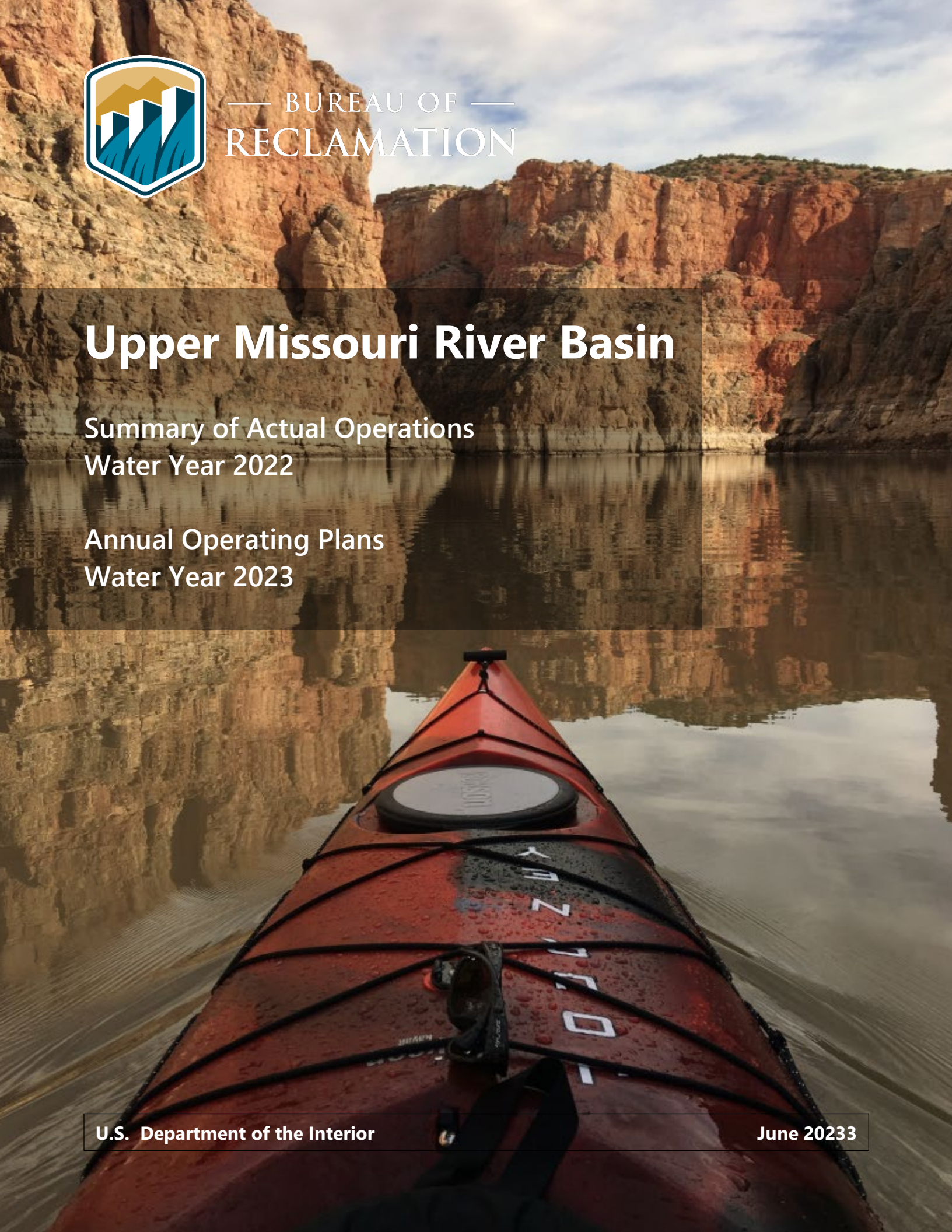

BUREAU OF RECLAMATION

Upper Missouri River Basin

Summary of Actual Operations
Water Year 2022

Annual Operating Plans
Water Year 2023

U.S. Department of the Interior

June 20233

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, 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 Photo – Spring kayak paddling through Bighorn Canyon in 2017. (Reclamation/Jack Connor)

Upper Missouri River Basin

Summary of Actual Operations
Water Year 2022

Annual Operating Plans
Water Year 2023

Hydrology and Water Operations
Wyoming Area Office
Montana Area Office
Dakotas Area Office

U.S. Department of the Interior **June 2023**

Acronyms and Abbreviations

abv	Above
AOP	Annual Operating Plan
ASI	Annual Site Inspection
Avg	Average
B	Boysen Reservoir
BB	Buffalo Bill Reservoir
BFID	Belle Fourche Irrigation District
CCWSC	Clark Canyon Water Supply Company
CCID	Crook County Irrigation District
cfs	Cubic feet per second
Corps	U.S. Army Corps of Engineers
Div.	Diversion
EAP	Emergency Action Plan
EBID	East Bench Irrigation District
EOM	End of month
FONSI	Finding of no significant impact
ft	Foot/feet
GID	Greenfields Irrigation District
IJC	International Joint Commission
Insp	Inspection
KAF	Thousand acre-feet
LOI	Letter of Intent
MID	Midvale Irrigation District
Mtn	Mountain
MT	Montana
MTAO	Montana Area Office (Reclamation)
MW	Megawatt(s)
MRJBC	Milk River Joint Board of Control
N/A	Not available
NRCS	Natural Resource Conservation Service
PS-MBP	Pick-Sloan Missouri Basin Program
PFR	Periodic Facility Review
Reclamation	Bureau of Reclamation
SM	Spirit Mountain
SMED	Spirit Mountain energy dissipation
SOD	Safety of Dams
SWE	Snow water equivalent
System	System of dams, reservoirs, and powerplants on the North Platte River
USFWS	United States Fish and Wildlife Service
Western	Western Area Power Administration

WGF	Wyoming Game and Fish Department
WY2022	Water Year 2022
WYAO	Wyoming Area Office (Reclamation)
yr	Year

Measurements

#	Number
%	Percent
AF	Acre-feet
cfs	Cubic feet per second
gwh	Gigawatt hours
kaf	Thousand acre-feet
kw	Kilowatts
Max	Maximum
Min	Minimum
MWh	Megawatt-hours

Contents

Tables

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Operating Plans for Water Year 2022 for Bighorn Basin Units Under the Responsibility of the Wyoming Area Office (WYAO)

Riverton Unit

The Riverton Project was reauthorized as the Riverton Unit Pick-Sloan Missouri Basin Program (PS-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 (MID). 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 MID and is above all unit land. It is the principal storage facility for the unit and is operated by MID under contract with Bureau of Reclamation (Reclamation). A small amount of flood control benefit is provided by normal operation for other purposes. However, when the Bull Lake Spillway is not operational the peak releases are limited to that of the outlet works (approximately 4,000 cfs). The status of the spillway requires adaptation of normal flood control operations as it is necessary to increase outflow as the inflows increase.

During the past several years, MID and Reclamation have entered into an annual agreement whereby Reclamation could store Boysen water in Bull Lake under any combination of four conditions set forth in the agreement. The agreement was approved for 2022 and the non-irrigation season releases were maintained above the required minimum flow rate of 20 cfs. As outlined in the agreement, a steady 20 cfs of the reservoir releases were accounted for as Boysen water being released from Bull Lake.

Summary of 2022 Operations

Bull Lake Reservoir carried 74,716 acre-feet (AF) of storage into Water Year 2022 (WY2022), which is 49 percent of the reservoir's active storage capacity. 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 within/near the basin above Bull Lake, are also shown. For each monthly inflow, outflow, storage, and SWE value the corresponding percentage of average (3 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)	Percent of 30-yr Average	Outflow (kaf)	Percent of 30-yr Average	EOM Storage (kaf)	Percent of 30-yr Average	Elevation (ft)	Snow (in)	Percent of 30-yr Average
Oct-21	9.3	149	2	25	82.4	108	5,780.41	0	0
Nov-21	6.8	211	2	64	87.6	114	5,782.46	2.15	169
Dec-21	2.0	80	2	81	88.0	113	5,782.6	2.4	77
Jan-22	2.2	102	2	82	88.6	114	5,782.82	4.62	96
Feb-22	1.1	62	1	87	88.2	113	5,782.67	6	94
Mar-22	1.5	75	2	89	88.1	113	5,782.63	6.73	84
Apr-22	2.6	63	2	50	89.1	113	5,783.01	7.07	70
May-22	22.0	75	7	49	104.2	111	5,788.67	8.38	93
Jun-22	75.6	119	33	115	147.3	113	5,803.34	5.12	171
Jul-22	40.4	90	48	113	139.5	106	5,800.83	0	0
Aug-22	22.2	115	52	108	109.8	106	5,790.7	0.03	0
Sep-22	8.8	94	52	144	66.2	87	5,773.77	0	0
WY2022	194.5	103	203.0	107	-	-	-	-	-

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.
ft = foot/feet in = inch(es kaf = thousand acre-feet yr = year(s

Using hydrological state data (snowpack, stream flows, etc.) forecasts of the April through July inflow volume are made each month between January and June. Table WYT 2 shows the monthly forecasts that were made in WY2022. For each forecast, Table WYT 2 shows the forecasted inflow as a percent of the historical 30-year average inflow.

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

Forecast Issue Month	April-July Inflow Forecast (kaf)	Percent of 30-yr Average Inflow
Jan-22	130	92
Feb-22	150	106
Mar-22	140	99
Apr-22	130	92
May-22	140	99
Jun-22	135	95

MID began diverting water into the Wyoming Canal on April 11 to flush the canal system and finish filling Pilot Butte and other storage locations within the district. Diversions into the Wyoming Canal continued through September 24. The peak diversion of 1,570 cfs occurred on June 13.

Additional hydrologic and statistical information pertaining to Bull Lake operations during 2022 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 (ft)	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

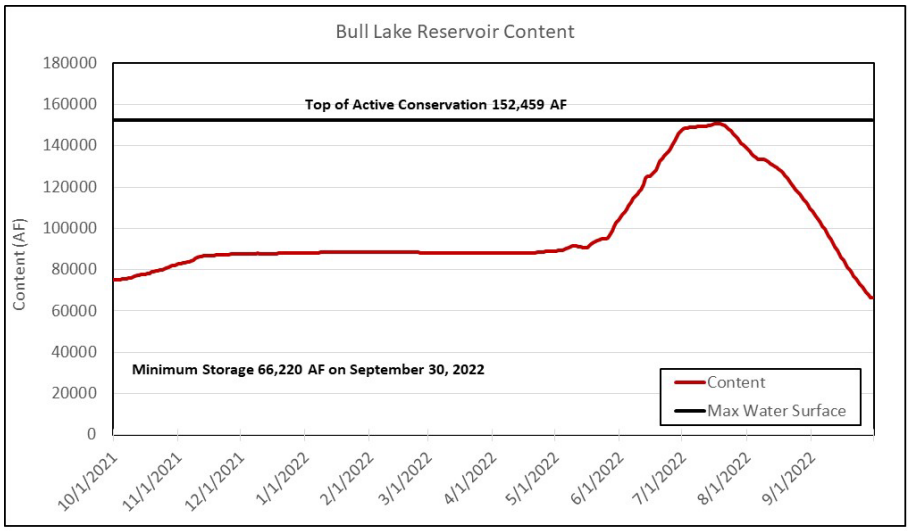
Storage-elevation data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	5777.39	74,888	10/1/2021
End of Year	5,773.77	66,220	9/30/2022
Annual Low	5,773.77	66,220	9/30/2022
Historic Low*	5,743.03	6,228	9/2/1950
Annual High	5,804.49	150,855	7/17/2022
Historic High	5,805.70	154,677	8/10/1965

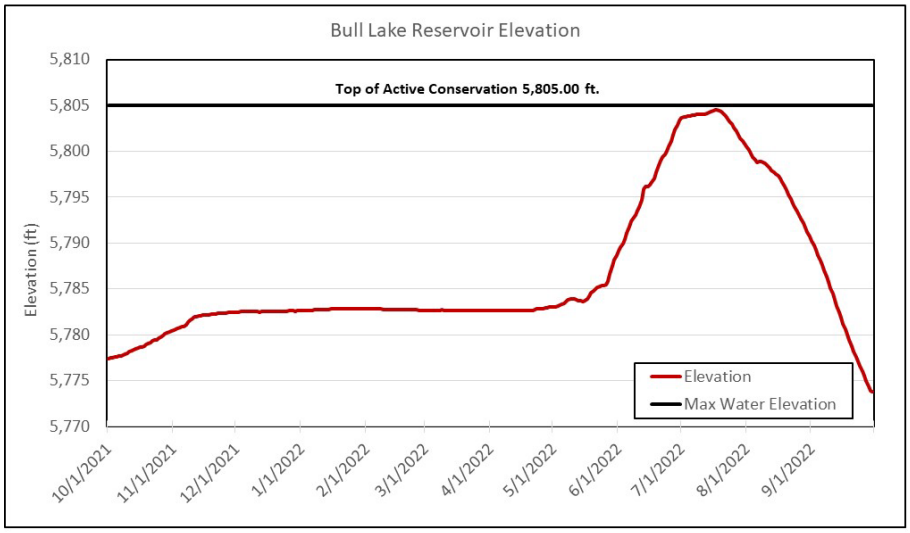
* Prior to 1952 daily records were not available. EOM records were used to determine the historic low.

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

Inflow-outflow data	Inflow	Date	Outflow	Date
Annual Total (AF)	194,465	OCT '21-SEP '22	202,961	OCT '21-SEP '22
Daily Peak (cfs)	2,992	6/12/2022	1,883	6/12/2022
Daily Minimum (cfs)	0	12/11/2021	25	11/8/2021
Peak Spillway Flow (cfs)	N/A	N/A	0	N/A
Total Spillway Flow (AF)	N/A	N/A	0	N/A

N/A = Not Available





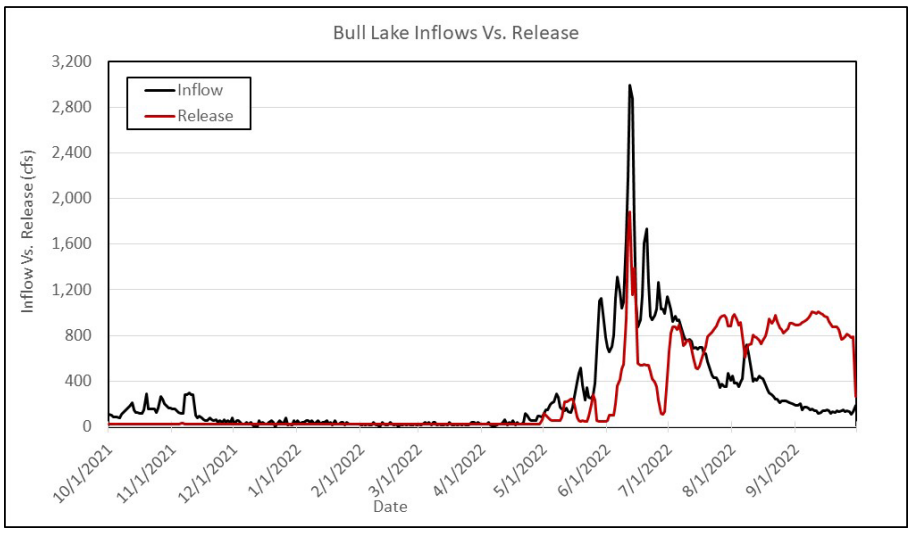


Figure WYG 1.—WY2022 storage, forebay elevation, inflow, and release at Bull Lake Reservoir.

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, which supplies the reservoir, are operated by MID under contract with Reclamation. The turbines at the inlet of the Wyoming canal are currently in inactive status.

Summary of 2022 Operations

Pilot Butte Reservoir began WY2022 completely drained. MID completed a maintenance project on the inlet works to Pilot Butte Reservoir which required Pilot Butte Reservoir to be completely drained. Pilot Butte Reservoir was empty from approximately September 28, 2022, through November 11, 2022, after which, MID began to fill the reservoir. Because of construction the annual Bull Lake exchange agreement was delayed from October to November and December of WY2022. The agreement allows MID 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 cfs in Bull Lake Creek during the winter months. Bull Lake Creek is a prized fishery, and the agreement insures its production.

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	Percent of 30-yr average	Outflow, kaf	Percent of 30-yr average	EOM Storage, kaf	Percent of 30-yr average	Elevation, ft
Oct-21	0	NA	0.0	N/A	0.0	NA	---
Nov-21	23.1	N/A	0.0	N/A	20.7	74	5,443.96
Dec-21	3.4	N/A	0.0	N/A	24.1	87	5,448.50
Jan-22	-0.2	N/A	0.0	N/A	23.9	85	5,448.21
Feb-22	-0.2	N/A	0.0	N/A	23.7	84	5,447.97
Mar-22	-0.2	N/A	0.0	N/A	23.5	82	5,447.70
Apr-22	3.4	60	2.2	45	24.6	84	5,449.20
May-22	20.6	94	18.7	74	26.5	102	5,451.53
Jun-22	36.6	104	33.6	104	29.5	101	5,455.18
Jul-22	34.8	94	41.1	97	23.3	98	5,447.43
Aug-22	38.7	121	38.8	110	23.2	120	5,447.36
Sep-22	28.6	129	34.1	135	17.7	113	5,439.72
WY2022	188.6	111	168.4	100	-	-	-

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 WY2022 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 (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	5,410.00	3,803	3,803
Top of Active Conversation	5,460.00	33,721	29,918

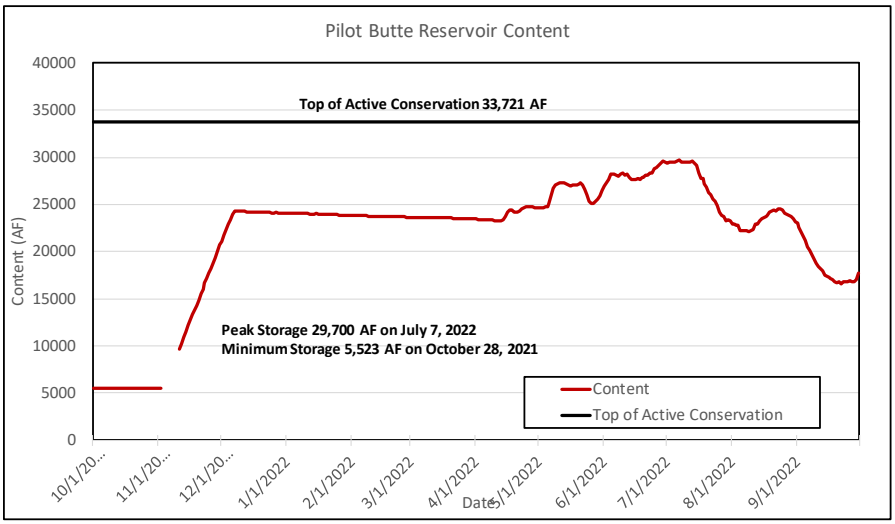
Table WYT 8.—Storage and elevation data for Pilot Butte Reservoir

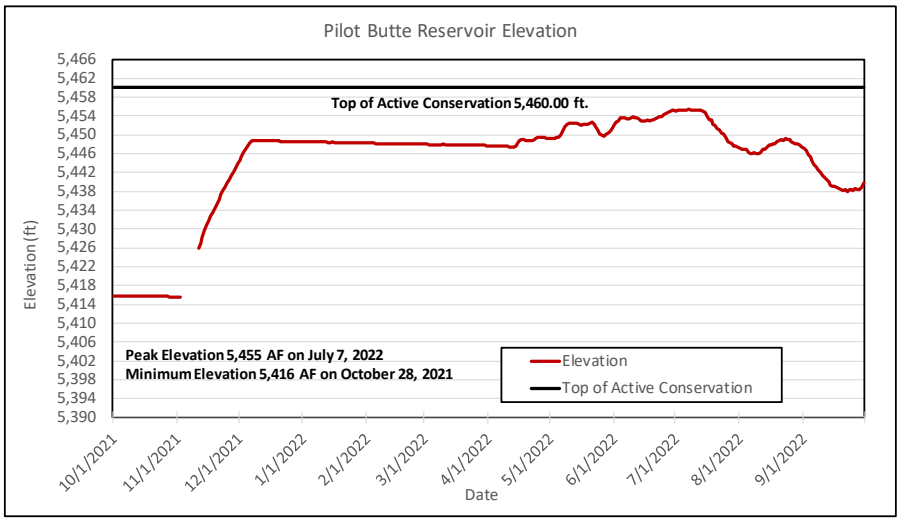
Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	5,409.00 (approximate)*	0 (approximate)*	10/1/2021
End of Year	5,439.72	17,735	9/30/2022
Annual Low	5,409.00 (approximate)*	0 (approximate)*	10/1/2021
Historic Low	5,409.00 (approximate)*	0 (approximate)*	10/1/2021
Annual High	5,455.41	29,700	7/7/2022
Historic High	5,460.60	37,465	4/20/1988

*Pilot Butte Reservoir was drained for construction. Elevation and storage are approximate.

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

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	188,557	OCT '21-SEP '22	168,443	OCT '21-SEP '22
Daily Peak (cfs)	877	8/12/2022	727	8/1/2022
Daily Minimum (cfs)	0	Winter Months	0	Winter Months
Peak Spillway Flow (cfs)	N/A	N/A	0	N/A
Total Spillway Flow (AF)	N/A	N/A	0	N/A





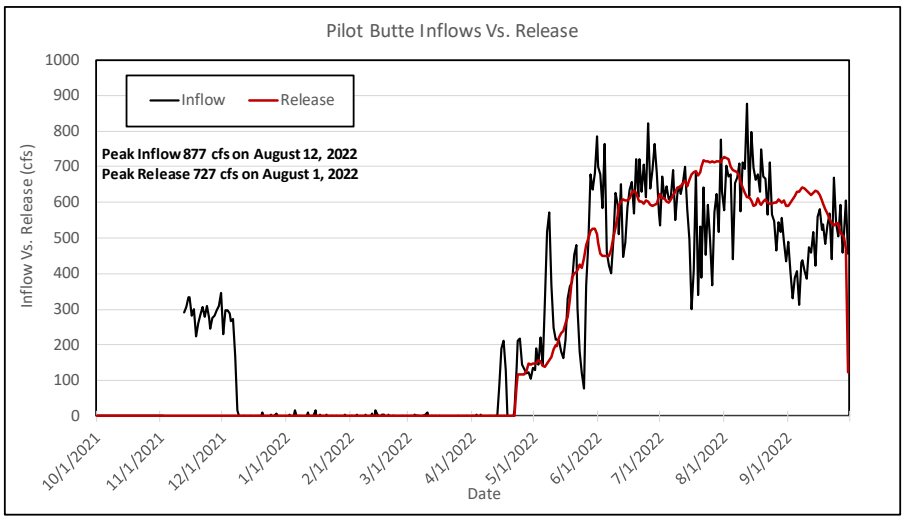


Figure WYG 2.—WY2022 storage, forebay elevation, inflow, and release at Pilot Butte Reservoir.

Boysen Reservoir and Powerplant

Boysen Reservoir (PS-MBP) is located on the Wind River above Thermopolis, Wyoming. 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. Of this amount 219,181 AF are allocated for inactive and dead storage; 522,413 AF is for active conservation storage and 150,632 AF is for exclusive flood control storage. Of the amount allocated for active conservation 144,229 AF are specifically allocated for joint use flood control storage. All the joint-use space is located between elevation 4,717.00 feet and elevation 4,725.00 feet, which is the top of the spillway gates when closed. The exclusive flood control space is located between elevation 4,725.00 feet and elevation 4,732.20 feet. When the reservoir rises above elevation 4,724.50 feet, the spillway gates are operated to maintain six 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 cfs due to the required gate clearance.

Irrigation water is provided from the reservoir for several units both upstream and downstream of Boysen Dam. Water is furnished downstream to about 7,500 acres in the Hanover-Bluff Unit (PS-MBP) and 3,400 acres on the Lucerne Canal in the Owl Creek Unit (PS-MBP). Supplemental water is furnished to other irrigation districts and to several 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 2022 Operations

Boysen Reservoir storage at the beginning of WY2022 was 634,702 AF. 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	Percent of 30-yr average	Outflow, kaf	Percent of 30-yr average	EOM storage, kaf	Percent of 30-yr average	Elevation, ft	Snow inch	Percent of 30-yr average
Oct-21	62.0	112	43.2	91	648.7	112	4.720.02	0.05	31
Nov-21	35.1	71	41.7	87	642.5	110	4.719.67	2.19	147
Dec-21	32.9	83	38.9	88	632.6	111	4.719.10	2.7	75
Jan-22	37.3	99	36.8	90	626.8	111	4.718.76	5.48	96
Feb-22	32.1	83	33.6	92	619.3	111	4.718.32	7.09	92
Mar-22	47.7	89	37.5	76	623.2	112	4.718.55	8.14	85
Apr-22	37.4	74	37.1	62	615.7	116	4.718.11	9.05	76
May-22	88.1	63	63.2	96	590.2	107	4.716.56	10.95	94
Jun-22	285.6	102	77.6	84	724.7	111	4.724.13	5.55	122

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

Month	Inflow, kaf	Percent of 30-yr average	Outflow, kaf	Percent of 30-yr average	EOM storage, kaf	Percent of 30-yr average	Elevation, ft	Snow inch	Percent of 30-yr average
Jul-22	77.3	58	73.4	70	694.9	110	4,722.56	0	0
Aug-22	43.9	89	69.5	81	666.8	112	4,721.03	0	0
Sep-22	41.7	91	63.5	102	643.1	111	4,719.70	0	31
WY2022	821.1	68	813.3	83	---	---	---	---	---

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 hydrological state 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 WY2022. 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	Percent of 30-yr average
Jan-22	550	91
Feb-22	550	91
Mar-22	500	83
Apr-22	450	75
May-22	500	83
Jun-22	525	87

During WY2022, the powerplants associated with Boysen Reservoir had a gross generation of approximately 62,162 MWh (102 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.

Important Events – WY2022

October 13, 2021: Winter flow rate was set at 700 cfs.

June 15, 2022: Reservoir releases peak at 4,777 cfs.

July 6, 2022: Peak end of day forebay elevation observed with a pool elevation of 4,724.26 feet (727,2189 AF).

Table WYT 12.—Reservoir allocations for Boysen Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	4,685.00	219,181	219,181
Top of Active Conversation	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

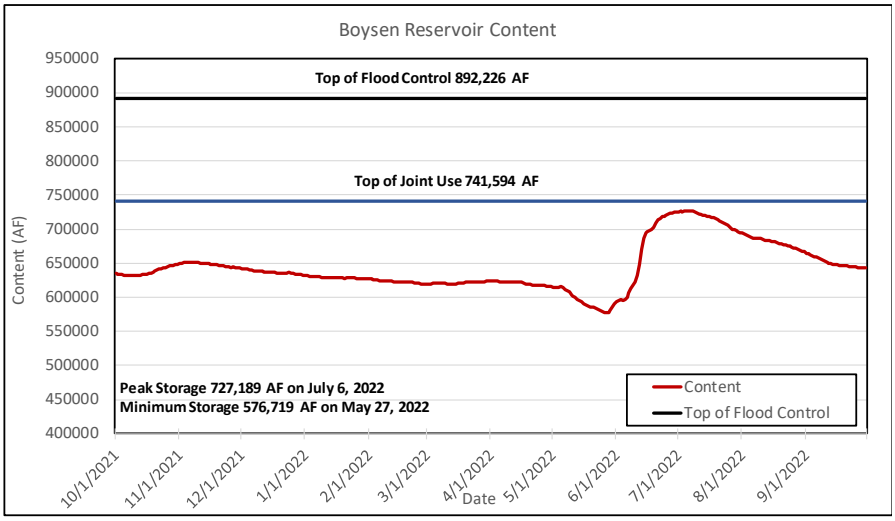
Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	4,719.22	634,702	10/1/2021
End of Year	4,719.70	643,074	9/30/2022
Annual Low	4,715.71	576,719	5/27/2022
Historic Low Elevation *	4,684.18	N/A	3/18/1956
Historic Low Content *	N/A	235,737	9/24/2002
Annual High	4,724.26	727,189	7/6/2022
Historic High	4,730.83	922,406	7/6/1967

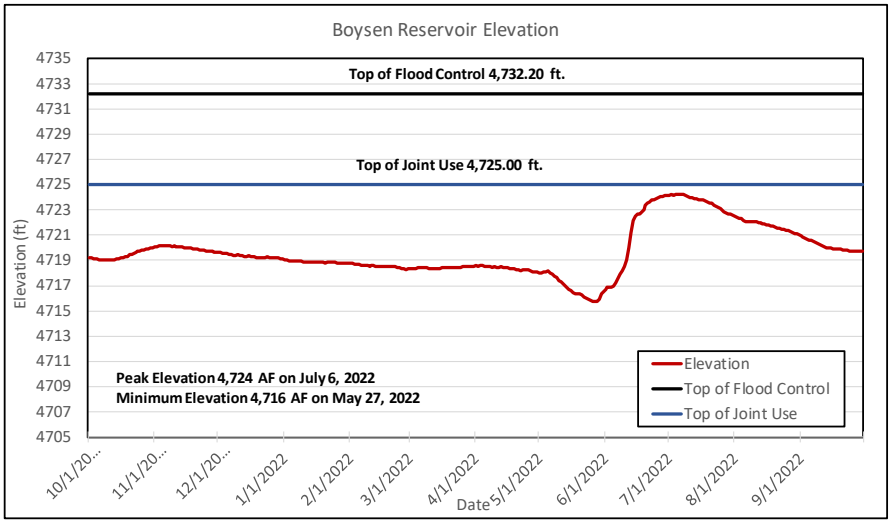
*Because storage space in a reservoir is lost as sediment is trapped behind the dam, reservoirs are resurveyed periodically to determine actual capacity. Based on the 1994 resurvey of Boysen Reservoir, the historic low content of 235,737 AF occurred at an elevation that was 2.69 ft higher than the historic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

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

Inflow-Outflow Data	Inflow*	Date	Outflow	Date
Annual Total (AF)	821,116	OCT '21-SEP '22	813,260	OCT '21-SEP '22
Daily Peak (cfs)	13,498	6/13/2022	4,777	6/15/2022
Daily Minimum (cfs)	36	4/22/2022	669	10/14/2021
Peak Spillway Flow (cfs)	N/A	N/A	641	11/4/2021
Total Spillway Flow (AF)	N/A	N/A	17,496	OCT '21-SEP '22

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





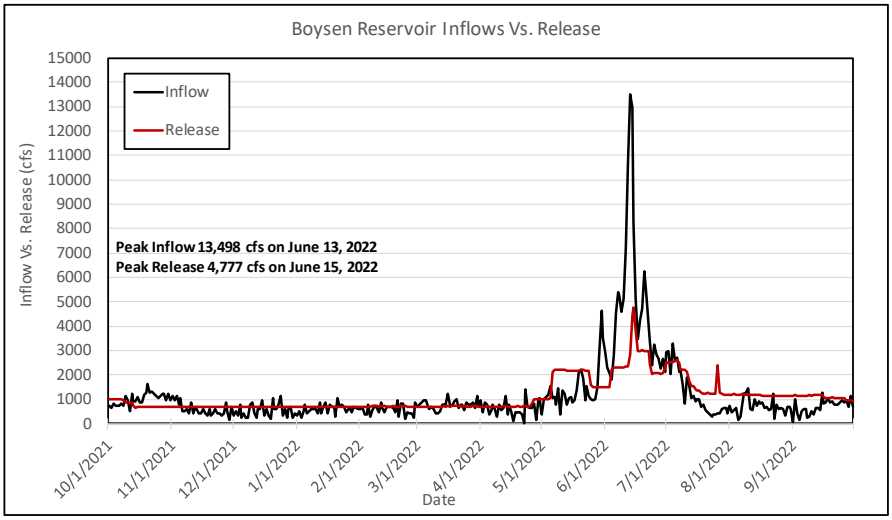


Figure WYG 3.—WY2022 storage, forebay elevation, inflow, and release at Boysen Reservoir.

Anchor Reservoir

Anchor Reservoir (PS-MBP) is located on the South Fork of Owl Creek, a tributary of the Bighorn River near Thermopolis, Wyoming. It has a total storage capacity of 17,228 AF of which 17,160 AF is active storage. Construction of the dam provides supplemental irrigation supply for the Owl Creek Unit (PS-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, in service since 1979, partition off the portions of the reservoir with high seepage losses. The top of the two dikes is at elevation 6,415.00 feet. However, when the reservoir rises above elevation 6,412.80 feet water flows through a notch in one of the dikes into the sinkhole area. The reservoir is operated to not exceed elevation 6,412.80 feet. 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 feet. Operation above 6,400.00 feet is directed by Wyoming Area Office (WYAO) staff to avoid overtopping the dikes.

Summary of 2022 Operations

The storage content of Anchor Reservoir at the beginning of WY2022 was 488 AF. Storage in the reservoir peaked on June 23 at a storage content of 5,485 AF. From that point forward the reservoir was operated to manage the reservoir level and deliver water supply to irrigators. 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 and 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	Percent of 30-yr average	Outflow, kaf	Percent of 30-yr average	Storage, kaf	Percent of 30-yr average	Elevation, ft
Oct-21	0.23	43	0.19	36%	0.53	132	6,362.81
Nov-21	-0.03	-18	0.00	N/A	0.49	N/A	6,362.00
Dec-21	-0.01	-7	0.00	N/A	0.48	N/A	6,361.80
Jan-22	0.02	32	0.00	N/A	0.50	N/A	6,362.20
Feb-22	0.01	13	0.00	N/A	0.51	N/A	6,362.46
Mar-22	0.19	77	0.00	N/A	0.66	N/A	6,365.54
Apr-22	-0.03	-5	0.00	N/A	---	N/A	---
May-22	1.85	50	1.80	74%	0.96	53	6,370.67
Jun-22	8.36	121	4.08	79%	5.24	148	6,404.09
Jul-22	0.59	28	4.86	152%	0.97	41	6,370.78
Aug-22	1.01	465	1.32	67%	0.66	106	6,365.70
Sep-22	0.40	76	0.37	50%	0.69	178	6,366.16
WY2022	12.58	83	12.63	83%	---	---	---

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 WY2022 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 (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	6,343.75	68	68
Top of Active Conversation*	6,441.00	17,228	17,160

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

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

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	6,361.89	488	10/1/2021
End of Year	6,366.16	688	9/30/2022
Annual Low	6,360.43	430	1/14/2022
Historic Low	---	---	---
Annual High	6,405.30	5,485	6/23/2022
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)	12,579	Oct '21-Sep '22	12,626	Oct '21-Sep '22
Daily Peak (cfs)	639	5/28/2022	98	6/29/2022
Daily Minimum (cfs)	0	Winter Months	0	Winter Months
Peak Spillway Flow (cfs)	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 feet, water flows through a notch in one of the dikes into the sinkhole area. This water is neither measured nor accounted for.

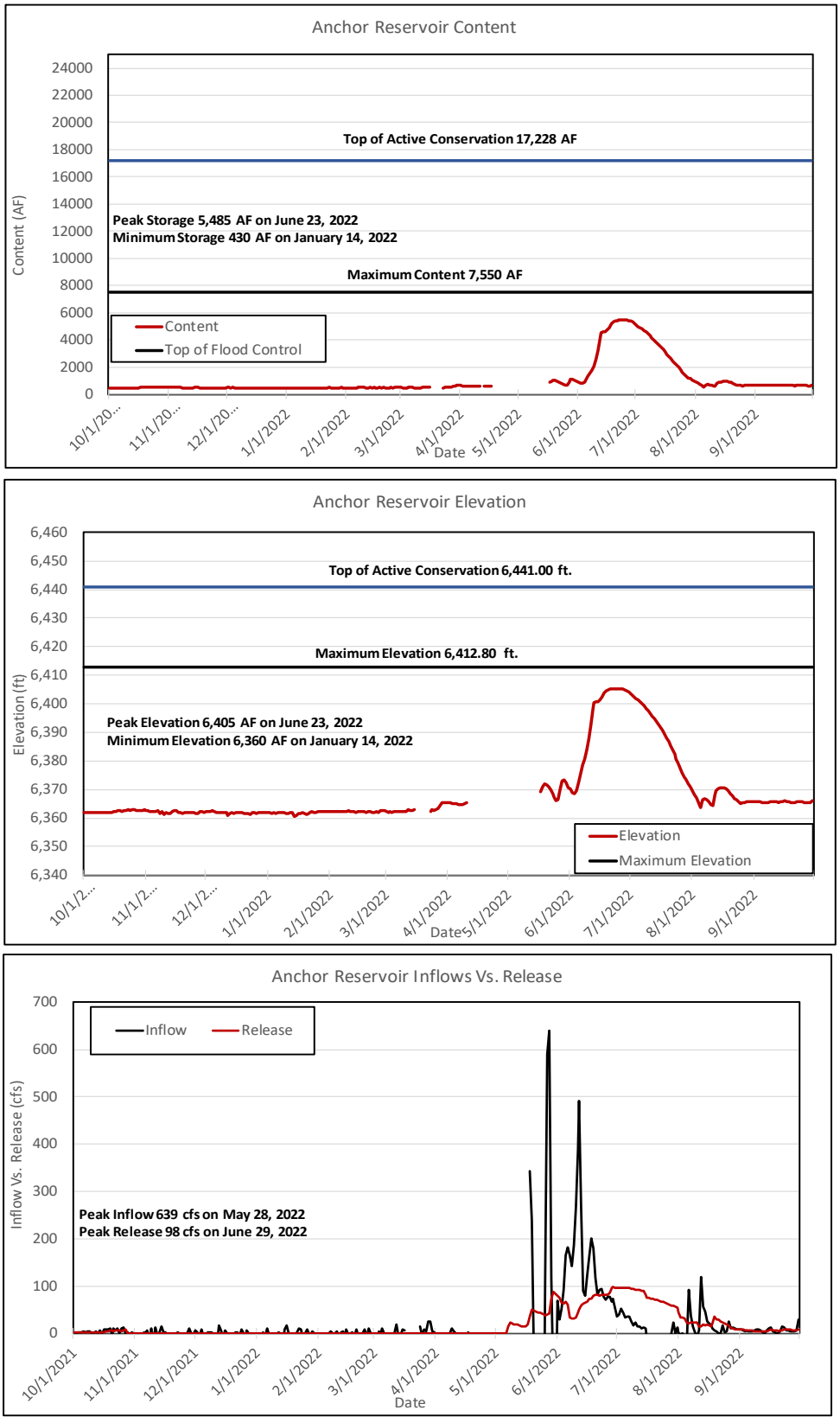


Figure WYG 4.—WY2022 storage, forebay elevation, inflow, and release at Anchor Reservoir.

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 (PS-MBP). The principal modifications to Buffalo Bill Dam included raising the height of the Dam by 25 feet, 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, constructing a visitor's center, and 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) the gated spillway, and (4) two river outlets (jet-flow valve and 4X5 high-pressure gates). 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. Irrigation releases for the project land along the Shoshone River are made through the Shoshone Powerplant, the river outlets, or through the Shoshone Canyon Conduit and Buffalo Bill or Heart Mountain Powerplants. Project works presently serve about 93,000 acres in the four divisions.

Heart Mountain Powerplant, Shoshone Project, with a nameplate capability of 6,000 kilowatts (kW) and maximum discharge capacity of 360 cfs, is located at the end of the Shoshone Canyon Conduit which obtains its water from a high-level outlet (elevation 5,233.00 feet) 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.

Shoshone Powerplant, reconstructed as part of the Buffalo Bill Unit (PS-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 use the Shoshone Powerplant became 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. In accordance with the Buffalo Bill Reservoir Enlargement Winter Release Operation Agreement a flow of at least 100 cfs is released to the Shoshone River at the base of the dam at all times. This is normally achieved using the Shoshone Powerplant. A maximum release of approximately 200 cfs can be made through the Shoshone Powerplant.

Buffalo Bill Powerplant, Buffalo Bill Unit (PS-MBP), with a nameplate capability of 18,000 kW, is located about one mile downstream of 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 cfs. The powerplant first generated power on July 15, 1992.

Spirit Mountain Powerplant, Buffalo Bill Unit (PS-MBP), with a nameplate capability of 4,500 kW and discharge capacity of 560 cfs, is a newly constructed energy dissipater powerplant located about one mile downstream of 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.

Buffalo Bill Reservoir

Buffalo Bill Dam and Reservoir, located on the Shoshone River above Cody, Wyoming, 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 feet, the top of the active conservation pool.

Summary of 2022 Operations

Buffalo Bill began WY2022 with 403,231 AF of storage. Operations to evacuate storage and deliver irrigation supply were maintained through the end of October. Table WYT 19 below shows the monthly inflows, outflows, EOM 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	Percent of 30-yr average	Outflow, kaf	Percent of 30-yr average	Storage, kaf	Percent of 30-yr average	Elevation, ft	Snow, in	Percent of 30-yr average
Oct-21	32.8	81	44.6	133	383.4	87	5,357.46	0	N/A
Nov-21	27.9	77	11.8	61	389.4	88	5,358.4	0.36	20
Dec-21	17.6	72	12.5	65	388.8	88	5,358.32	2.52	52
Jan-22	14.5	73	12.7	68	387.6	89	5,358.14	7.12	90
Feb-22	11.7	65	11.5	62	384.9	90	5,357.72	9.76	89
Mar-22	19.6	80	12.9	52	389.4	92	5,358.43	11.16	82
Apr-22	40.0	51	38.1	113	375.4	94	5,356.22	11.74	70
May-2	165.6	71	113.0	88	396.3	88	5,359.45	14.98	88
Jun-22	278.5	134	219.8	63	619.9	106	5,390.18	12.06	128
Jul-22	63.3	97	177.4	70	610.9	105	5,389.05	0	N/A

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

Month	Inflow, kaf	Percent of 30-yr average	Outflow, kaf	Percent of 30-yr average	Storage, kaf	Percent of 30-yr average	Elevation, ft	Snow, in	Percent of 30-yr average
Aug-22	31.5	113	118.3	92	541.9	105	5,380.09	0	N/A
Sep-22	16.8	106	96.6	106	471.9	105	5,370.55	0	N/A
WY2022	937.4	(101)	869.2	(94)					

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 hydrological state 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 WY2022. 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	Percent of 30-yr Average
Jan-22	600	81
Feb-22	600	81
Mar-22	570	77
Apr-22	500	68
May-22	600	81
Jun-22	660	89

During WY2022, the powerplants associated with Buffalo Bill Reservoir had a gross generation of approximately 111,043 MWh. Figure WYG 5 shows WY2022 storage, forebay elevation, inflow, and release at Buffalo Bill Reservoir.

