5	0.3	0.2	-0.3	-0.2	-0.4	3.1
% of Average	30.5%	158.4%	224.7%	111.5%	48.2%	16.4%	14.9%	24.8%	11.5%	N/A	N/A	N/A	18.1%
LAKE TSCHIDA	1.7	3.4	2.3	0.9	6.1	9.3	6.0	3.8	2.0	0.9	-0.2	-0.5	35.9
% of Average	113.0%	228.6%	243.3%	112.5%	126.9%	31.7%	35.8%	68.8%	28.0%	25.8%	N/A	N/A	48.6%
JAMESTOWN RESERVOIR	6.6	2.3	1.4	0.6	1.1	3.5	3.5	12.1	27.5	29.7	16.8	11.6	116.7
% of Average	409.3%	178.9%	228.3%	210.7%	259.7%	32.0%	9.7%	131.4%	613.3%	536.1%	341.7%	573.6%	150.4%
SHADEHILL RESERVOIR	-3.5	-1.4	-0.9	-0.7	0.3	-0.3	0.6	-0.8	0.0	-0.8	-7.1	-4.8	-19.6
% of Average	N/A	N/A	N/A	N/A	5.8%	N/A	3.0%	N/A	0.4%	N/A	N/A	N/A	-25.8%
ANGOSTURA RESERVOIR	9.6	3.3	4.5	3.7	6.3	3.2	7.1	6.1	0.9	0.2	0.6	0.1	45.6
% of Average	396.8%	103.8%	226.6%	161.9%	124.7%	28.5%	83.6%	45.6%	6.0%	6.5%	37.9%	6.4%	65.5%
DEERFIELD RESERVOIR	0.9	1.0	0.9	0.7	0.8	1.0	1.0	1.2	0.6	0.6	0.7	0.7	10.2
% of Average	122.6%	140.7%	127.1%	104.1%	136.7%	95.8%	75.9%	80.6%	45.5%	62.9%	81.0%	97.3%	90.5%
PACTOLA RESERVOIR	2.6	2.4	2.3	2.3	2.6	2.3	3.3	3.9	2.8	1.8	1.6	1.2	29.3
% of Average	120.5%	129.7%	155.3%	147.1%	168.8%	82.2%	73.5%	56.2%	41.9%	48.2%	55.6%	56.3%	76.1%
KEYHOLE RESERVOIR	-0.6	-0.5	-0.1	0.1	0.4	-0.3	0.4	3.5	-3.2	-3.6	-4.0	-4.5	-12.2
% of Average	N/A	N/A	N/A	14.0%	16.1%	N/A	19.5%	86.8%	N/A	N/A	N/A	N/A	-91.5%
BELLE FOURCHE RESERVOIR	-0.7	-1.6	-0.9	-0.1	9.3	11.5	3.1	9.9	7.4	-0.8	4.6	5.5	47.3
% of Average	N/A	N/A	N/A	N/A	104.1%	80.9%	26.6%	58.7%	71.4%	N/A	213.5%	115.3%	41.7%

[1] Negative values are the result of calculated inflow based on reservoir release and change in reservoir content.

[2] Percent of average inflow for Anchor Reservoir is based on a 22-year average, 1991-2012, this is due to the availability of data for Anchor Reservoir.