Important Events – WY2022

October 17, 2022: End of 2022 irrigation diversions by the Shoshone projects.

October 18, 2022: Releases to the Shoshone River reduced to the winter outflow rate of 200 cfs.

April 19, 2022: Irrigation diversions by the Shoshone Project were initiated for the WY2022 irrigation season.

July 18, 2022: Buffalo Bill Reservoir reached a peak pool elevation for the water year of 5,391.90 ft.

Table WYT 21.—Reservoir allocations for Buffalo Bill Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	5,259.60	41,748	41,748
Top of Active Conversation	5,393.50	646,565	604,817

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

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	5,360.52	403,231	10/1/2021
End of Year	5,370.55	471,935	9/30/2022
Annual Low	5,353.03	355,362	5/15/2022
Historic Low*	---	19,080	1/31/1941
Annual High	5,391.90	633,668	7/18/2022
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)	937,358	OCT '21-SEP '22	869,203	OCT '21-SEP '22
Daily Peak (cfs)	15,586	6/13/2022	5,635	6/24/2022
Daily Minimum (cfs)	9*	12/30/2021	187	12/7/2021
Peak Spillway Flow (cfs)	---	---	24	4/7/2022
Total Spillway Flow (AF)	---	---	48	OCT '21-SEP '22

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

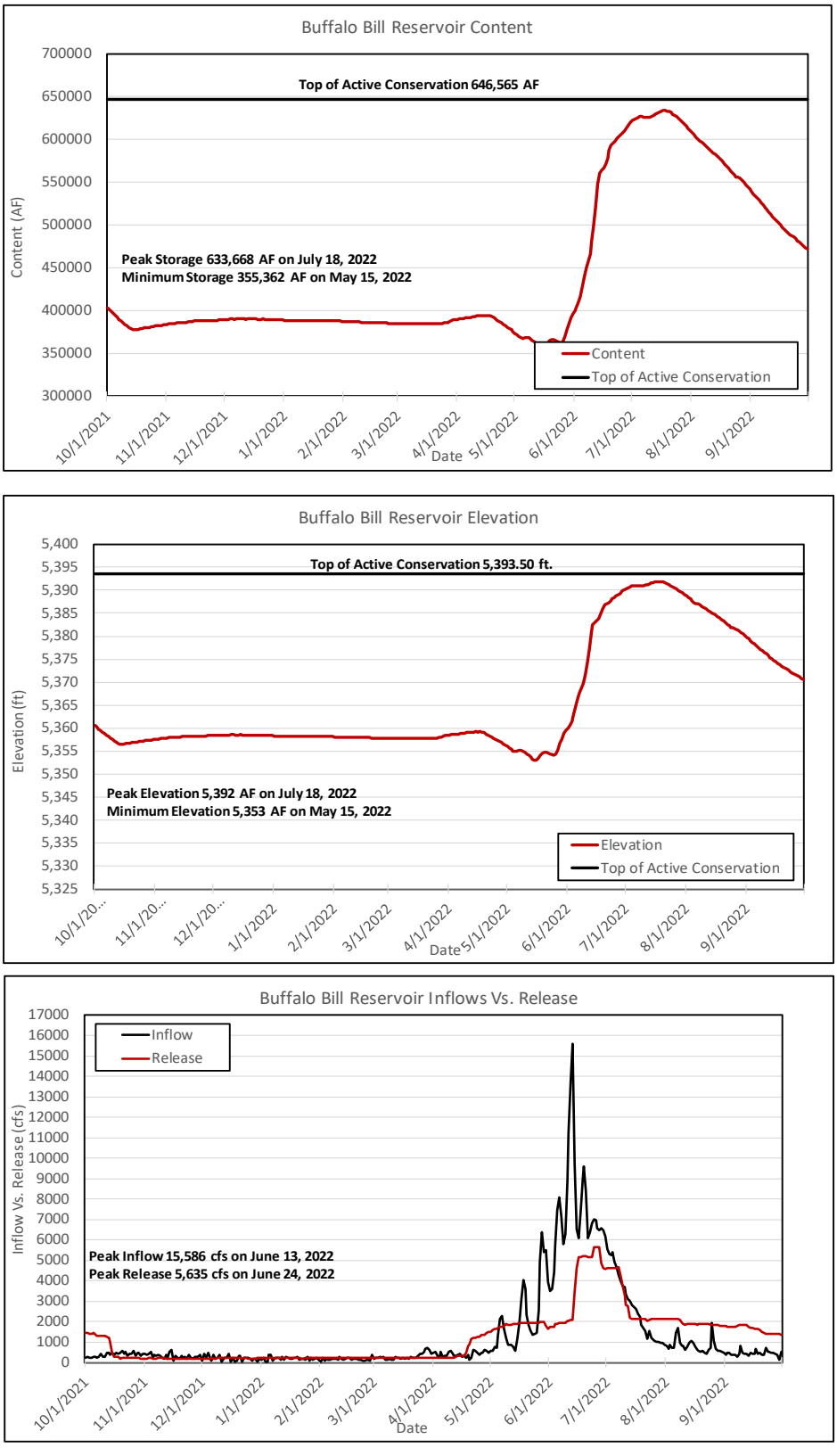


Figure WYG 6.—WY2022 storage, forebay elevation, inflow, and release at Buffalo Bill Reservoir

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

Flushing flows from Boysen Reservoir are often performed in the Spring (when possible given other demands) to support the downstream fisheries. The Wyoming Game and Fish Department (WGF) requested a flushing flow but because forecasts indicated that inflows would be below average, no flushing flows occurred.

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 cfs, 150 cfs, 200 cfs, or 350 cfs will be provided below Buffalo Bill Powerplant. The agreement serves to ensure a minimum release of 100 cfs 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 WY2022, based on the Agreement, Reclamation determined that a flow of 200 cfs was required for the winter release below 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, Wyoming. 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 feet and a minimum of 5,339.50 feet. The normal water surface elevation is typically 5,340.00 feet.

Reservoir levels during WY2022 were adequate for recreational activities on Buffalo Bill Reservoir.

Flood damages prevented in the Wind/Bighorn and Shoshone River systems are shown in Table WYT 24.

Water Year 2022 Flood Benefits

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

Reservoir	Local	Main Stem	2022 Total	1950 - 2022 Accumulation Total
Bull Lake[2]	$371,900	$0	$371,900	$16,204,700
Boysen	$1,222,800	$11,465,900	$12,688,700	$477,472,600
Buffalo Bill[2]	$13,808,100	$0	$13,808,100	$100,238,800

1/ This data is received from the U.S. Army Corps of Engineers (Corps) Omaha District Office and is revised every October. The period of assessment is 1950 - 2022.
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 2023 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 2022 to project operations under various runoff conditions for WY2023. The projected operations for three inflow scenarios are shown in Tables WYT 25, 26, and 27 and Figure 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 the MID. 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:

- 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 feet during July while eliminating or minimizing any spill.

- During April-October, releases must be adequate to meet the irrigation needs of MID and downstream irrigators with senior water rights on Bull Lake Creek.

- Based on the available water supply non-irrigation season releases from Bull Lake to Bull Lake Creek are generally maintained between 20 and 45 cfs.

- 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 (depicted the concept drawing on this slide). Reclamation awarded a contract on 9/20/2018 to Malcolm International LLC for about $44.5 million to construct the project. Construction is ongoing but unforeseen groundwater issues near the new Spillway the have delayed the project at least a year (completion in 2024). Heavy equipment will have to use an alternate access on the south side of Bull Lake Creek. The normal access route along Bull Lake Creek will remain open for non-construction traffic. United States Fish and Wildlife Service/Tribes requested that Reclamation avoid using the normal access to reduce disturbance to wintering trumpeter swans. The reservoir will be lowered to 5,777 ft (74,000 AF) for cofferdam installation/ removal in fall 2024 of the construction period of 2023–2024. Access across the dam will be closed during bridge removal relocation and cofferdam completion at the existing

spillway; alternate access to the east side of the dam will be provided with no dam crest closure in the month of April. Access to the left abutment of the dam may experience up to 15-minute delays. Access to the creek below the construction areas will remain open. Contract specifications require Contractor to meet Tribal Employment Rights Office requirements for traffic control signage to guide recreationalists.

If not for the modification to the spillway normal operations of the reservoir would be to maintain the reservoir below elevation 5,794.00 feet through the winter to prevent 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 feet) and to also provide fishery habitat.

2023 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.

Under all inflow scenarios, releases in October following the end of irrigation season and continuing through the fall and winter will be adjusted to reach and maintain the targeted winter pool elevation. Water diverted into the Wyoming Canal can be delivered to MID lands directly or routed through Pilot Butte Reservoir and delivered to district lands via the Pilot Canal.

Table WYT 25.—Monthly operating plans for WY2023 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	Jun	Jul	Aug	Sep	Total
Bull Lake Reservoir (Initial content: 74.7 kaf)														
Reservoir Inflow	kaf	6.8	3.3	2.9	2.1	1.8	2	4.2	32.5	65.1	43.3	18.5	8.2	190.7
Total Dam Release	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	18.4	37.9	12.3	52.7	52.2	184.1
Total Dam Release	cfs	25	25	25	25	25	25	25	300	638	200	857	877	---
Excess Release	kaf	0	0	0	0	0	0	0	0	36.5	10.8	5.8	0	53
EOM Content	kaf	71.5	73.3	74.6	75.2	75.6	76.1	78.8	92.8	120	151	116.8	72.8	---
EOM Elevation	ft	5,776	5,776.7	5,777.3	5,777.5	5,777.7	5,777.9	5,779	5,784.5	5,794.3	5,804.5	5,793.2	5,776.5	---
Bull Lake Res. Net Change	kaf	5.3	1.8	1.4	0.6	0.4	0.5	2.7	14.1	27.2	31	-34.2	-44	6.6
Wind River														
Flow abv Bull Lake Creek	kaf	34	23.1	18.9	21.3	18.3	17.7	21.1	78.8	191.4	110.3	41.8	26.7	603.4
Crowheart Gage Flow	kaf	35.5	24.6	20.4	22.8	19.7	19.2	22.6	97.2	229.3	122.6	94.5	78.9	787.5
Flow Below Div. Dam	kaf	25	24.6	20.4	22.8	19.7	19.2	5.2	42.5	164.6	41.7	30.6	18.3	434.8
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	cfs	305.9	413.2	332.4	371.4	354.5	312.9	78.4	406.2	2380.2	255.8	164.5	70	---
Wyoming Canal														
Total Diversion	kaf	10.5	0	0	0	0	0	17.4	54.7	64.7	80.9	63.9	60.6	352.7
North Canal Flow	kaf	0	0	0	0	0	0	9.8	26.4	31.2	36.5	36.1	30	170
North Canal Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot Butte Reservoir (Initial content: 18.9 kaf)														
Reservoir Inflow	kaf	10.5	0	0	0	0	0	7.6	28.3	33.5	44.4	27.8	30.6	182.7
Power Generated	MWh	0.2	7.2	0	0	0	0	16.2	37.5	33.5	44.4	27.8	33.6	200.4
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	---

Table WYT 25.—Monthly operating plans for WY2023 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	Jun	Jul	Aug	Sep	Total
Pilot Butte Res. Net Change	kaf	10.3	-0.2	-0.1	-0.1	-0.1	-0.2	0.7	0	0	0	-10	-3	-2.7
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 – 145 kaf / Wind River ab Bull Lake Creek – 333 kaf. This plan assumes an annual demand of 170 kaf for the North Canal and 182 kaf for the Pilot Canal.

Table WYT 26.—Monthly operating plans for WY2023 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	Jun	Jul	Aug	Sep	Total
Bull Lake Reservoir (Initial content: 74.7 kaf)														
Reservoir Inflow	kaf	4.3	2.6	2.1	1.7	1.2	1.5	2.8	29.3	36.7	23.9	13.9	5.8	125.8
Total Dam Release	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5	16.9	49.1	77.4	6.6	162
Total Dam Release	cfs	25	25	25	25	25	25	25	25	284	798	1259	110	---
Excess Release	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
EOM Content	kaf	69	70.1	70.6	70.8	70.6	70.6	71.9	99.7	119.4	94.3	30.8	30	---
EOM Elevation	ft	5,774.9	5,775.4	5,775.6	5,775.7	5,775.6	5,775.6	5,776.2	5,787	5,794.1	5,785	5,756.9	5,756.5	---
Bull Lake Res. Net Change	kaf	2.8	1.1	0.6	0.2	-0.2	0	1.3	27.8	19.8	-25.2	-63.5	-0.8	-36.2
Wind River														
Flow abv Bull Lake Creek	kaf	28.4	21.4	17.2	18.1	13.7	15.9	27.9	66.2	77.8	58.1	35.2	24.8	404.7
Crowheart Gage Flow	kaf	29.9	22.9	18.7	19.6	15.1	17.4	29.4	67.7	94.7	107.2	112.6	31.4	566.7
Flow Below Div. Dam	kaf	19.4	22.9	18.7	19.6	15.1	17.4	12	21.9	27.2	30.3	24.8	16.5	245.8
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
Riverton Gage Flow	cfs	214.8	384.6	304.7	319.4	271.7	283.6	192.6	70	70	70	70	70	---

Table WYT 26.—Monthly operating plans for WY2023 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	Jun	Jul	Aug	Sep	Total
Wyoming Canal														
Total Diversion	kaf	10.5	0	0	0	0	0	17.4	45.9	67.5	76.9	87.8	14.9	320.9
North Canal Flow	kaf	0	0	0	0	0	0	9.8	26.4	31.2	36.5	50	8	161.9
North Canal Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	22	22
Pilot Butte Reservoir (Initial content: 18.9 kaf)														
Reservoir Inflow	kaf	10.5	0	0	0	0	0	7.6	19.5	36.3	40.4	37.8	6.9	159
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	14.6	163.7
Pilot Canal Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	18.7	18.7
EOM Content	kaf	28	27.8	27.7	27.6	27.5	27.3	28	19.2	22	18	18	10	---
Pilot Butte Res. Net Change	kaf	10.3	-0.2	-0.1	-0.1	-0.1	-0.2	0.7	-8.8	2.8	-4	0	-8	-7.7
EOM Elevation	ft	5,457.8	5,457.6	5,457.5	5,457.4	5,457.3	5,457	5,457.8	5,447.1	5,450.7	5,445.5	5,445.5	5,433.5	---

Based on Minimum April-July runoff of: Bull Lake – 104 kaf / Wind River ab Bull Lake Creek – 223 kaf. This plan assumes an annual demand of 162 kaf for the North Canal and 159 kaf for the Pilot Canal.

Table WYT 27.—Monthly Operating Plans for WY2023 for Bull Lake Reservoir and other Riverton Unit features based on the Maximum Probable runoff scenario.

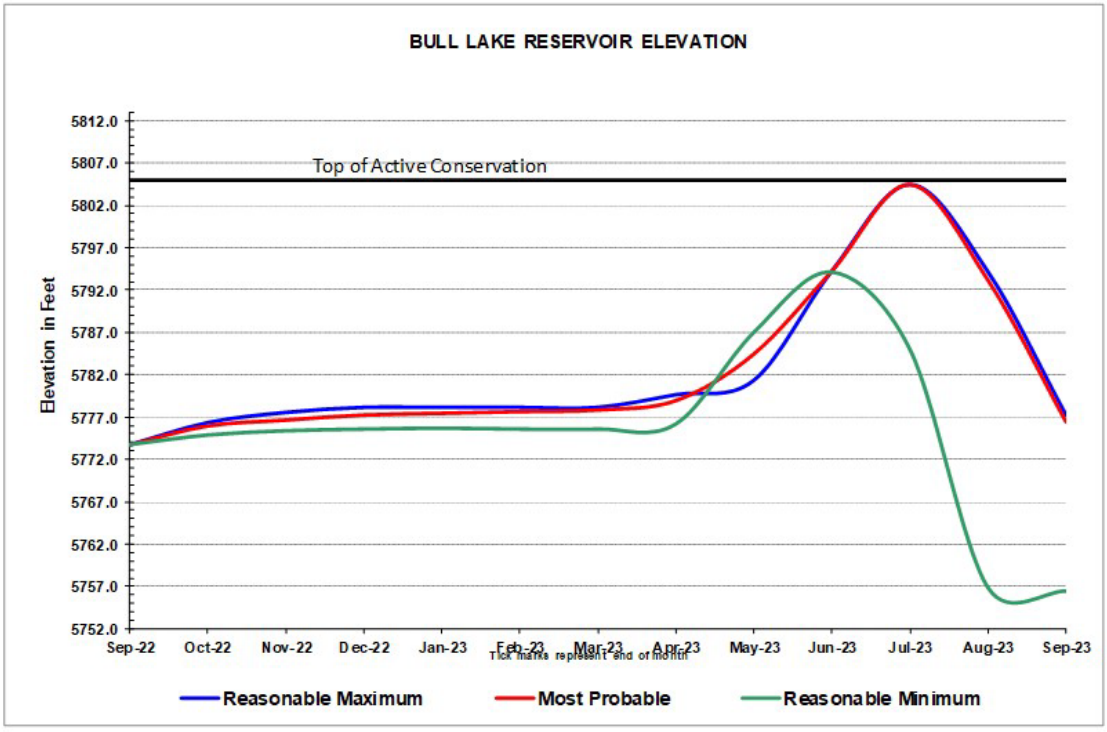
Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Bull Lake Reservoir (Initial content: 74.7 kaf)														
Reservoir Inflow	kaf	7.9	4.3	3.1	2.7	2.4	3	5.2	27.8	96.9	77.5	30	14.1	274.9
Total Dam Release	kaf	1.5	1.5	1.5	2.7	2.4	3	1.5	23.5	61.9	46.5	61.2	59.2	266.4
Total Dam Release	cfs	25	25	25	44	43	48	25	382	1040	756	995	995	---
Excess Release	kaf	0	0	0	0	0	0	0	21.9	60.4	45	50.2	23.2	200.7
EOM Content	kaf	72.6	75.4	76.9	76.9	76.9	77	80.7	85	120	151	119.8	74.7	---
EOM Elevation	ft	5,776.4	5,777.6	5,778.2	5,778.2	5,778.2	5,778.2	5,779.7	5,781.4	5,794.3	5,804.5	5,794.2	5,777.3	---
Bull Lake Res. Net Change	kaf	6.4	2.8	1.6	0	0	0	3.7	4.3	35	31	-31.2	-45.1	8.5
Wind River														
Flow abv Bull Lake Creek	kaf	37.1	32.5	30.3	31.7	20.5	27.5	27.9	145.3	323.8	196.6	77.4	50.6	1001.2

Table WYT 27.—Monthly Operating Plans for WY2023 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	Jun	Jul	Aug	Sep	Total
Crowheart Gage Flow	kaf	38.6	34	31.8	34.4	22.9	30.5	29.4	168.8	385.7	243.1	138.6	109.8	1267.6
Flow below Div. Dam	kaf	28.1	34	31.8	34.4	22.9	30.5	12	114.1	321	162.2	79.9	46.2	917.1
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
LeClie/River Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverton Gage Flow	cfs	356.3	571.2	517.8	559.5	412.3	495.6	192.6	1569.5	5007.9	2215.6	966.1	539.6	---
Wyoming Canal														
Total Diversion	kaf	10.5	0	0	0	0	0	17.4	54.7	64.7	80.9	58.7	63.6	350.5
North Canal Flow	kaf	0	0	0	0	0	0	9.8	26.4	31.2	36.5	30.9	30	164.8
North Canal Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot Butte Reservoir (Initial content: 18.9 kaf)														
Reservoir Inflow	kaf	10.5	0	0	0	0	0	7.6	28.3	33.5	44.4	27.8	33.6	185.7
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	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	10.3	-0.2	-0.1	-0.1	-0.1	-0.2	0.7	0	0	0	-10	0	0.3
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 – 201 kaf / Wind River ab Bull Lake Creek – 694 kaf. This plan assumes an annual demand of 164 kaf for the North Canal and 186 kaf for the Pilot Canal.

BULL LAKE RESERVOIR



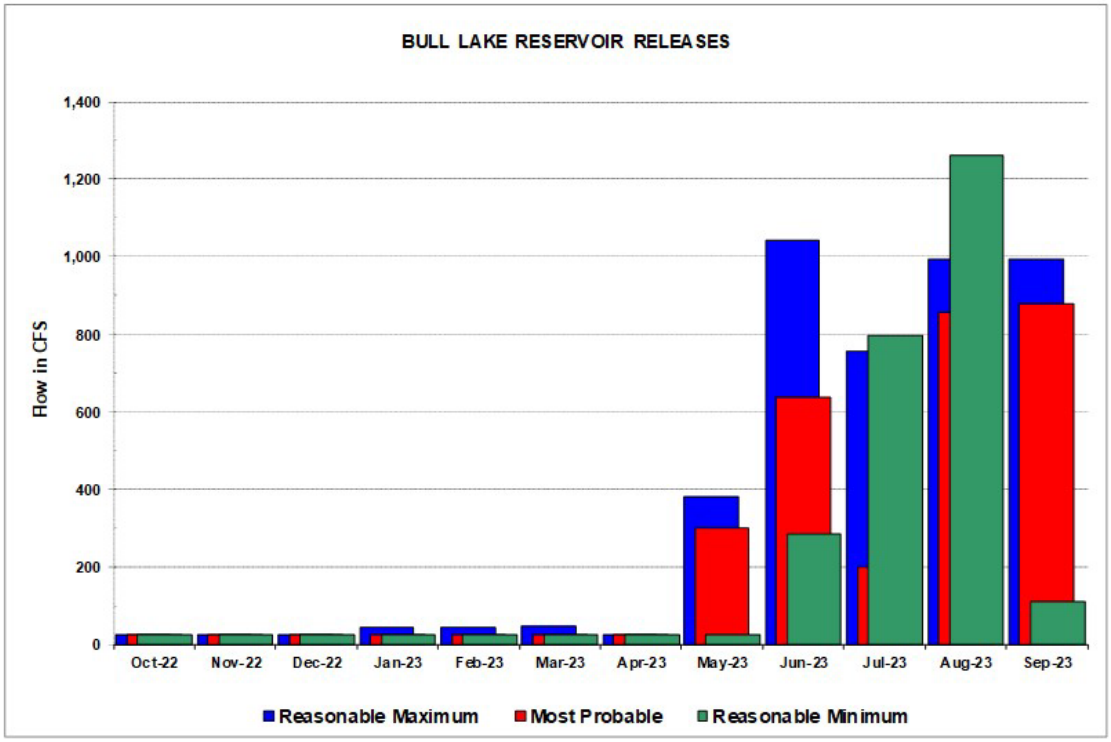


Figure WYG 7.—WY2023 forebay elevation and inflow at Bull Lake Reservoir under a minimum, expected, and maximum forecast.

Boysen Reservoir and Powerplant

Three operating plans were prepared in October 2022 to project water operations under various inflow conditions during WY2023. 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 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 U.S. Army Corps of Engineers (Corps); and enhance fish, wildlife, and recreation opportunities in both the Reservoir and the Wind/Bighorn Rivers.

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 cfs. 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 cfs and 1,150 cfs, depending on reservoir conditions going into the winter. The WGF considers 800 cfs to be the preferred fishery flow from October through February and flows below 600 cfs to be detrimental to the river fishery. A release of approximately 1,150 cfs 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

- October through 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 through February to reduce the risk of ice jams, which may cause flooding or damage to bridges and other structures.

- March through 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 feet (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 feet 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 two feet 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.

- August through 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.

2023 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 Table WYT 34.

Table WYT 28.—Monthly operating plans for WY2023 for Boysen Reservoir based on the most probable runoff scenario.

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Boysen Reservoir (Initial content: 571.2 kaf)														
Monthly Inflow	kaf	51.1	49.4	40.7	38.7	38.9	53.8	46.5	148.6	276.7	105.6	39.5	41.6	931.1
Monthly Inflow	cfs	831	830	662	629	700	875	781	2417	4650	1717	642	699	---
Turbine Release	kaf	55.3	53.6	55.3	55.3	50	55.3	59.5	123	133.3	93.7	81.4	78.7	894.4
Bypass/Spill/Waste	kaf	0	0	0	0	0	0	0	0	26.9	0	0	0	26.9
Total Release	kaf	55.3	53.6	55.3	55.3	50	55.3	59.5	123	160.2	93.7	81.4	78.7	921.3
Total Release	cfs	899	901	899	899	900	899	1000	2000	2692	1524	1324	1323	---
EOM Content	kaf	638.9	634.7	620.1	603.5	592.4	590.9	577.9	603.5	720	731.9	690	652.9	---
EOM Elevation	ft	4,719.46	4,719.22	4,718.36	4,717.37	4,716.69	4,716.6	4,715.78	4,717.37	4,723.89	4,724.5	4,722.29	4,720.25	---
Net Change Content	kaf	-4.2	-4.2	-14.6	-16.6	-11.1	-1.5	-13	25.6	116.5	11.9	-41.9	-37.1	9.8
Boysen Power Plant														
Turbine Release	kaf	55.3	53.6	55.3	55.3	50	55.3	59.5	123	133.3	93.7	81.4	78.7	894.4
Turbine Release	cfs	899	901	899	899	900	899	1000	2000	2240	1524	1324	1323	---
Generation	gwh	4.835	4.676	4.8	4.758	4.267	4.702	5.028	10.287	11.52	8.468	7.324	6.944	77.609
Max Generation	gwh	11.904	11.52	11.904	11.904	8.817	11.904	11.52	11.904	11.52	11.904	11.904	11.52	138.225
% Max Generation	%	41	41	40	40	48	39	44	86	100	71	62	60	---
Ave	kwh/af	87	87	87	86	85	85	85	84	86	90	90	88	87
EOM Power Cap	mw	16	16	16	16	16	16	16	16	16	16	16	16	---

Based on most probable April through July inflow of 577 kaf.

Table WYT 29.—Monthly operating plans for water year 2023 for Boysen Reservoir based on the minimum probable runoff scenario

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Boysen Reservoir (Initial content: 571.2 kaf)														
Monthly Inflow	kaf	34.7	37.3	31.3	29.7	27.6	41.2	31.4	61	58.7	29.9	27.2	36.3	446.3
Monthly Inflow	cfs	564	627	509	483	497	670	528	992	986	486	442	610	---
Turbine Release	kaf	55.3	53.6	55.3	55.3	50	49.2	41.7	63	71.4	73.8	70.7	62.5	701.8
Bypass/Spill/Waste	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Release	kaf	55.3	53.6	55.3	55.3	50	49.2	41.7	63	71.4	73.8	70.7	62.5	701.8
Total Release	cfs	899	901	899	899	900	800	701	1025	1200	1200	1150	1050	---
EOM Content	kaf	622.5	606.2	582.2	556.6	534.2	526.2	515.9	513.9	501.2	457.3	413.8	387.6	---
EOM Elevation	ft	4,718.51	4,717.53	4,716.06	4,714.4	4,712.91	4,712.36	4,711.65	4,711.51	4,710.61	4,707.36	4,703.9	4,701.69	---
Net Change Content	kaf	34.7	37.3	31.3	29.7	27.6	41.2	31.4	61	58.7	29.9	27.2	36.3	446.3
Boysen Power Plant														
Turbine Release	kaf	55.3	53.6	55.3	55.3	50	49.2	41.7	63	71.4	73.8	70.7	62.5	701.8
Turbine Release	cfs	899	901	899	899	900	800	701	1025	1200	1200	1150	1050	---
Generation	gwh	4.814	4.618	4.709	4.638	4.129	4.03	3.401	5.083	5.713	5.742	5.231	4.433	56.541
Max Generation	gwh	11.904	11.52	11.904	11.904	8.817	11.904	11.52	11.904	11.52	11.904	11.904	11.52	138.225
% Max Generation	%	40	40	40	39	47	34	30	43	50	48	44	38	---
Ave	kwh/af	87	86	85	84	83	82	82	81	80	78	74	71	81
EOM Power Cap	mw	16	16	16	16	16	16	16	15	15	14	13	13	---

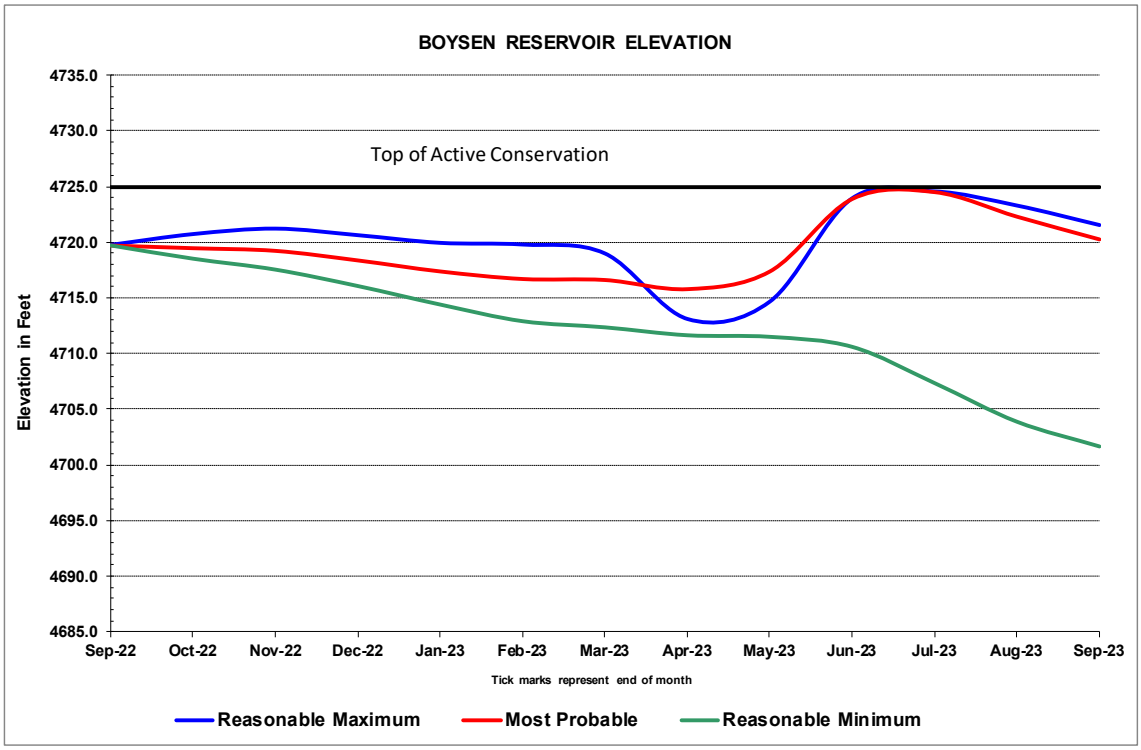
Based on reasonable minimum April-July inflow of 181 kaf

Table WYT 30.—Monthly operating plans for WY2023 for Boysen Reservoir based on the maximum probable runoff scenario

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Boysen Reservoir (Initial content: 571.2 kaf)														
Monthly Inflow	kaf	72.6	62.3	44.7	43.1	47.4	62.7	70.2	245	454.9	317.9	74.3	63	1558.1
Monthly Inflow	cfs	1181	1047	727	701	853	1020	1180	3985	7645	5170	1208	1059	---
Turbine Release	kaf	55.3	53.6	55.3	55.3	50	76.9	138.5	141	137.3	135.7	98.7	95.5	1093.1
Bypass/Spill/Waste	kaf	0	0	0	0	0	0	25.1	80.4	157.3	170.3	0	0	433.1
Total Release	kaf	55.3	53.6	55.3	55.3	50	76.9	163.6	221.4	294.6	306	98.7	95.5	1526.2
Total Release	cfs	899	901	899	899	900	1251	2749	3601	4951	4977	1605	1605	---
EOM Content	kaf	660.4	669.1	658.5	646.3	643.7	629.5	536.1	559.7	720	731.9	707.5	675	---
EOM Elevation	ft	4,720.67	4,721.16	4,720.57	4,719.88	4,719.73	4,718.92	4,713.04	4,714.61	4,723.89	4,724.5	4,723.23	4,721.48	---
Net Change Content	kaf	17.3	8.7	-10.6	-12.2	-2.6	-14.2	-93.4	23.6	160.3	11.9	-24.4	-32.5	31.9
Boysen Power Plant														
Turbine Release	kaf	55.3	53.6	55.3	55.3	50	76.9	138.5	141	137.3	135.7	98.7	95.5	1093.1
Turbine Release	cfs	899	901	899	899	900	1251	2328	2293	2307	2207	1605	1605	---
Generation	gwh	4.863	4.745	4.893	4.864	4.381	6.669	11.434	11.289	11.516	11.901	8.885	8.479	93.919
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	%	41	41	41	82	50	56	99	95	100	100	75	74	---
Ave	kwh/af	88	89	88	88	88	87	83	80	84	88	90	89	86
EOM Power Cap	mw	16	16	16	16	16	16	15	15	16	16	16	16	---

Based on reasonable maximum April-July inflow of 1088 kaf.

BOYSEN RESERVOIR



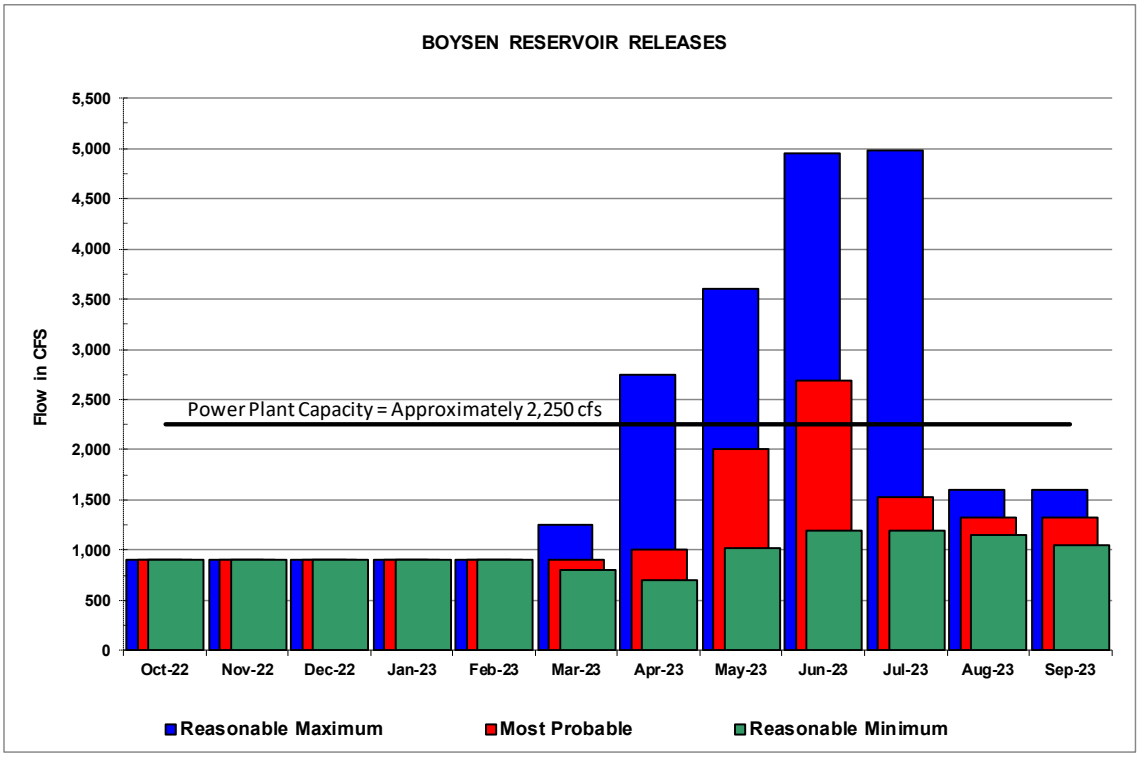


Figure WYG 8.—WY2023 forebay elevation and inflow at Boysen Reservoir under a minimum, expected, and maximum forecast.

Buffalo Bill Reservoir and Powerplants

Three operating plans were prepared for WY2023 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, 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 feet (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 cfs is provided in the river below the dam at all times. Additional winter releases beyond the 100 cfs minimum release up to a combined total of 350 cfs 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 cfs 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, 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 cfs or less during the runoff season and assures that outflow is less than inflow at all times of flood rate inflow.

2023 Operating Plans

Under most probable inflow conditions, projected inflows for October, November, and December of WY2023 have been adjusted to reflect the recent trends for the basin. Inflows for January through September of WY2022 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 WY2023. 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 WY2023 in the reasonable maximum inflows operating plan.

At the beginning of WY2023 storage in Buffalo Bill Reservoir was 470,872 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 2023 winter release would be 200 cfs. 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, Wyoming.

The Shoshone, Buffalo Bill, Heart Mountain, and Spirit Mountain Powerplants will all be available for power generation in WY2023 after all the winter maintenance is completed. 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 WY2023 for Buffalo Bill Reservoir based on the most probable runoff scenario

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Buffalo Bill Reservoir (Initial content: 446.4 kaf)														
Monthly Inflow	kaf	27.2	20.7	16.3	16.4	13.6	21.9	46.2	160.1	296.2	142.3	42	20.9	823.8
Shoshone Release	kaf	6.2	11.8	6.2	6.2	5.6	6.2	6	12	11.2	11.2	6.2	6	94.8
Non-Power Release	kaf	0	0.1	0	0	0	0	0	8.3	55	6.6	0	0	70
Total Flow Below Dam	kaf	6.2	11.9	6.2	6.2	5.6	6.2	6	20.3	66.2	17.8	6.2	6	164.8
Buffalo Bill Release	kaf	15.3	0	6.1	6.1	5.5	7	40.6	53.7	50.9	51.4	49.8	49.3	335.7
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	0	18.6	18	18.6	17.2	6.6	93.8
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	13.5	53.9	128.9	177.4	136.1	114.5	95.2	812.9
Spill/Waste	kaf	0	0	0	0	0	0	0	8.3	55	6.6	0	0	69.9
EOM Targets	kaf	-	463.9	-	-	-	-	470	-	620	626.2	-	-	---
EOM Content	kaf	451.1	459.6	463.3	467.1	469.3	477.7	470	501.2	620	626.2	553.7	479.4	---
Estimated Total Storage	kaf	454.5	463	466.7	470.5	472.7	481.1	473.4	504.6	623.4	629.6	557.1	482.8	---
EOM Elevation	ft	5368.19	5369.4	5369.92	5370.45	5370.76	5371.92	5370.85	5375.15	5390.72	5391.5	5382.18	5372.16	---
Net Change Content	kaf	-17.4	8.5	3.7	3.8	2.2	8.4	-7.7	31.2	118.8	6.2	-72.5	-74.3	10.9
Flow Below Buffalo Bill Pwr	kaf	21.5	11.9	12.3	12.3	11.1	13.2	46.6	74	117.1	69.2	56	55.3	500.5
Flow Below Buffalo Bill Pwr	cfs	350	200	200	200	200	215	783	1203	1968	1125	911	929	---
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	16.9	50.2	96.3	138.7	91.5	76.9	65.5	637.9
Passing Cody Gage	cfs	651	260	260	260	259	275	844	1566	2331	1488	1251	1101	---
Shoshone Power Plant														
Shoshone Release	kaf	6.2	11.8	6.2	6.2	5.6	6.2	6	12	11.2	11.2	6.2	6	94.8
Generation	gwh	1.14	2.159	1.141	1.143	1.034	1.149	1.112	2.23	2.156	2.238	1.223	1.139	17.864
Maximum Generation	gwh	2.232	2.16	2.232	2.232	2.016	2.232	2.16	2.232	2.16	2.232	2.232	2.16	26.28
Percent of Maximum Generation	%	51	100	51	51	51	51	51	100	100	100	55	53	---
Average Generation	kwh/af	184	183	184	184	185	185	185	186	193	200	197	190	188
EOM Power Cap	mw	3	3	3	3	3	3	3	3	3	3	3	3	---

Table WYT 31.—Monthly operating plans for WY2023 for Buffalo Bill Reservoir based on the most probable runoff scenario

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Buffalo Bill Power Plant														
Buffalo Bill Release	kaf	15.3	0	6.1	6.1	5.5	7	40.6	53.7	50.9	51.4	49.8	49.3	335.7
Generation	gwh	4.148	0	1.678	1.68	1.517	1.935	10.915	13.383	12.957	13.401	13.055	12.837	87.506
Maximum Generation	gwh	12.053	0	9.374	10.714	9.677	10.714	12.182	13.392	12.96	13.392	13.392	12.96	130.81
Percent of Maximum Generation	-	34	0	18	16	16	18	90	100	100	100	97	99	---
Average Generation	kwh/af	271		275	275	276	276	269	249	255	261	262	260	261
EOM Power Cap	mw	16	0	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	0	34.4	33.3	34.4	34.4	33.3	192.6
Generation	gwh	2.332	0	0	0	0	0	0	2.844	2.959	3.25	3.29	3.127	17.802
Maximum Generation	gwh	3.348	2.592	2.678	3.348	2.903	3.248	0	3.348	3.24	3.348	3.348	3.24	34.641
Percent of Maximum Generation	-	70	0	0	0	0	0	0	85	91	97	98	97	---
Average Generation	kwh/af	102	-	-	-	-	-	-	83	89	94	96	94	92
EOM Power Cap	mw	3	0	0	0	0	0	0	4	5	5	5	4	---
Heart Mountain Power Plant														
Heart Mtn Release	kaf	14.8	0	0	0	0	0	0	18.6	18	18.6	17.2	6.6	93.8
Generation	gwh	3.543	0	0	0	0	0	0	4.453	4.309	4.453	4.117	1.58	22.455
Maximum Generation	gwh	3.571	0	0	0	0	0	0	4.464	4.32	4.464	4.464	4.32	25.603
Percent of Maximum Generation	-	99	0	0	0	0	0	0	100	100	100	92	37	---
Average Generation	kwh/af	239							239	239	239	239	239	239
EOM Power Cap	mw	5	0	0	0	0	0	0	6	6	6	6	6	---
Total Generation														
Total Generation	gwh	11.163	2.159	2.819	2.823	2.551	3.084	12.027	22.91	22.381	23.342	21.685	18.683	145.627
EOM Power Cap	mw	27	3	16	17	17	17	20	31	32	32	32	31	---

ased on Most Probable inflow of 645 kaf.

Table WYT 32.—Monthly operating plans for WY2023 for Buffalo Bill Reservoir based on the minimum probable runoff scenario

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Buffalo Bill Reservoir (Initial content: 446.4 kaf)														
Monthly Inflow	kaf	21	18	14.8	12.9	11.8	17.6	43	148.6	160	71.6	28.4	17.8	565.5
Shoshone Release	kaf	6.2	11.9	6.2	6.1	5.6	6.1	6	6.2	6	6.2	6.2	6	78.7
Non-Power Release	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Flow Below Dam	kaf	6.2	11.9	6.2	6.1	5.6	6.1	6	6.2	6	6.2	6.2	6	78.7
Buffalo Bill Release	kaf	15.3	0	6.1	6.2	5.5	6.2	27.4	52	49.8	51.9	53.2	53.4	327
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	0	11.9	15	15.1	13.8	2.5	73.1
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	106.4	113.1	121.5	114.5	95.2	697.4
Spill/Waste	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
EOM Targets	kaf	-	463.9	-	-	-	-	463.9	550	626.2	626.2		475	---
EOM Content	kaf	444.9	450.7	452.9	453.2	453.6	458.6	460.9	503.1	550	500.1	414	336.6	---
Est Total Storage	kaf	448.3	454.1	456.3	456.6	457	462	464.3	506.5	553.4	503.5	417.4	340	---
EOM Elevation	ft	5,367.31	5,368.14	5,368.45	5,368.49	5,368.55	5,369.26	5,369.58	5,375.41	5,381.69	5,375	5,362.77	5,350.56	---
Net Change Content	kaf	-23.6	5.8	2.2	0.3	0.4	5	2.3	42.2	46.9	-49.9	-86.1	-77.4	-131.9
Flow Below Buffalo Bill Pwr	kaf	21.5	11.9	12.3	12.3	11.1	12.3	33.4	58.2	55.8	58.1	59.4	59.4	405.7
Flow Below Buffalo Bill Pwr	cfs	350	200	200	200	200	200	561	947	938	945	966	998	---
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	73.8	74.4	76.9	76.9	65.5	522.4
Passing Cody Gage	cfs	651	260	260	260	259	260	622	1200	1250	1251	1251	1101	---
Shoshone Power Plant														
Shoshone Release	kaf	6.2	11.9	6.2	6.1	5.6	6.1	6	6.2	6	6.2	6.2	6	78.7
Generation	gwh	1.138	2.167	1.134	1.117	1.025	1.119	1.103	1.154	1.145	1.182	1.138	1.045	14.467
Maximum Generation	gwh	2.232	2.16	2.232	2.232	2.016	2.232	2.16	2.232	2.16	2.232	2.232	2.16	26.28
Percent of Maximum Generation	%	51	100	51	50	51	50	51	52	53	53	51	48	---
Average Generation	kwh/af	184	182	183	183	183	183	184	186	191	191	184	174	184

Table WYT 32.—Monthly operating plans for WY2023 for Buffalo Bill Reservoir based on the minimum probable runoff scenario

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
EOM Power Cap	mw	3	3	3	3	3	3	3	3	3	3	3	3	---
Buffalo Bill Power Plant														
Buffalo Bill Release	kaf	15.3	0	6.1	6.2	5.5	6.2	27.4	52	49.8	51.9	53.2	53.4	327
Generation	gwh	4.142	0	1.67	1.699	1.507	1.701	7.416	13.15	12.628	13.034	13.094	12.923	82.964
Maximum Generation	gwh	12.053	0	9.374	10.714	9.677	10.714	12.182	13.392	12.96	13.392	13.392	12.96	130.81
Percent of Maximum Generation	-	34	0	18	16	16	16	61	98	97	97	98	100	-
Average Generation	kwh/af	271	-	274	274	274	274	271	253	254	251	246	242	254
EOM Power Cap	mw	16	0	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	7	34.4	33.3	34.4	34.4	33.3	199.6
Generation	gwh	2.323	0	0	0	0	0	0.719	2.963	2.89	2.9	2.723	2.499	17.017
Max Generation	gwh	3.348	2.592	2.678	3.348	2.903	1.741	3.013	3.348	3.24	3.348	3.348	3.24	36.147
% Max Generation	-	69	0	0	0	0	0	24	89	89	87	81	77	-
Average Generation	kwh/af	102	-	-	-	-	-	103	86	87	84	79	75	85
EOM Power Cap	mw	3	0	0	0	0	0	1	4	4	4	4	3	-
Heart Mountain Power Plant														
Heart Mtn Release	kaf	14.8	0	0	0	0	0	0	11.9	15	15.1	13.8	2.5	73.1
Generation	gwh	3.543	0	0	0	0	0	0	2.849	3.591	3.615	3.304	0.598	17.5
Max Generation	gwh	3.571	0	0	0	0	0	0	4.464	4.32	4.464	4.464	4.32	25.603
% Max Generation	-	99	0	0	0	0	0	0	64	83	81	74	14	-
Average Generation	kwh/af	239	-	-	-	-	-	-	239	239	239	239	239	239
EOM Power Cap	mw	5	0	0	0	0	0	0	6	6	6	6	6	-
Total Generation														
Total Generation	gwh	11.146	2.167	2.804	2.816	2.532	2.82	9.238	20.116	20.254	20.731	20.259	17.065	131.948
EOM Power Cap	mw	27	3	16	17	17	17	21	31	31	31	31	30	-

ased on reasonable minimum April-July inflow of 423 kaf.

Table WYT 33.—Monthly operating plans for WY2023 for Buffalo Bill Reservoir based on the maximum probable runoff scenario

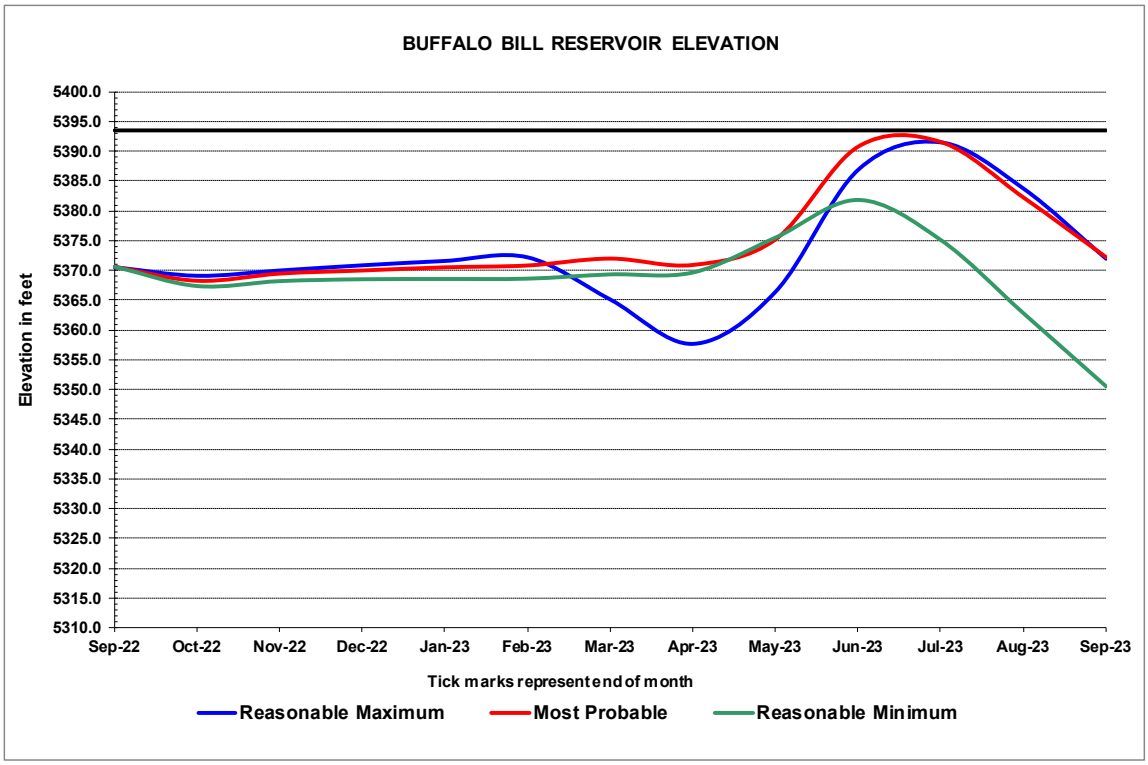
Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Buffalo Bill Reservoir (Initial content: 446.4 kaf)														
Monthly Inflow	kaf	33.7	27.5	18.8	17.9	15.7	23.5	62.1	213.4	432.7	314.8	74.2	36	1270.3
Shoshone Release	kaf	6.2	11.8	8	8	7.2	12.3	12.3	12.6	11.6	11.4	11.3	11.4	124.1
Non-Power Release	kaf	0	9.1	0	0	0	20.9	43.8	31.8	157.2	148.1	12.3	10.2	433.4
Total Flow Below Dam	kaf	6.2	20.9	8	8	7.2	33.2	56.1	44.4	168.8	159.5	23.6	21.6	557.5
Buffalo Bill Release	kaf	15.3	0	4.3	4.3	3.9	40	47.4	56.3	52.4	52.1	51.3	50.8	378.1
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	0	18.6	18	18.6	18.6	18	106.6
Heart Mtn Delivery	kaf	8	0	0	0	0	0	7	36	42	48	41	33	215
Total Outflow	kaf	44.6	21.2	12.6	12.6	11.4	73.5	110.8	155.6	281.5	278.5	134.8	123.7	1260.8
Spill/Waste	kaf	0	9	0	0	0	0	0	0	156.5	144.7	12.3	10.2	332.7
EOM Targets	kaf	-	463.9	-	-	-	-	-	450	590	626.3		478	---
EOM Content	kaf	457.6	463.9	470.1	475.4	479.7	429.7	381	438.8	590	626.3	565.7	478	---
Estimated Total Storage	kaf	461	467.3	473.5	478.8	483.1	433.1	384.4	442.2	593.4	629.7	569.1	481.4	---
EOM Elevation	ft	5,369.11	5,370	5,370.87	5,371.6	5,372.2	5,365.12	5,357.68	5,366.44	5,386.91	5,391.51	5,383.75	5,371.97	---
Net Change Content	kaf	-10.9	6.3	6.2	5.3	4.3	-50	-48.7	57.8	151.2	36.3	-60.6	-87.7	9.5
Flow Below Buffalo Bill Pwr	kaf	21.5	20.9	12.3	12.3	11.1	73.2	103.5	100.7	221.2	211.6	74.9	72.4	935.6
Flow Below Buffalo Bill Pwr	cfs	350	351	200	200	200	1190	1739	1638	3717	3441	1218	1217	---
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	24.5	16	16	14.4	76.9	107.1	123	242.8	233.9	97.2	94	1085.8
Passing Cody Gage	cfs	651	412	260	260	259	1251	1800	2000	4080	3804	1581	1580	---
Shoshone Power Plant														
Shoshone Release	kaf	6.2	11.8	8	8	7.2	12.3	12.3	12.6	11.6	11.4	11.3	11.4	124.1
Generation	gwh	1.142	2.16	1.476	1.481	1.336	2.24	2.165	2.227	2.165	2.237	2.225	2.16	23.014
Maximum Generation	gwh	2.232	2.16	2.232	2.232	2.016	2.232	2.16	2.232	2.16	2.232	2.232	2.16	26.28
Percent of Maximum Generation	%	51	100	66	66	66	100	100	100	100	100	100	100	---
Average Generation	kwh/af	184	183	185	185	186	182	176	177	187	196	197	189	185
EOM Power Cap	mw	3	3	3	3	3	3	3	3	3	3	3	3	---

Table WYT 33.—Monthly operating plans for WY2023 for Buffalo Bill Reservoir based on the maximum probable runoff scenario

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Buffalo Bill Power Plant														
Buffalo Bill Release	kaf	15.3	0	4.3	4.3	3.9	40	47.4	56.3	52.4	52.1	51.3	50.8	378.1
Generation	gwh	4.154	0	1.186	1.189	1.081	10.717	12.189	13.392	12.955	13.394	13.393	12.955	96.605
Maximum Generation	gwh	12.053	0	9.374	10.714	9.677	10.714	12.182	13.392	12.96	13.392	13.392	12.96	130.81
Percent of Maximum Generation	-	34	0	13	11	11	100	100	100	100	100	100	100	-
Average Generation	kwh/af	272	0	276	277	277	268	257	238	247	257	261	255	256
EOM Power Cap	mw	16	0	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	7	34.4	33.3	34.4	34.4	33.3	199.6
Generation	gwh	2.342	0	0	0	0	0	0.638	2.455	2.743	3.178	3.266	2.954	17.576
Maximum Generation	gwh	3.348	2.592	2.678	3.348	2.903	1.741	3.013	3.348	3.24	3.348	3.348	3.24	36.147
Percent of Maximum Generation	-	70	0	0	0	0	0	21	73	85	95	98	91	-
Average Generation	kwh/af	103	0	-	-	-	-	91	71	82	92	95	89	88
EOM Power Cap	mw	3	0	0	0	0	0	1	4	5	5	5	4	-
Heart Mountain Power Plant														
Heart Mtn Release	kaf	14.8	0	0	0	0	0	0	18.6	18	18.6	18.6	18	106.6
Generation	gwh	3.543	0	0	0	0	0	0	4.453	4.309	4.453	4.453	4.309	25.52
Maximum Generation	gwh	3.571	0	0	0	0	0	0	4.464	4.32	4.464	4.464	4.32	25.603
Percent of Maximum Generation	-	99	0	0	0	0	0	0	100	100	100	100	100	-
Average Generation	kwh/af	239	0	-	-	-	-	-	239	239	239	239	239	239
EOM Power Cap	mw	5	0	0	0	0	0	0	6	6	6	6	6	-
Total Generation														
Total Generation	gwh	11.181	2.16	2.662	2.67	2.417	12.957	14.992	22.527	22.172	23.262	23.337	22.378	162.715
EOM Power Cap	mw	27	3	16	17	17	17	21	31	32	32	32	31	-

Based on reasonable maximum April-July inflow of 1023 kaf.

BUFFALO BILL RESERVOIR



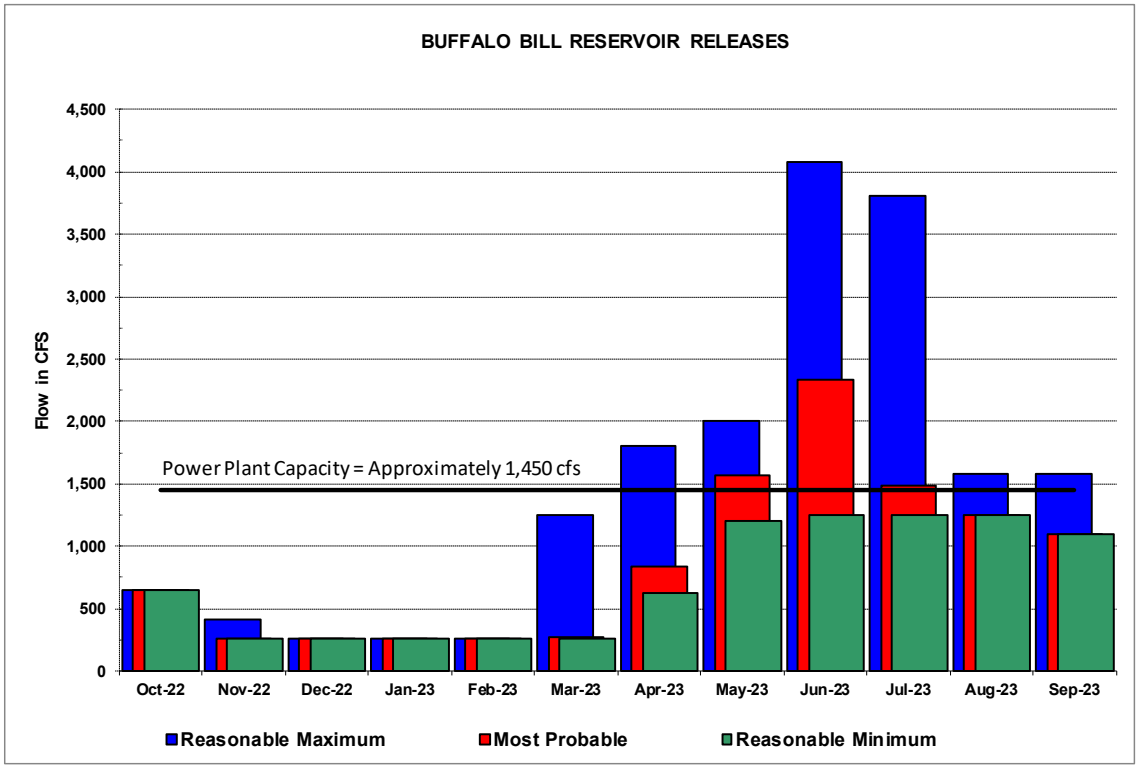


Figure WYG 9.—WY2023 forebay elevation and inflow at Buffalo Bill Reservoir under a minimum, expected, and maximum forecast.

Table WYT 34 shows WY2022 scheduled outages for Bighorn Powerplants.

Table WYT 35.—WY2022 scheduled outages for Bighorn Powerplants

Power Plant	Task Name	Start	Finish	Outage Hours	Notes
Boysen	B#1 Brakes	10/4/2022	10/20/2022	384	
Boysen	B#2	10/17/2022	10/31/2022	366	
Boysen	B-K1A and Bus 1	10/18/2022	11/9/2022	528	
Boysen	B#2	10/31/2022	11/28/2022	672	
Boysen	B#2	11/7/2022	11/28/2022	504	
Buffalo Bill/Spirit Mtn.	Shoshone Canyon Conduit Insp (BB1,2,3 & SM1)	10/26/2022	12/7/2022	1008	
Buffalo Bill	BB#2 Annual Maintenance	10/25/2022	11/28/2022	816	
Buffalo Bill	BB-KW38 and KZ2A Doble and Hi Pot Testing	10/27/2022	11/9/2022	312	
SMED	SMED #1 Generator Brushes	11/1/2022	11/3/2022	48	
Spirit Mtn.	SM#1 Brushes	11/7/2022	11/9/2022	48	
Heart Mtn. Unit One	Seasonal Plant - No Water	10/18/2022	4/15/2023	0	Seasonal Plant - No water

Annual Operating Plans for Water Year 2022 for Missouri Basin Units Under the Responsibility of the Montana Area Office

Water Year 2022 Precipitation, Snowpack, and Water Supply Forecasts

Reclamation's Montana Area Office (MTAO) has oversight and operational responsibility of 10 reservoirs east of the Continental Divide in the state of Montana. These reservoirs include Clark Canyon Dam and Canyon Ferry Dam in the Missouri River headwaters in Southwestern Montana; Gibson Dam and associated offstream reservoirs of Pishkun and Willow Creek along the Rocky Mountain front; Tiber Dam in central Montana; Sherburne Dam and associated Milk River project reservoirs of Fresno and Nelson Dams in northern Montana; and Bighorn Reservoir near the Montana-Wyoming border. Each reservoir will describe specific operations for WY2022 in the following sections.

The following sections document basin-wide conditions and specific data for each of the reservoirs for MTAO. Precipitation greatly effects operational decisions and is an important factor for all reservoirs. The main data sets that are tracked are overall precipitation and SWE. Monthly data on valley and mountain precipitation per basin during WY2022 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 are based on SWE and other basin parameters such as antecedent conditions, drought indices, and El Niño-Southern Oscillation data. Other agencies that forecast runoff include the Corps and the Natural Resource Conservation Service (NRCS).

On January 1, the NRCS reported mountain snowpack as SWE throughout Montana and parts of Wyoming ranging from 94 percent of normal in the Bighorn basin to 116 percent of normal in the St. Mary River basin. A tabular report of the SWE is also shown on Table MTT 3. Reclamation's water supply forecasts prepared on January 1 indicated April through July runoff volumes varied from 47 percent of average at Clark Canyon Dam to 107 percent of average at Sherburne Dam, Table MTT 4. All of Reclamation's reservoirs reached their peak snowpack for the year between April 22 and May 5, Figure MTG 2 and MTG 3.

Table MTT 1.—2022 Annual monthly precipitation data for valleys of interest in Montana and Wyoming

PRECIPITATION IN INCHES AND PERCENT OF AVERAGE

2022 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	1.60	146	0.33	43	0.58	82	0.84	130	0.25	41	0.63	77	1.55	110	3.02	143	1.48	62	0.78	67	0.93	93	0.79	72
Year-to-Date Precip and % of Average	1.60	146	1.92	104	2.50	98	3.34	104	3.59	94	4.22	91	5.77	96	8.78	108	10.27	98	11.05	95	11.98	95	12.76	93
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	1.60	175	0.27	46	0.50	97	0.60	148	0.24	58	0.44	76	1.12	97	2.46	136	1.46	65	0.80	68	0.81	84	1.01	100
Year-to-Date Precip and % of Average	1.60	175	1.87	125	2.37	117	2.97	123	3.22	113	3.66	107	4.78	104	7.24	113	8.70	101	9.49	97	10.30	96	11.31	96
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	2.90	165	1.32	83	2.76	152	1.00	64	0.65	45	1.01	58	2.61	120	4.56	173	3.43	131	0.58	44	1.09	92	1.38	102
Year-to-Date Precip and % of Average	2.90	165	4.22	126	6.97	135	7.97	119	8.62	105	9.63	97	12.24	101	16.80	114	20.23	117	20.81	112	21.89	110	23.27	110
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	2.05	150	0.39	46	1.13	176	0.59	107	0.62	107	0.82	88	1.77	93	4.12	166	2.43	87	0.82	67	1.13	100	1.08	86
Year-to-Date Precip and % of Average	2.05	150	2.44	111	3.56	125	4.15	122	4.77	120	5.59	114	7.37	108	11.49	124	13.92	115	14.74	111	15.87	110	16.94	108
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	1.94	160	0.56	62	1.18	134	0.72	96	0.41	58	0.68	71	1.64	105	3.35	153	2.15	86	0.76	62	0.96	90	1.10	95
Year-to-Date Precip and % of Average	1.94	160	2.50	118	3.68	123	4.40	117	4.82	108	5.50	101	7.14	102	10.49	114	12.64	108	13.41	104	14.36	103	15.46	102
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	0.15	16	0.21	39	0.60	134	0.41	98	0.56	118	0.60	97	1.09	71	0.81	35	1.59	56	1.85	175	1.26	112	0.92	69
Year-to-Date Precip and % of Average	0.15	16	0.36	24	0.95	50	1.37	58	1.93	68	2.52	73	3.61	73	4.42	61	6.01	60	7.85	71	9.12	74	10.04	74
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	0.72	71	0.74	74	1.09	155	0.56	76	0.72	103	0.90	109	0.61	45	0.91	46	2.93	103	1.50	131	0.72	70	0.67	58
Year-to-Date Precip and % of Average	0.72	71	1.46	73	2.56	94	3.12	90	3.83	92	4.73	95	5.34	84	6.25	75	9.18	82	10.69	87	11.41	85	12.08	83
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	0.39	44	0.24	46	0.45	119	0.11	27	0.14	42	0.35	72	0.41	37	0.89	44	3.03	106	1.94	124	0.62	51	0.43	36
Year-to-Date Precip and % of Average	0.39	44	0.64	45	1.08	60	1.19	54	1.33	52	1.68	56	2.09	51	2.98	49	6.01	67	7.95	75	8.57	73	9.00	69
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	3.15	120	3.55	110	4.12	162	2.49	98	1.90	84	3.68	142	1.58	67	2.92	100	4.92	128	1.73	121	0.67	49	1.22	69
Year-to-Date Precip and % of Average	3.15	120	6.70	115	10.81	129	13.30	122	15.20	115	18.88	120	20.45	113	23.37	111	28.29	114	30.02	114	30.69	111	31.91	108
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	1.95	176	0.13	22	0.43	93	0.43	100	0.44	86	0.66	90	1.95	142	2.59	119	0.66	46	0.41	52	1.15	186	1.26	113
Year-to-Date Precip and % of Average	1.95	176	2.09	121	2.52	115	2.95	113	3.40	108	4.06	105	6.01	115	8.60	116	9.25	105	9.66	100	10.81	105	12.08	106

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

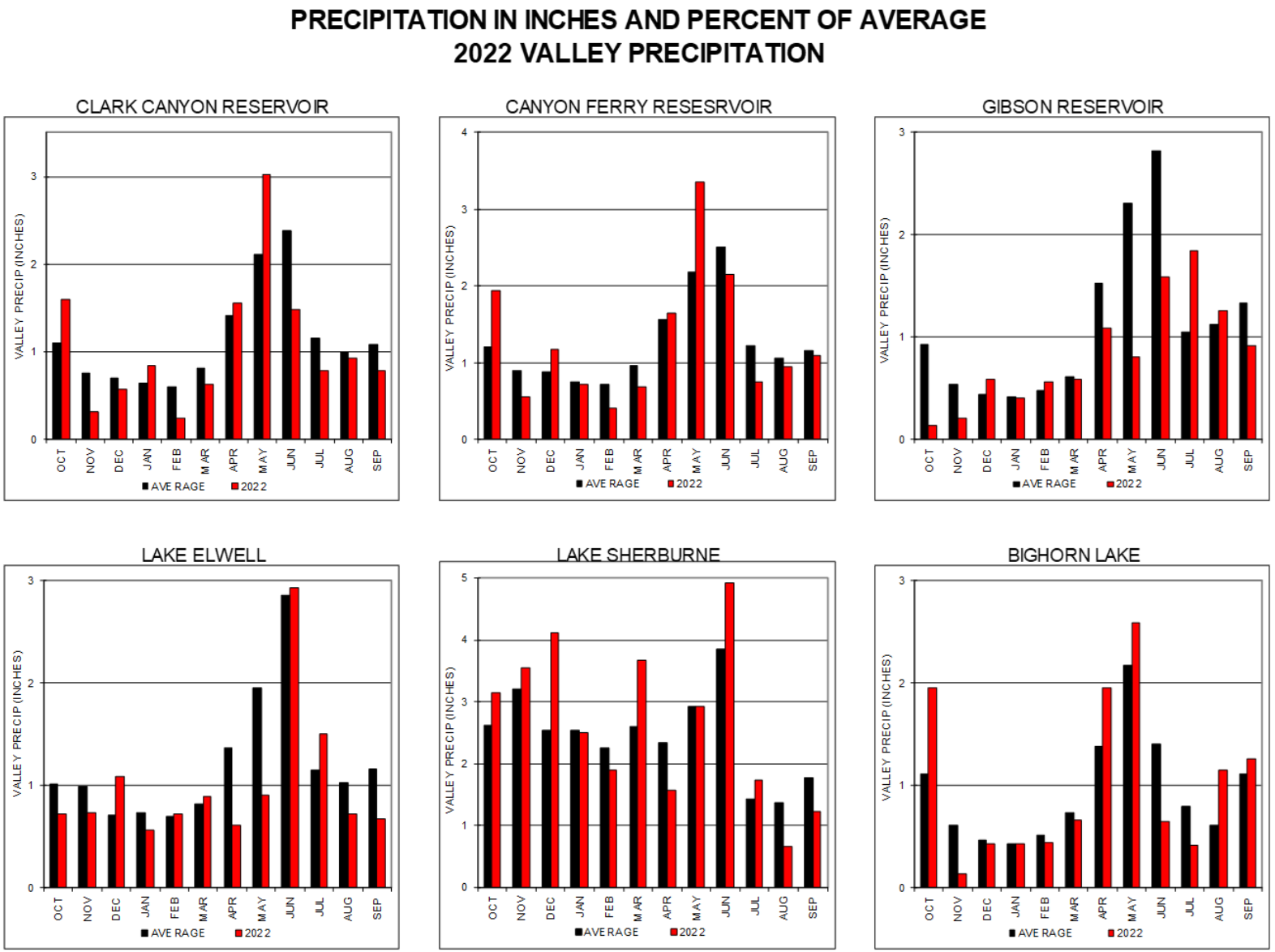


Figure MTG 1.—WY2022 monthly precipitation in valleys above MTAO managed reservoirs in Montana.

Table MTT 2.—WY2022 Annual monthly precipitation data for mountains of interest in Montana and Wyoming

PRECIPITATION IN INCHES AND PERCENT OF AVERAGE

2022 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	1.98		2.14		2.64		2.23		1.85		2.22		2.51		2.99		2.77		0.96		0.92		1.52	
Monthly Precip and % of Average	5.46	276	1.64	77	4.66	177	1.08	48	0.40	22	0.90	41	2.66	106	4.66	156	3.40	123	0.62	65	0.98	107	1.94	128
Year-to-Date Precip and % of Average	5.46	276	7.10	172	11.76	174	12.84	143	13.24	122	14.14	108	16.80	108	21.46	116	24.86	117	25.48	114	26.46	114	28.40	115
Clark Canyon Reservoir																								
Monthly Average Precip	2.21		2.38		2.51		2.26		1.87		2.31		3.04		3.34		3.04		0.97		1.00		1.49	
Monthly Precip and % of Average	4.54	205	1.67	70	3.47	138	2.20	97	0.96	51	1.57	68	3.47	114	5.64	169	2.66	87	0.64	66	0.79	79	1.19	80
Year-to-Date Precip and % of Average	4.54	205	6.21	135	9.69	136	11.89	127	12.84	114	14.41	106	17.89	108	23.53	118	26.19	114	26.83	112	27.61	111	28.80	109
Jefferson Drainage																								
Monthly Average Precip	2.18		2.45		2.67		2.42		2.04		2.33		3.06		3.29		2.97		1.12		1.06		1.50	
Monthly Precip and % of Average	3.38	155	1.79	73	3.43	128	2.53	105	1.29	63	1.74	75	3.39	111	5.31	161	2.85	96	0.95	85	0.85	80	1.57	104
Year-to-Date Precip and % of Average	3.38	155	5.17	112	8.59	118	11.13	115	12.42	106	14.16	101	17.55	102	22.86	112	25.71	110	26.66	109	27.51	108	29.08	107
Madison Drainage																								
Monthly Average Precip	2.93		3.66		3.95		3.76		3.12		3.67		3.91		3.88		3.18		1.28		1.19		1.74	
Monthly Precip and % of Average	4.55	155	3.13	85	5.79	147	2.24	59	1.28	41	2.01	55	4.18	107	6.46	167	4.59	144	0.81	64	1.41	118	2.21	127
Year-to-Date Precip and % of Average	4.55	155	7.68	116	13.46	128	15.70	110	16.98	97	18.99	90	23.16	93	29.63	103	34.21	107	35.03	105	36.44	106	38.65	107
Gallatin Drainage																								
Monthly Average Precip	3.27		3.33		3.42		3.23		3.22		3.63		4.68		4.57		3.82		1.57		1.47		2.07	
Monthly Precip and % of Average	4.07	124	3.33	100	4.80	140	2.30	71	1.57	49	2.60	72	5.93	127	7.93	174	4.50	118	1.07	68	1.53	105	1.87	90
Year-to-Date Precip and % of Average	4.07	124	7.40	112	12.20	122	14.50	109	16.07	98	18.67	93	24.60	99	32.53	111	37.03	112	38.10	110	39.63	109	41.50	108
Canyon Ferry Reservoir																								
Monthly Average Precip	2.48		2.86		3.10		2.89		2.46		2.81		3.40		3.56		3.07		1.19		1.12		1.59	
Monthly Precip and % of Average	3.56	144	2.29	80	4.26	137	2.43	84	1.30	53	1.88	67	3.85	113	5.69	160	3.49	114	0.90	75	1.09	97	1.73	109
Year-to-Date Precip and % of Average	3.56	144	5.85	110	10.11	120	12.54	111	13.85	100	15.73	95	19.57	98	25.27	107	28.76	108	29.65	107	30.74	106	32.47	106
Gibson Reservoir																								
Monthly Average Precip	2.39		2.38		2.40		2.41		2.18		2.04		2.57		3.43		3.58		1.12		1.32		1.83	
Monthly Precip and % of Average	1.40	58	2.06	87	5.07	211	2.28	95	2.63	121	2.65	130	2.01	78	2.21	65	2.94	82	1.77	158	1.98	149	1.62	89
Year-to-Date Precip and % of Average	1.40	58	3.46	72	8.52	119	10.80	113	13.44	114	16.09	117	18.09	110	20.31	103	23.24	99	25.02	102	26.99	104	28.62	103
Lake Elwell Reservoir																								
Monthly Average Precip	3.15		3.77		3.86		4.07		3.44		3.24		3.42		3.95		4.01		1.28		1.46		2.34	
Monthly Precip and % of Average	2.72	86	3.66	97	7.22	187	3.70	91	3.80	110	4.30	133	2.76	81	2.78	70	4.36	109	1.58	123	1.60	110	1.44	62
Year-to-Date Precip and % of Average	2.72	86	6.38	92	13.60	126	17.30	116	21.10	115	25.40	118	28.16	113	30.94	107	35.30	107	36.88	108	38.48	108	39.92	105
Sherburne Reservoir																								
Monthly Average Precip	5.03		6.83		6.85		7.05		5.30		5.83		4.18		3.93		4.95		1.60		1.60		2.55	
Monthly Precip and % of Average	7.45	148	10.25	150	11.70	171	5.70	81	5.10	96	7.15	123	3.75	90	6.00	153	8.25	167	1.50	94	1.55	97	1.50	59
Year-to-Date Precip and % of Average	7.45	148	17.70	149	29.40	157	35.10	136	40.20	129	47.35	128	51.10	124	57.10	127	65.35	131	66.85	130	68.40	129	69.90	126
Bighorn Lake																								
Monthly Average Precip	2.32		2.25		2.17		2.06		1.96		2.50		3.14		3.32		2.27		1.17		1.13		1.85	
Monthly Precip and % of Average	3.26	141	1.44	64	2.73	126	1.87	91	1.33	68	1.54	62	3.98	127	5.10	154	1.82	80	0.89	76	2.22	197	2.49	135
Year-to-Date Precip and % of Average	3.26	141	4.70	103	7.42	110	9.29	106	10.61	99	12.16	92	16.13	98	21.23	108	23.05	105	23.94	103	26.16	108	28.65	110

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.

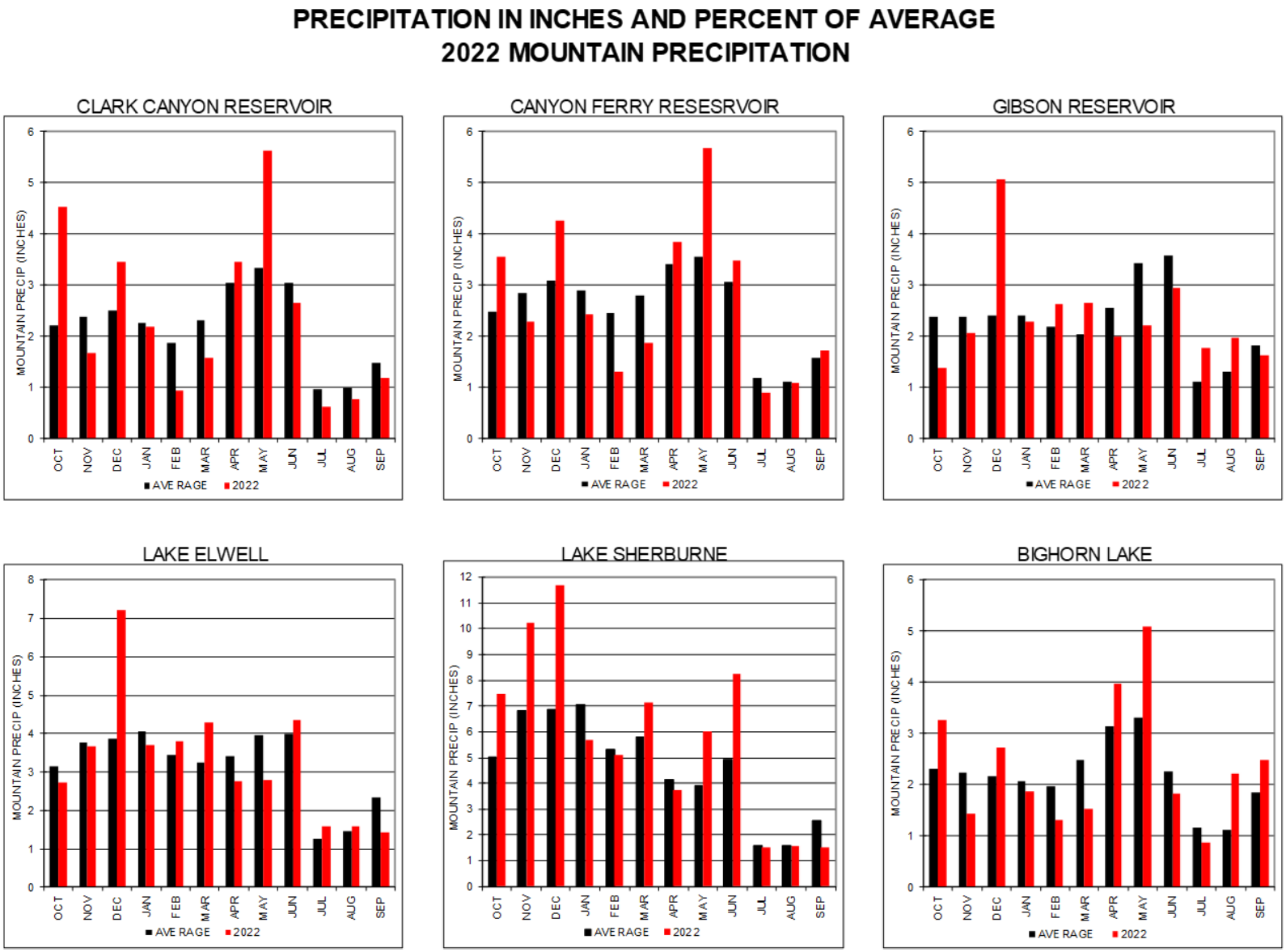


Figure MTG 2.—WY2022 monthly precipitation in mountains above MTAO managed reservoirs in Montana.

Table MTT 3.—2022 NRCS mountain snow water content as a percent of normal (median)

Drainage Basin	Jan 1	Feb 1	Mar 1	Apr 1	May 1
Headwaters Mainstem Missouri	96	93	83	75	94
Sun	110	101	108	104	127
Teton - Marias	105	96	102	101	119
St. Mary	116	103	108	102	123
Milk River	100	88	77	24	--
Bighorn Basin	94	93	87	79	103

Table MTT 4.—2022 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	Jun. 1, kaf[4]	Percent of Average	Actual April-July, kaf[5]	Percent of Average	Percent of April Forecast[6]
Clark Canyon	37	47	41	52	42	53	36	45	37	58	32	67	42.6	54	87
Canyon Ferry	1,290	72	1,365	76	1,161	65	1,056	59	1,088	72	873	90	1,486.8	87	83
Gibson	406	101	368	91	414	103	390	97	364	102	200	97	377.8	94	103
Tiber	376	101	361	97	360	97	323	87	356	113	214	116	339	91	105
Sherburne	104	107	106	109	96	98	99	102	90	103	57	122	115	118	117
Fresno[7]	69	85	61	76	56	69	35	70	24	56	10	42	34	42	61
Yellowtail	874	71	900	73	860	70	728	59	786	75	576	78	990	81	136

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
6/ Fresno Reservoir is percent of March Forecasted
7/ Fresno Reservoir Forecast is natural flow of Milk River at Eastern Crossing for March through September, Forecasts by Alberta Environment and Parks.