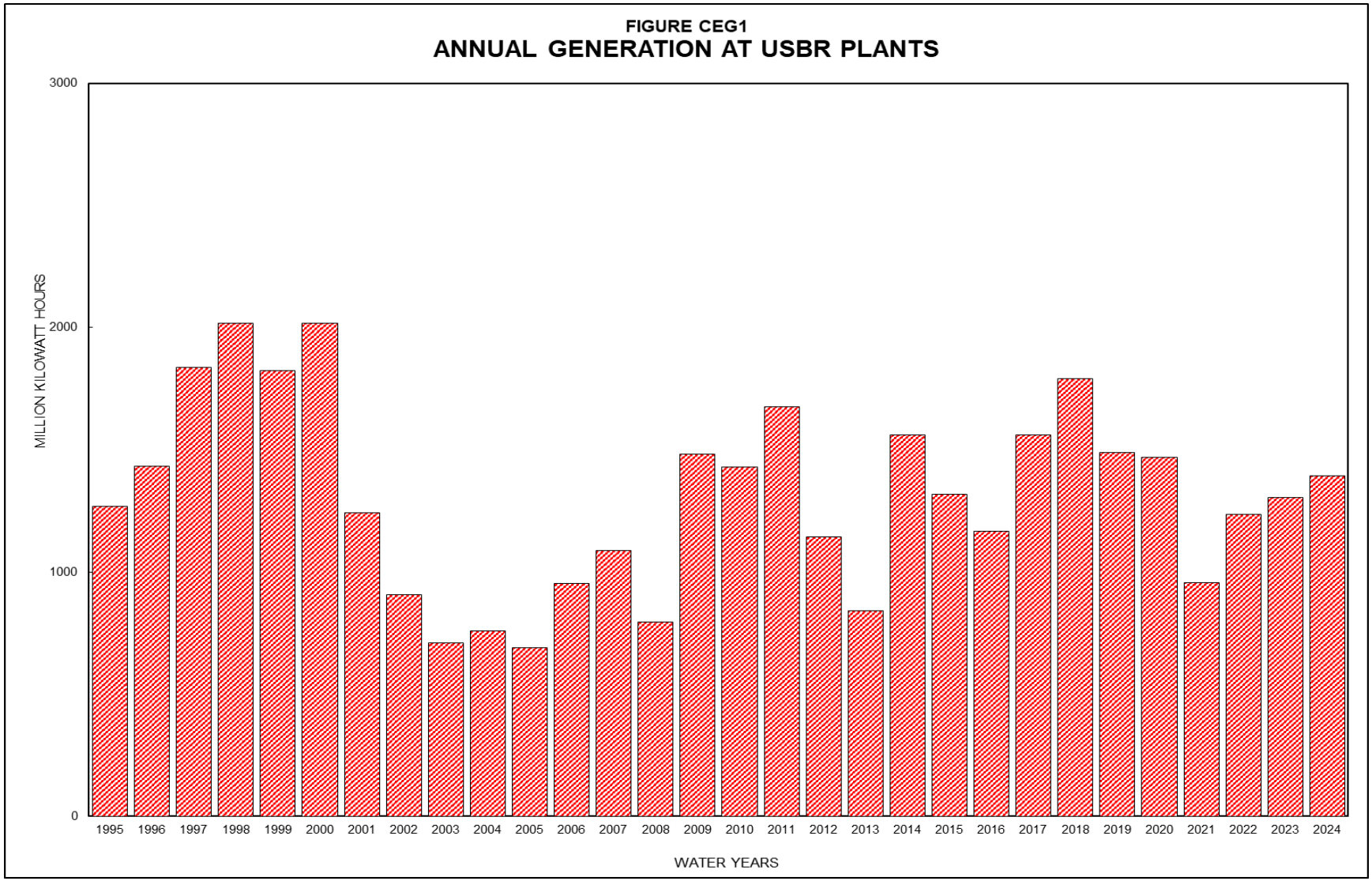


Figure CEG 1.—Annual generation at Bureau of Reclamation powerplants.