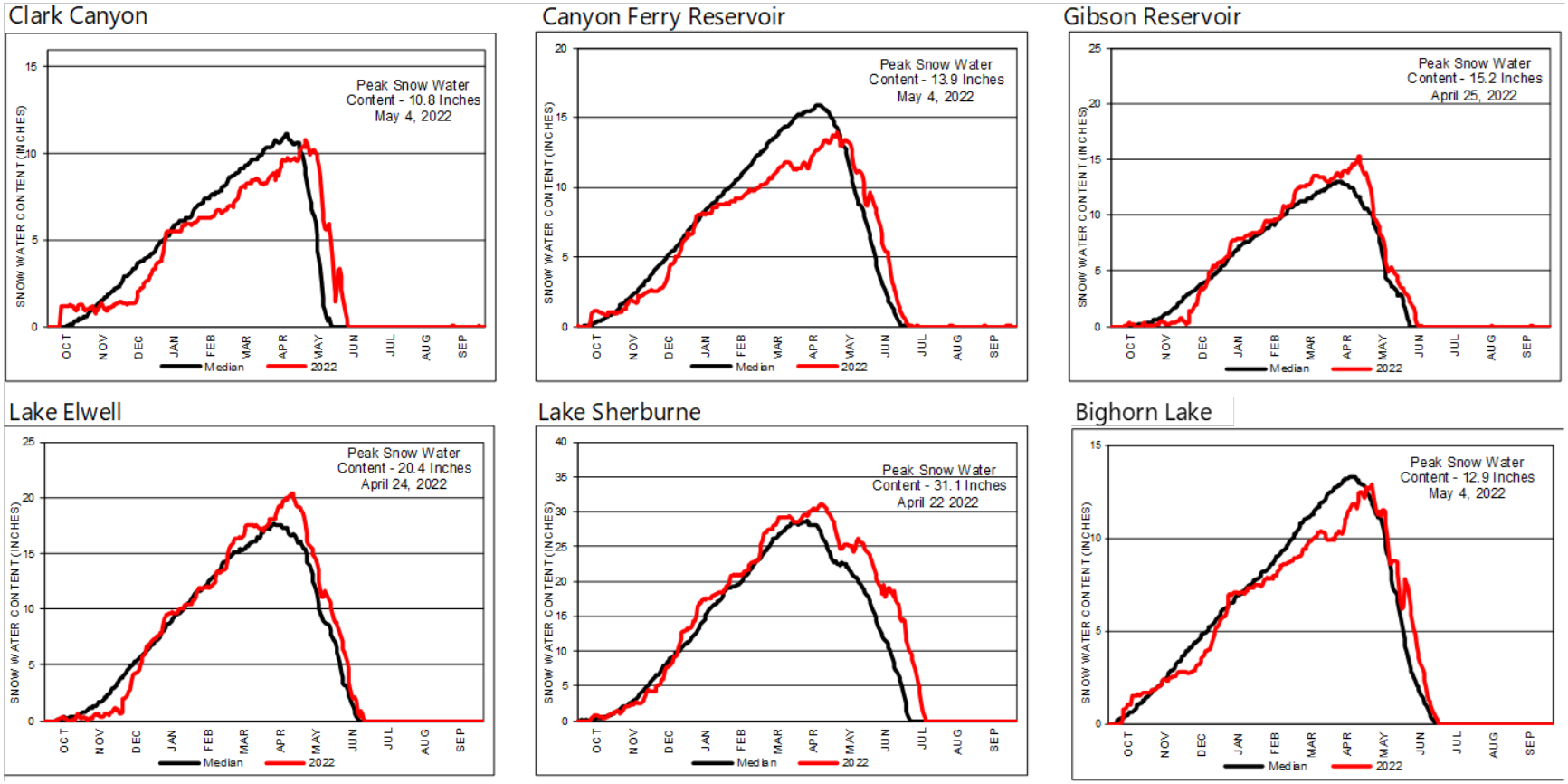


Figure MTG 3.—WY2022 SWE and average SWE in the mountains above MTAO managed reservoirs in Montana.

Water Year 2022 Flood Benefits

The Corps evaluated reservoir regulation data pertaining to Reclamation reservoirs within the jurisdiction of the MTAO and indicated that five reservoirs provided flood relief during WY2022. These five reservoirs include Clark Canyon reservoir on the Red Rock River, Canyon Ferry Lake on the Missouri River near Helena; Lake Elwell on the Marias River near Chester; Bighorn Lake on the Bighorn River near Fort Smith; and Lake Sherburne near Glacier National Park. The most notable examples of peak flows regulated by Reclamation reservoirs during spring runoff are shown in Table MTT 5.

Table MTT 5.—WY2022 peak flows regulated at Reclamation reservoirs

Reservoir	Peak Inflow, cfs	River Discharge, cfs	Date
Canyon Ferry Lake	22,021	6,226	06/14/22
Lake Elwell	5,831	682	06/22/22
Bighorn Lake	11,602	7,203	06/20/22

The Corps estimated the operations of MTAO reservoirs reduced flood damages by $41,262,800 in WY2022. Flood damages are prevented by storing water which would have contributed to flooding and are categorized as local (upstream of Fort Peck Reservoir) or mainstem (downstream of Fort Peck Reservoir). The local and mainstem flood damages prevented in WY2022 are listed in Table MTT 6 and Figure MTG 4 shows the annual flood damages prevented by MTAO reservoirs since 1950, adjusted to present value. For additional information refer to the individual reservoir operation summaries in this report.

Table MTT 6.—WY2022 flood damages prevented (thousands of dollars)

Reservoir	Local	Mainstem	2022 Total	Total Accum.
Clark Canyon Reservoir	9.9	209.1	219.0	63,190
Canyon Ferry Lake	1,701.6	18,590.5	20,292.1	869,252
Lake Elwell	0	4,270.2	4,270.2	386,490
Fresno Reservoir	0	0	0	57,163
Gibson Reservoir[1]	0	0	0	31,384
Bighorn Lake	802.1	13,732.2	14,534.3	508,783
Lake Sherburne[2]	1,947.2	0	1,947.2	31,384
Total	4,460.8	36,802	41,262.8	1,932,793

1/ No space allocated for flood control, but some flood protection provided through other purposes.
2/ Includes Corps estimated flood damages.

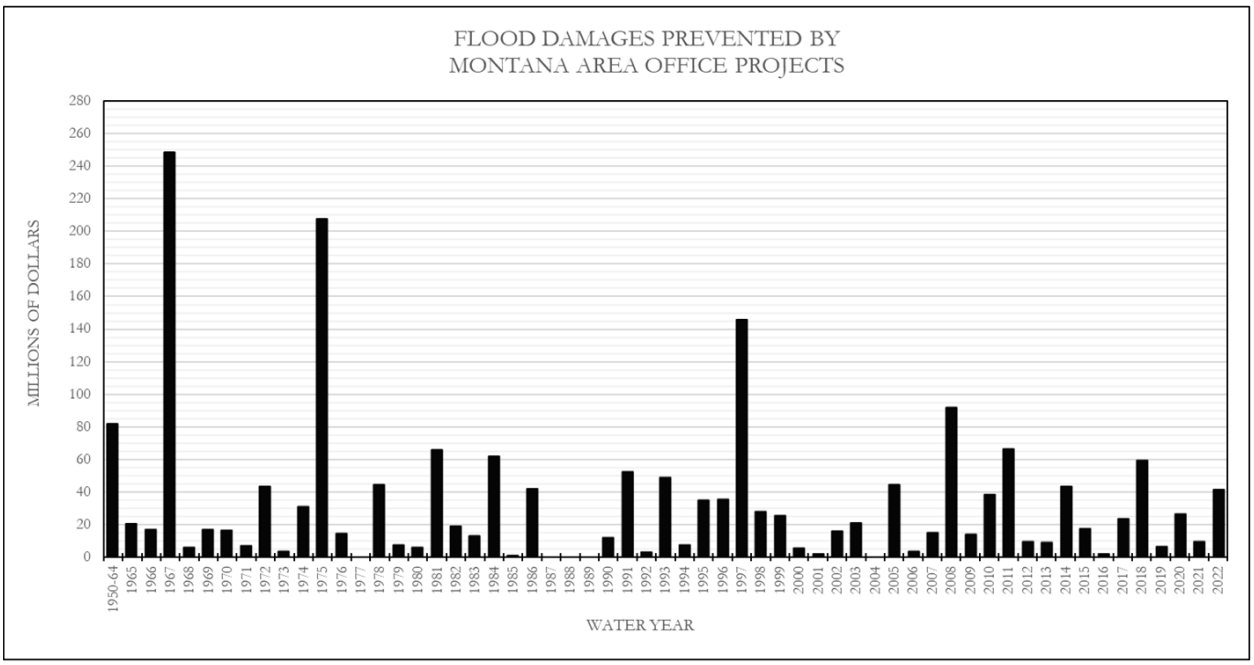


Figure MTG 4.—Flood damages prevented by MTAO Projects for each water year since 1964 adjusted to present value.

Unit Operational Summaries for Water Year 2022

Clark Canyon Reservoir

Clark Canyon Reservoir is located on the Beaverhead River approximately 20 miles upstream from Dillon, Montana. 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.

Summary of 2022 Operations

October through December

WY2022 started in October with a winter release rate of 25 cfs, which is set by the East Bench Joint Board with concurrence by Reclamation. Climatic conditions during October through December exhibited 2-4 degrees above normal temperatures, while below normal rain and snow amounts fell in the Beaverhead basin and above-normal precipitation fell in the Red Rock basin. The groundwater return-flows from upstream irrigation projects kept inflows into Clark Canyon near 150 cfs which allowed the reservoir to slowly fill. See Table MTT 9 for specific data related to Clark Canyon Reservoir's inflows, releases, and storage content.

January through March

In January, Reclamation begins to forecast the April through July runoff volume based on snowpack measurements and other basin parameters. The January 1 forecasted runoff was

47 percent of average, see Table MTT4 for monthly forecasted runoff volumes. January exhibited normal temperature and above normal precipitation patterns throughout the Beaverhead and Red Rock basins, while February and March precipitation ranged from 25-70 percent of normal. By the end of March, the Beaverhead and Red Rock Basins were designated as severe to extreme drought conditions according to the Montana drought monitor map (Figure MTG 5).

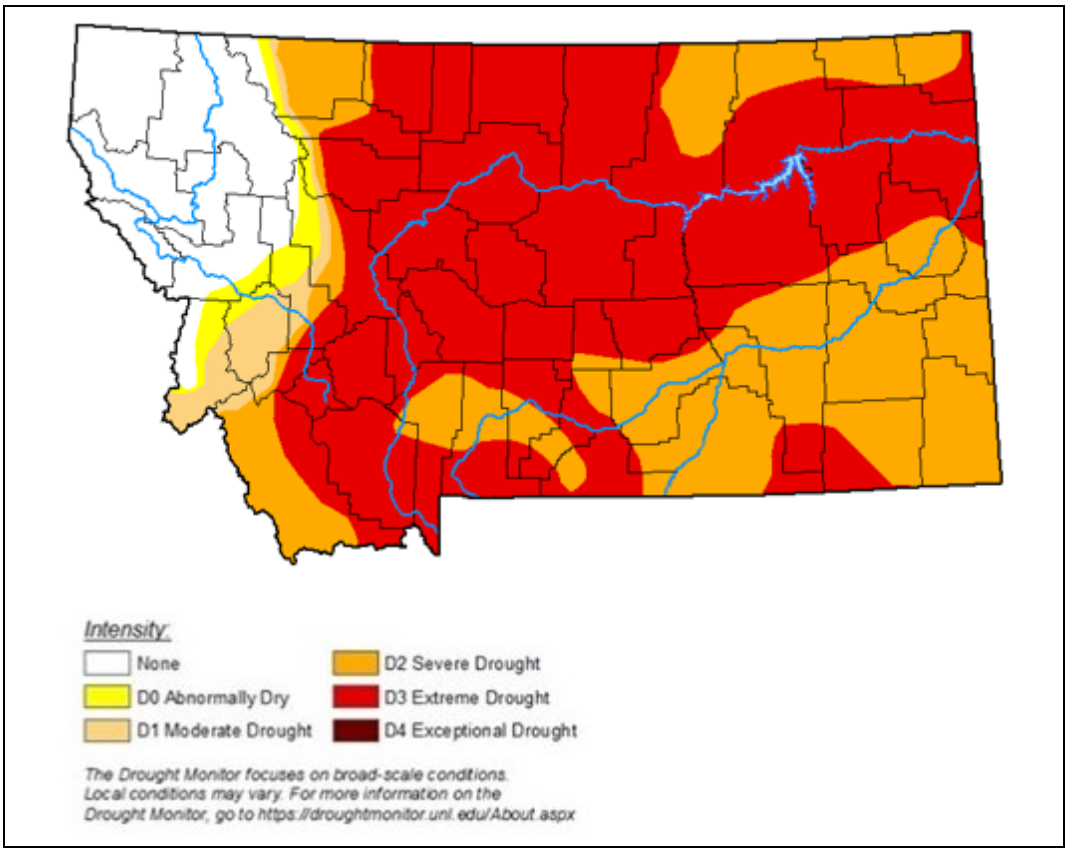


Figure MTG 5.—Montana drought monitor map, March 29, 2022.

The Joint Board, consisting of three representatives from the East Bench Irrigation District (EBID) and three representatives from Clark Canyon Water Supply Company (CCWSC), met in March 2022 to discuss the water supply outlook for the 2022 irrigation season. The projected storage content prepared and presented by Reclamation was within levels that would trigger the drought management plan. The drought management plan provides guidance for setting reduced allotments to conserve storage in drought years. The Joint Board made the decision to postpone setting allotments until more information could be provided in April.

April through July

The April 1 forecasted runoff volume into Clark Canyon was 36,000 AF, 45 percent average. The low volume was a result of the drought from the previous year and the much below normal snowpack. By mid-April the Joint Board met again to determine irrigation allotments. The

storage content projections were within the drought management guidelines, therefore the Joint Board set allotments at the third-tier reduction. The third tier reduced allotment means CCWSC would receive 3.0 acre-feet per acre (AF/acre) and the EBID would receive 2.0 AF/acre. April inflows totaled 4.7 kaf or 30 percent of the 30-year average and is second lowest inflow since 1965. Lowest inflow on record for the month of April was 3.9 kaf in 2004. Releases to the Beaverhead River were being maintained near 25 cfs.

On May 1, Reclamation's May through July forecasted inflow volume increased to 58 percent of average. This was a result of late season snow falling during April bringing the May 1 SWE to 91 percent of median. May and June are historically the highest rainfall months of the year and augment the snowmelt runoff volume. Rain and cool temperatures did come to the Beaverhead and Red Rock basins during May and June providing additional soil moisture to local irrigators and improving runoff conditions to the extent that, by the end of June, southwestern MT was nearly out of a drought status designation. Release changes from Clark Canyon Dam during June were based upon irrigation demands.

The Joint Board determined to increase allotments from the third tier to the second tier in early July as forecasted water supply improved and the projected operations suggested additional water deliveries would be available for the irrigators.

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 did not fill and therefore did not contribute any additional runoff into Clark Canyon. The April through July runoff volume into Clark Canyon was 42,600 AF, 54 percent of average.

August through September

August temperatures were warm, and irrigation demands were high and, as a result, Clark Canyon Reservoir continued to draft quicker than projected. The Joint Board held a meeting in August and decided to reduce releases and end the irrigation season earlier than normal to conserve carryover storage for next year. Releases from Clark Canyon were stepped down from 375 cfs on August 31 to a winter release rate of 25 cfs by September 9. September was again hot and dry leaving southwestern Montana in a drought status by the end of the water year.

Most of the storage water released from Clark Canyon Reservoir during WY2022 was released from May through September for meeting downstream irrigation demands. The EBID water users received approximately 49,910 AF at the point of diversion, leaving 1,140 AF of their allotment in the reservoir. The CCWSC received supplemental water along with their water rights of 75,725 AF, leaving 8,883 AF of their total allotment of water. The total irrigation deliveries recorded by the river commissioner for the "non-signer" users on the Beaverhead River was 36,252 AF on approximately 8,000 acres.

Important Events – Water Year 2022

April 2022: The Joint Board set reduced irrigation allotments at the third tier.

July 2022: The Joint Board increased irrigation allotments to the second tier.

September 9, 2022: Irrigation season ended earlier than normal, and releases were set at a 25 cfs winter release rate.

Table MTT 7 shows reservoir allocations for Clark Canyon Reservoir. Table MTT 8 shows storage and elevation data for Clark Canyon Reservoir. Table MTT 9 shows inflow and discharge data for Clark Canyon Reservoir. Table MTT 10 shows WY2022 monthly inflow, outflow, and storage data for Clark Canyon Reservoir. Figure MTG 6 shows WY2022 hydrologic data for Clark Canyon Reservoir.

Table MTT 11.—Reservoir allocations for Clark Canyon Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	5,470.60	1,115	1,115
Top of Active Conversation	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

Based on new sediment survey data (effective as of 10/1/2020).

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

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	5,514.54	52,290	10/1/2021
End of Year	5,514.87	53,120	9/30/2022
Annual Low	5,511.98	46,153	9/5/2022
Annual High	5,529.51	99,710	5/5/2022
Historic High	5,564.70	283,073	6/25/1984

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

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	116,820	Oct '21-Sep '22	115,990	Oct '21-Sep '22
Daily Peak (cfs)	509	6/15/2022	807	7/27/2022
Daily Minimum (cfs)	7	4/9/2022	25	10/13/2021
Peak Spill (cfs)			0	N/A
Total Spill (AF)			0	N/A

Table MTT 14.—WY2022 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	9.2	52	8.7	18	59.9	69
November	8.8	50	7.8	19	67.2	69
December	8.7	58	7.7	20	74.3	70
January	8.9	68	6.7	24	81.7	72
February	7.9	66	6.0	24	88.1	74
March	8.8	59	6.9	22	95.4	74
April	4.7	31	8.4	18	98.6	73
May	6.5	40	23.2	49	93.9	74
June	18.2	70	32.6	68	90.0	76
July	13.1	61	42.9	83	67.5	72
August	11.8	78	31.7	102	47.0	61
September	10.1	67	17.0	23	53.1	69
Annual	116.8	59	199.6	58		
April-July	42.6	54				

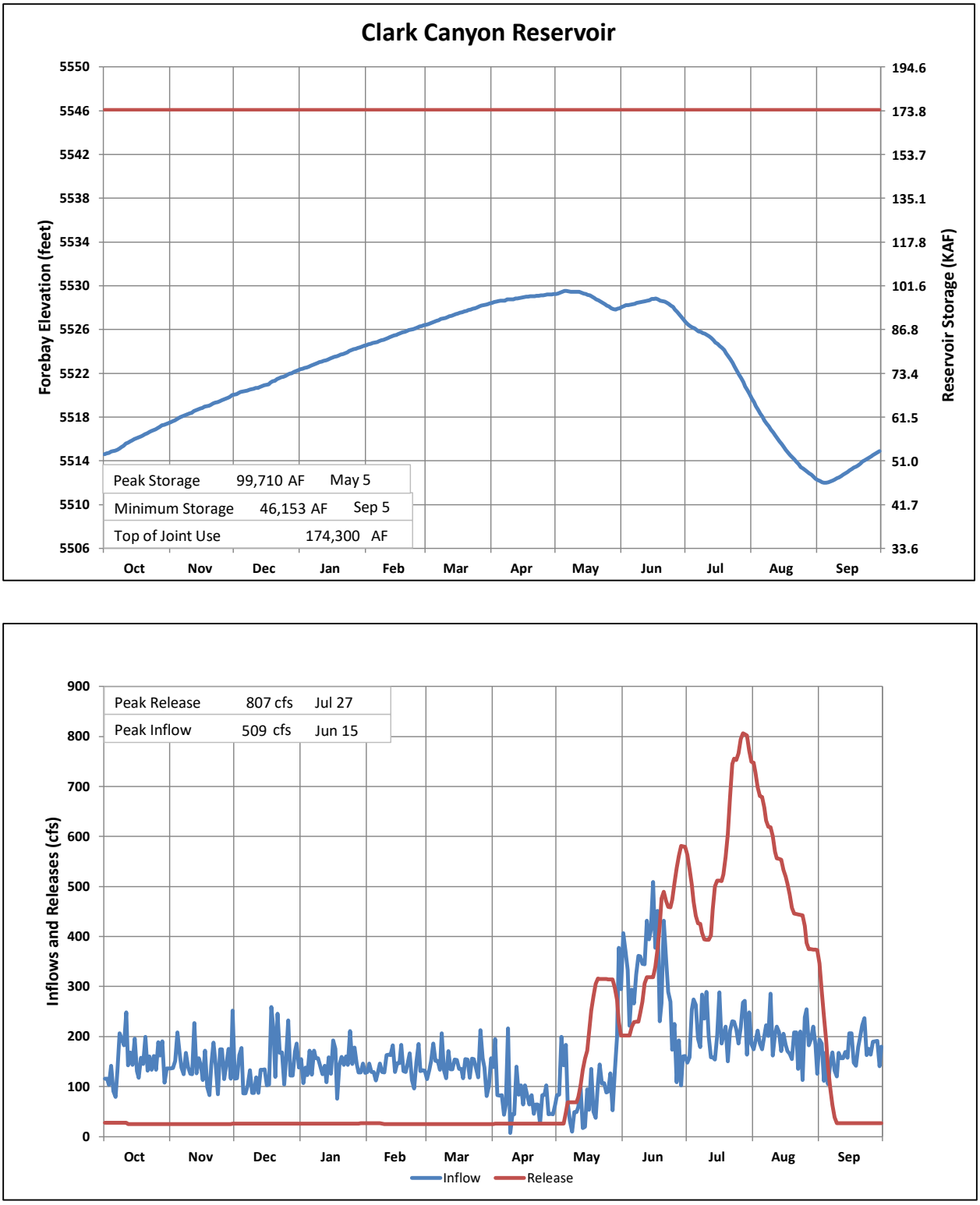


Figure MTG 7.—WY2022 hydrologic data for Clark Canyon Reservoir.

Canyon Ferry Lake and Powerplant

Canyon Ferry Lake, formed by Canyon Ferry Dam, is located on the Missouri River near Helena, Montana. Canyon Ferry's storage is operated for power generation and irrigation; however, flood control, recreation, and fish and wildlife are among the other functions 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.

Summary of Water Year 2022 Operations

October through December

WY2022 started out with very warm and dry conditions resulting from the summer drought. Climatic conditions during October through December continued with very warm temperatures while below normal rain amounts fell in the Gallatin, Jefferson, and Madison Basins, which are the main tributaries to the Missouri River headwaters above Canyon Ferry Reservoir. Inflows were forecasted below normal and storage content was also below normal, therefore releases were reduced to 3,000 cfs in October to recover and or try to maintain reservoir storage. A river release target of 3,000 cfs below Holter Dam is the minimum release required as per operational agreements. The desired fishery flows below Holter Dam on the Missouri River is 4,100 cfs. Inflows and releases were similar therefore the reservoir maintained a steady elevation until the end of December. On December 22 releases were increased in coordination with NorthWestern Energy as per our operational agreement. NorthWestern Energy can supplement river flows and use up to 47,500 AF of water in Canyon Ferry from December through February. The reservoir slowly drafted as releases surpassed inflows. By December 31 the Montana drought monitor map showed most of the basins above Canyon Ferry as severe to exceptionally dry. See Table MTT 9 for specific data related to Canyon Ferry Reservoir's inflows, releases, and storage content.

January through March

In January, Reclamation begins to forecast the April through July runoff volume based on SWE and other basin parameters. The January 1 forecasted runoff was 72 percent of average, see Table MTT4 for monthly forecasted runoff volumes. Even though the snowpack in the basins above Canyon Ferry reservoir was near 96 percent of median, the drought conditions, low inflows, and dry soil moisture, caused the forecast to be lower than average. The February 1 forecasted runoff increased to 76 percent of average due to slight change in basin conditions. Snow continued to slowly accumulate, and releases continued to be adjusted throughout January and February in coordination with Northwestern Energy. The March 1 runoff forecast decreased to 65 percent of average as the snowfall was below average levels. In accordance with Reclamation's most probable operational plan, releases were maintained at 3,000 cfs to conserve storage.

April through June

On April 1, the Montana drought monitor map still had the watershed above Canyon Ferry designated as severe to exceptionally dry. Reclamation's April through July forecasted inflow volume declined to 59 percent of average in response to very low snowpack and dry soil

conditions. The operational plan was to start filling Canyon Ferry Reservoir while releases remained near 3,000 cfs below Holter Dam to the Missouri River. Diversions for the Helena Valley Irrigation District to the Helena Valley Reservoir began the first week of April. A mid-April spring storm produced more snow which resulted in an early May peak snowpack for the year (Figure MTG 3). However, as April progressed, inflows did not rise as the soils soaked up any runoff and spring moisture. April precipitation was 45 to 70 percent of normal. The reservoir elevation remained level as inflows were near 3,000 cfs. April inflows were the lowest on record since 1961.

On May 1, Reclamation's May through July forecasted inflow volume was 72 percent of average. May and June are historically the most productive months of the year for rainfall to augment the snowmelt runoff volume. The weather was cold delaying the snowmelt runoff and therefore the inflows remained much below normal. Runoff did not increase until the last week of May and therefore the end of the month elevation was only 3,780.1 ft. Inflows during May were 50 percent of normal.

On June 1, the snowpack in the Upper Missouri Basin was 160 percent of average as the snowmelt runoff continued to be delayed (Figure MTG 8). Releases were planned to remain at 3,000 cfs below Holter until storage was recovered. However, a rainstorm was forecasted in the basin above Canyon Ferry and concerns arose about a possible rain-on-snow event. The rain-on-snow event would cause a quick increase to inflows with uncertainty of how high inflows would rise. In response, Canyon Ferry releases were gradually increased from 3,000 cfs to a peak near 9,000 cfs over ten days to slow the rate of fill. The rain-on-snow event did occur, and inflows rose from 9,000 cfs to 22,000 cfs. The peak was high, but the duration and volume of the high inflows were the concern. Once the rain-on-snow event concluded and inflows started to decline, release were reduced back to 4,100 cfs to fill the remaining storage at Canyon Ferry.

The rain-on-snow event caused more damage to the Yellowstone River basin and was a historic event. The storm effected the Gallatin basin the most regarding the operations of Canyon Ferry. The Gallatin River surpassed 8,000 cfs at the Logan gage, whereas the median streamflow for June is near 3,000 cfs.

Canyon Ferry Reservoir filled almost 16 feet during the month of June. By the beginning of July, Canyon Ferry reached full pool and entered the flood control space. As a result, releases were coordinated with the Corps and were increased to near 6,000 cfs to evacuate the small amount of storage in the exclusive flood control space.

The April through July runoff into Canyon Ferry during WY2022 was 87 percent of average, totaling 1,486,800 AF. The rain in June significantly changed the drought conditions in Southwestern Montana, Figure MTG 9. Figure MTG 8 shows NRCS SWE for May 31, 2023.

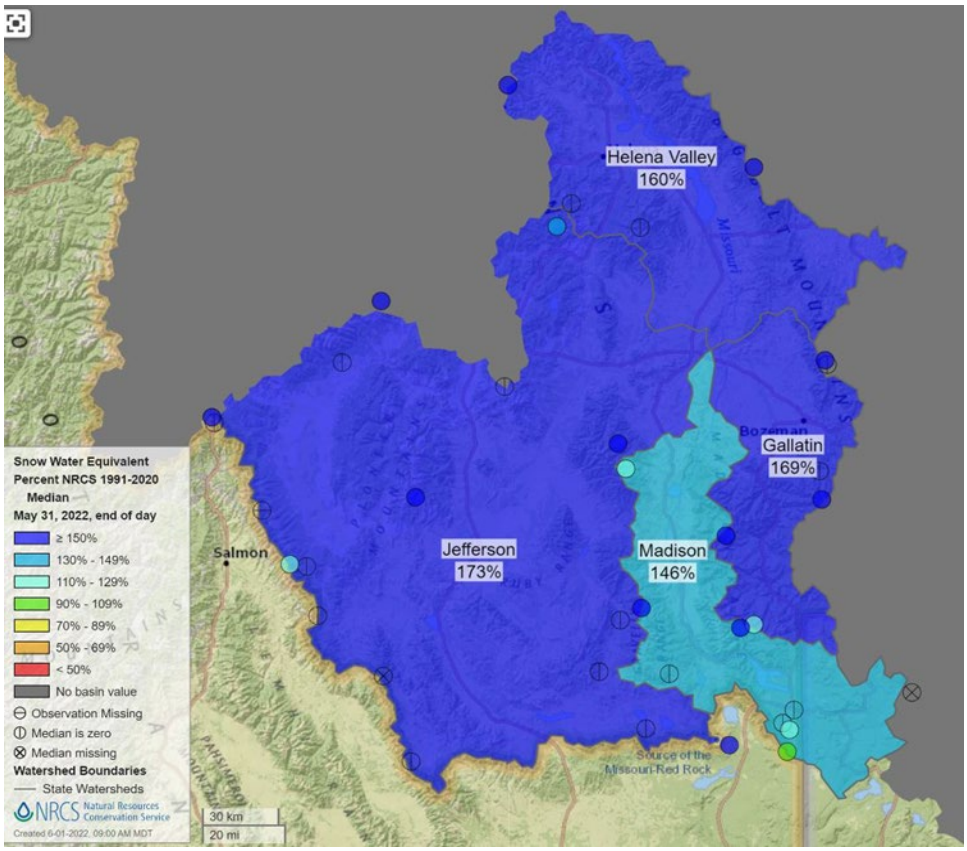


Figure MTG 9.—NRCS SWE, May 31, 2022.

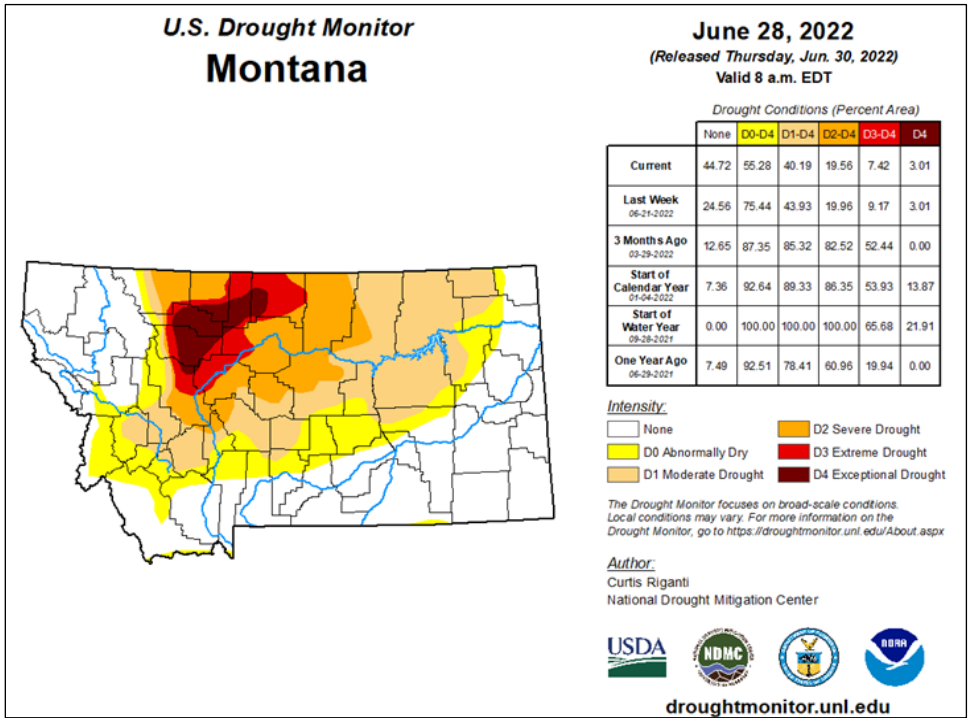


Figure MTG 10.—Montana Drought Monitor Map, June 28, 2022.

July through September

Releases from Canyon Ferry were managed to maintain flows below Holter Dam near 4,100 cfs. Storage in Canyon Ferry continued to decline, as normal, throughout July, August, and September.

Important Events -Water Year 2022

December 2021 – February 2022: In coordination with Northwestern Energy, base flow releases were increased due to colder weather. The volume delivered was in accordance with the operation agreement in using 47,500 AF of water in Canyon Ferry.

April 6, 2022: 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.

June 2022: Peak inflows into Canyon Ferry were 22,000 cfs on June 14. Peak releases were near 8,300 cfs on June 17 due to the rain on snow event. Canyon Ferry reservoir rose 15.6 feet in the month of June.

September 30, 2022: HVID discontinued all diversions to Helena Valley Reservoir.

Table MTT 15 shows reservoir allocations for Canyon Ferry Reservoir. Table MTT 16 shows storage and elevation data for Canyon Ferry Reservoir. Table MTT 17 shows inflow and discharge data for Canyon Ferry Reservoir. Table MTT 18 shows WY2022 monthly inflow, outflow, and storage data for Canyon Ferry Reservoir

Table MTT 19.—Reservoir allocations for Canyon Ferry Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	3,728.00	388,641	387,542
Top of Active Conversation	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, 2021

Table MTT 20.—Storage and elevation data for Canyon Ferry Reservoir

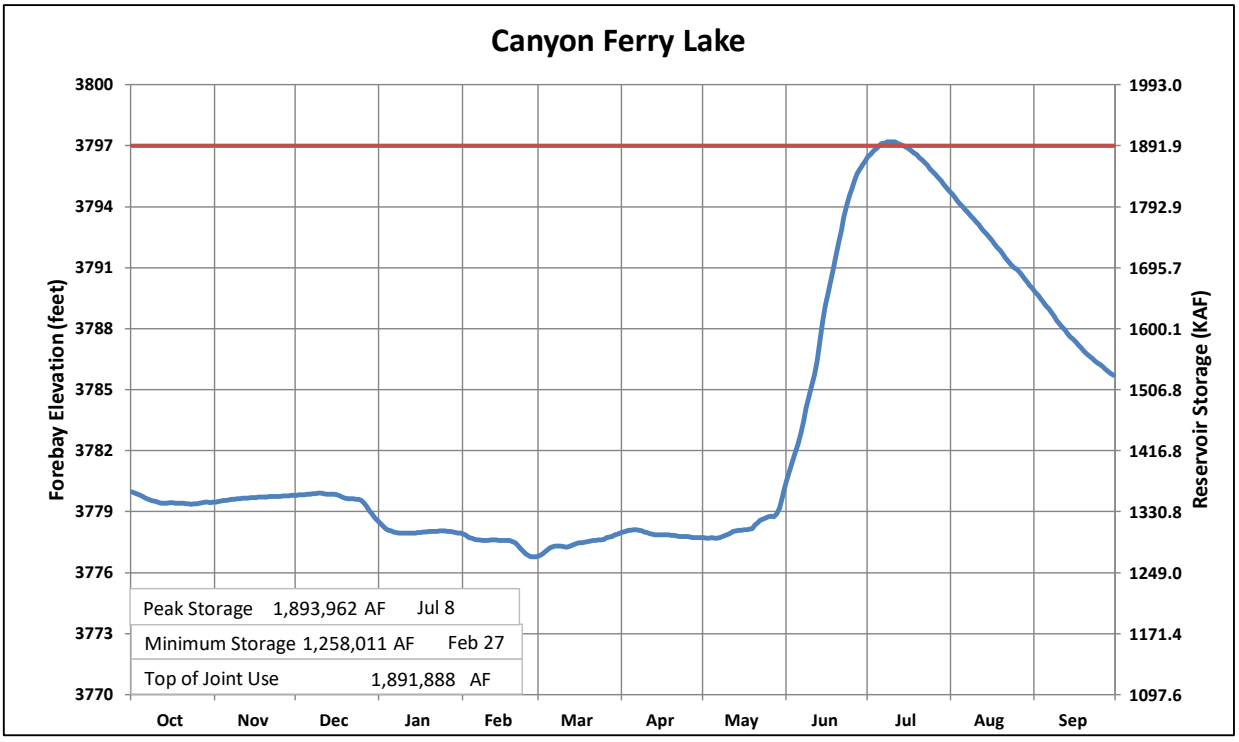
Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	3,780.07	1,348,744	10/1/2021
End of Year	3,785.71	1,517,205	9/30/2022
Annual Low	3,776.77	1,258,011	2/27/2022
Annual High	3,797.20	1,893,962	7/8/2022
Historic High	3,800.00	2,050,900	6/23/1964

Table MTT 21.—Inflow and discharge data for Canyon Ferry Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	2,780,679	Oct '21-Sep '22	2,612,218	Oct '21-Sep '22
Daily Peak (CFS)	22,021	6/14/2022	8,650	6/17/2022
Daily Minimum (CFS)	915	12/28/2022	2,819	10/17/2021
Peak Spill (CFS)			4,032	6/8/2022
Total Spill (AF)			363,919	Mar '21-Sep '22

Table MTT 22.—WY2022 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	160.6	70	0.2	62	177.7	77	1,331.5	85
November	184.6	75	0.0	---	175.0	76	1,341.1	85
December	164.1	78	0.0	---	198.7	78	1,306.5	85
January	174.5	82	0.0	---	191.8	73	1,289.2	86
February	160.7	79	0.0	---	191.7	78	1,258.3	87
March	219.2	85	0.0	---	187.7	68	1,289.8	91
April	174.7	56	5.7	73	175.3	60	1,283.5	89
May	260.8	49	21.7	131	171.3	48	1,351.3	85
June	804.1	118	22.2	121	271.8	62	1,861.4	102
July	247.2	87	20.3	100	278.2	83	1,810.2	103
August	110.7	80	22.5	111	247.6	105	1,650.8	101
September	119.4	76	15.5	133	237.5	109	1,517.2	97
Annual	2,780,679	80	107.9	113	2,504.3	74		
April-July	1,486,836	82						



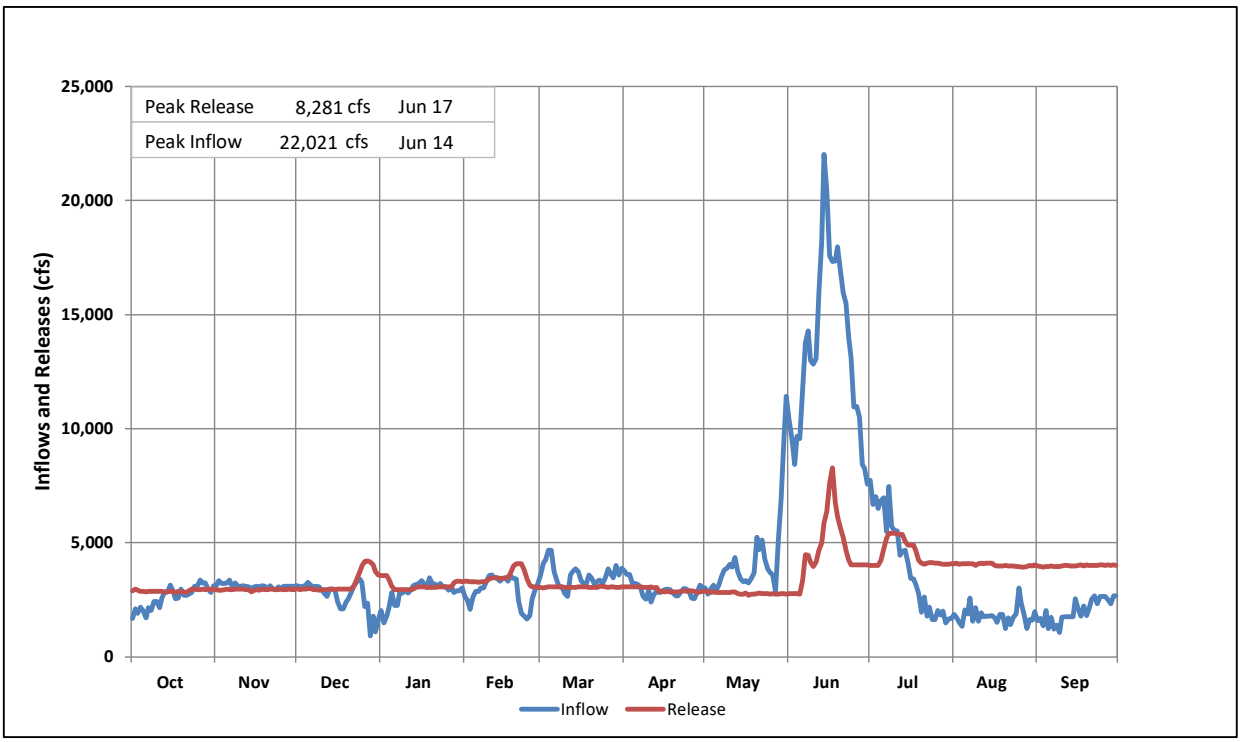


Figure MTG 11.—WY2022 hydrologic data for Canyon Ferry Reservoir

Helena Valley Reservoir

Helena Valley Reservoir is a regulating off-stream reservoir for Helena Valley Unit (PS-MBP), 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, Montana. Helena Valley Reservoir receives its entire water supply by pumping from Canyon Ferry Reservoir. When fully developed, Helena Valley Unit can irrigate about 14,100 acres of full-service land and 3,500 acres of supplemental service lands. Present development services about 13,867 full-service acres, including 5,200 acres previously irrigated by pumping from Helena Valley Reservoir or from other streams.

Summary of 2022 Operations

At the beginning of the water year, storage in Helena Valley Reservoir was approximately 4 feet below full pool. The reservoir slowly declines throughout the winter due to municipal demands and seepage. The reservoir therefore drafts another 4 to 5 feet by the end of March or beginning of April. The operating criteria goals are to fill Helena Valley Reservoir by May 1 and maintain it nearly full through June. In response, diversions to the Helena Valley Unit from Canyon Ferry Reservoir started on April 6. 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 2022 season on September 30, 2022. 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 23.—Reservoir allocations for Helena Valley Reservoir

Reservoir Allocations	Elevation (ft)	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

Table MTT 24.—Storage and elevation data for Helena Valley Reservoir

Storage Elevation DATA	Elevation (ft)	Storage (AF)	Date
Beginning of Year	3,815.82	8,403	10/01/21
End of Year	3,817.13	9,000	9/30/22
Annual Low	3,811.84	6,774	4/5/22
Annual High	3,819.49	10,153	7/4/22
Historic High	3,820.60	10,738	6/02/75

Table MTT 25.—Inflow and discharge data for Helena Valley Reservoir

Inflow-Outflow Data	Annual (AF)
Pumped from Canyon Ferry to Helena Valley Unit	107,901
Released from reservoir for irrigation	80,470
Delivered to the city of Helena for municipal use	1,570

Table MTT 26.—WY2022 monthly elevation and storage data for Helena Valley Reservoir

Month	Forebay Elevation (Feet)	Storage Content (kaf)	Pumped to Helena Valley (kaf)
October	3,815.28	8.2	2.8
November	3,814.53	7.8	0.0
December	3,813.86	7.5	0.0
January	3,813.21	7.3	0.0
February	3,812.63	7.1	0.0
March	3,811.99	6.8	0.0
April	3,818.34	9.6	5.6
May	3,817.97	9.4	21.7
June	3,818.90	9.8	22.1
July	3,816.81	8.8	20.3
August	3,817.26	9.1	22.4
September	3,817.13	9.0	15.5
Annual			110.4

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 three 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.

Gibson Reservoir

Gibson Reservoir is located on the Sun River west of Augusta, Montana. Gibson Reservoir typically fills each year due to adequate inflows in most years.

Summary of 2022 Operations

October through December

Gibson Reservoir typically begins the new water year with a nearly empty reservoir as irrigation demands require the release of 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 of Willow Creek Reservoir. Storage levels remain steady as average releases and inflows were both near 150 cfs. The river releases help meet any remaining downstream irrigation demands while also providing beneficial flows for the fall brown trout spawn. See Table MTT 22 and for specific data related to Gibson Reservoir's inflows, releases, and storage content.

November and December precipitation was above average in the Sun River drainage. Gibson Reservoir continued to fill approximately 14 feet as inflows were near 200 cfs and releases to the Sun River were near 120 cfs.

January through March

In January, Reclamation begins to forecast the April through July runoff volume based on snowpack measurements and other basin parameters. The January 1 forecasted runoff was 101 percent of average or 406 kaf. A good snowstorm passed through during the first part of January increasing the basin SWE. The remainder of the month had minimal snow accumulation, which led to an EOM total SWE below average. Therefore, the February 1 runoff forecast dropped slightly to 91 percent of average. Inflows during February averaged near 130 cfs and releases were increased to near 150 cfs since storage water was available. The snowpack continued to build during March which was much needed as the Sun River basin remained in extreme drought conditions from the previous water year. Gibson Reservoir storage continued to fill and ended March with 23,733 AF of storage at elevation 4,647.35 feet.

April through June

The April through July spring forecast for Gibson Reservoir was 390,000 AF, 97 percent of average. April temperatures were below normal while snow continued to accumulate resulting in an April 25 peak snowpack. By the month's end diversion to Pishkun Reservoir via the Pishkun Supply Canal was initiated. Both Willow Creek and Pishkun reservoirs need to be refilled to meet the irrigation demands throughout the summer. See the next sections for more information on Willow Creek and Pishkun Reservoirs.

The May through July spring forecast for Gibson was 364,000 AF, 102 percent of average. The snow melted at a normal rate during May, however, inflows did not increase significantly until the end of the month. The cooler weather caused the inflows to be less than releases, therefore the elevation in Gibson was still 33 feet from full pool by the end of May. Depending on runoff conditions and reservoir levels, Gibson's spillway gates are to 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 feet to the top of the conservation pool at elevation 4,724.0 feet. Near the end of May there was concern that the reservoir would not fill by end of May, as historically seen, but there was still ample snowpack and time for the remaining volume to be stored in Gibson.

Inflows in June were steadily above 3,000 cfs which allowed the reservoir to gradually fill. Releases did have to be increased to a peak release of 3,060 cfs to the Sun River on June 21 to manage reservoir elevation as the reservoir neared full pool. Inflows did recede but remained higher than normal for the remainder of the month.

July through September

July temperatures were 2 to 4 degrees above normal, and much needed precipitation fell within the Sun River drainage. Irrigation requirements were still high with the timely rain showers. The actual April through July runoff totaled 377,800 AF, 94 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 30 as Gibson Reservoir reached the minimum content near 5,500 AF.

Releases from Gibson during late August and September were designed to pass all inflows for downstream users. Therefore, Gibson reservoir remained at minimum content (5,500 AF) for the rest of the water year. Temperatures in September were 4 to 8 degrees above normal, and drought conditions persisted. By the end of September, the Montana drought monitor map designated the Sun River area drought conditions as moderate to extreme.

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.

Summary of 2022 Operations

The content in Pishkun Reservoir at the beginning of the WY2022 was 36,199 AF at elevation 4,362.69 feet. Storage during the fall and winter decreased to 34,500 AF due to evaporation and ice storage. Diversions from the Sun River started refilling the reservoir on April 30, 2022. The reservoir slowly filled and reached near the top of active conservation pool at elevation 4,370.0 feet in mid-May. Irrigation releases from Pishkun Reservoir began on May 9. Pishkun releases from May through September were designed to meet irrigation demands. GID delivered a reduced allotment of 1.5 AF per acre (full allotment is 2.0 AF per acre) to its water users in WY2022 due to drought conditions in the basin.

Approximately 293,000 AF of water was released from Pishkun Reservoir from May 9 through September 5 to help meet irrigation demands on the Sun River Project. All diversions from the Sun River into Pishkun Reservoir were discontinued on August 30.

Additional hydrologic and statistical data pertaining to Pishkun Reservoir can be found in Table MTT 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.

Willow Creek Reservoir began to refill during the fall through the Willow Creek Feeder canal as the reservoir storage was low. The diversions were discontinued mid-December due to weather. Natural inflows into Willow Creek Reservoir also contributes to the overall inflows. Storage increased approximately 8,560 AF or 7.9 feet from October through March 30.

From late March through late May, GID again initiated diversions from the Sun River via the Willow Creek Feeder Canal to assist in continuing to fill the reservoir another 6.5 feet. Willow Creek reservoir reached near full pool at elevation 4,140.91 on May 29. On July 6, releases from Willow Creek Reservoir were initiated to meet downstream demands. These releases continued to fluctuate throughout the summer until releases ceased on August 30. Willow Creek Feeder Canal diversions began again in late September to begin refilling the reservoir in preparation for next year.

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

Important Events – Water Year 2022

April 25, 2022: Began to refill Willow Creek Reservoir via Willow Creek Feeder Canal.

April 30, 2022: Diversions to the Pishkun Supply Canal were initiated.

July 6, 2022: Releases from Willow Creek Reservoir were initiated to supplement the Sun River.

September 5, 2022: Releases from Pishkun Reservoir for irrigation deliveries were discontinued for the season.

Table MTT 27 shows reservoir allocations for Gibson Reservoir. Table MTT 28 shows storage and elevation data for Gibson Reservoir. Table MTT 29 shows inflow and discharge data for Gibson Reservoir. Table MTT 30 shows WY2022 monthly inflow, outflow, and storage data for Gibson Reservoir. Figure MTG 12 shows WY2022 hydrologic data for Gibson Reservoir.

Table MTT 31.—Reservoir allocations for Gibson Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	4,557.50	0	0
Top of Active Conversation	4,724.00	98,687	98,687

Table MTT 32.—Storage and elevation data for Gibson Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	4,610.34	5,547	10/1/2021
End of Year	4,610.44	5,578	9/30/2022
Annual Low	4,609.87	5,401	8/31/2022
Annual High	4,724.06	98,767	6/21/2022
Historic High	4,732.23	116,400	6/8/1964

Table MTT 33.—Inflow and discharge data for Gibson Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	479,719	Oct '21-Sep '22	479,688	Oct '21-Sep '22
Daily Peak (CFS)	4,537	6/11/2022	3,931	6/21/2022
Daily Minimum (CFS)	25	2/23/2022	100	12/15/2021

Table MTT 34.—WY2022 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	9.8	74	3.4	108	8.6	116	6.0	33
November	11.4	81	5.0	156	7.3	91	7.1	33
December	13.8	122	2.5	896	7.5	78	12.4	50
January	9.8	97	0.0	---	8.8	101	14.3	52
February	7.6	81	0.0	---	8.9	111	14.0	47
March	19.1	133	0.7	76	10.4	110	23.7	67
April	26.6	61	6.3	69	11.3	62	34.0	63
May	117.3	76	67.8	145	23.7	30	59.2	65
June	176.8	116	73.8	116	71.5	75	98.6	108
July	57.1	109	78.8	98	14.4	82	66.4	147
August	18.8	88	73.0	179	8.4	83	5.4	31
September	11.7	84	1.7	16	11.7	130	5.6	40
Annual	479,719	94	313.0	121	192.5	69		
April-July	377,774	94						

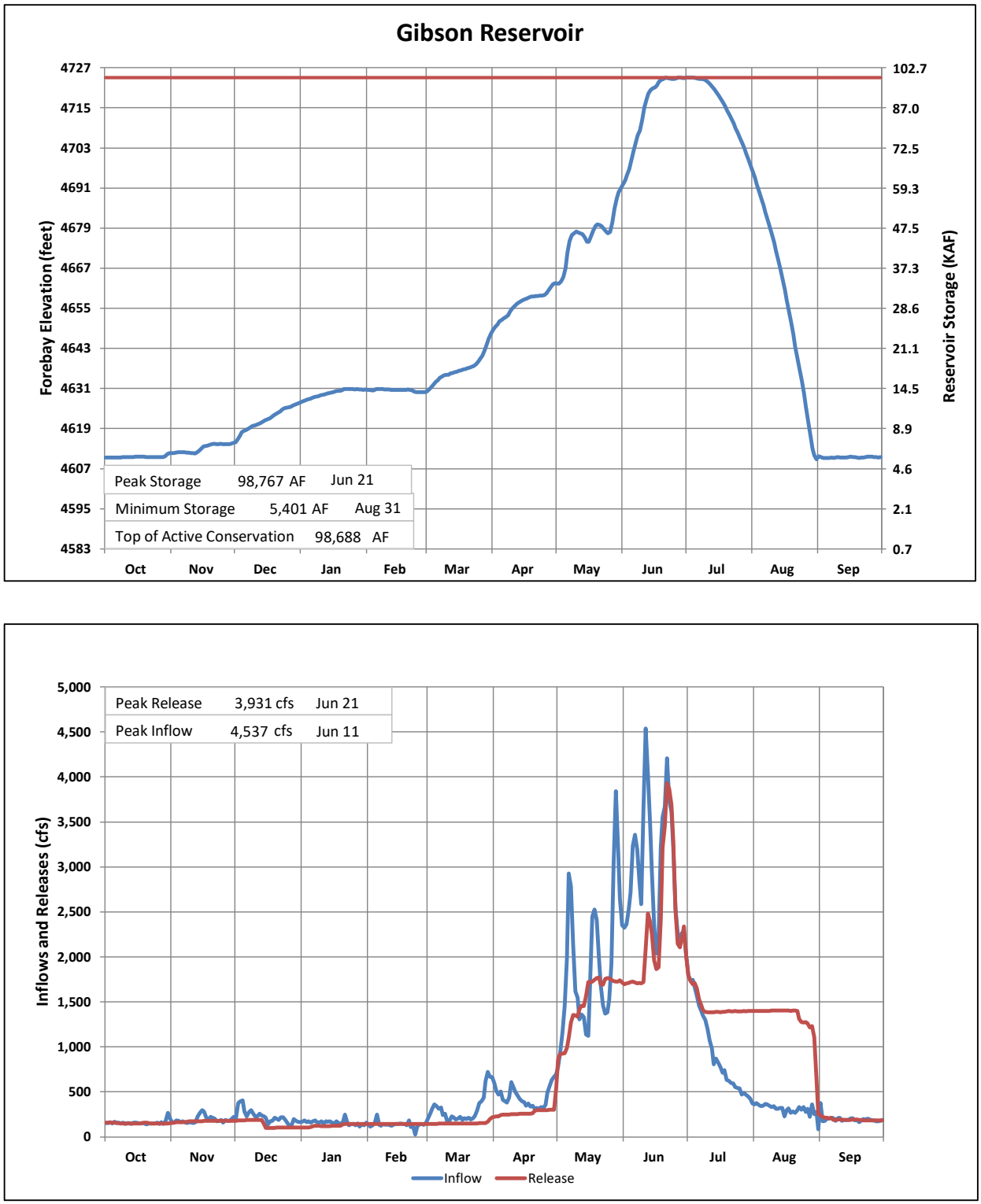


Figure MTG 13.—WY2022 hydrologic data for Gibson Reservoir.

Table MTT 23 shows reservoir allocations for Pishkun Reservoir. Table MTT 354 shows storage and elevation data for Pishkun Reservoir. Table MTT 365 shows inflow and discharge data for Pishkun Reservoir. Table MTT 376 shows WY2022 monthly inflow, outflow, and storage data for Pishkun Reservoir. Figure MTG 141 shows WY2022 hydrologic data for Pishkun Reservoir.

Table MTT 38.—Reservoir allocations for Pishkun Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	4,342.00	16,008	16,008
Top of Active Conversation	4,370.00	46,694	30,686

Table MTT 39.—Storage and elevation data for Pishkun Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	4,362.69	36,199	10/1/2021
End of Year	4,362.58	36,052	9/30/2022
Annual Low	4,360.82	33,759	7/27/2022
Annual High	4,369.99	46,679	8/29/2022
Historic High	4,371.40	48,950	7/4/1953

Table MTT 40.—Inflow and discharge data for Pishkun Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	293,309	Oct '21-Sep '22	293,456	Oct '21-Sep '22
Daily Peak (CFS)	1,370	6/20/2022	1,695	6/30/2022
Daily Minimum (CFS)	0	*	0	*

* During non-irrigation season

Table MTT 41.—WY2022 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 29-yr Avg
October	-0.5	---	0.0	---	35.7	126
November	-0.4	---	0.0	---	35.2	120
December	-0.2	---	0.0	---	35.0	120
January	-0.1	---	0.0	---	34.9	120
February	-0.1	---	0.0	---	34.7	120
March	-0.2	---	0.0	---	34.5	115
April	-0.2	---	0.0	---	34.3	94
May	61.4	143	49.6	144	46.1	100

Table MTT 41.—WY2022 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 29-yr Avg
June	76.8	124	82.1	122	40.9	102
July	80.2	104	86.4	108	34.7	93
August	76.1	181	66.6	153	44.2	129
September	0.7	6	8.8	50	36.1	129
Annual	293.3	120	293.5	120		

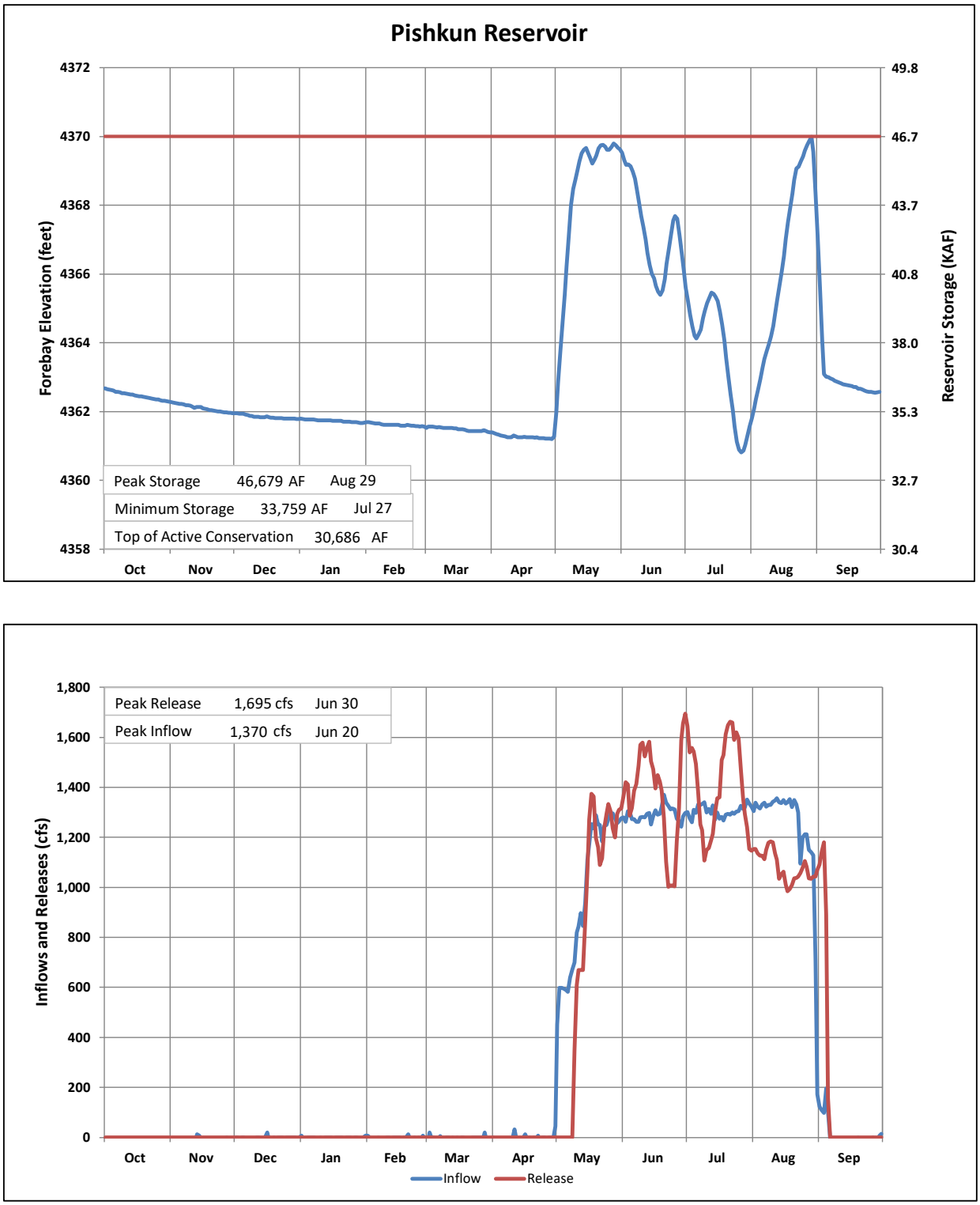


Figure MTG 15.—WY2022 hydrologic data for Pishkun Reservoir.

Table MTT 27 shows reservoir allocations for Willow Creek Reservoir. Table MTT 428 shows storage and elevation data for Willow Creek Reservoir. Table MTT 439 shows inflow and discharge data for Willow Creek Reservoir. Table MTT 30 shows WY2022 monthly inflow, outflow, and storage data for Willow Creek Reservoir. Figure MTG 162 shows WY2022 hydrologic data for Willow Creek Reservoir.

Table MTT 44.—Reservoir allocations for Willow Creek Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	4085.28	1	1
Top of Active Conversation	4142.00	31,848	31,847

Table MTT 45.—Storage and elevation data for Willow Creek Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	4,126.78	13,080	10/1/2021
End of Year	4,121.24	8,918	9/30/2022
Annual Low	4,120.29	8,245	9/17/2022
Annual High	4,140.91	30,295	5/29/2022
Historic High	4,144.80	36,033	6/22/2018

Table MTT 46.—Inflow and discharge data for Willow Creek Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	16,916	Oct '21-Sep '22	21,524	Oct '21-Sep '22
Daily Peak (CFS)	108	4/11/2022	250	7/25/2022
Daily Minimum (CFS)	0	*	0	*

* During non-irrigation season

Table MTT 47.—WY2022 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	1.8	98	0.0	---	15.4	79
November	3.9	223	0.0	---	19.2	87
December	2.4	445	0.0	---	21.6	96
January	0.2	43	0.0	---	21.8	95
February	0.0	0	0.0	---	21.8	93
March	0.3	70	0.0	---	22.2	93
April	4.3	268	0.0	---	26.5	104

Table MTT 47.—WY2022 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
May	3.8	99	0.0	---	30.3	107
June	-0.3	---	0.0	0	30.0	102
July	-0.1	---	10.4	150	19.5	86
August	0.0	0	11.2	264	8.4	43
September	0.6	77	0.0	0	8.9	46
Annual	16.9	106	21.5	134		

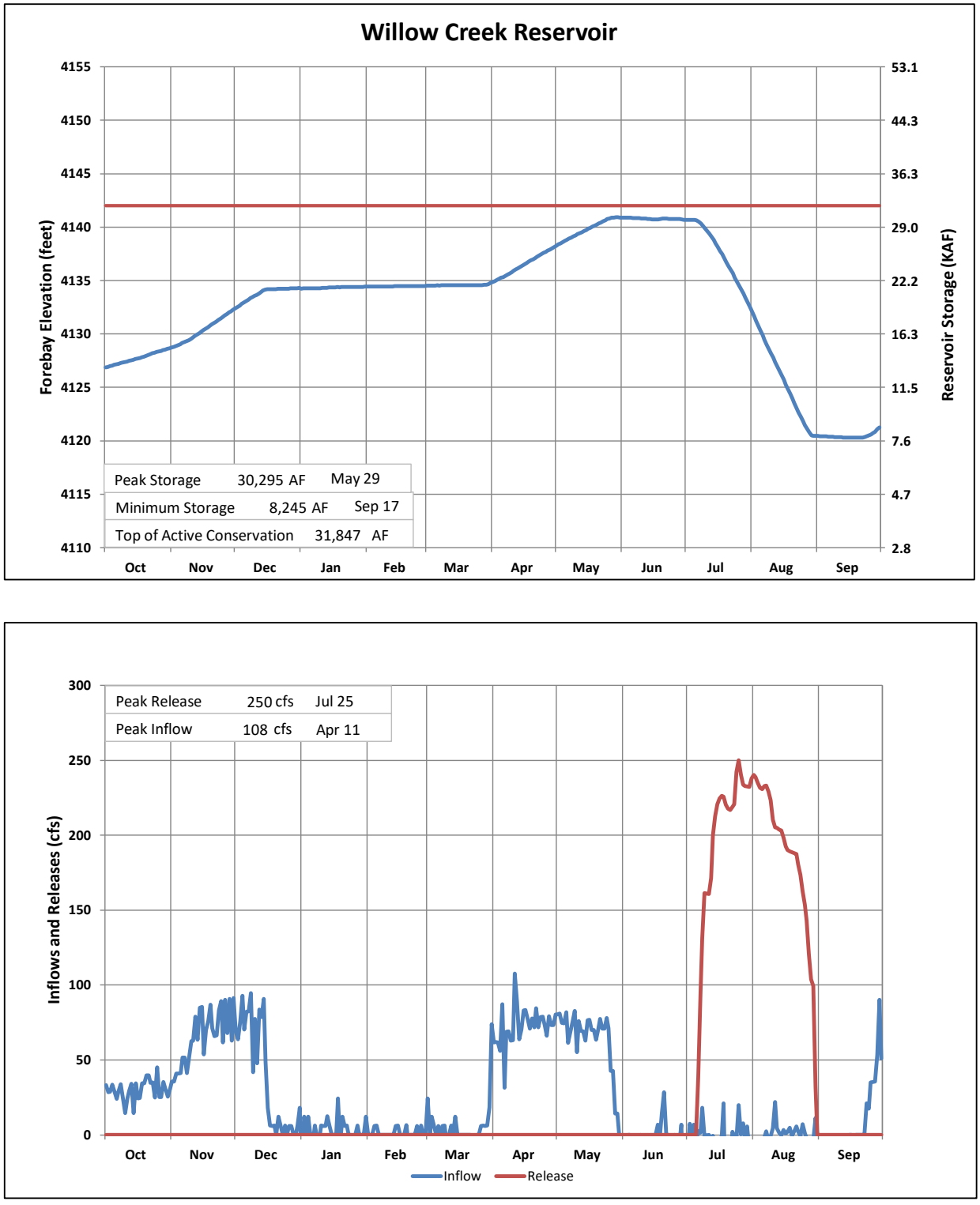


Figure MTG 17.—WY2022 hydrologic data for Willow Creek Reservoir.

Lake Elwell (Tiber Dam)

Tiber Dam (PS-MBP) is located on the Marias River near Chester, Montana. It was built to provide water supply for 127,000 acres in the Lower Marias Unit and for flood control. Because 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 brought on-line in June 2004. The Tiber Montana, LLC powerplant capacity is approximately 700 cfs.

Summary of 2022 Operations

The hydrologic conditions in the Marias River Basin during WY2022, started dry, became near normal, then turned dry at the end of the water year. The reservoir was drafted to a low point of 2,981.6 feet by the middle of March and filled to 2,993.0 feet in early July. River releases were close to 500 cfs through the winter and spring. Releases were higher in June, July, and August, when they fluctuated between 500 cfs and 1,250 cfs. The following is a summary of WY2022 hydrologic conditions in the Marias River Basin and corresponding operations of Lake Elwell and Tiber Dam.

October through December

Storage in Lake Elwell started the year near normal at 102 percent of average. Conditions were drier than average during October, and near average for November and December. Inflow during this period totaled 90 percent of average. Releases were maintained at 500 cfs. By the end of December 2020, the Lake Elwell water surface elevation was at 2,983.7 feet, 103 percent of average.

January through March

In January, Reclamation begins to forecast the April through July runoff volume based on snowpack measurements and other basin parameters. Snowpack was 95 percent of median at the start of January and runoff was forecasted to be 101 percent of average. Precipitation was mixed during January through March but overall, it was drier than average. Lack of plains snowpack and below-average precipitation resulted in below-average inflows during March. Releases remained at 500 cfs through March.

April through July

April precipitation was also below-average. April inflow was only 61 percent of average. Snowpack peaked on April 22 at 80 percent of the median peak snowpack. Releases remained at 500 cfs.

On May 1, inflows were forecasted to be above average. Precipitation and inflows were below average during May, and by June 1, inflow forecasts decreased slightly. Releases were being

coordinated with Montana Fish, Wildlife and Park as part of a pallid sturgeon research project. Releases were expected to increase in June due to adequate water supply and the releases requested for the research. Between June 13 and June 18, releases were increased to 1,250 cfs. and then down to 700 cfs. Higher releases were requested for the study but based on the remaining snowpack and actual inflows, Lake Elwell was not expected to fill. Releases were projected to be at 700 cfs or less for the remainder of the water year.

Towards the end of June, a large precipitation event occurred as the reservoir neared full pool, and releases were increased to 1,250 cfs. Releases continued at this release until July 6, when releases were increased to 1,500 cfs for a few days, and then decreased to 1,000 cfs for the remainder of July. Since Lake Elwell was near normal full pool, operations were being coordinated with the Corps.

Overall, precipitation was above average during June and July. Storage peaked on July 9 at 926,379 AF, at elevation 2,993.0 feet. Actual April through July inflow was 91 percent of average.

August through September

Releases were decreased to 600 cfs in August and 500 cfs in September to conserve storage. On September 15 an efficiency test was conducted on the powerplant turbine. Releases were briefly fluctuated between 500 and 600 cfs for the test.

Precipitation was below average in August and continued to get drier toward the end of the water year.

Important Events – Water Year 2022

During June 13 and June 18, 2022, releases were increased to 1,250 cfs and decreased to 700 cfs. This change in releases was in coordination with Montana Fish, Wildlife and Parks as part of a research project for pallid sturgeon.

On September 15, 2022, an efficiency test was conducted on the powerplant turbine. Releases were briefly fluctuated between 500 and 600 cfs for the test. Releases returned to 550 cfs following the efficiency test.

Additional hydrologic and statistical information pertaining to the operation of Lake Elwell during WY2022 can be found in Tables MTT 31 through 34 and Figure MTG 13.

Table MTT 48.—Reservoir allocations for Lake Elwell

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	2,966.40	554,330	554,330
Top of Active Conversation	2,976.00	667,213	112,883
Top of Joint Use	2,993.00	925,649	258,436
Top of Exclusive Flood Control	3,012.50	1,328,723	403,074

Table MTT 49.—Storage and elevation data for Lake Elwell

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	2,986.63	816,767	10/1/2021
End of Year	2,987.77	834,940	9/30/2022
Annual Low	2,981.58	741,974	3/13/2022
Annual High	2,993.04	926,379	7/9/2022
Historic High	3,011.42	1,303,858	7/19/2011

Table MTT 50.— Inflow and discharge data for Lake Elwell

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	459,154	Oct '21-Sep '22	440,981	Oct '21-Sep '22
Daily Peak (CFS)	5,831	6/22/2022	1,555	7/7/2022
Daily Minimum (CFS)	-249	9/8/2022	456	12/7/2021
Peak Spill (CFS)	---	---	0	NA
Total Spill (AF)	---	---	0	NA

Table MTT 51.—WY2022 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	5.7	37	31.2	77	791.2	102
November	23.1	115	30.0	91	784.4	103
December	18.7	108	30.2	95	772.9	103
January	14.0	86	30.5	96	756.3	103
February	14.3	71	27.6	94	743.0	102
March	32.2	77	30.2	87	744.9	102
April	34.0	61	30.2	79	748.7	100
May	89.7	68	31.7	58	806.7	98
June	160.4	112	47.4	66	919.6	103
July	53.8	128	72.4	114	901.0	103
August	10.5	90	47.0	93	864.5	104
September	2.8	29	32.3	74	834.9	104
Annual	459.1	88	441.0	84	---	---
April-July	337.9	91	---	---	---	---

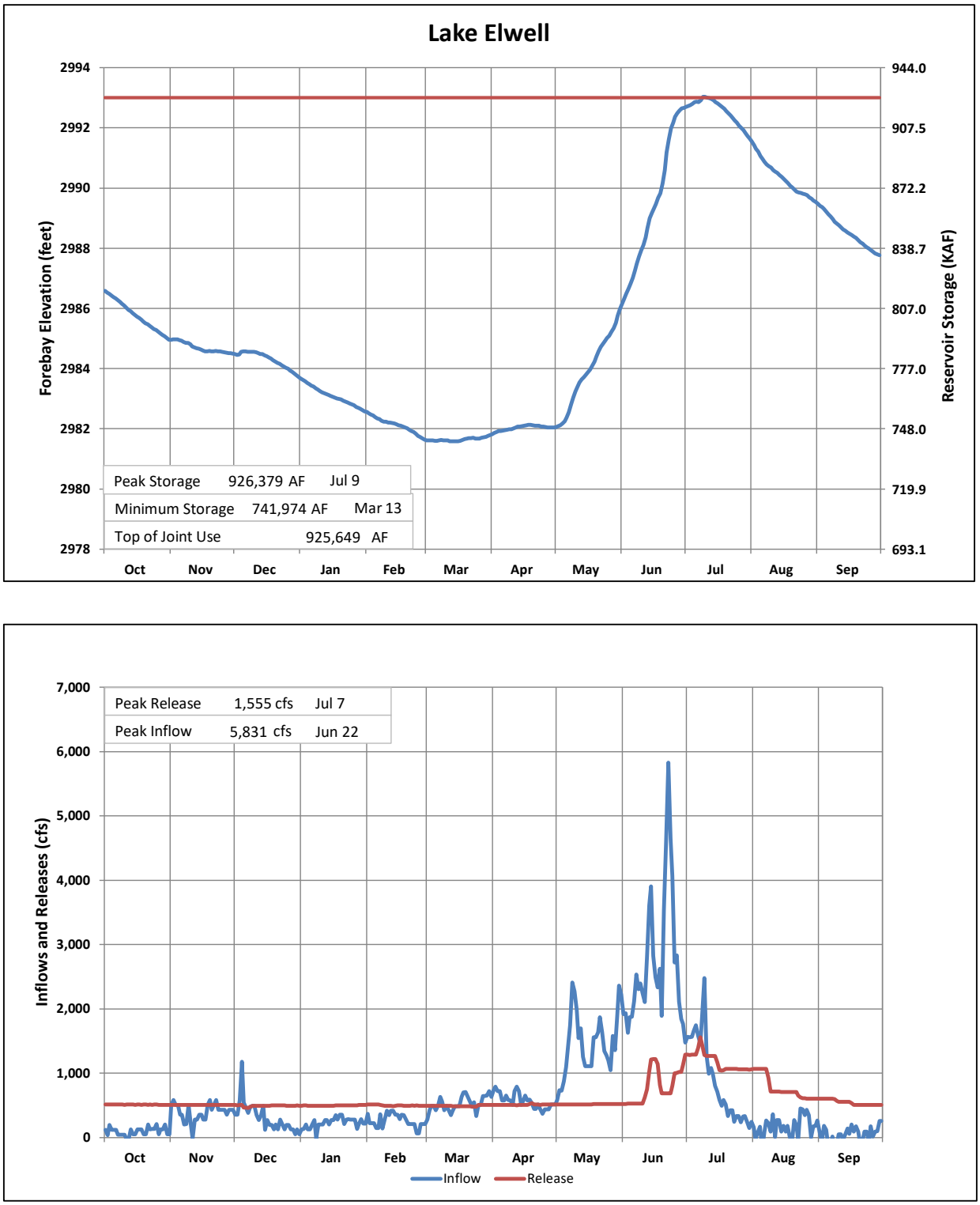


Figure MTG 18.—WY2022 hydrologic data for Lake Elwell

Milk River Project

The 117,000-acre Milk River Project, located 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 Milk River 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 located 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.

Summary of 2022 Operations

WY2022 started off with below average storage in Lake Sherburne. October and November rain events increased storage to much above average. In addition, above average snowpack during WY2022 resulted in above average inflows and storage into September. Dry conditions towards the end of the water year resulted in lower-than-average carryover.

October through December

At the start of WY2022 storage content in Lake Sherburne was below average. Releases from Lake Sherburne were shutoff for the season on October 1 based on low storage in Lake Sherburne. At the end of October, a weather system moved through the St. Mary River Basin bringing heavy precipitation and well above average inflows.

Unusually warm November weather systems brought rain instead of snow. The above average precipitation continued into December increasing Lake Sherburne storage to 177 percent of average by the end of the month. Inflows were 215 percent of average for October through December. Figure MTG 19 shows percent of normal precipitation from October through December from NOAA Regional Climate Centers.

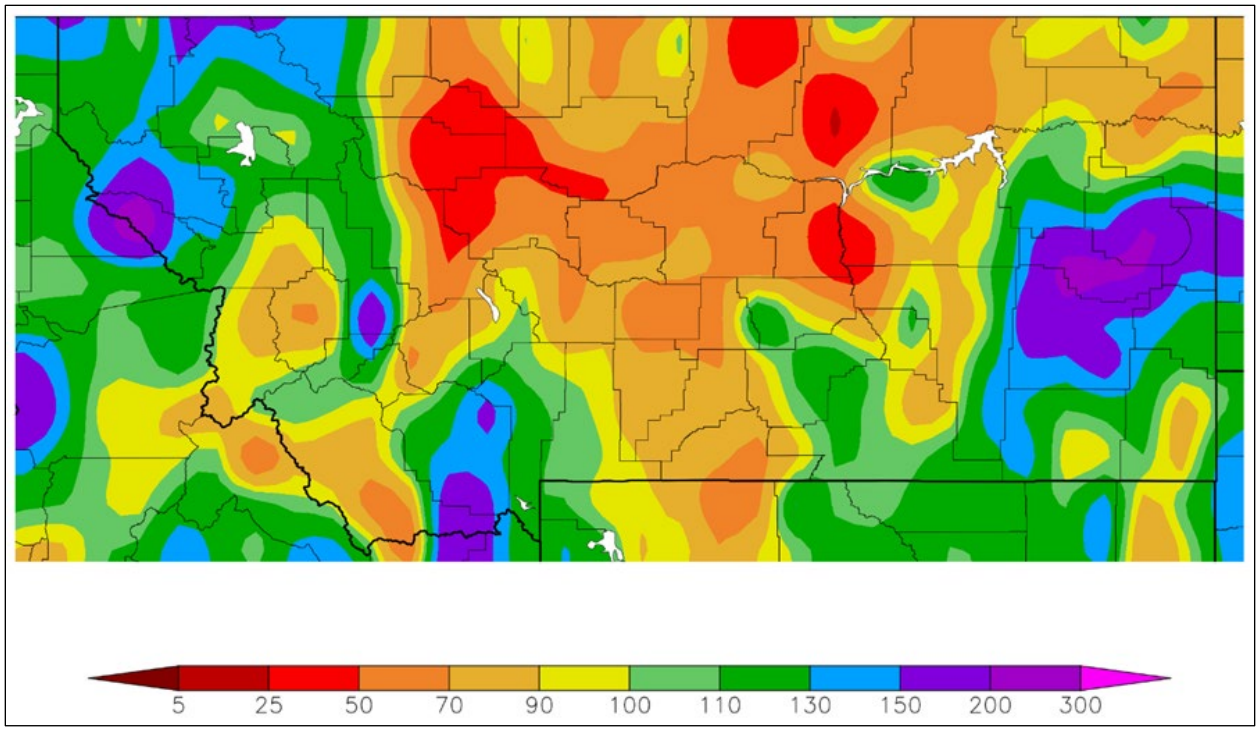


Figure MTG 20.—Percent of Normal Precipitation from October through December from NOAA Regional Climate Centers.

January through March

On January 1, 2022, the NRCS reported mountain snowpack SWE in the St. Mary Basin was 117 percent of median. Precipitation was below average in January and February but above average in March. Temperatures were above average.

Releases from Lake Sherburne started on March 14 to provide water for St. Mary Canal diversions. Initiating releases from Lake Sherburne before diversions into the St. Mary Canal fills storage space in Lower St. Mary Lake and behind the St. Mary Diversion Dam if that space is not already filled by natural runoff.

The St. Mary Canal was operable by mid-March due to very little snow in the canal and the mild climate conditions. The St. Mary Canal started up on March 15 to begin the transfer of water from the St. Mary River Basin to Fresno Reservoir. Some clearing of snow and ice was required once the canal started. Fresno Reservoir storage was low and there was little plains snowpack to naturally fill the reservoir. Water from the St. Mary Basin was needed in the Milk River Basin. Releases from Lake Sherburne and diversions to the canal were ramped-up during March and by the end of the month releases and diversions were 600 cfs.

The U.S. can create a deficit delivery during March, April, and May in the St. Mary River Basin. A deficit delivery provides Canada less natural flow than they are entitled to. A deficit delivery is allowed under the guidance of 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. Based on storage in Lake Sherburne and the runoff forecasts, a deficit delivery to Canada in the St. Mary River Basin was not expected in WY2022. No deficits occurred during March.

April through July

Mountain snowpack SWE was 101 percent of median on April 1. Snowpack peaked on April 22 at 109 percent of the median peak snowpack but about two weeks later than normal. St. Mary Canal diversions were maintained at 600 cfs. Releases from Lake Sherburne were based on supplementing natural runoff to maintain canal diversions at 600 cfs.

Precipitation and resulting inflows were below average during April and May. Cooler than averages temperatures were delaying snowmelt runoff. Storage in Lake Sherburne was rapidly declining in April. As a result, a deficit delivery of St. Mary River water to Canada was created in April and May.

Inflows picked up towards the end of May and Lake Sherburne began refilling and the St. Mary accounting deficit was paid down to the minimum allowed amount of 2,000 cfs-days. Lake Sherburne filled to near normal full pool by the end of June and remained near full through end of July. The peak elevation for the year was 4,787.94 ft on July 30.

August through September

Releases from Lake Sherburne remained high to support St. Mary Canal diversions until storage decreased to approximately 10,000 AF towards the end of September. St. Mary Canal diversions remained at 600 cfs until September 25 when diversions started decreasing for shutdown. St. Mary Canal diversions were discontinued for the season on September 30. Releases from Lake Sherburne were shut off on October 6. Releases are required until October 1 in accordance with the biological opinion for bull trout.

Based on provisional data, diversions from the St. Mary River to the Milk River totaled 226,203 AF. The canal was shut down by October 1, so fish screens did not have to be installed as per the biological opinion. Storage levels in Lake Sherburne were low enough that no additional water needed to be released in October.

During the 2022 irrigation season several conference calls were conducted with the IJC field representatives due to the drought conditions. Deficit deliveries were repaid between September 16 and 30.

Additional hydrologic and statistical information pertaining to the operation of Lake Sherburne during 2022 can be found in Tables MTT 35 through 38 and Figure MTG 15.

Fresno Reservoir

Fresno Reservoir is located upstream of all 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 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 cfs 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.

Summary of 2022 Operations

Reservoir storage in the Milk River Basin started off the year below average. Lack of plains snowpack in WY2022 exacerbated the dry conditions. Irrigation allotments were reduced, and the 2022 irrigation season ended early because of persistent dry conditions. This was the second consecutive year of similar dry conditions.

October through December

Releases from Fresno Reservoir were reduced to 40 cfs at the start of the water year. This is the minimum release from Fresno Reservoir based on the minimum allowed gate opening for one gate on the river outlet works. The quantity of water released varies depending on the elevation of the reservoir. Storage was 93 percent of average at the start of the water year.

Inflows during October through December were below average with the St. Mary Canal shutting off by mid-September. Precipitation was below average during October and November and above average during December.

January through February

Snowpack in the Bear Paw Mountains was 91 percent of median on January 1. However, plains snowpack throughout the Milk River basin was nearly non-existent. January and February precipitation was below average while temperatures were above average. These climate conditions did not improve the water supply outlook.

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 69 percent of median. The Milk River runoff forecast is provided by Alberta Environment and Parks. 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 precipitation was below average. Inflows increased slightly during March from snowmelt runoff but were later augmented by water from the St. Mary Basin. Storage in Fresno Reservoir at the end of March was only 75 percent of average.

April was very dry. The Milk River Joint Board of Control set the initial irrigation allotment for the 2022 irrigation season at a reduced allotment of 1.3 AF/acre at their April 6 meeting. MRJBC planned to start the irrigation season on approximately May 1. Water was transferred from Fresno Reservoir to Nelson Reservoir during April to balance storage for the upcoming irrigation season. Water was moved by increasing releases from Fresno Reservoir to 400 cfs. Releases from Fresno Reservoir decreased after the transfer about mid-April to conserve storage. Releases increased again on April 20 for the start of the irrigation season to meet irrigation water orders by Malta Irrigation District. Storage in Fresno Reservoir peaked for the season on April 25 at 2,567.33 feet, with a content of 59,067 AF.

Precipitation remained dry during May. Fresno Reservoir storage drafted to 29,300 AF, 44 percent of average by June 7. Inflows were lower than forecasted while releases for irrigation remained higher than forecasted. Dry conditions did not provide any relief during May.

Drought conditions were extreme over a large area of the Milk River Basin. Rain in early June improved the water supply outlook however conditions remained much below average. Before the rain, irrigation was expected to be done for the season by end of June due to lack of storage in Fresno and Nelson Reservoirs. The improved conditions made some additional irrigation possible during July.

The irrigation season stopped for a period during June into July to allow storage to recover in Fresno and Nelson Reservoirs. Water was transferred from Fresno Reservoir to Nelson Reservoir during this time. Fort Belknap Indian Irrigation Project remained in operation. Harlem Irrigation District also remained in operation because of pump problems experienced all year and Glasgow Irrigation District remained in operation instead of allowing the water to flow to the Missouri River.

July through September

Conditions were near average in July. Precipitation kept inflows slightly above average during July. This slightly improved the outlook for the remaining of the irrigation season, but the season still ended sooner than normal.

Irrigation releases from Fresno Reservoir were restarted on July 7 and were ramped down on August 24 which ended the irrigation season. Releases were decreased to 200 cfs by August 27. A 100 cfs release was required for Fort Belknap Indian Irrigation Project and the downstream municipalities. The other 100 cfs was being transferred to Nelson Reservoir for carryover storage. Storage in Fresno Reservoir reached its annual minimum of 12,414 AF on August 25.