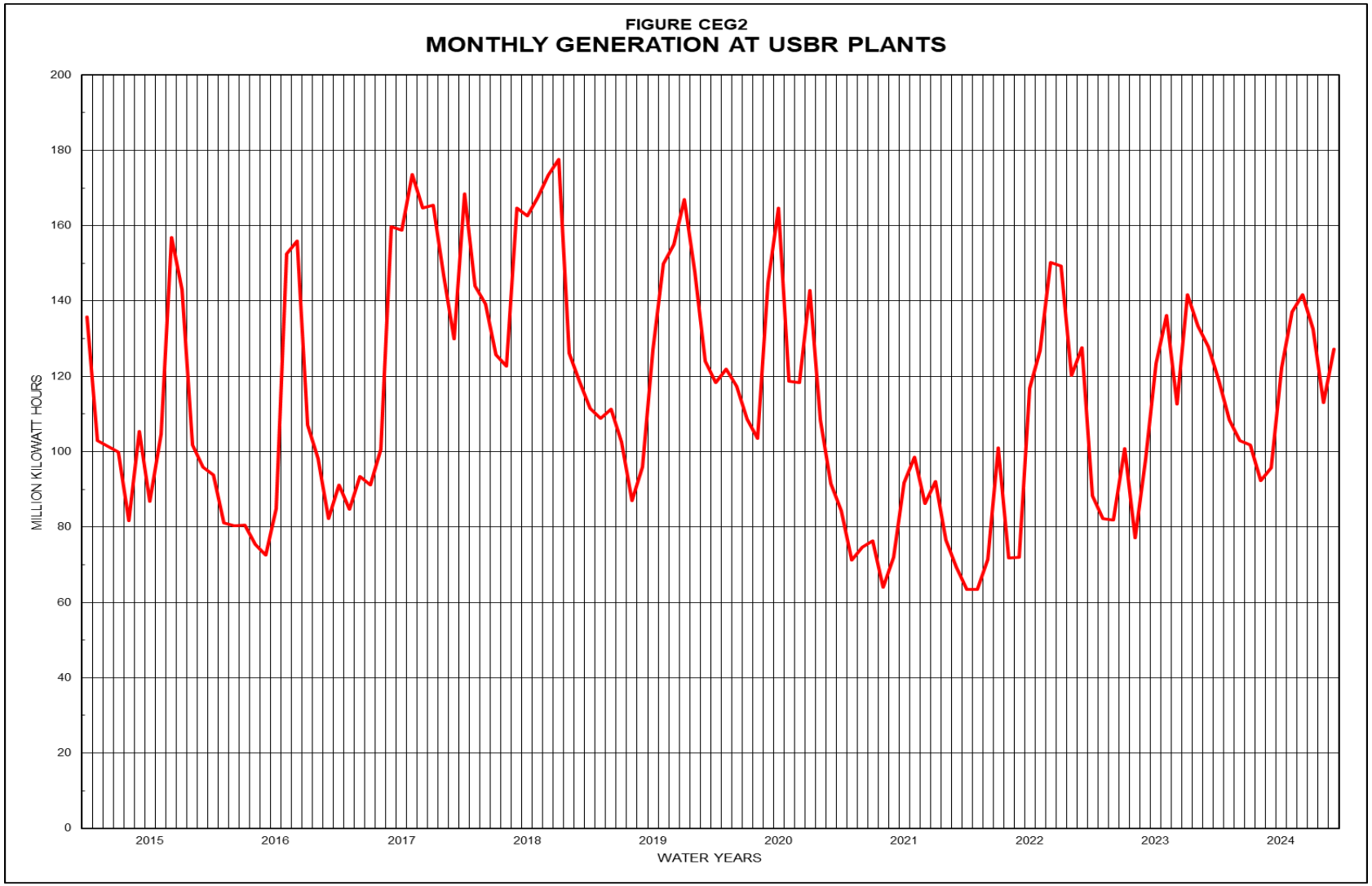


Figure CEG 2.—Annual generation at Bureau of Reclamation powerplants.