Conditions were drier than average in August and September. Releases were decreased to 100 cfs on September 20 and decreased again to the winter release of approximately 40 cfs on September 30. The continued inflow of St. Mary River basin water helped Fresno Reservoir storage recover to approximately 36,800 AF by September 30. Fort Belknap Indian Irrigation Project used all their storage in Fresno Reservoir during WY2022. Fresno Reservoir storage ended WY2022 at 87 percent of average.

Additional hydrologic and statistical information pertaining to the operation of Fresno Reservoir during 2022 can be found in Tables MTT 39 through 42 and Figure MTG 16.

Nelson Reservoir

Nelson Reservoir, located near Malta, Montana, 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.

Summary of 2022 Operations

October through March

Storage in Nelson Reservoir at the start of WY2022 was 80 percent of average. Storage slowly decreased through seepage and evaporation until diversions through the Dodson South Canal reached Nelson Reservoir on March 23. Storage in Nelson Reservoir on March 31 was 75 percent of average.

April through July

Water was transferred from Fresno Reservoir to Nelson Reservoir during April. Releases through the Nelson South Canal started on May 1 which was the start of the irrigation season. Releases through the Nelson North Canal for Glasgow Irrigation District only occurred during June 3-7 for the first irrigation session. Releases to Nelson South Canal stopped on June 13 for the first session. Releases restarted on July 18 through both the Nelson South and Nelson North Canals.

August through September

All irrigation releases were shut off on August 22 because of the shortened irrigation season and lack of storage water in Nelson Reservoir. Water was transferred during August and September from Fresno Reservoir to Nelson Reservoir for carryover storage. Malta Irrigation District continued to operate the Dodson South Canal into October to capture natural runoff and irrigation return flows. Storage in Nelson Reservoir was still only 80 percent of average by the end of WY2022.

Additional hydrologic and statistical information pertaining to the operation of Nelson Reservoir during 2022 can be found in Tables MTT 43 through 46 and Figure MTG 17.

Important Events – Water Year 2022

March 23, 2022: Diversions to Dodson South Canal reach Nelson Reservoir.

March 14, 2022: Releases begin from Lake Sherburne to prepare for the start of St. Mary Canal diversions.

March 15, 2022: Diversions to St. Mary Canal started to move water to the Milk River Basin.

April 6, 2022: MRJBC set the irrigation allotment at 1.3 AF/acre. This is approximately 1.0 AF/acre lower than a full water supply.

April 7, 2022: Fresno Reservoir releases were increased to start transferring water from Fresno Reservoir to Nelson Reservoir.

April 20, 2022: 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.

April 20, 2022: Fresno Reservoir releases were increased for the start of irrigation season.

May 25, 2022: A conference call was held with the IJC field representatives to discuss St. Mary and Milk River apportionments.

June 8, 2022: A conference call was held by the MRJBC to discuss water supply. It was determined to stop irrigation mid-June to allow storage to recover in Fresno and Nelson Reservoirs.

July 7, 2022: A conference call was held by the MRJBC to discuss water supply. It was determined to restart irrigation mid-July.

August 1, 2022: A conference call was held by the MRJBC to discuss water supply. It was decided to irrigate for approximately two more weeks.

August 22, 2022: Releases from Nelson Reservoir were discontinued.

August 27, 2022: Releases from Fresno Reservoir are set at approximately 200 cfs to serve the municipalities and Fort Belknap Irrigation District and transfer water from Fresno Reservoir to Nelson Reservoir.

September 7, 2022: A conference call was held with the IJC field representatives to discuss St. Mary and Milk River apportionments.

September 30, 2022: St. Mary Canal diversions were discontinued for the season.

September 30, 2022: Releases from Fresno Reservoir are set to the winter release rate of approximately 40 cfs.

October 6, 2022: Lake Sherburne releases were discontinued.

October 12, 2022: A conference call was held with the IJC field representatives to discuss St. Mary and Milk River apportionments.

Additional hydrologic and statistical information pertaining to the operation of Lake Sherburne during WY2022 can be found in Tables MTT 35 through 38 and Figure MTG 15.

Table MTT 52.—Reservoir allocations for Lake Sherburne

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	4,729.30	1,899	1,899
Top of Active Conversation	4,788.00	66,147	64,248

Table MTT 53.—Storage and elevation data for Lake Sherburne

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	4,743.67	11,345	10/1/2021
End of Year	4,741.99	10,008	9/30/2022
Annual Low	4,741.99	10,008	9/30/2022
Annual High	4,787.94	66,043	7/30/2022
Historic High	4,788.30	68,371	6/30/1986

Table MTT 54.—Inflow and discharge data for Lake Sherburne

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	173,786	OCT '21-SEP '22	175,113	OCT '21-SEP '22
Daily Peak (CFS)	1,836	6/12/2022	804	7/4/2022
Daily Minimum (CFS)	-9	9/28/2022	0	*

* During non-irrigation season.

Table MTT 55.—WY2022 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	7.2	108	0.0	---	18.5	95
November	17.8	243	0.0	---	36.3	147
December	12.6	358	0.0	---	48.9	177
January	2.7	98	0.0	---	51.5	170
February	1.6	69	0.0	---	53.2	164
March	3.9	102	13.0	269	44.0	140
April	4.8	48	34.2	194	14.6	61
May	27.6	89	21.4	120	20.8	56
June	57.3	105	12.5	67	65.5	114
July	25.7	141	25.2	101	66.0	132
August	8.5	100	34.7	111	39.7	148
September	4.2	76	33.9	198	10.0	64
Annual	173.8	126	175.1	127	---	---
April-July	115.4	118	---	---	---	---

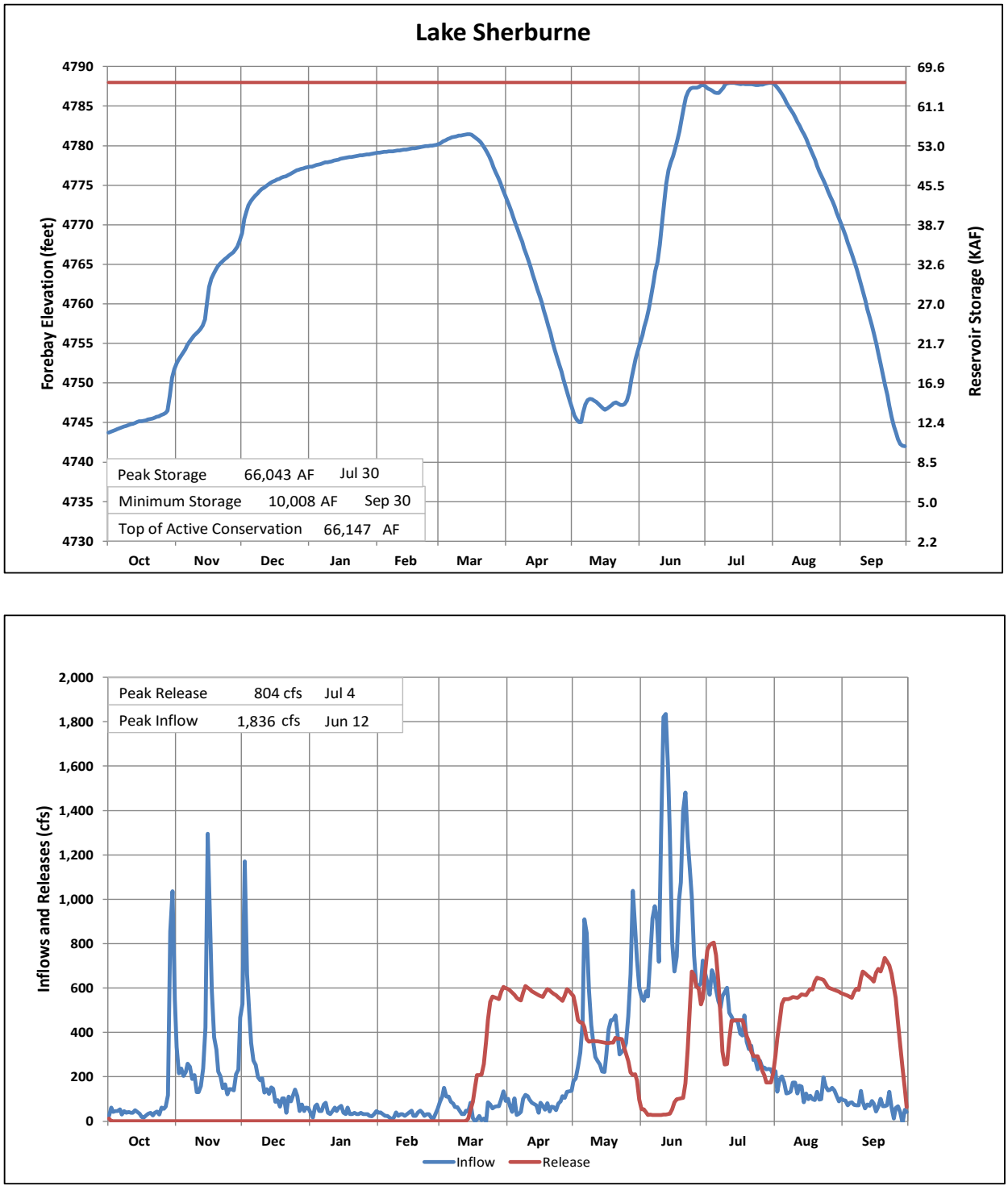


Figure MTG 21.—WY2022 hydrologic data for Lake Sherburne.

Additional hydrologic and statistical information pertaining to the operation of Fresno Reservoir during WY2022 can be found in Tables MTT 39 through 42 and Figure MTG 16.

Table MTT 56.—Reservoir allocations for Fresno Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	2,530.00	158	158
Top of Active Conversation	2,567.00	57,905	57,747
Top of Joint Use	2,575.00	91,746	33,841

Table MTT 57.—Storage and elevation data for Fresno Reservoir

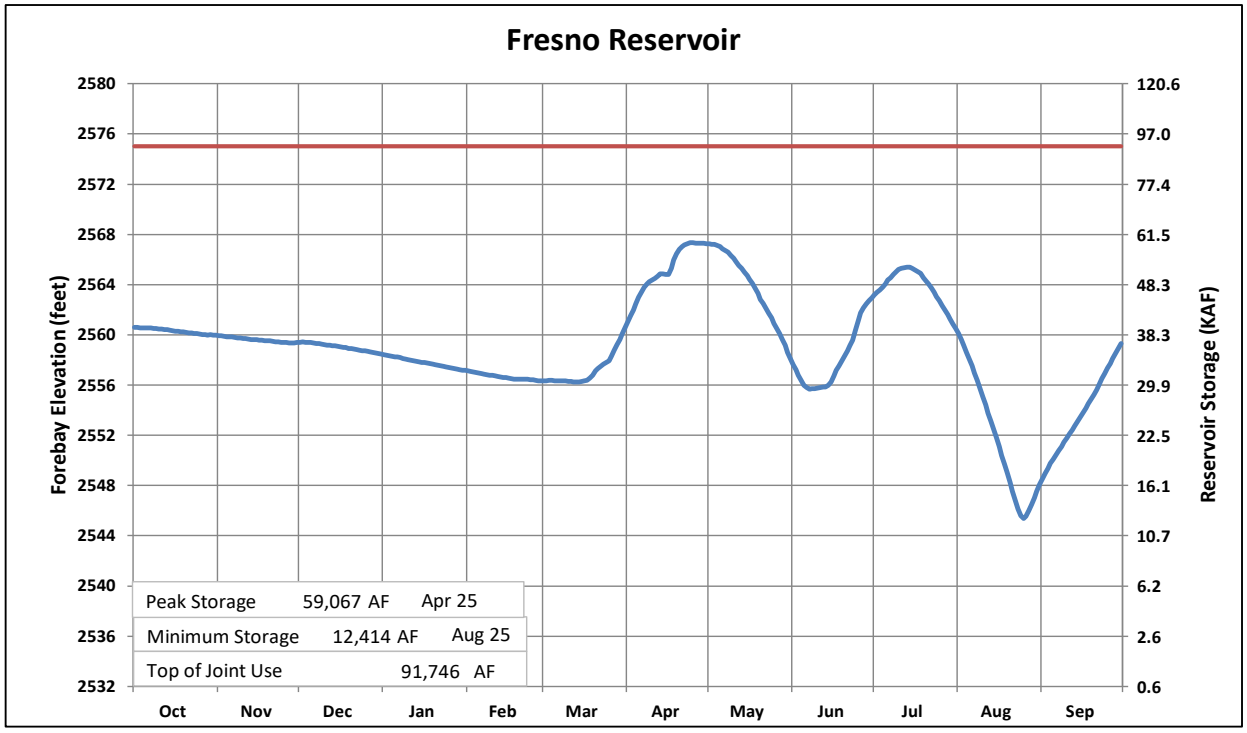
Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	2,560.65	39,831	10/1/2021
End of Year	2,559.31	36,775	9/30/2022
Annual Low	2,545.38	12,414	8/25/2022
Annual High	2,567.33	59,067	4/25/2022
Historic High	2,579.30	153,694	4/2/1952

Table MTT 58.—Inflow and discharge data for Fresno Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	228,801	Oct '21-Sep '22	231,880	Oct '21-Sep '22
Daily Peak (CFS)	1,224	6/25/2022	1,173	5/27/2022
Daily Minimum (CFS)	-22	1/10/2022	39	1/30/2022

Table MTT 59.—WY2022 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	1.1	17	2.7	47	38.3	89
November	1.2	39	2.5	83	36.9	85
December	0.6	35	2.6	86	34.9	83
January	-0.2	---	2.5	84	32.2	80
February	0.6	14	2.3	74	30.5	75
March	11.6	47	2.5	26	39.6	75
April	37.6	119	18.3	109	58.9	86
May	35.6	85	60.3	138	34.1	51
June	43.8	89	32.4	71	45.5	64
July	34.1	116	40.1	82	39.5	78
August	32.5	112	55.9	134	16.1	40
September	30.4	146	9.8	51	36.8	87
Annual	228.8	94	231.9	95	---	---
April-July	151.0	99	---	---	---	---



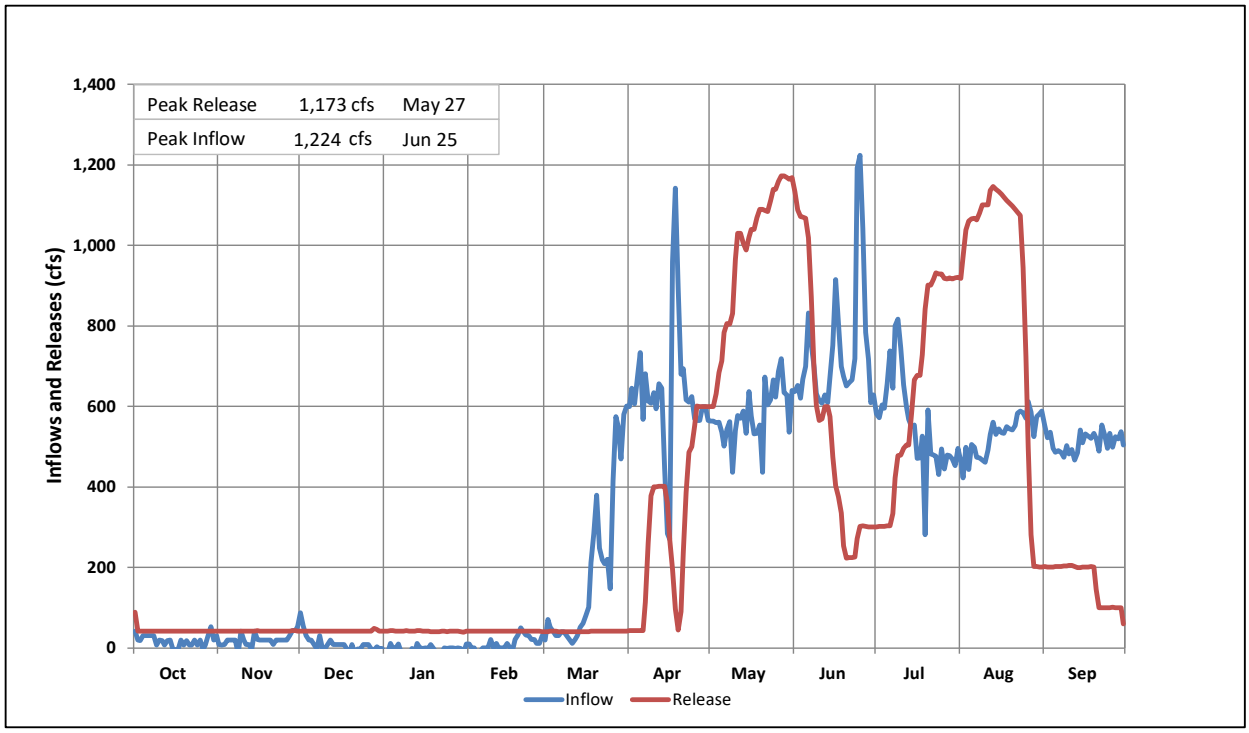


Figure MTG 22.—WY 2022 hydrologic data for Fresno Reservoir.

Additional hydrologic and statistical information pertaining to the operation of Nelson Reservoir during WY2022 can be found in Tables MTT 43 through 46 and Figure MTG 17.

Table MTT 60.—Reservoir allocations for Nelson Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	2,200.00	18,140	18,140
Top of Active Conversation	2,221.60	78,950	60,810

Table MTT 61.—Storage and elevation data for Nelson Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	2,212.52	45,165	10/1/2021
End of Year	2,212.39	44,772	9/30/2022
Annual Low	2,208.45	34,618	8/21/2022
Annual High	2,215.14	53,754	7/18/2022
Historic High	2,221.68	79,297	6/1/2007

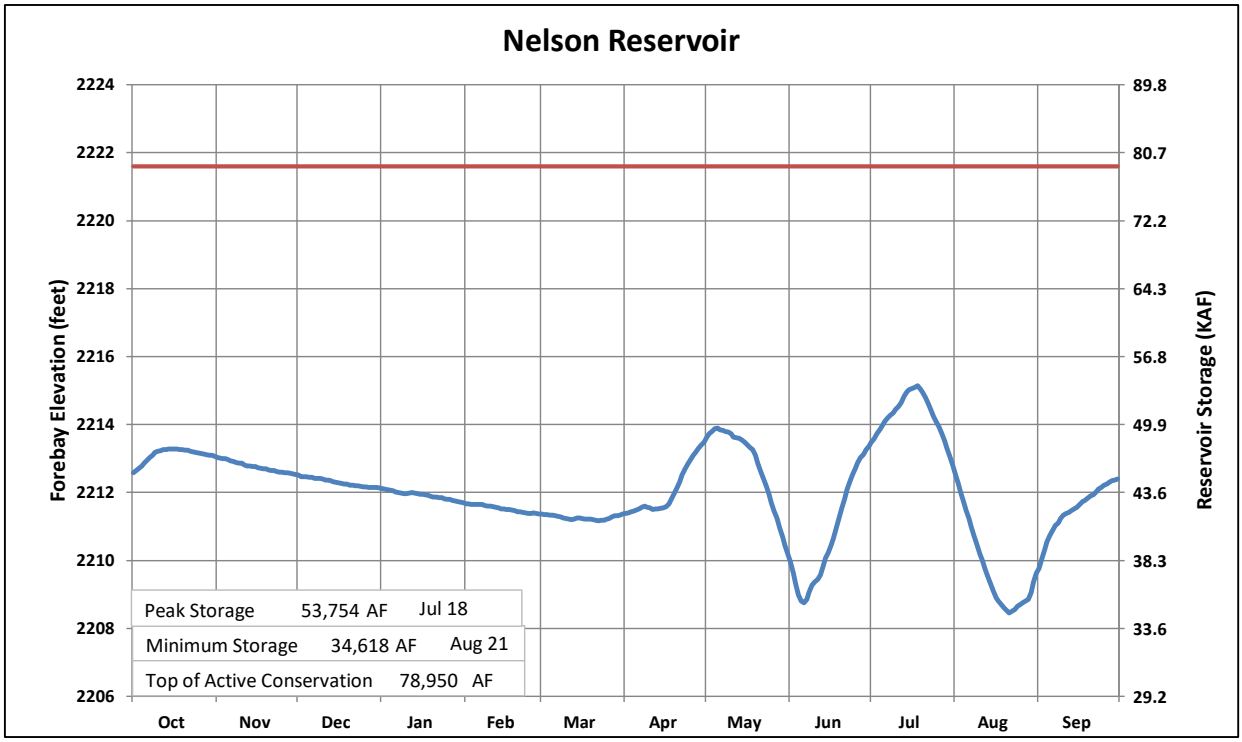
Table MTT 62.—Inflow and discharge data for Nelson Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	35,887	Oct '21-Sep '22	36,280	Oct '21-Sep '22
Daily Peak (CFS)	411	6/20/2022	360	7/31/2022
Daily Minimum (CFS)	-142	6/2/2022	0	*

* During non-irrigation season

Table MTT 63.—WY2022 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	1.7	71	0.0	---	46.8	82
November	-1.6	---	0.0	---	45.2	82
December	-1.2	---	0.0	---	44.0	82
January	-1.3	---	0.0	---	42.7	82
February	-0.9	---	0.0	---	41.8	82
March	0.0	0	0.0	---	41.8	75
April	6.4	65	0.0	0	48.2	74
May	4.5	51	13.8	132	38.8	62
June	12.6	131	3.7	38	47.8	76
July	6.0	89	7.8	54	46.1	84
August	2.4	25	11.0	105	37.4	70
September	7.4	109	0.0	0	44.8	80
Annual	35.9	68	36.3	68	---	---



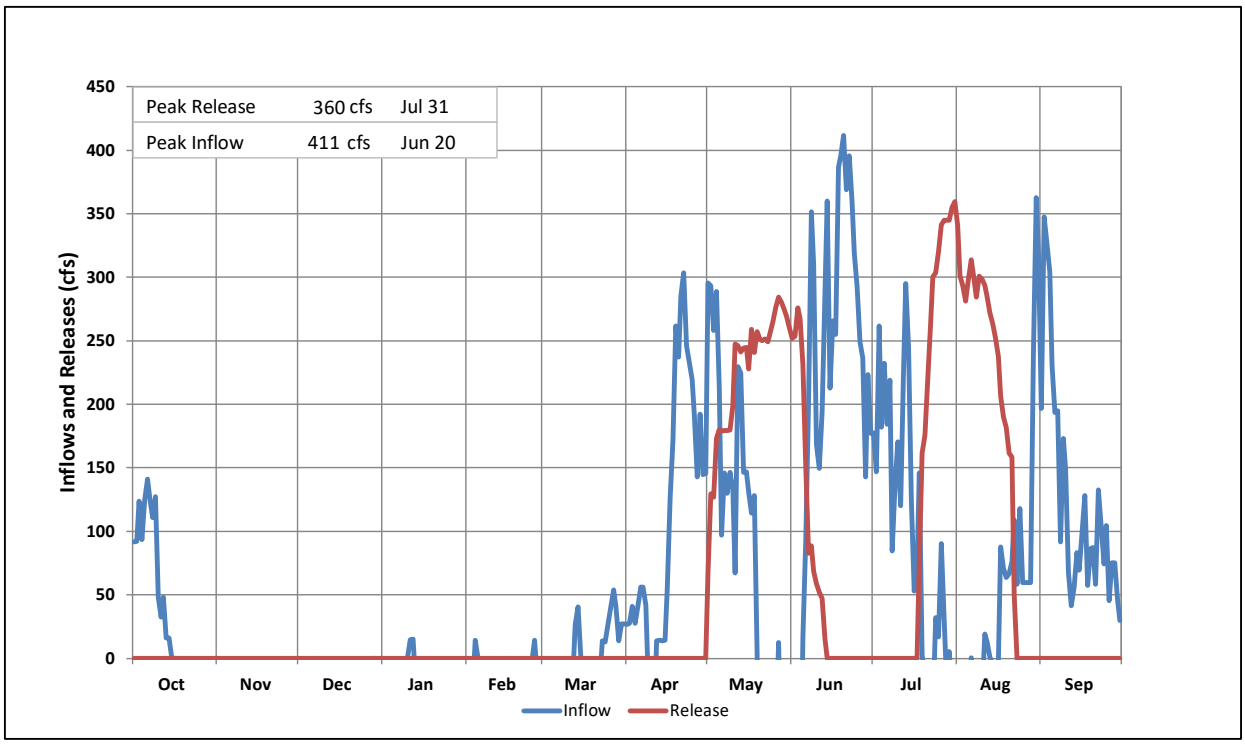


Figure MTG 23.—WY2022 hydrologic data for Nelson Reservoir.

Bighorn Lake and Yellowtail Powerplant

Bighorn Lake (PS-MBP) is located on the Bighorn River about 45 miles southwest of Hardin, Montana. 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 the WYAO and all reservoir and river operations in the Bighorn River Basin are closely coordinated between the MTAO and WYAO.

Summary of 2022 Operations

Hydrologic conditions in the Bighorn River Basin varied during WY2022. Overall, precipitation was near average while the basin was warmer than average. Snowpack accumulated later and melted out later than normal. Releases to the Bighorn River fluctuated between a low of 1,900 cfs and a high of 7,000 cfs.

October

Storage in Bighorn Lake started WY2022 at elevation 3,626.7 feet or 98 percent of the 30-year average. The dry conditions in September 2021, lower storage, and below average inflows resulted in the below average release to the Bighorn River of 1,900 cfs to start off WY2022. Precipitation was above average during October. This resulted in greater than expected inflows. Releases were increased to 2,000 cfs based on forecasted winter releases.

November through February

Winter river releases are set during the early part of November based on the established operating criteria. The release is based on current storage, forecasted inflows and a March 31 storage target of 3,617.0 feet. The initial winter release was calculated to be 2,125 cfs.

Releases were slightly increased during the winter months to stay on track with the end of March storage target. No major changes were needed due to snowpack and forecasts being in the normal range. By the end of February, river releases were 2,360 cfs while storage was at elevation 3,618.1 feet.

March

On March 1, the operational focus shifts from March 31 to April 30 in accordance with established operating criteria. Snowpack and forecasted inflows were below average on March 1. The storage target for April 30 was 3,617.2 feet based on the March 1 April through July inflow forecast of 860,000 AF, 70 percent of average.

River releases were decreased to 2,000 cfs during March and storage on March 31 was 3,617.4 feet.

April through June

The April 1 April through July inflow forecast decreased to 728,000 AF, 59 percent of average, due to the drier than average conditions during March. Snowpack was much below average. Under this forecast, Bighorn Lake was not expected to fill to normal full pool, 3,640.0 feet. Releases were maintained at 2,000 cfs during April. The elevation of Bighorn Lake decreased to a minimum of 3,615.3 for the year. April was wetter and cooler than average improving snowpack throughout the Bighorn Basin. Storage ended the month at 3,616.5 feet, 106 percent of average.

The May 1, April through July inflow forecast increased to 899,000 AF. This forecast included the actual volume of inflow that was received during April, 112,700 AF. Due to the storage level in Bighorn Lake and the increased forecast, releases to the Bighorn River were increased to 2,575 cfs on May 11. Bighorn Lake was expected to fill to normal full pool. River releases were expected to peak at 4,500 cfs under median inflow conditions.

May actual inflows were lower than forecasted because cooler than average temperatures during May delayed the snowmelt runoff Resulting in snowpack that was much above average by the end of May.

The June 1 April through July inflow forecast was about the same as the previous month at 908,000 AF which included actual April and May inflow volume. Bighorn Lake was expected to fill to normal full pool. River releases were expected to peak at 5,500 cfs under median inflow conditions.

River releases were increased to 3,000 cfs by June 1 based on storage and increasing inflow at the end of May. Based on the inflow forecast in June releases were increased to 4,500 cfs by June 9.

Heavy precipitation during June 12-15 in the Shoshone River basin resulted in increased releases from Buffalo Bill Reservoir causing higher-than-expected inflows into Bighorn Lake. Between the additional inflow from the rain and the late snowmelt, inflows peaked on June 20 at 11,600 cfs. Releases to the Bighorn River were increased to 7,000 cfs by June 18. Storage reached 1,001,100 AF at elevation 3,639.3 feet on June 30.

Operations were closely coordinated with the Corps. The heavy precipitation that fell in the Shoshone River basin also fell in the Yellowstone River basin. Major flooding occurred at the upper end of the Yellowstone River and many tributaries to the Yellowstone River as a result of rain falling on the remaining snowpack. The coordinated operations required delaying increases to the releases to the Bighorn River to allow the flood wave on the Yellowstone River to pass Miles City, Montana. Figure MTG 24 shows precipitation during June 2022 from NOAA Regional Climate Centers.

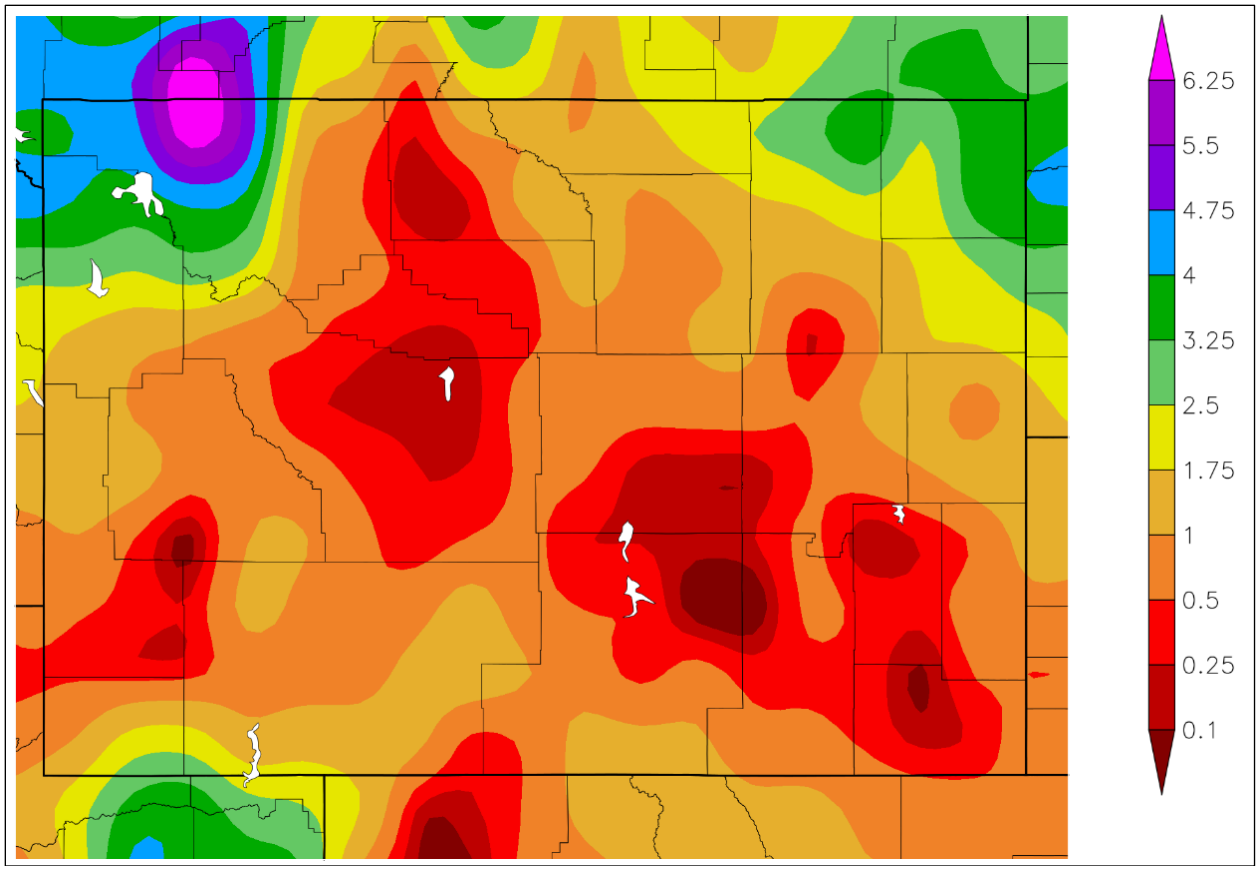


Figure MTG 25.—Precipitation during June 2022 from NOAA Regional Climate Centers.

July through September

Inflow forecasts continued to be refined throughout the snowmelt runoff season. Although inflows were high during June because of the late snowmelt, precipitation over most of the basin was below average. Releases to the river were being decreased starting on June 27. Peak storage on July 9 was 1,005,900 AF at elevation 3,639.6 feet. Inflows and releases continued to decrease during July. River releases were down to 2,600 cfs by July 18.

Conditions remained dry during July and were warmer than average. Precipitation was near normal during August and September, but temperatures remained much above average. Releases were reduced to 2,500 cfs on August 8 based on the carryover storage target of 3,617.0 feet for March 31, 2023. End of WY2022 storage was 931,100 AF at elevation 3,633.4 feet, 106 percent of average.

Total generation produced at Yellowtail Powerplant during WY2022 was 645,639 MWh, 83 percent of average. Approximately 95 percent of all water released from Yellowtail Dam during WY2022 (1,825,498 AF) was released through the powerplant. The remaining 92,903 AF was released either through the river outlet gates or the spillway gates.

Important Events – Water Year 2022

April 7, 2022: The Bighorn Canal is started for the irrigation season.

July 9, 2022: Bighorn Reservoir reached its maximum elevation for the year, 3,639.6 ft.

September 29, 2022: The Bighorn Canal was shut down for the irrigation season.

Additional hydrologic and statistical information pertaining to the operations of Bighorn Lake during WY2022 can be found on Tables MTT 47 through 50.

For more detailed information on the operations of Boysen and Buffalo Bill Reservoirs during WY2022, refer to the narratives for Boysen Reservoir and Powerplant and Shoshone Project under the responsibility of the WYAO.

Table MTT 64.—Reservoir allocations for Bighorn Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	3,547.00	467,473	467,473
Top of Active Conversation	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

Table MTT 65.—Storage and elevation data for Bighorn Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	3,626.65	866,789	10/1/2021
End of Year	3,633.45	931,130	9/30/2022
Annual Low	3,615.27	789,009	4/21/2022
Annual High	3,639.62	1,005,907	7/9/2022
Historic High	3,656.36	1,363,994	7/6/1967

Table MTT 66.—Inflow and discharge data for Bighorn Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	1,982,743	OCT '21-SEP '22	1,874,294	OCT '21-SEP '22
Daily Peak (CFS)	11,602	6/20/2022	7,070	6/26/2022
Daily Minimum (CFS)	760	1/4/2022	1,898	10/12/2021
Peak Spill (CFS)			2,750	6/23/2022
Total Spill (kaf)			92,904	6/13-7/11/2022

Table MTT 67.—WY2022 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	153.9	93	0.7	31	120.1	74	904.5	102
November	117.4	94	0.0	---	124.0	84	902.1	103
December	101.5	95	0.0	---	133.2	88	874.6	104
January	98.1	91	0.0	---	137.9	90	839.1	104
February	90.4	81	0.0	---	129.2	91	804.1	103
March	122.4	78	0.0	---	131.2	74	799.6	104
April	112.7	64	4.0	282	118.7	59	793.7	106
May	219.3	71	6.4	55	143.1	63	867.9	107
June	453.4	97	14.1	66	309.8	98	1,001.1	108
July	204.3	74	24.9	91	223.8	83	961.1	106
August	149.9	97	27.7	104	155.1	89	932.5	107
September	159.4	97	16.6	101	148.2	98	931.1	106
Annual	1,982.7	85	94.4	88	1,874.3	82	---	---
April-July	989.7	81	---	---	---	---	---	---

Annual Operating Plans for Water Year 2022 for Missouri Basin Units Under the Responsibility of the Dakotas Area Office

Weather Summary for North and South Dakota, WY2022

October precipitation was very much above normal at Dickinson and Heart Butte Reservoirs; much above normal at Angosura Reservoir; normal at Jamestown and Keyhole Reservoirs; below normal at Deerfield Reservoir; much below normal at Pactola and Shadehill Reservoirs; and very much below normal at Belle Fourche reservoir.

November precipitation was much above normal at Deerfield Reservoir; above normal at Belle Fourche Reservoir; below normal at Jamestown, Keyhole and Shadehill Reservoir; much below normal at Pactola Reservoir; and very much below normal at Angostura, Dickinson, and Heart Butte Reservoirs.

December precipitation was very much above normal at Angostura, Deerfield, Jamestown, and Keyhole Reservoirs; much above normal at Pactola Reservoir; above normal at Belle Fourche Reservoir; normal at Dickinson, Heart Butte, and Shadehill Reservoirs.

January precipitation was very much above normal at Deerfield, Jamestown, and Keyhole Reservoirs; normal at Pactola and Shadehill Reservoirs; below normal at Belle Fourche Reservoir; and very much below normal at Angostura, Dickinson, and Heart Butte Reservoirs.

February precipitation was very much above normal at Belle Fourche, Deerfield, Keyhole, and Pactola Reservoirs; normal at Shadehill Reservoir; much below normal at Angostura, Heart Butte, and Jamestown Reservoirs; and very much below normal at Dickinson Reservoir.

March precipitation was much above normal at Shadehill Reservoir; below normal at Deerfield, Keyhole, and Pactola Reservoirs; much below normal at Angostura reservoir, and very much below normal at Belle Fourche, Dickinson, Heart Butte, and Jamestown Reservoirs.

April precipitation was very much above normal at Belle Fourche, Heart Butte, and Jamestown Reservoirs; above normal at Deerfield and Pactola Reservoirs; normal at Shadehill Reservoir; below normal at Angostura and Keyhole Reservoirs; and very much below normal at Dickinson Reservoir.

May precipitation was very much above normal at Belle Fourche, Deerfield, Keyhole and Pactola Reservoirs; above normal at Jamestown and Shadehill Reservoirs; normal at Angostura, Dickinson, and Heart Butte Reservoirs.

June precipitation was very much above normal at Deerfield Reservoir; above normal at Pactola Reservoir; normal at Belle Fourche and Shadehill Reservoirs; and below normal at Angostura, Dickinson, Heart Butte, Jamestown, and Keyhole Reservoirs.

July precipitation was very much above normal at Belle Fourche, Deerfield, Dickinson, Keyhole and Pactola Reservoirs; normal at Heart Butte Reservoir; below normal at Angostura and Shadehill Reservoirs; and very much below normal at Jamestown Reservoir.

August precipitation was very much above normal at Deerfield and Pactola Reservoirs; much above normal at Belle Fourche Reservoir; above normal at Angostura and Dickinson Reservoirs; normal at Keyhole and Shadehill Reservoirs; much below normal at Jamestown reservoir; and very much below normal at Heart Butte Reservoir.

September precipitation was much above normal at Belle Fourche and Shadehill Reservoirs; much above normal at Deerfield and Pactola Reservoirs; below normal at Keyhole Reservoir; normal at Heart Butte Reservoir; and very much below normal at Angostura, Dickinson, and Jamestown Reservoirs.

Total annual precipitation and end-of-year storage for Reclamation facilities in North Dakota, South Dakota, and northeastern Wyoming are shown on Tables DKT 1 and DKT 2.

Table DKT 1.—Total annual precipitation for Reclamation Reservoirs

Reservoir	2022 Total	Average Total	Percent of Average
Angostura [1]	14.82	17.67	84
Belle Fourche [2]	8.68	15.86	55
Deerfield [3]	14.94	14.38	104
Keyhole [4]	13.16	17.99	73
Pactola	13.05	20.58	63
Shadehill [5]	20.90	17.86	117
Dickinson	14.29	15.63	91
Heart Butte	18.15	16.79	108
Jamestown	18.95	19.84	96

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 the Dakotas and Eastern Wyoming, (AF)

Reservoir	Storage September 30, 2021	Storage September 30, 2022	Change in Storage
Angostura	75,485	61,946	-13,539
Belle Fourche	69,244	91,970	22,726
Deerfield	15,048	15,369	321
Keyhole	128,144	119,643	-8,501
Pactola	52,676	51,481	-1,195
Shadehill	74,319	92,565	18,246
Dickinson	4,192	7,220	3,028
Heart Butte	43,586	53,951	10,365
Jamestown	20,742	27,408	6,666

Flood Benefits

One of Reclamation's reservoir in North Dakota and two Reclamation reservoirs in South Dakota provided flood relief during WY2022.

The information on the distribution of flood damages prevented is provided by the Corps. The distributions of flood damages prevented for each reservoir are shown in Table DKT 3. Figure DKG 1 shows a 30-year bar graph of flood damages prevented.

Table DKT 3.—Flood damages and accumulated damages prevented in 2022

Facility	Local	Main Stem	2022 Total	Previous Accumulations	1950-2022 Cumulative Totals
Heart Butte	$0	$90,800	$90,800	$17,039,800	$17,130,600
Shadehill	$0	$181,500	$181,500	$14,144,400	$14,325,900
Angostura	$0	$0	$0	$22,900	$22,900
Pactola	$0	$0	$0	$4,945,700	$4,945,700
Keyhole	$0	$300	$300	$4,931,900	$4,932,200
Jamestown	$16,082,100	$0	$16,082,100	$220,762,800	$236,844,900
Total	$16,082,100	$272,600	$16,354,700	$261,847,600	$278,202,200

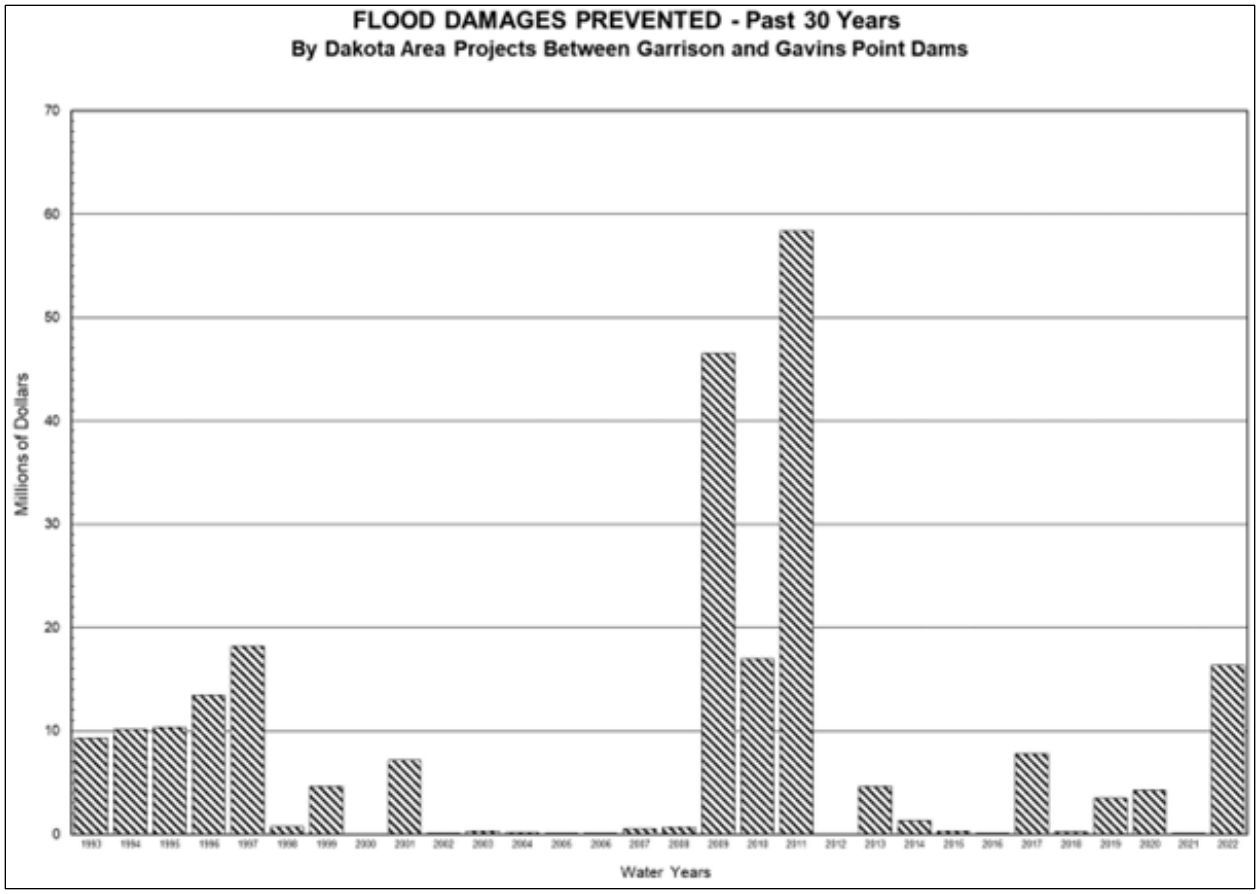


Figure DKG 2.—Flood damages prevented: 30-year plot.

Unit Operational Summaries for Water Year 2022

Dickinson Reservoir

Background

Dickinson Dam and Edward Arthur Patterson Lake (Dickinson Reservoir) are located on the Heart River one mile west of Dickinson, North Dakota. The reservoir has a dead capacity of 356 AF, an inactive capacity of 100 AF and an active conservation capacity of 8,156 AF (for a total storage capacity of 8,612 AF at the top of conservation elevation 2,420.00 ft.). Reservoir water is used for irrigating approximately 230 acres along the Heart River downstream of the dam and for municipal use by the Dickinson Parks and Recreation District.

Water Year 2022 Operations Summary

E.A. Paterson Reservoir (Dickinson Dam) started WY2022 at elevation 2415.36 ft and with a storage of 4,051 AF, which is 4.64 ft and 4,561 AF below the top of the conservation pool. Precipitation for WY2022 was 14.29 inches, which is 91 percent of its 15.63-inch average. Inflows for WY2022 totaled 21,192 AF, which is 109 percent of its 19,492 AF average. Peak inflows occurred in May, totaling 5,412 AF for the month. The peak reservoir elevation for

WY2022 was 2,420.65 ft, with a storage of 9,278 AF, occurring on April 30, 2022. The minimum elevation for WY2022 was 2,415.26 ft, with a storage of 3,978 AF, occurring on October 8, 2021. WY2022 ended at elevation 2,418.89 ft, and storage of 7,220 AF, which is 1.10 ft and 1,392 AF below the top of the conservation pool.

Dickinson Dam went into Internal Alert on April 29, with a reservoir elevation over 2420.00 ft and remained there until July 29 when it went into normal operations and remained there for the rest of the water year.

A Periodic Facility Review (PFR) was conducted on September 1, 2022, by personnel from the regional office along with personnel from DKAO.

Monthly Statistics for Water Year 2022

Record and near record monthly inflows in 71 years of record keeping were recorded in the following months: July had its fourth highest inflow; September had its seventh lowest inflow.

Record or near record monthly end of month content in 71 years of record keeping were recorded in the following months: April had its tenth highest storage.

Additional statistical information on Dickinson Reservoir and its operations during 2022 can be found on Table DKT 4 through 7 and Figure DKG 2.

Table DKT 4.—Reservoir allocations for Dickinson Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive	2,405.00	438	438
Top of Active Conversation	2,420.00	8,452	8,014
Top of Joint Use			
Top of Exclusive Flood Control			

Table DKT 5.—Storage and elevation data for Dickinson Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	2,415.37	4,192	OCT 01, 2021
End of Year	2,418.89	7,220	SEP 30, 2022
Annual Low	2,415.26	3,978	OCT 08, 2021
Annual High	2,420.65	9,278	APR 30, 2022
Historic High	2,422.19	***9,348	MAR 21, 1997

*** 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 on June 9, 1982)

Table DKT 6.—Inflow and outflow data for Dickinson Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	21,192	OCT 21-SEP 22	18,031	Oct 21-Sep 22
Daily Peak (CFS)*	687	APR 29, 2022	558	Jul 09, 2022
Daily Minimum (CFS)**	0	**	0	**

* 24-hour daily inflow and 15-minute instantaneous discharge
** Frequently observed during fall and winter months

Table DKT 7.—Inflow, outflow, and storage content for Dickinson Reservoir

Month	Inflow		Outflow		Content	
	AF	Percent of Avg	AF	Percent of Avg	AF	Percent of Avg
October	254	40	0	0	4,446	80
November	31	18	0	0	4,343	79
December	85	62	0	0	4,428	80
January	55	19	0	0	4,483	80
February	63	6	0	0	4,546	76
March	492	7	0	0	5,038	72
April	4,909	114	669	16	9,278	129
May	5,142	218	5,773	135	8,647	121
June	4,241	191	4,325	190	8,563	121
July	6,640	835	6,760	516	8,443	129
August	-293	NA	503	63	7,647	126
September	-427	NA	0	0	7,220	125
Annual	21,192	109	18,030	85		
April-July	20,932	216				

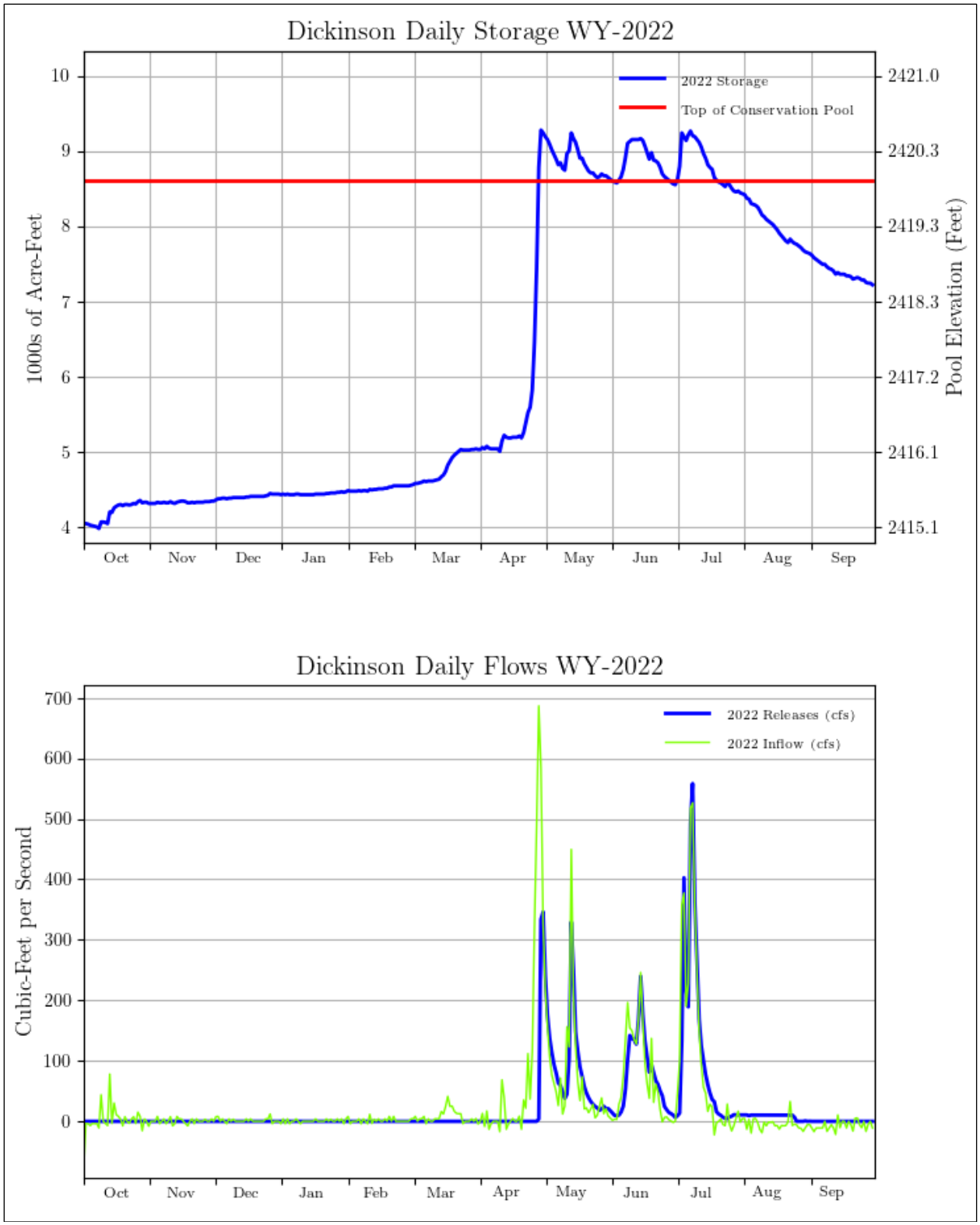


Figure DKG 3.—Dickinson Reservoir water data.

Heart Butte Reservoir

Background

Heart Butte Dam and Lake Tschida (Heart Butte Reservoir) is located on the Heart River 15 miles south of Glen Ullin, North Dakota. The reservoir has a dead storage capacity of 5,227 AF, an active conservation capacity of 61,915 AF (for a total storage capacity of 67,142 AF at the top of active conservation elevation 2,064.50), and an exclusive flood control space of 147,027 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 7,320 acres are now being irrigated.

Water Year 2022 Operational Summary

Lake Tschida Reservoir (Heart Butte Dam) started WY2022 at elevation 2,056.46 ft, with a storage of 42,662 AF, 8.04 ft and 24,480 AF below the top of the conservation pool. Precipitation for WY2022 was 18.15 inches, 108 percent of its 16.79-inch average. Inflows for WY2022 totaled 70,774 AF, 81 percent of its 87,080 AF average. Peak inflows occurred in May, totaling 25,838 AF for the month. The peak reservoir elevation for WY2022 was 2,066.51 ft, with a storage of 71,975 AF, occurring on July 12, 2022. The minimum elevation for WY2022 was 2,056.29 ft, with a storage of 42,248 AF, occurring on October 12, 2021. WY2022 ended at elevation 2,060.73 ft, and storage of 53,951 AF, 3.77 ft and 13,191 AF below the top of the conservation pool.

Heart Butte Dam went into Internal Alert on May 4, with a reservoir elevation over 2,064.50 ft and remained there until May 29, when the reservoir returned to normal operations, with an elevation under 2,064.50 ft. Internal Alert for reservoir elevation was declared for a second time on July 5 and remained there until July 21 when it went back into normal operations for the remainder of the water year.

A PFR was conducted on August 31, 2022, by personnel from the regional office along with personnel from DKAO.

Monthly Statistics for Water Year 2022

Record and near record monthly inflows in 73 years of record keeping were recorded in the following months: May had its eighth highest inflow, and July had its fifth lowest inflow. Record or near record monthly end of month content in 73 years of record keeping were recorded in the following months: October had its seventh lowest storage, November had its seventh lowest storage, December had its sixth lowest storage, January had its sixth lowest storage, February had its sixth lowest storage, and March had its fourth lowest storage.

Additional statistical information on Heart Butte Reservoir and its operations during 2022 can be found on Table DKT 8 through 11 and Figure DKG 3.

Table DKT 8.—Hydrologic data for 2022 Heart Butte Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	2,030.00	4,328	4,328
Top of Active Conversation	2,064.50	65,091	60,763
Top of Joint Use			
Top of Exclusive Flood Control	2,094.50	212,696	147,605

Table DKT 9.—Storage and elevation data for Heart Butte Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date
Beginning of Year	2,056.49	43,586	Oct 01, 2021
End of Year	2,060.73	53,951	Sep 30, 2022
Annual Low	2,056.29	42,248	Oct 12, 2021
Annual High	2,066.51	71,975	Jul 12, 2022
Historic High	2,086.23	173,203	Apr 09, 1952

Table DKT 10.—Inflow and outflow data for Heart Butte Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	70,774	OCT 21-SEP 22	59,365	OCT 21-SEP 22
Daily Peak (CFS)	1,522	APR 30, 2022	770	JUL 120, 2022
Daily Minimum (CFS)	0	*	0	*

Table DKT 11.—Inflow, outflow and storage content data for Heart Butte Reservoir

Month	Inflow		Outflow		Content	
	AF	Percent of Avg	AF	Percent of Avg	AF	Percent of Avg
October	1,075	67	382	16	44,279	76
November	647	49	0	0	44,047	76
December	921	96	570	44	44,398	77
January	523	44	579	50	44,322	77
February	1,026	28	520	25	44,828	76
March	2,954	10	395	2	47,387	68
April	11,568	49	0	0	58,955	85
May	25,838	260	20,510	194	64,283	94
June	6,640	67	7,285	78	63,638	92
July	19,520	497	19,581	260	63,577	97
August	157	10	5,920	108	57,814	94
September	-95	NA	3,768	128	53,951	91
Annual	70,774	81	59,510	69		
April-July	63,566	134				

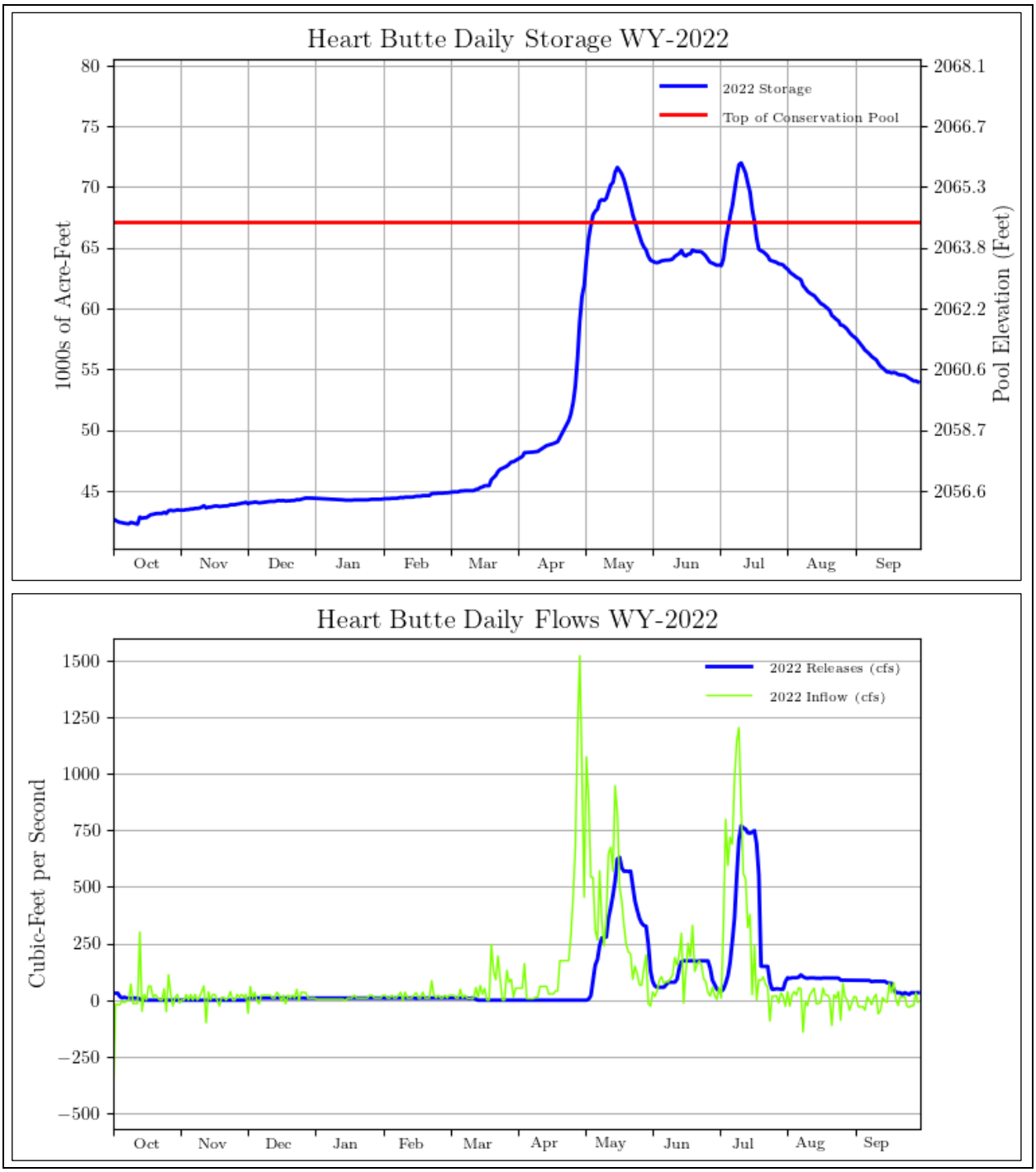


Figure DKG 4.—Heart Butte Reservoir water data.

Jamestown Reservoir

Background

Jamestown Reservoir is located on the James River just above the city of Jamestown, North Dakota. 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 1428.00 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.

Water Year 2022 Operations Summary

Jamestown Reservoir started WY2022 at elevation 1,426.03 ft and storage of 20,725 AF, 4.97 feet, and 9,763 AF above the top of the conservation pool (elevation 1,428.00 ft and storage 24,226 AF). Jamestown Reservoir peaked at elevation 1,442.46 ft on May 20, 2022, with 93,162 AF of storage. The minimum reservoir elevation for WY2022 was 1,425.85 ft and storage of 20,422 AF occurred on October 6, 2022. The reservoir elevation on September 30, 2022, was 1,429.61 ft with storage of 27,408 AF, 1.39 feet and 3,080 AF above the top of active conservation pool.

The maximum instantaneous discharge of 807 cfs occurred on July 19, 2022. Reservoir net inflows for WY2022 were the ninth highest inflows on record for the dam and totaled 166,432 AF, 275 percent of average. The maximum 24 hour computed inflows occurred on May 15 with 3,189 cfs. Precipitation for the water year totaled 18.95 inches, 96 percent of average.

On March 13, a small spring runoff started to occur. An e-mail on March 21, from the Corps was predicting a low flow year for both Jamestown (Reclamation) and Pipestem (Corps) dams.

On April 8 the reservoir's elevation reached over 1,431.00 ft, activating the Emergency Action Plan (EAP) for Internal Alert. At elevations at or above 1,431.00 ft the releases are under Corps direction.

On April 18 the Corps directed Reclamation to start releases of 100 cfs from Jamestown Dam and to increase the releases to 200 cfs on April 19.

On April 26 the Corps directed Reclamation to increase the releases to 300 cfs from Jamestown Dam and to increase the releases to 400 cfs on April 27.

On May 5 the Corps directed Reclamation to increase the releases to 500 cfs from Jamestown Dam and to increase the releases to 650 cfs on April 27 and, finally, to 800 cfs on May 17.

The maximum daily inflow for Jamestown Dam occurred on May 15 with 3,188 cfs.
On May 17 with the reservoir's elevation reaching over 1,440.00 ft with releases of 750 cfs or greater, activated the EAP for Response level 1.

An e-mail from the Corps on May 17, 2022, indicated continued rains in May have moved operations from a low-flow year into a high-flow year.

Jamestown Dam reservoir elevation peaked at 1,442.46 ft on May 20.

On July 8 with the reservoir's elevation went below 1,440.00 ft with releases of 750 cfs or greater, EAP response was lowered from level 1 to internal alert.

On August 1 the Corps directed Reclamation to reduce the releases to 700 cfs from Jamestown Dam. Combined releases with Pipestem Dam were 1,300 cfs.

On August 2 the Corps directed Reclamation to reduce the releases to 600 cfs from Jamestown Dam, then to 500 cfs on August 3, and finally, to 400 cfs on August 4.

On August 8, the Corps directed Reclamation to reduce releases to 300 cfs from Jamestown Dam.

On August 16 the reservoir went out of Internal Alert and into Normal Operations with the reservoir elevation below 1,431.00 ft and releases below 450 cfs. This also returned Corps control of the releases back to Reclamation control.

On August 18, Reclamation, in agreement with Corps, reduced releases to 150 cfs from Jamestown Dam.

On August 25, Reclamation, in agreement with Corps, reduced releases to 50 cfs from Jamestown Dam.

On September 6, Reclamation, in agreement with Corps, shut off all releases from Jamestown Dam.

No water was released specifically for downstream irrigation.

An Emergency Management program, orientation seminar and communications drill were conducted on March 10, 2022.

The Annual Site Inspection (ASI) was conducted on September 12, 2022, by personnel from Dakotas Area Office in Bismarck, North Dakota.

An event driven functional exercise occurred from April 8 to August 16, 2022. An after-action report for the event was sent to the Missouri Basin Regional Office on September 27, 2022.

Monthly Statistics For Water Year 2022

Record and near record monthly inflows in sixty-nine years of record keeping were recorded during the following months: May had its second highest inflow, June had its highest ever inflow, and July had its eighth highest inflow.

Record and near record monthly end of month content in sixty-nine years of record keeping were recorded during the following months: May had its third highest storage, and June had its second highest storage.

Additional statistical information on Jamestown Reservoir and its operations during 2022 can be found on Table DKT 12 through 15 and Figure DKG 4.

Table DKT 12.—Hydrologic data for 2022 Jamestown Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	1,400.00	292	292
Top of Active Conversation	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

Table DKT 13.—Storage and elevation data for Jamestown Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date
Beginning of Year	1,426.04	20,742	OCT 01, 2021
End of Year	1,429.61	27,408	SEP 30, 2022
Annual Low	1,425.85	20,422	OCT 06, 2021
Annual High	1,442.46	93,162	MAY 203, 2022
Historic High	1,454.10	222,318	APR 26, 2009

Table DKT 14.—Inflow and outflow data for Jamestown Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	166,432	OCT 21-SEP 22	159,766	OCT 21-SEP 22
Daily Peak (CFS)	3,189	MAY 15, 2022	807	JUL 19, 2022
Daily Minimum (CFS)	0	*	0	*

Table DKT 15.—Inflow, outflow, and storage content data for Jamestown Reservoir

Month	Inflow		Outflow		Content	
	AF	Percent of Avg	AF	Percent of Avg	AF	Percent of Avg
October	169	4	0	0	20,911	79
November	-85	2	0	0	20,826	80
December	102	64	0	0	20,928	81
January	410	218	0	0	21,338	84
February	172	1	0	0	21,510	85
March	4,234	7	0	0	25,744	83
April	26,653	NA	6,393	67	46,004	99
May	85,330	0	40,405	263	90,929	224
June	35,197	NA	47,455	478	78,671	227
July	10,030	NA	49,201	758	39,501	122
August	4,191	NA	15,735	314	27,957	89
September	28	NA	577	12	27,408	98
Annual	166,431	275	159,766	266		
April-July	157,210	366				

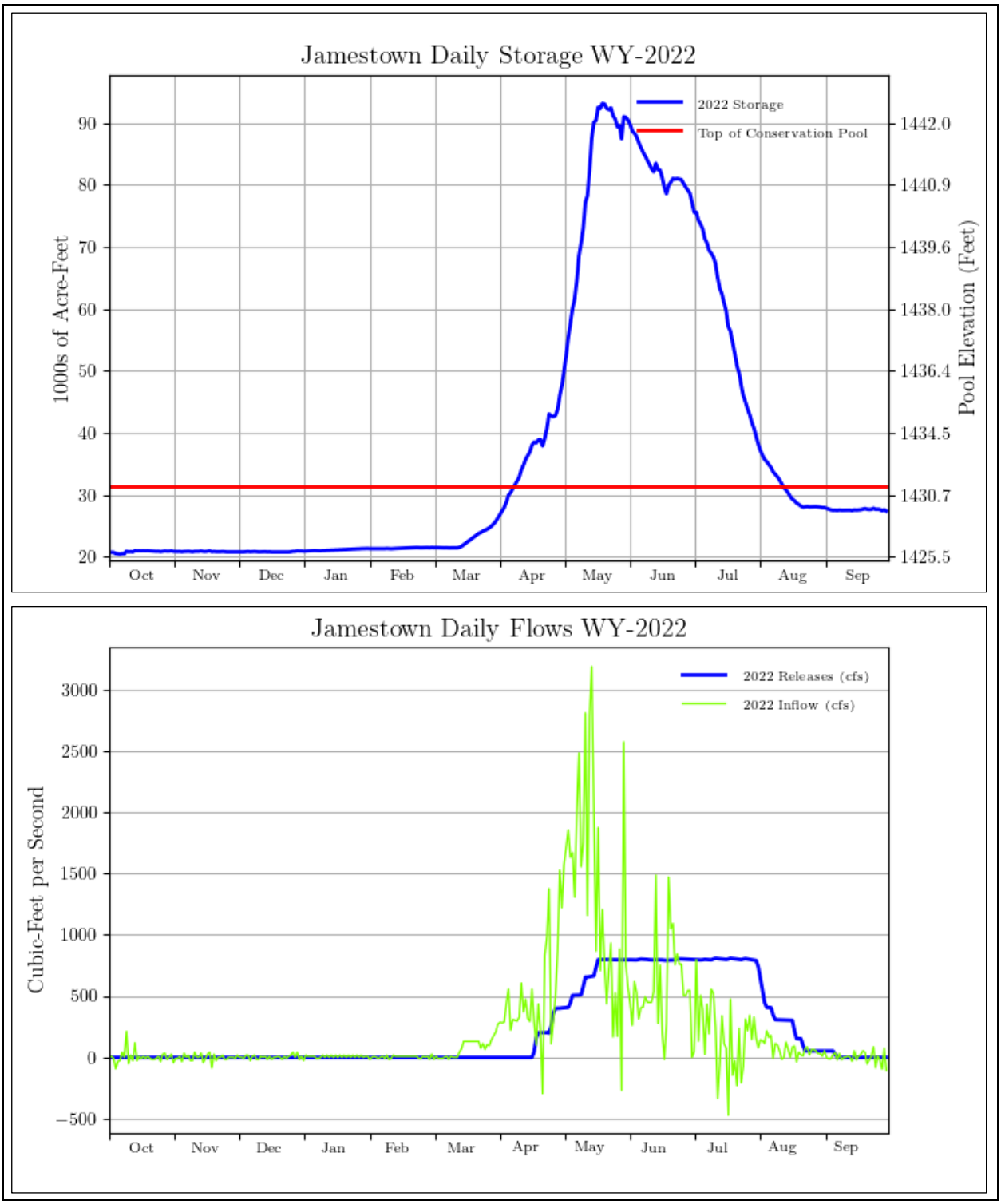


Figure DKG 5.—Jamestown Reservoir water data.

Angostura Reservoir

Background

Angostura Reservoir (PS-MBP), located on the Cheyenne River above Hot Springs, South Dakota, was built to service about 12,200 acres in the Angostura Unit (PS-MBP) and for power generation. It has a total capacity of 123,048 AF with an additional surcharge capacity of 57,308 AF. Its principle 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 kilowatts. 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 cfs. 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 to 2004 has averaged 670 AF per year. The new area and capacity tables were first used in WY2006.

Water Year 2022 Operations Summary

Angostura Reservoir Started WY2022 at elevation 3,175.11 ft with storage of 75,485 AF, 12.09 ft and 47,563 AF below the top of the conservation pool. Precipitation for WY2022 was 14.82 inches at Oral Station, 84 percent of average. Inflows for WY2022 totaled 29,657 AF, 36 percent of average. Peak inflows occurred in March totaling 3,688 AF for the month. The peak reservoir elevation for WY2022 was 3,180.96 ft with storage of 96,472 AF, 6.24 ft and 26,576 AF below the top of the conservation pool, occurring on May 17, 2022. The minimum elevation for WY2022 was 3,170.61 ft with storage of 61,776 AF, 16.59 ft and 61,272 AF below the top of the conservation pool, occurring on September 22, 2022. WY2022 ended at elevation 3,170.67 ft with storage of 61,946 AF, 16.53 ft and 61,102 AF below the top of the conservation pool. Angostura Reservoir ended the water year with 33,280 AF in active storage.

The Angostura Irrigation District had a water allotment of 12 inches per acre for its irrigators. Releases for irrigation began May 17, 2022, and reached a peak of 266 cfs on August 3, 2022. The irrigation releases were terminated on September 16, 2022. Total irrigation deliveries were 25,484 AF.

An EAP orientation meeting was held on March 10, 2022.

An ASI for Angostura Dam was conducted on July 27, 2022. There are three incomplete Safety of Dams (SOD) recommendations regarding probabilistic seismic hazard analysis, seismic analysis of structural elements, and methodology/accuracy of historic toe drain flow data.

No dam safety related incidents occurred during WY2022.

There were no large construction contracts at Angostura in 2022.

Monthly Statistics For Water Year 2022

Record and near record monthly inflows in 71 years of record keeping were recorded during the following months: December had its ninth highest inflow.

Record and near record monthly end of month content in 71 years of record keeping were recorded during the following months: June had its tenth lowest storage, July had its ninth lowest storage, August had its seventh lowest storage, and September had its seventh lowest storage.

Additional statistical information on Angostura Reservoir and its operations during WY2022 can be found on Table DKT 16 through 19 and Figure DKG 5.

Table DKT 16.—Hydrologic data for 2022 Angostura Reservoir

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 Conversation	3,187.20	123,048	80,843
Top of Joint Use			
Top of Exclusive Flood Control			

Table DKT 17.—Storage and elevation data for Angostura Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date (end-of-day)
Beginning of Year	3,175.11	75,485	SEP 30, 2021
End of Year	3,170.67	61,946	SEP 30, 2022
Annual Low	3,170.61	61,766	SEP 22, 2022
Annual High	3,180.96	96,472	MAY 17, 2022
Historic High	3,189.37	*152,228	MAY 20, 1978

* 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 3189.0 on June 18, 1962)

Table DKT 18.—Inflow and outflow data for Angostura Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	29,657	Oct 21-Sep 22	43,196	OCT 21-SEP 22
Daily Peak (CFS)	194	Jun 07, 2022	273	AUG 07, 2022
Daily Minimum (CFS)	-97	May 11, 2022	1	FEB 25, 2022

Table DKT 19.—Inflow, outflow, and storage content data for Angostura Reservoir

	Inflow		Outflow		EOM Content	
Month	AF	Percent of Avg	AF	Percent of Avg	AF	Percent of Avg
October	2,553	113	100	9	77,938	80
November	2,501	105	230	16	80,209	82
December	2,611	128	258	38	82,562	83
January	2,457	109	196	33	84,823	84
February	2,902	65	87	10	87,638	84
March	3,688	27	63	1	91,263	82
April	3,615	47	267	7	94,611	82
May	3,439	19	2,976	21	95,047	80
June	3,539	18	7,310	36	91,303	77
July	792	11	13,248	83	78,847	72
August	1,135	37	13,107	103	66,875	67
September	425	41	5,454	100	61,946	65
Annual	29,657	36	43,196	52		
April-July	11,385	22				

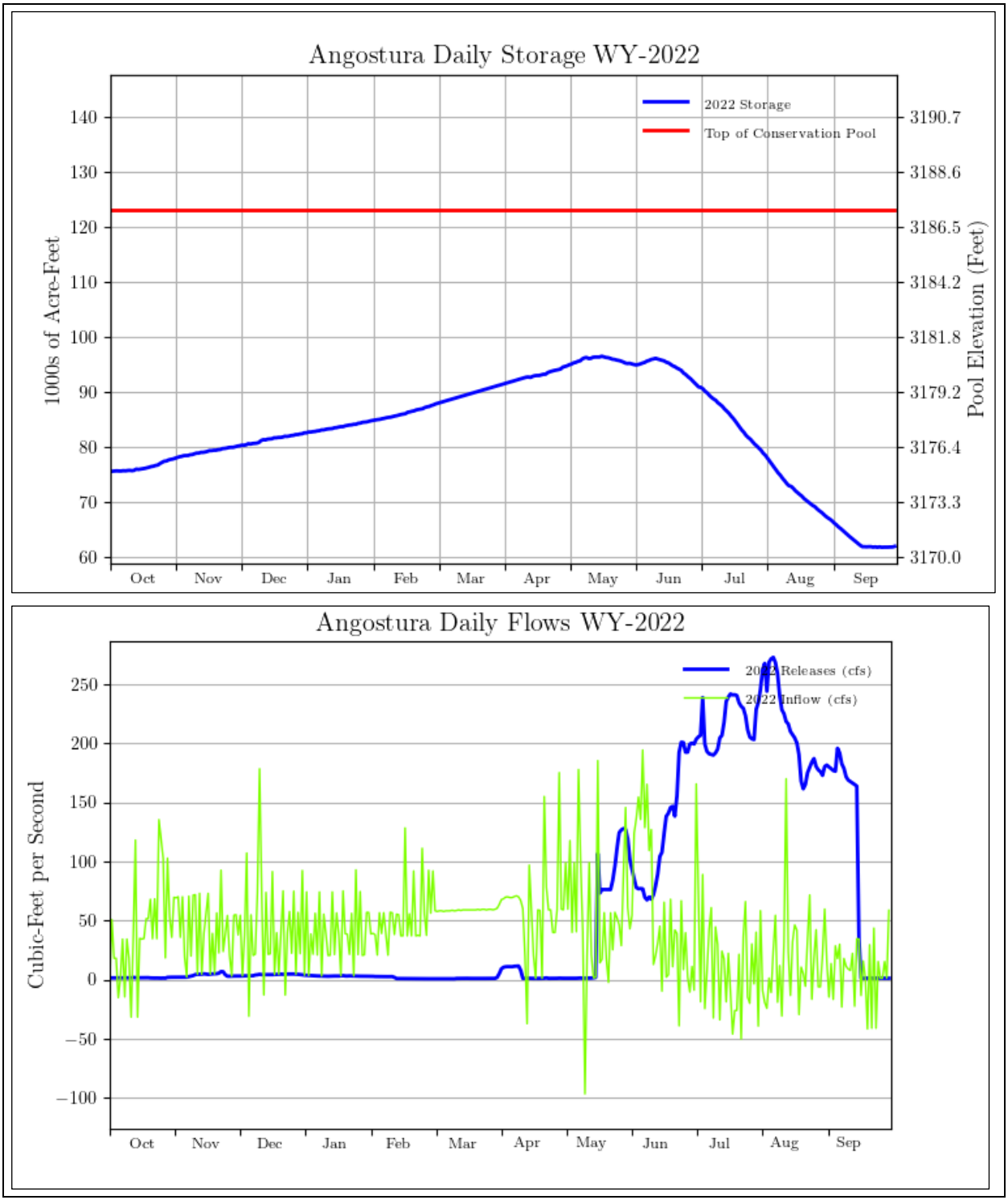


Figure DKG 6.—Angostura Reservoir water data.

Belle Fourche Reservoir

Background

Belle Fourche Reservoir located near Belle Fourche, South Dakota, is formed by Belle Fourche Dam on Owl Creek, a tributary of the Belle Fourche River. It has a total capacity of 172,873 AF (169,790 AF active). The reservoir is filled by diverting water from the Belle Fourche River through the Inlet Canal, which has a capacity of 1,300 cfs. 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 feet 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 Belle Fourche Irrigation District (BFID) is required to continue to bypass 5 cfs for domestic use prior to diverting the Johnson Lateral water right for up to 40 cfs. If flows into the diversion dam are greater than 45 cfs, the District is required to bypass up to 60 cfs for downstream irrigation rights. Any flows in excess of 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.

Water Year 2022 Operations Summary

Belle Fourche Reservoir started WY2022 at elevation 2,958.83 ft and with storage of 69,244 AF, 16.17 ft and 103,629 AF below top of conservation pool. Precipitation for WY2022 was 8.68 inches at Belle Fourche Station, 55 percent of average. Inflows for WY2022 totaled 116,445 AF, 102 percent of average. Peak inflows occurred in May totaling 18,897 AF for the month. The peak reservoir elevation for 2022 was 2,974.47 ft with storage of 168,637 AF, occurring on June 13, 2022. The minimum elevation for WY2022 was 2,958.87 ft with storage of 69,437 AF, occurring on October 1, 2021. WY2022 ended at elevation 2,963.19 ft and storage of 91,970 AF, 11.81 ft and 91,970 AF below the top of the conservation pool. Belle Fourche Reservoir ended the water year with 88,887 AF in active storage.

The BFID had a full water allotment of 18 inches for its irrigators. The North Canal and South Canals were turned on May 23, 2022, and May 18, 2022, respectively. Releases reached a peak of 370 cfs on August 18, 2022, for North Canal and a peak of 280 cfs on Aug 7, 2022, for South Canal. The South Canal was shut off September 23, 2022. The North Canal was shut off September 16, 2022. Total irrigation releases for the 2022 season were 99,858 AF.

An EAP orientation meeting was held on March 9, 2022.

The ASI for Belle Fourche Dam was conducted on August 3, 2022. There are no incomplete SOD recommendations.

No dam safety related incidents occurred.

A road maintenance contract was awarded to Bachman Construction LLC in 2020 for $117,993.40 to gravel, water, blade, and mow thirteen miles of government managed gravel roads at Belle Fourche Reservoir three times per year for three years during the summer recreation seasons. The construction service contract was completed in 2022.

The Provo, UT construction group was on-site at Belle Fourche Reservoir - Gaden's Point during 2022 and installed a new boat ramp on Gaden's Point utilizing an FLTP grant from the Federal Highway Administration.

Monthly Statistics For Water Year 2022

Record and near record monthly inflows in 71 years of record keeping were recorded during the following months: July had its sixth lowest inflow.

Record and near record monthly end of month content in 71 years of record keeping were recorded during the following months: No storage records were achieved.

Additional statistical information on Belle Fourche Reservoir and its operations during WY2022 can be found on Table DKT 20 through 23 and Figure DKG 6.