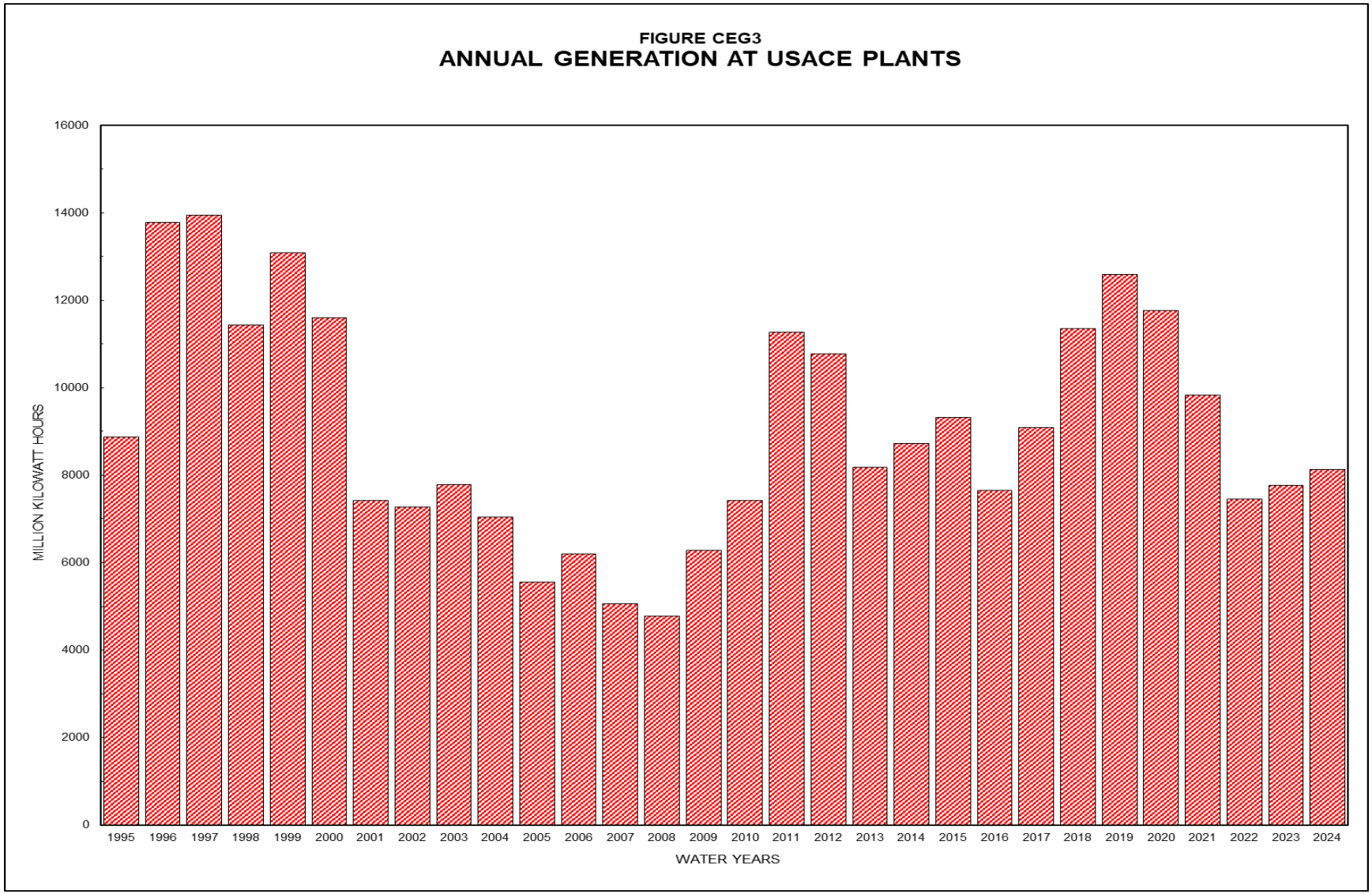


Figure CEG 3.—Monthly power generation at Bureau of Reclamation powerplants.