Table DKT 20.—Hydrologic data for WY 2022 Belle Fourche Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	2,927.00	3,083	3,083
Top of Active Conversation	2,975.00	172,873	169,790
Top of Joint Use			
TOP OF EXCLUSIVE FLOOD CONTROL			

Table DKT 21.—Storage and elevation data for Belle Fourche Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date (end-of-day)
Beginning of Year	2,958.83	69,244	SEP 30, 2021
End of Year	2,963.19	91,970	SEP 30, 2022
Annual Low	2,958.87	69,437	OCT 01, 2021
Annual High	2,974.47	168,637	JUN 13, 2022
Historic High	2,975.92	196,792	MAY 30, 1996

Table DKT 22.—Inflow and outflow data for Belle Fourche Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	116,445	OCT 21-SEP 22	93,720	OCT 21-SEP 22
Daily Peak (CFS)	826	APR 20, 2022	640	AUG 07, 2022
Daily Minimum (CFS)	-462	JUL 26, 2022	0	OCT 01, 2021

Table DKT 23.—Inflow, outflow, and storage content data for Belle Fourche Reservoir

Month	Inflow		Outflow		EOM Content	
	AF	Percent of Avg	AF	Percent of Avg	AF	Percent of Avg
October		106	0	0	80,245	104
November	11,001	108	0	0	90,801	105
December	10,556	110	0	0	100,482	106
January	9,681	111	0	0	110,343	107
February	9,861	96	0	0	119,327	106
March	8.984	68	0	0	130,015	102
April	10,688	129	0	0	147,754	105
May	17,739	130	3,533	47	163,118	110
June	18,897	127	10,087	60	167,606	117
July	14,575	-68	31,440	88	133,534	120
August	-2,633	47	33,947	98	100,893	127
September	1,306	114	14,713	86	91,970	137
	5,790					
Annual	116,445	102	93,720	83		
April-July	48,578	111				

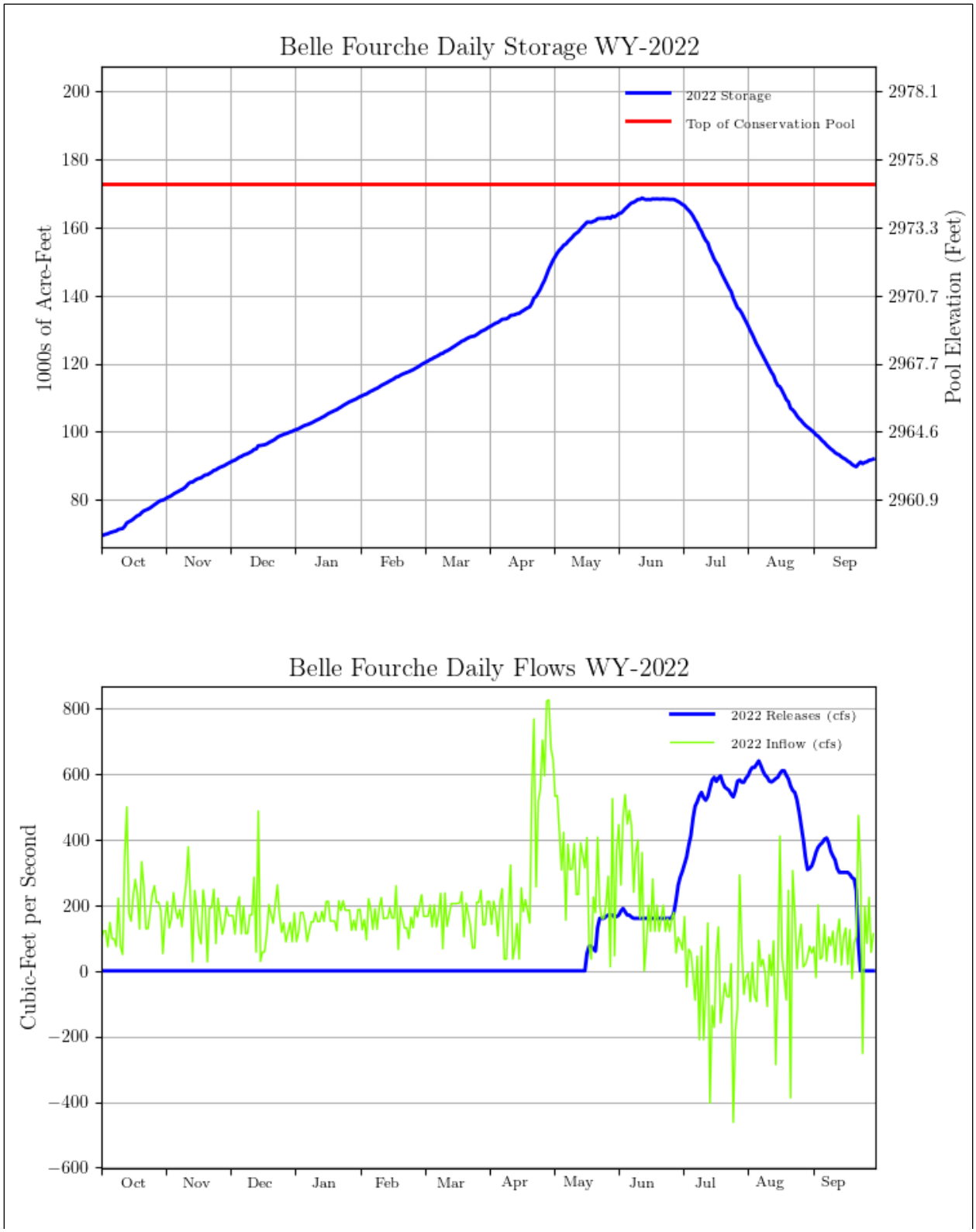


Figure DKG 7.—Belle Fourche Reservoir water data.

Deerfield Reservoir

Background

Deerfield Reservoir is located on Castle Creek, a tributary of Rapid Creek above Rapid City. Deerfield Reservoir (Rapid Valley Project) and Pactola Reservoir (Rapid Valley Unit, PS-MBP), 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 Rapid Valley Water Conservancy District for the storage space at Deerfield Reservoir. The majority of prior rights to the flows of Rapid Creek during the irrigation season is 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 feet, 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 of 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, 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-in bypass can provide.

Water Year 2022 Operations Summary

Deerfield Reservoir started WY2022 at elevation 5,906.53 ft and with storage of 15,048 AF, 1.47 ft below full and 606 AF below the top of the conservation pool. Precipitation for WY2022 was 104 percent of average. Inflows for WY2022 totaled 12,750 AF, 121 percent of average. Peak inflows occurred in May, totaling 1,295 AF for the month. The peak reservoir elevation for WY2022 was 5,907.90 ft with storage of 15,622 AF occurring on May 30, 2022. The minimum elevation for WY2022 was 5,906.31 ft with storage of 14,957 AF, occurring on November 18, 2021. WY2022 ended at elevation 5,907.30 ft with storage of 15,369 AF, 0.70 ft and 285 AF below the top of the conservation pool. Deerfield ended the water year with 15,218 AF in active storage.

Natural flows in Rapid Creek were above average throughout the water season. Rapid Valley Conservation District ordered 951 AF of water and the city of Rapid City ordered 1,045 AF of water in 2022 to meet the water demands.

An EAP orientation meeting was held on March 31, 2022.

An ASI examination was performed June 13, 2022. There are no incomplete SOD recommendations.

No dam safety related incidents occurred in 2022.

No construction contracts occurred at Deerfield Dam in 2022.

Monthly Statistics For Water Year 2022

Record and near record monthly inflows in 70 years of record keeping were recorded during the following months: October had its ninth highest inflow, November had its tenth highest inflow, December had its sixth highest inflow, January had its sixth highest inflow, and February had its sixth highest inflow.

Record and near record monthly end of month content in 70 years of record keeping were recorded during the following months: July had its eighth highest storage, August had its fourth highest storage, and September had its third highest storage.

Additional statistical information on Deerfield Reservoir and its operations during WY2022 can be found on Table DKT 24 through 27 and Figure DKG 7.

Table DKT 24.—Hydrologic data for WY2022 Deerfield Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	5,839.00	151	151
Top of Active Conversation	5,908.00	15,654	15,503
Top of Joint Use			
Top of Exclusive Flood Control			

Table DKT 25.—Storage and elevation data for Deerfield Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date (end-of-day)
Beginning of Year	5,906.53	15,048	OCT 01, 2021
End of Year	5,907.30	15,369	SEP 30, 2022
Annual Low	5,906.31	14,957	NOV 18, 2021
Annual High	5,907.90	15,622	MAY 30, 2022
Historic High	5,909.05	16,157	FEB 25, 1985

Table DKT 26.—Inflow and outflow data for Deerfield Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	12,750	OCT 21-SEP 22	12,429	OCT 21-SEP 22
Daily Peak (CFS)	49	MAY 12, 2022	25	MAY 31, 2022
Daily Minimum (CFS)	5	NOV 11, 2021	15	MAR 03, 2022

Table DKT 27.—Inflow, outflow, and storage content data for Deerfield Reservoir

Month	Inflow		Outflow		EOM Content	
	AF	Percent of Avg	AF	Percent of Avg	AF	Percent of Avg
October	1,176	165	1,230	152	14,994	117
November	1,056	164	1,077	234	14,973	115
December	1,124	168	1,107	264	14,990	113
January	1,098	166	1,107	269	14,981	111
February	984	161	1,000	245	14,965	109
March	1,021	113	930	143	15,056	108
April	1,114	90	893	85	15,277	108
May	1,295	89	954	69	15,618	110
June	1,168	91	1,219	92	15,567	110
July	944	100	986	84	15,525	111
August	977	132	1,015	84	15,487	115
September	793	121	911	80	15,369	118
Annual	12,750	121	12,429	119		
April-July	4,521	92				

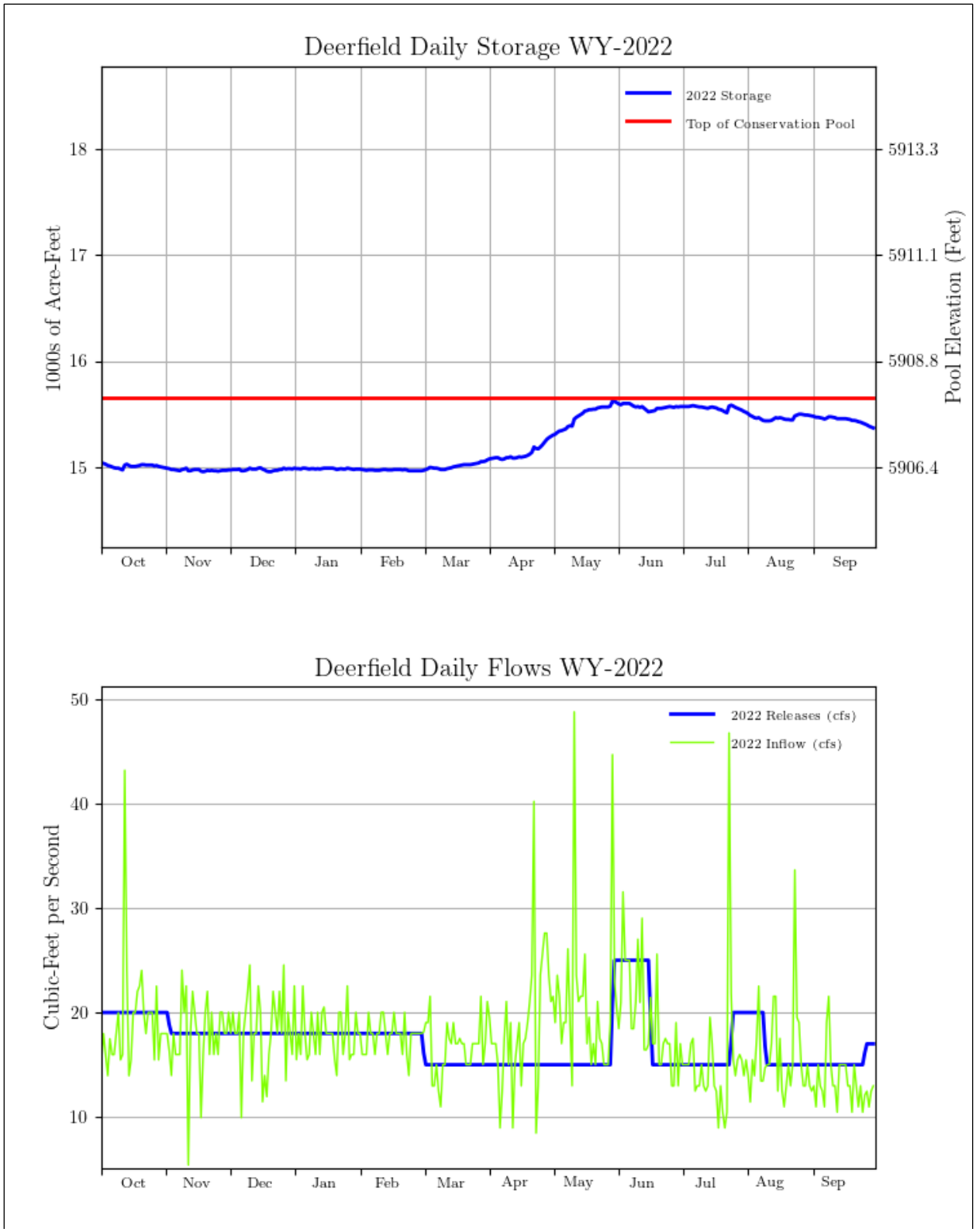


Figure DKG 8.—Deerfield Reservoir water data.

Keyhole Reservoir

Background

Keyhole Reservoir (PS-MBP), located on the Belle Fourche River below Moorcroft, Wyoming, 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 BFID 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 (CCID) 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 cfs at maximum water surface elevation. The downstream safe channel capacity is 3,000 cfs. Formulas for forecasting inflows have not been developed. Research by the Soil Conservation Service during water years 1992 through 1994 show that inflow forecasting to Keyhole Reservoir is not reliable since there is no consistent snowpack and precipitation is highly variable. 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 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 through 2003 has averaged 240 AF per year. The new area and capacity tables were first used in WY2006.

Water Year 2022 Operations Summary

Keyhole Reservoir started WY2022 at elevation 4,091.89 ft and storage of 128,144 AF, 7.41 ft and 60,527 AF below the top of the conservation pool. Precipitation for WY2022 was 73 percent of average. Inflows for WY2022 totaled -2,741AF (well below average). Peak inflows occurred in April, totaling 1,968 AF for the month. The peak reservoir elevation for WY2022 was 4,092.90 ft with storage of 135,300 AF, occurring on June 11, 2022. The minimum elevation for WY2022 was 4,090.62 ft with storage of 119,643 AF, occurred on September 30, 2022. WY2022 ended at elevation 4,090.62 ft and storage of 119,643 AF, 8.68 ft and 69,028 AF below the top of the conservation pool. Keyhole Reservoir ended the water year with 113,051 AF in active storage.

There were 1,405 AF of water released by CCID in WY2022.

There were 4,181 AF of water released by BFID in WY2022.

An Emergency Management/Security Tabletop Exercise was held March 16, 2022.

The ASI of Keyhole was conducted on July 13, 2022. There are no incomplete SOD recommendations.

No dam safety related incidents occurred at Keyhole in 2022.

There were no construction contracts at Keyhole in 2022.

Monthly Statistics For Water Year 2022

Record and near record monthly inflows in 71 years of record keeping were recorded during the following months: October had its tenth highest inflow.

Record and near record monthly end of month content in 71 years of record keeping were recorded during the following months: No storage records were achieved.

Additional statistical information on Keyhole Reservoir and its operations during WY2022 can be found on Table DKT 28 through 31 and Figure DKG 8.

Table DKT 28.—Hydrologic data for 2022 Keyhole Reservoir

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 Conversation	4,099.30	188,671	182,079
Top of Exclusive Flood Control	4,111.50	329,134	140,463

Table DKT 29.—Storage and elevation data for Keyhole Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date (end-of-day)
Beginning of Year	4,091.89	153,701	SEP 30, 2021
End of Year	4,090.62	119,643	SEP 30, 2022
Annual Low	4,090.62	119,643	SEP 30, 2022
Annual High	4,092.90	135,300	JUN 11, 2022
Historic High	4,100.38	210,222	MAY 21, 1978

Table DKT 30.—Inflow and outflow data for Keyhole Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	-2,741	OCT 21-SEP 22	5,760	OCT 21-SEP 22
Daily Peak (CFS)	398	JUN 04, 2022	87	JUL 29, 2022
Daily Minimum (CFS)	-452	OCT 28, 2021	0	OCT 01, 2021

Table DKT 31.—Inflow, outflow, and storage content data for Keyhole Reservoir

Month	Inflow		Outflow		EOM Content	
	AF	Percent of Avg	AF	Percent of Avg	AF	Percent of Avg
October	139	-37	0	0	128,283	131
November	-620	-197	0	0	127,663	131
December	412	219	0	0	128,075	131
January	139	28	0	0	128,214	131
February	485	18	0	0	128,699	128
March	976	12	0	0	129,675	120
April	1,968	80	0	0	131,643	123
May	1,282	26	0	0	132,925	120
June	715	24	0	0	133,640	120
July	-3,143	354	1,728	44	128,769	120
August	-3,595	190	4,032	112	121,142	119
September	-1,499	86	0	0	119,643	121
Annual	-13,734	-17	5,760	39		
April-July	822	9				

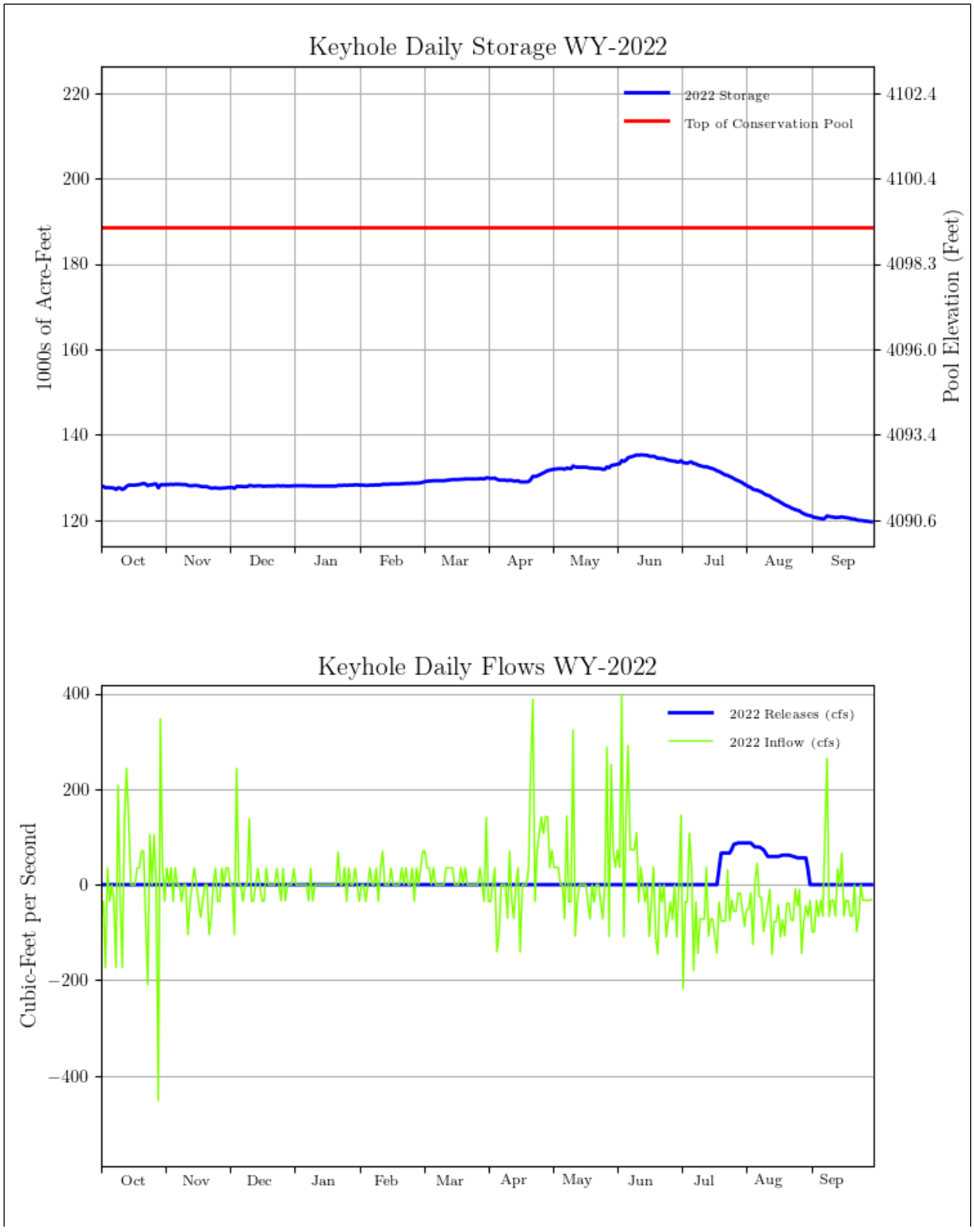


Figure DKG 9.—Keyhole Reservoir water data.

Pactola Reservoir

Background

Pactola Reservoir, Rapid Valley Unit (PS-MBP), located on Rapid Creek above Rapid City, South Dakota, acts in conjunction with Deerfield Reservoir, Rapid Valley Project, 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 NRCS SNOTEL snow monitoring (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) determined on the basis of present-day hydrologic technology. 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 feet, widening the existing rock-cut spillway chute and stilling basin from 240 feet to 425 feet, 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 the city and 6,000 AF was retained by Reclamation.

Water Year 2022 Operations Summary

Pactola Reservoir started WY2022 at elevation 4,576.28 ft with storage of 52,676 AF, 3.92 ft and 3,296 AF below the top of the conservation pool. Precipitation for WY2022 was 63 percent of average. Inflows for WY2022 totaled 34,395 AF, 88 percent of average. Peak inflows occurred in June totaling 4,669 AF for the month. The peak reservoir elevation for WY2022 was 4,580.12 ft with storage of 55,906 AF, occurred on June 7, 2022. The minimum elevation for WY2022 was 4,574.81 ft with storage of 51,481 AF, occurred on September 30, 2022. WY2022 ended at elevation 4,574.81 ft with storage of 51,481 AF, 5.39 ft and 4,491 AF below the top of the conservation pool. Pactola Reservoir ended the water year with 50,464 AF in active storage.

Natural flows in Rapid Creek were above average throughout the water season. Rapid Valley Conservation District ordered 951 AF of water and Rapid City ordered 1,045 AF of water in 2022 to meet the water demands.

An EAP orientation meeting was held on March 31, 2022.

An ASI examination was performed June 13, 2022. There is one incomplete SOD recommendation regarding an issue evaluation study to understand the risks with static potential failure modes at the dam.

No dam safety related incidents occurred at Pactola Dam during 2022.

No construction contracts occurred at Pactola Dam during 2022. Elevator refurbishment is being performed by Rapid City and is ongoing.

Monthly Statistics For Water Year 2022

Record and near record monthly inflows in sixty-seven years of record keeping were recorded during the following months: October had its tenth highest inflow.

Record and near record monthly end of month content in sixty-seven years of record keeping were recorded during the following months: October had its fourth lowest storage, November had its third lowest storage, December had its third lowest storage, January had its third lowest storage, February had its third lowest storage, March had its third lowest storage, April had its fourth lowest storage, and May had its ninth lowest storage.

Additional statistical information on Pactola Reservoir and its operations during WY2022 can be found on Table DKT 32 through 35 and Figure DKG 9.

Table DKT 32.—Hydrologic Data for WY2022 Pactola Reservoir

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 Conversation	4,580.20	55,972	54,955
Top of Joint Use			
Top of Exclusive Flood Control	4,621.50	99,029	43,057

Table DKT 33.—Storage and elevation data for Pactola Reservoir

Storage-Elevation Data	Elevation (FT)	Storage (AF)	Date (end-of-day)
Beginning of Year	4,576.28	53,676	SEP 30, 2021
End of Year	4,574.81	51,481	SEP 30, 2022
Annual Low	4,574.81	51,481	SEP 30, 2022
Annual High	4,580.12	55,906	JUN 07, 2022
Historic High	4,589.43	64,246	JUN 29, 2015

Table DKT 34.—Inflow and outflow data for Pactola Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	34,395	OCT 21-SEP 22	35,590	OCT 21-SEP 22
Daily Peak (CFS)	125	JUN 05, 2022	110	JUN 08, 2022
Daily Minimum (CFS)	-404	NOV 02, 2021	31	MAR 31, 2022

Table DKT 35.—Inflow, outflow, and storage content data for Pactola Reservoir

Month	Inflow		Outflow		EOM Content	
	AF	Percent of Avg	AF	Percent of Avg	AF	Percent of Avg
October	3,762	162	2,877	146	53,561	117
November	1,593	91	2,813	178	52,341	114
December	2,254	150	2,710	171	51,885	113
January	2,452	157	2,110	142	52,227	114
February	2,112	137	1,818	135	52,521	114
March	2,937	114	1,956	105	53,502	114
April	3,146	73	1,870	62	54,778	114
May	4,294	62	3,363	59	55,709	113
June	4,669	65	5,140	77	55,238	111
July	2,909	68	4,110	70	54,037	112
August	2,329	80	3,575	84	52,791	115
September	1,938	84	3,248	111	51,481	113
Annual	34,395	88	35,590	93		
April-July	15,018	66				

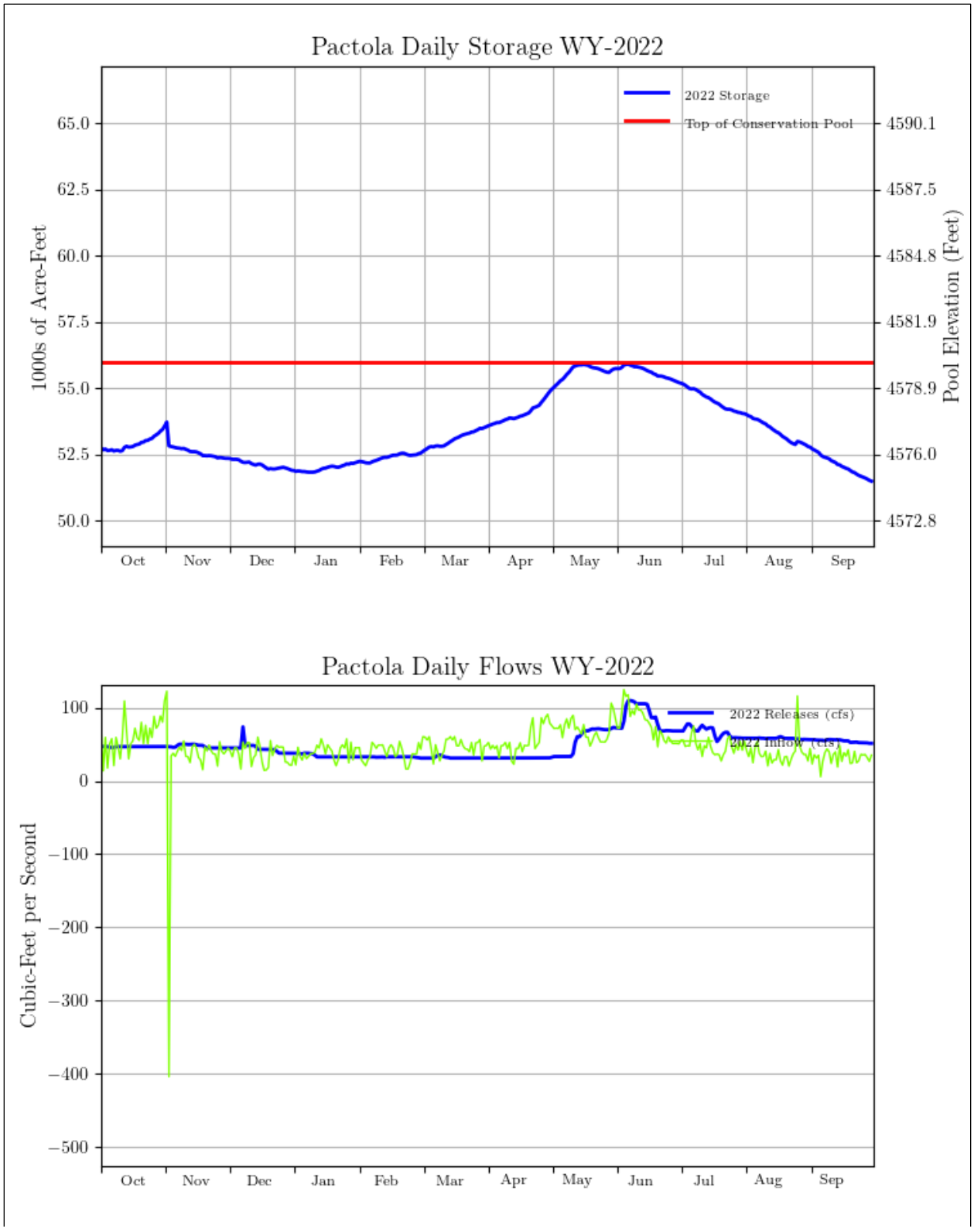


Figure DKG 10.—Pactola Reservoir water data.

Shadehill Reservoir

Background

Shadehill Reservoir, a feature of the Shadehill Unit (PS-MBP), is located on the Grand River near Shadehill, South Dakota, and was constructed for irrigation of 9,700 acres, 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 ungated 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 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 cfs 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 that 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 elevation 2,260 and 2,272 ft and because the Corps has constructed Bowman Haley Reservoir upstream from Shadehill Reservoir with 53,800 AF of flood control space, the Corps 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 and 2,272 ft revert to Reclamation. By a revised field working agreement dated May 15, 1972, it was agreed that the space between elevation 2,260 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.

Water Year 2022 Operations Summary

Shadehill Reservoir started WY2022 at elevation 2,261.30 ft with storage of 74,319 AF, 10.70 ft and 45,853 AF below the top of the conservation pool. Precipitation for WY2022 was 117 percent of average. Inflows for WY2022 totaled 31,360 AF, 42 percent of average. Peak inflows occurred in April, totaling 11,425 AF for the month. The peak reservoir elevation for WY2022 was 2,267.54 ft with storage of 99,126 AF, occurring on July 18, 2022.

The minimum elevation for WY2022 was 2,260.40 ft with storage of 71,232 AF, occurring on February 22, 2022. WY2022 ended at elevation 2,266.02 ft and storage of 92,565 AF, 5.98 ft and 27,607 AF below the top of the conservation pool. Shadehill Reservoir ended the water year with 48,696 AF in active storage.

All irrigation demands were met from river maintenance releases. There were no storage releases for irrigation needed during WY2022.

An Emergency Management/Security Functional Exercise was held March 22, 2022.

An ASI for Shadehill Dam was conducted on June 7, 2022. There are no incomplete SOD recommendations.

No dam safety related incidents occurred at Shadehill in 2022.

No construction contracts occurred at Shadehill in 2022.

Monthly Statistics For Water Year 2022

Record and near record monthly inflows in 71 years of record keeping were recorded during the following months: October had its tenth highest inflow, November had its eighth lowest inflow, January had its third lowest inflow, March had its tenth lowest inflow, and September had its tenth lowest inflow.

Record and near record monthly end of month content in 71 years of record keeping were recorded during the following months: No storage records were achieved.

Additional statistical information on Shadehill Reservoir and its operations during WY2022 can be found on Table DKT 36 through 39 and Figure DKG 10.

Table DKT 36.—Hydrologic Data for 2022 Shadehill Reservoir

Reservoir Allocations	Elevation (ft)	Total Reservoir Storage (AF)	Storage Allocation (AF)
Top of Inactive and Dead	2,250.80	43,869	43,869
Top of Active Conversation	2,272.00	120,172	76,303
Top of Joint Use			
Top of Exclusive Flood Control	2,302.00	350,176	230,004

Table DKT 37.—Storage and elevation data for Shadehill Reservoir

Storage-Elevation Data	Elevation (ft)	Storage (AF)	Date (end-of-day)
Beginning of Year	2,261.30	74,319	SEP 30, 2021
End of Year	2,266.02	92,565	SEP 30, 2022
Annual Low	2,260.40	71,234	FEB 22 2022
Annual High	2,267.54	99,126	JUL 18, 2022
Historic High	2,297.90	318,438	APR 10, 1952

Table DKT 38.—Inflow and outflow data for Shadehill Reservoir

Inflow-Outflow Data	Inflow	Date	Outflow	Date
Annual Total (AF)	31,360	OCT 21-SEP 22	13,290	OCT 21-SEP 22
Daily Peak (CFS)	1,059	JAN 24, 2022	21	JUL 18, 2022
Daily Minimum (CFS)	-781	APR 28, 2022	9	OCT 21, 2021

Table DKT 39.—Inflow, outflow, and storage content data for Shadehill Reservoir

Month	Inflow		Outflow		EOM Content	
	AF	Percent o Avg	AF	Percent of Avg	AF	Percent of Avg
October	3,069	237	1,048	27	76,340	70
November	-517	-58	1,013	31	74,810	71
December	170	23	1,045	41	73,935	71
January	-925	-103	1,035	44	71,975	70
February	394	12	902	43	71,467	69
March	1,847	8	999	9	72,315	62
April	11,425	57	997	6	82,743	69
May	10,492	96	1,217	12	92,018	76
June	6,058	68	1,229	15	96,847	80
July	2,517	75	1,294	24	98,070	82
August	-1,426	-506	1,290	31	95,462	83
September	-1,744	5626	1,221	35	92,565	83
Annual	31,360	42	13,290	18		
April-July	30,492	71				

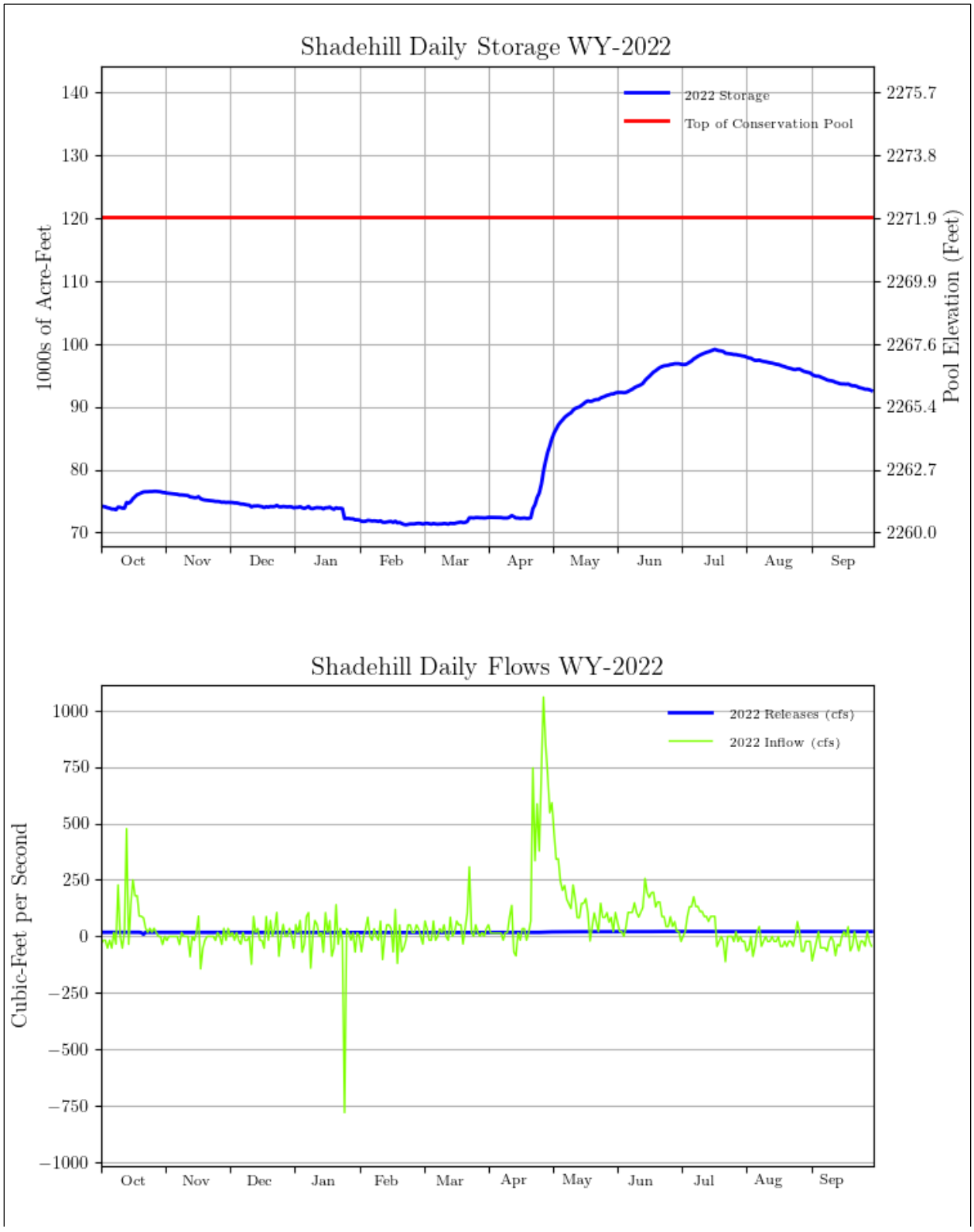


Figure DKG 11.—Shadehill Reservoir water data.

Summary of Operations for Water Year 2022 for Reservoirs Under the Responsibility of the Dakotas Area Office

Dickinson Reservoir

At the beginning of WY2023 Dickinson Dam and E. A. Patterson Lake (Dickinson Reservoir) had an elevation of 2,418.89 ft with storage of 7,220 AF, 1.10 feet and 1,392 AF below the top of the active conservation pool (elevation 2,420.00 ft at 8,452 AF). The reservoir is normally operated as full as possible at all times. 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

At the beginning of WY2023 Heart Butte Dam and Lake Tschida (Heart Butte Reservoir) had an elevation of 2,060.73 ft with storage of 53,951 AF, 3.77 feet and 13,191 AF below the top of the active conservation pool (elevation 2,064.50 at 65,091 AF). 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 2,064.50 ft the river releases will be maintained at about 10 cfs to ensure a live stream 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 ensured of filling.

Jamestown Reservoir

At the beginning of WY2023 Jamestown Reservoir had an elevation of 1,429.61 ft with storage of 27,408 AF, 1.39 feet and 3,080 AF above the top of the active conservation pool (elevation 1,428.00 at 24,226 AF). Water releases will be shut off when the reservoir elevation reaches approximately 1429.60 ft and will remain shut off throughout the winter until spring runoff requires releases to be made for flood protection. The reservoir is normally operated under the following criteria and limitations set forth in the field working agreement between the Corps and Reclamation that reads as follows:

Flood Control Regulation of Joint-Use Pool - Jamestown Reservoir

The joint space between elevations 1,428 and 1,431 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 at the beginning of spring runoff period. That portion of the joint-use pool between elevations 1,429.8 and 1,431.0 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 1429.8 ft after September 1 will be evacuated as directed by the Corps.

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 1,429.80 (Base of flood control zone) to elevation 1,431.00 ft (top of joint use pool)
  Release greater of:
  - Conservation releases
  - 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 at the time inflows cease.
- Season: September 1 to November 1
  Make releases necessary to evacuate reservoir to elevation 1,429.80 ft prior to November 1.

- Season: November 1 to beginning of spring runoff
  Make releases necessary to maintain elevation 1,429.80 ft.

Angostura Reservoir

Angostura Reservoir started WY2023 at elevation 3,170.67 ft, and storage of 61,946 AF, 16.53 ft and 61,102 AF below the top of the conservation pool (elevation 3187.2 at 123,048 AF). Since Angostura Reservoir is the principle source of water for the Angostura Irrigation District and no accurate inflow forecasts are available for this reservoir, it is typically operated as full as possible. Water may be released downstream to meet irrigation demands if the reservoir is expected to fill. In that case, excess water is released through the spillway when the reservoir is nearly full and assured of filling.

Releases are made from Angostura Reservoir for flood control or irrigation requirements. Flood control releases are typically made when significant precipitation events threaten to overfill the reservoir.

Belle Fourche Reservoir

Belle Fourche Reservoir started WY2023 at elevation 2,963.19 ft and storage of 91,970 AF, 11.81 ft and 80,903 AF below the top of the conservation pool (elevation 2975.0 ft at 172,873 AF). 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 cfs 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 BFIDt 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 feet per 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 feet. 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

Deerfield Reservoir started WY2023 at elevation 5,907.30 ft with storage of 15,369 AF, 0.70 ft and 285 AF below the top of the conservation pool (elevation 5,908 ft at 15,654 AF). The reservoir winter draw down was at 14,730 AF on December 1, 2021. 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 which is the start of the irrigation season. The Rapid Valley Water Conservancy District did not order water from Deerfield for irrigation in WY2021. Rapid City did not release water from Deerfield for municipal use in WY2022.

A release of around 13 cfs 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 NRCS SNOTEL snow monitoring 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 WY2022.

The jet flow gates are used for winter releases and provide minimum stream flows of 6 cfs or more which will enhancing winter fishery conditions in Castle Creek and improving fishery production conditions in the stream.

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 cfs 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

Keyhole Reservoir started WY2023 at elevation 4,090.62 ft and storage of 119,643 AF, 8.68 ft and 69,028 AF below the top of conservation pool (elevation 4,099.3 at 188,671 AF).

Releases from Keyhole Reservoir are made for either irrigation requirements or flood control. Releases are not anticipated from the reservoir from October through May. Flood control releases are not expected unless extreme precipitation events threaten to overfill 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 BFIDin South Dakota and the (CCID) in Wyoming. Each organization maintains a storage account in Keyhole Reservoir. The contract with the BFID also includes provisions for the annual purchase of additional unsold South Dakota storage. Peak irrigation demand releases are normally between 125 and 175 cfs.

The BFID 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 BFID 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

Pactola Reservoir started WY2023 at elevation 4,574.81 ft and storage of 51,481 AF, 5.39 ft and 4,491 AF below the top of the conservation pool (elevation 4,580.2 ft at 55,972 AF). Operating criteria established for the reservoir in the Definite Plan Report called for minimum winter conservation releases to be 7 cfs from October 1 to April 15 and 20 cfs from April 15 to October 1 when the reservoir content is below 29,000 AF. Releases of 15 cfs from October 1 through March 1 and 20 cfs from March 1 through October 1 are established for reservoir content above 29,000 AF. Minimum summer conservation releases are 20 cfs.

- Reservoir content less than 29,000 AF (with no water in the U.S. storage)
  October 1 - April 15 7 cfs
  April 15 - October 1 20 cfs
- Reservoir content greater than 29,000 AF (with no water in the U.S. storage)
  October 1 - March 1 15 cfs
  March 1 - October 1 20 cfs

Pactola Reservoir is typically 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 standing operating plans. The following minimum releases will be made as long as water is available in the Fisheries, Wildlife, and Recreation Pool (U.S. storage).

- Reservoir content less than 29,000 AF (with water in the U.S. storage)
  October 1 – April 15 15 cfs
  April 15 - October 1 20 cfs

- Reservoir content greater than 29,000 AF (with water in the U.S. storage)
  Year round 20 cfs

Although it is not mandatory, if possible, Pactola Releases can be adjusted during the summer months to aim for 40 cfs passing the gauging station in Founder's Park. Also, if possible, during the cooler fall months Reclamation aims for 30 to 35 cfs 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 cfs. Also, the Reclamation has an instream flow right for U.S. storage release flows that is in addition to the 10 cfs minimum required by the State for natural flows past Farmingdale.

The winter release for WY2023 is approximately 40 cfs and has been coordinated with Rapid City, South Dakota Department of Game, Fish, and Parks, local water users, Forest Service, and Corps. With a reservoir content of 29,000 AF and above, a release of 20 cfs 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 cfs 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 cfs and 1000 cfs. Releases in excess of 200 cfs when storage is below the top of the conservation pool at elevation 4,580.20 ft will be cleared with the Corps. The Corps 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.

Shadehill Reservoir

Shadehill Reservoir started WY2023 at elevation 2,266.02 ft and storage of 92,565 AF, 5.98 ft and 27,607 AF below the top of the conservation pool (elevation 2272.0 ft at 120,172 AF). The winter release will be maintained at approximately 50 cfs to prepare the reservoir elevation for spring inflows. This release rate will be maintained constant until ice melts out in the channel in the spring to prevent ice jams at crossings. In the spring, after ice melts out of the channel, the release will be adjusted based on inflows and storage in the reservoir. 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, consisting primarily of ranchers.