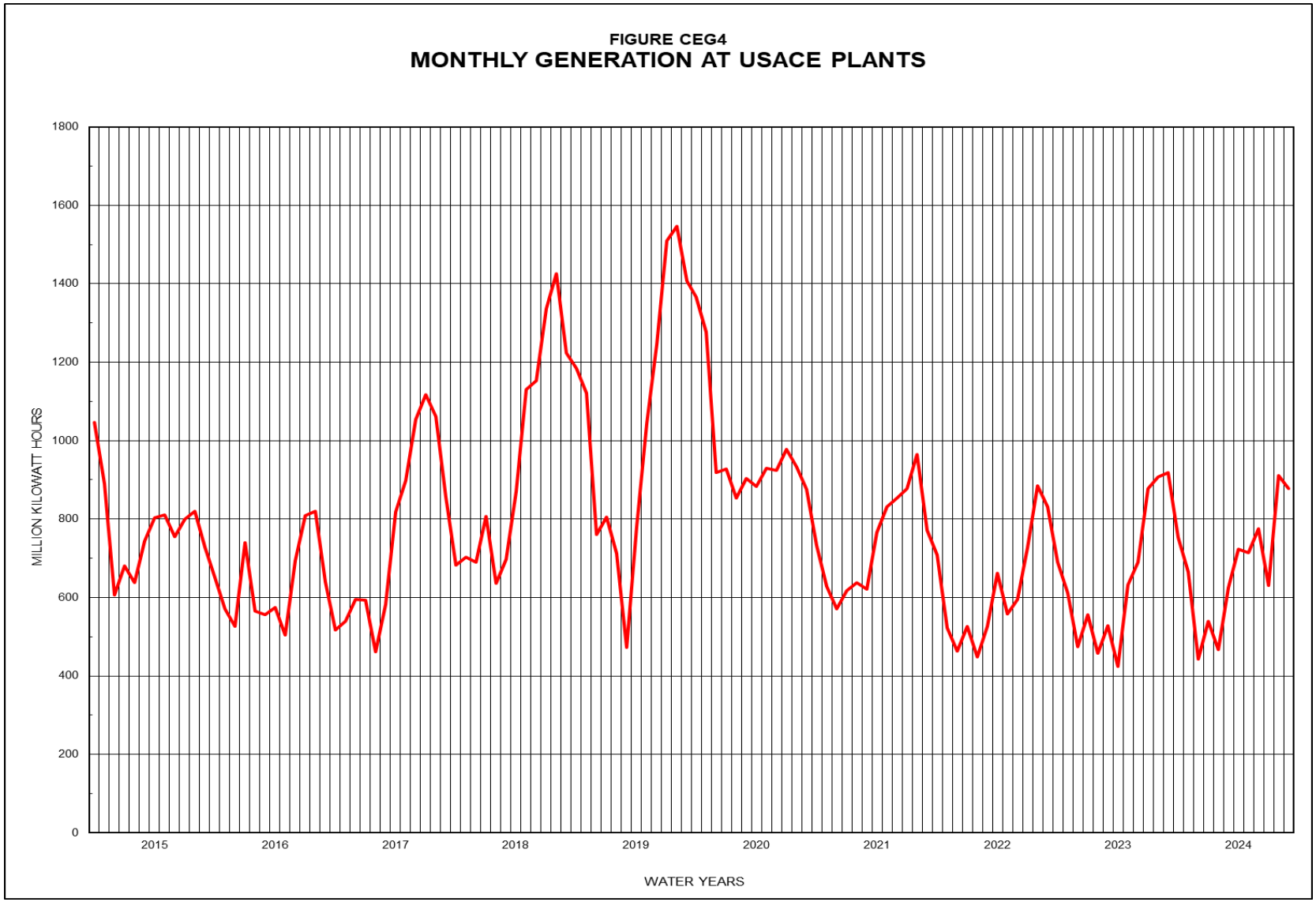


Figure CEG 4.—Annual generation at USACE plants.

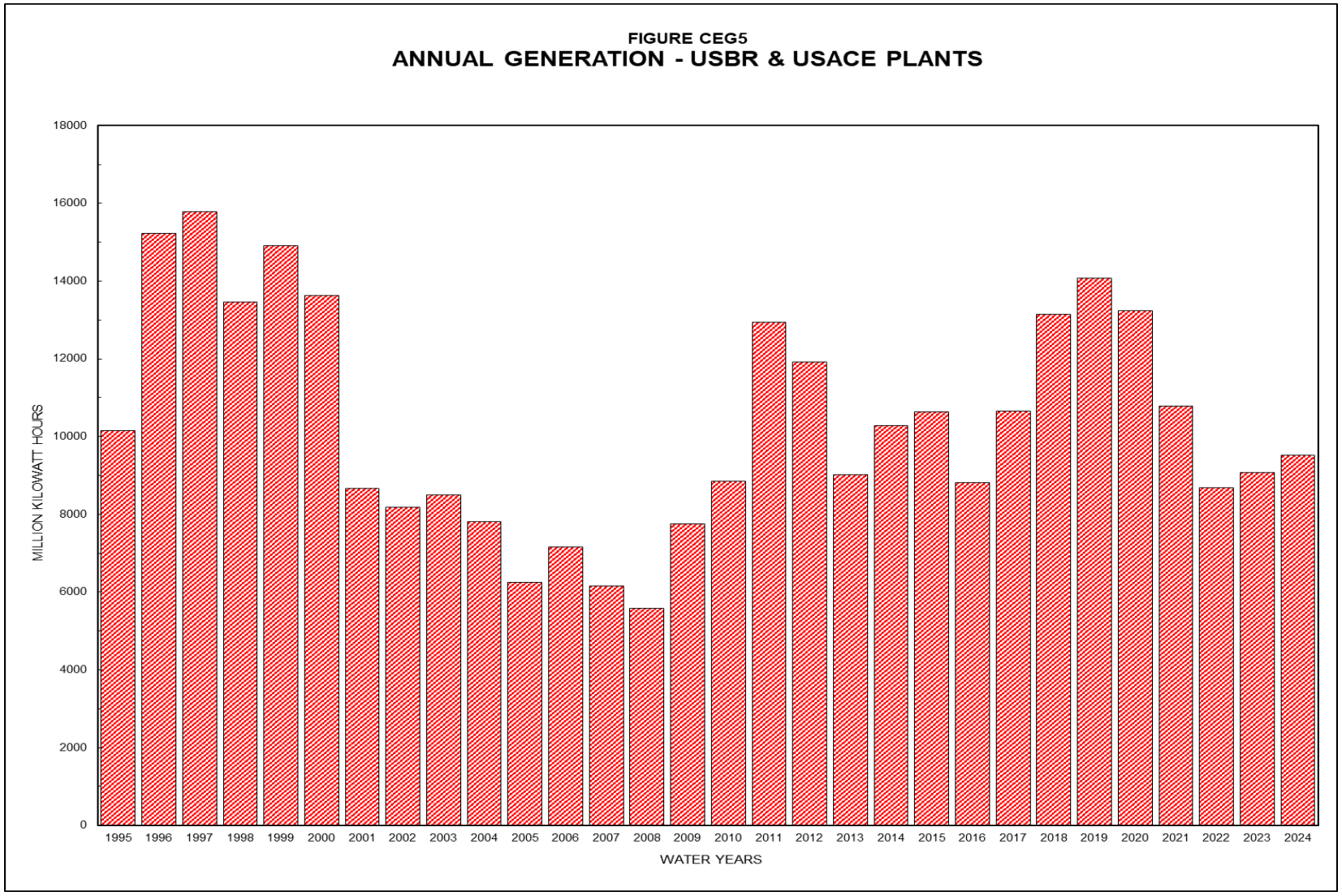


Figure CEG 5.—Monthly power generation at U.S. Army Corps of Engineers powerplants.

FIGURE CEG6

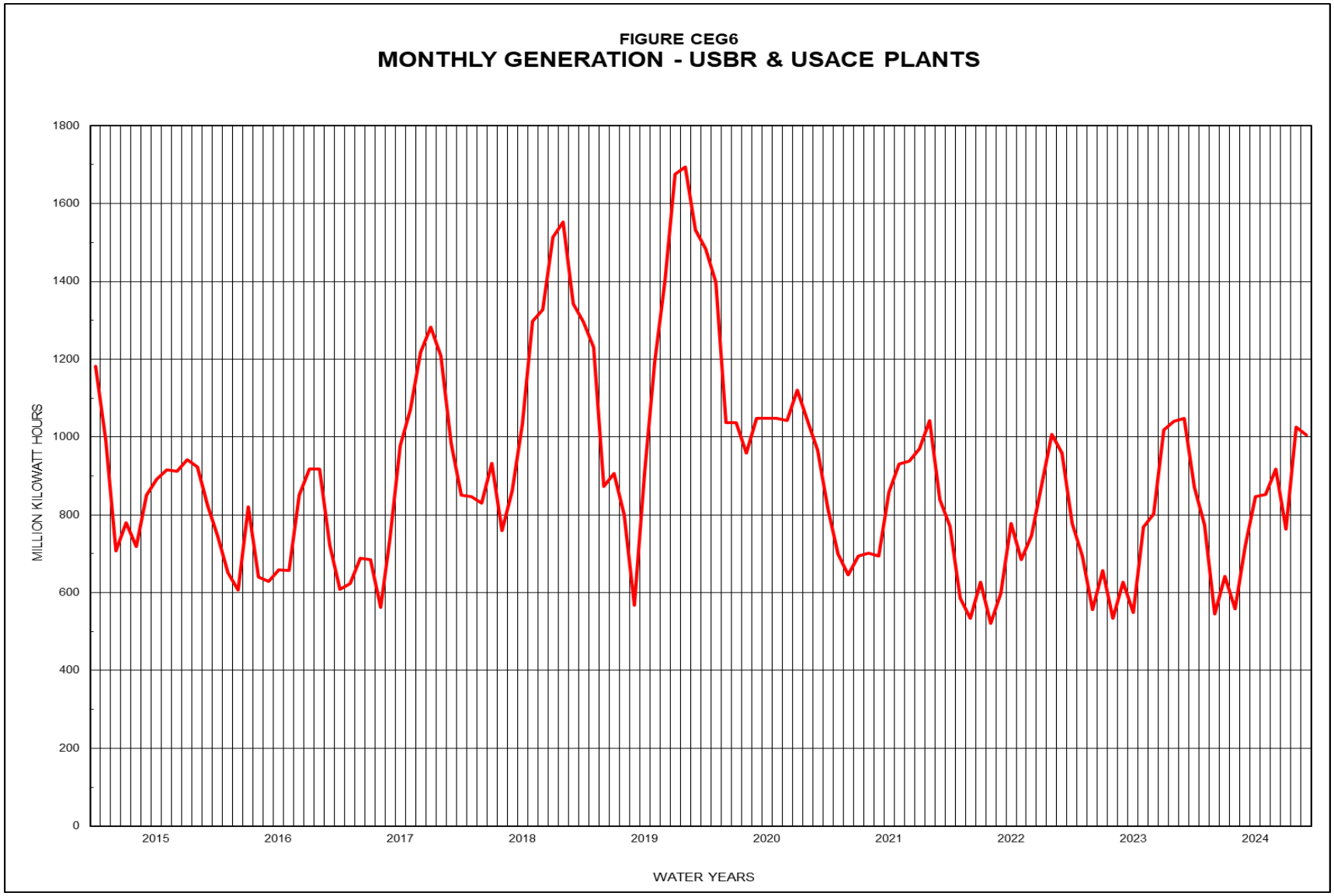


Figure CEG 6.—Annual generation at Reclamation and USACE powerplants.